

The Multidimensional Poverty Index (MPI)

A brief introduction to a new poverty measure developed by:

Oxford Poverty and Human Development Initiative (OPHI) and UNDP Human Development Report (HDR)

I. Introduction

Since gradually rising to the top of international social and economic policy agendas following the end of World War II, the field of “international human development” has undergone a succession of often-remarkable improvements driven by a quasi-constant learning process. Some of the most important steps forward – slowly bridging the gap between theory and practice, and between policies and outcomes – have occurred in the fields of data and measurement. Within the scope of data and measurement, the following discussion will focus on the most recent improvement in the measure of poverty, the development of the Multidimensional Poverty Index (MPI). After first moving away from its traditional income-based poverty measurement method towards the broader Human Poverty Index (HPI) for its Human Development Reports (HDRs) as of 1997, in 2010 the UN Development Program made a second transition by adopting the MPI to measure poverty. The creation of the Multidimensional Poverty Index is a direct reflection of progress in both our understanding of socio-economic development, as well as in our capacity to use data to pursue this objective.

Our discussion will seek to address the defining characteristics of the MPI, to offer a general illustration of how this index is calculated and to give an idea of the different applications it can have. The goal will be to better understand the MPI’s technicalities as well as its potential to serve as a tool to improve the fields of social and economic development by optimizing data-use both for *ex-ante* policy formulation as well as *ex-post* impact assessments.

II. MPI - Insights into the multidimensionality of poverty

Often associated with re-known economist Amartya Sen's 'capabilities approach' to human development, the MPI is designed to account for the fact that the full experience and constraints of poverty cannot be appropriately reflected by one deprivation (income), in addition to the fact that when combined for one person, multiple deprivations across several basic indicators can have negative interaction-cumulative effects leading to a higher 'intensity' of poverty. "Poor people themselves define their poverty much more broadly to include lack of education, health, housing, empowerment, employment, personal security, and more..." (OPHI, 2011) Moreover, it is important to consider non-income forms of deprivation independently from income (and not just as additional, cumulative factors that make some already financially-poor people worse off than others): in many countries, the poor quality of public infrastructure and provision of essential services (think crime/conflict, electricity blackouts, clean water, sanitation networks, education, etc...) may cause some financially well-off people to nonetheless face forms of deprivation that preclude them from achieving basic levels of human development.¹

One of the objectives of the MPI, then, is to reach a level of detail, or granularity, that allows users to determine the specific types and combinations of deprivations affecting individuals or households. One of the measure's most important innovations is that it offers analysts and policy-makers the capacity to 'fold and un-fold' the data according to various scales of analysis – that is, to alternatively pass from an aggregate (national) level down to successive disaggregated levels (sub-national region, social group, household or individual.) At the same time, because it also differentiates between different types of deprivations (different dimensions

¹ Examples of cross-country variations in poverty profiles: "Only 40 per cent of Ethiopia's people are income poor (living on less than US \$1.25 a day), whereas 89 per cent are poor by the MPI. Less than one fifth of Yemen's people are income poor, whereas more than half are poor by the MPI. Conversely, in Mongolia, 22 per cent are income poor, compared to 6 per cent MPI poor." (OPHI, 2011)

of poverty, and different indicators – see details below), the MPI also serves to observe “patterns of poverty – how much a each indicator or each dimension contributes to poverty”(OPHI, 2011) in a given context. Both of these axes of innovation are helping to better understand the nuances of ‘poverty’ by exposing the very different forms and varying levels of intensity it can take across countries or regions, and helping to study the interconnections between different deprivations.

III. Data

Of course, no matter how important measurement techniques may be, they are only ever as accurate as the quality of the data on which they are based. In order to offer the possibilities mentioned above, the MPI has a few requirements regarding underlying data sets: for best results, the measure must be calculated using one common survey that provides data at the individual level, or alternatively at the household level (or two surveys with common individual and household IDs, in which case the data sets can be merged). For some dimensions of poverty, working at the household level implies accepting some assumptions that make the MPI different from traditional measures of poverty. This point can be illustrated by looking at the main cross-country MPI developed for the UNDP Human Development Report and by differentiating between the Living Standards dimension on the one hand, and the dimensions for Health and Education on the other. For living standard indicators (i.e. water, electricity, sanitation, etc..), working at the household level is not problematic and is consistent with traditional measures because a deprivation automatically affects all household members equally. However, the indicators for Health and Education – such as nutrition, or years of schooling – are individual-level indicators. Therefore a household-level MPI analysis relies on the concept of positive and negative externalities to assume that the negative or positive effects stemming from one

household member's deprivation generally extend to the other members of the household. For example, having one household member with a higher level of education can generate sufficient positive externalities to the rest of the household so that the latter need not be considered deprived in terms of education.

Data availability is a key issue and critical area for progress. While in developed countries we often take for granted the availability of reliable data sets drawn from comprehensive and periodic surveys, data collection is often a much more complicated and irregular process in many developing countries. As a result, designing an MPI and selecting which indicators will be included can be a process of negotiation between the analytical-policy objectives one desires to reach, and the limits given which data is available to reach these objectives. In some cases, exceptions can be made for key indicators: for example, if data for a given form of deprivation is not available in the survey (and cannot be applied to the specific household or individual IDs), one option can be to calculate geographic values and then apply the deprivation uniformly across a given area (region, district, municipality, etc..). While this technique requires compromising some accuracy, it can prove useful. This current constraint is also identified by OPHI and UNDP analysts as a potential area for research and methodological innovation – for instance, might it be possible to calculate different MPI measures using different data sets and then to aggregate or average results?

IV. Calculating the MPI – UNDP Global MPI and regional-national variants

Currently there are two main applications of the MPI.

The first and most prominent is a centralized, standard cross-country measure of MPI developed by OPHI and UNDP for application on a global scale and for recurring use in the UNDP Human

Development Reports (HDRs). Of course when trying to cover so many countries data availability is a key issue, and this version was specifically crafted so that the required data is available in as many countries as possible (104 and then 109 in 2010 and 2011). The dimensions and indicators have nonetheless been chosen through “a consultation process with experts in each dimension to determine which proxies would be most feasible and appropriate” (OPHI, 2011), and the various cut-off levels are often drawn from internationally-recognized standards such as the Millennium Development Goals.

The second application is through customized measures, generally developed at the national level by governments seeking to take advantage of the MPI methodology’s flexibility to adapt it to fit the national context and reflect political-social-cultural values and priorities.

First we will conduct a simplified step-by-step MPI calculation, using the OPHI/UNDP global MPI as a model, in order to see how the final index value is reached. Afterwards we will look at the topic of customized MPIs and explain how these can be used and the advantages they can offer for national-level development.

IV – 1. Global MPI calculation exercise

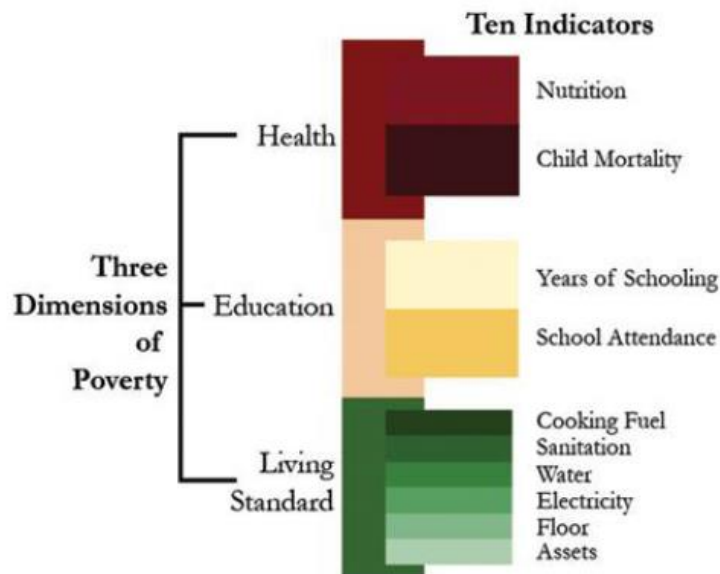
The following exercise is a replication of a guide offered by Oxford’s Poverty and Human Development Initiative.

Step 1: Defining the data source

Step 2: Choosing the unit of analysis

Step 3: Choosing the dimensions and indicators

Figure 1. Composition of the MPI – dimensions and indicators



Step 4: Choosing the indicators' deprivation cut-offs (cf. deprivation matrix, step 7)

Step 5: Choosing the indicators' weights

Here each dimension is given an equal weight of 30%, and thereafter each indicator's weight is determined by the number of indicators for any given dimension (see deprivation matrix, step 7.)

Step 6: Choosing the poverty cut-off (to identify the poor)

A second cut-off or threshold is used to identify the multi-dimensionally poor, which in the Alkire-Foster methodology is called the **poverty cut-off**. Someone or a household is considered poor if the weighted deprivation score is equal or greater than the poverty cut-off. In the MPI, a person is identified as poor if he or she has a deprivation score higher than or equal to 1/3. In other words, a person's deprivation must be no less than a third of the considered indicators to be considered **MPI poor**.

Step 7: Computing the MPI

In this step we develop a deprivation matrix that allows us to compile household-level data for each dimension and indicator, then to use the dual cut-offs (first cut-off is what makes a household deprived for one indicator, then the second is what a household's aggregate weighted deprivation needs to be for that household to be counted as deprived, or poor) to then calculate the incidence (H) and the intensity (A) of poverty in our population. The MPI is then simply calculated as the product of incidence and intensity.

Dimensions	Household size	Households				Weights
		A	B	C	D	
Education		4	7	5	4	
Indicators	No one has completed five years of schooling	0	1	0	1	1/6 = 0.167
	At least one school-age child is not enrolled in school	0	1	0	0	1/6 = 0.167
Health						
	At least one member is malnourished	0	0	1	0	1/6 = 0.167
	One or more children have died	1	1	0	1	1/6 = 0.167
Living Standards						
	No electricity	0	1	1	1	1/18 = 0.056
	No access to clean drinking water	0	0	1	0	1/18 = 0.056
	No access to adequate sanitation	0	1	1	0	1/18 = 0.056
	House has dirt floor	0	0	0	0	1/18 = 0.056
	Household uses 'dirty' cooking fuel (dung, firewood, or charcoal)	1	1	1	1	1/18 = 0.056
	Household has no car and owns at most one bicycle, motorcycle, radio, refrigerator, telephone or television	0	1	0	1	1/18 = 0.056
	Total deprivations:	2	7	5	5	
	Weighted deprivation for household, C_i :	0.222	0.722	0.389	0.5	
	Household deprived (i.e. below cutoff $k=0.33$)?	No	Yes	Yes	Yes	
	Censored score C_i (k)	0	0.722	0.389	0.5	

Note: In the following table, '0' and '1' correspond to 'non-deprived' and 'deprived' and therefore already reflect the application of the first indicator-level cut-off.

Calculations:

Weighted deprivation of each person in Household 1:
$$C_i = \left(1 \times \frac{1}{6}\right) + \left(1 \times \frac{1}{18}\right) = 0.222$$

The aggregate weighted deprivation (C_i) represents a measure of the household's deprivation adjusted to reflect the weights given to each indicator. The weighted deprivation for this household falls under the established cut-off of 33% (step 4) therefore this household is not considered multi-dimensionally deprived and it is excluded from MPI calculations – this process is referred to as 'censuring.'

Incidence of poverty (Multidimensional Headcount ratio):

$$H = \frac{(7 + 5 + 4)}{(4 + 7 + 5 + 4)} = 0.80$$

The Headcount ratio (H) represents the incidence of poverty, or the proportion of people within the population who experience deprivations. In this case, 80% of the population is poor.

Intensity of poverty (Adjusted Headcount Ratio)

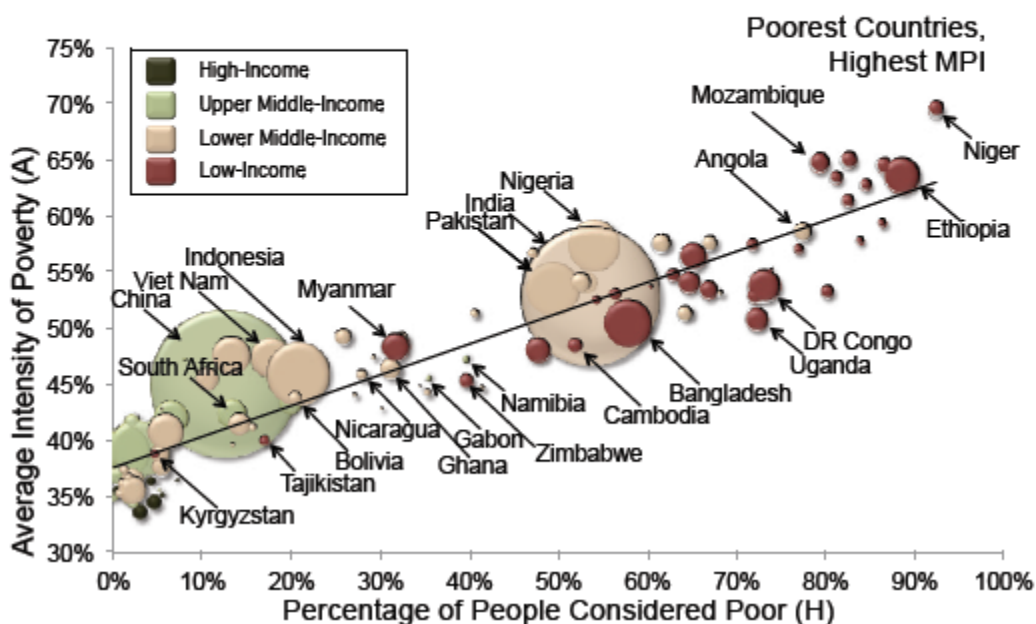
$$A = \frac{(0 \times 4) + (0.722 \times 7) + (0.389 \times 5) + (0.5 \times 4)}{(7 + 5 + 4)} = 0.56$$

The Adjusted Headcount Ratio (A) represents the intensity of deprivation, or the average proportion of weighted deprivations each household experiences.

$$MPI = H \times A = 0.450$$

The figure below is interesting because it shows a distribution of all countries whose standard MPI was calculated in 2010, while differentiating between differences in incidence and intensity of poverty as well as how these countries are classified according to traditional income-level considerations. As might be expected, we find a clear correlation between these three factors, in spite of a few exceptions as noted in the figure’s caption (e.g. Kyrgyzstan and Tajikistan having particularly low intensity of poverty.)

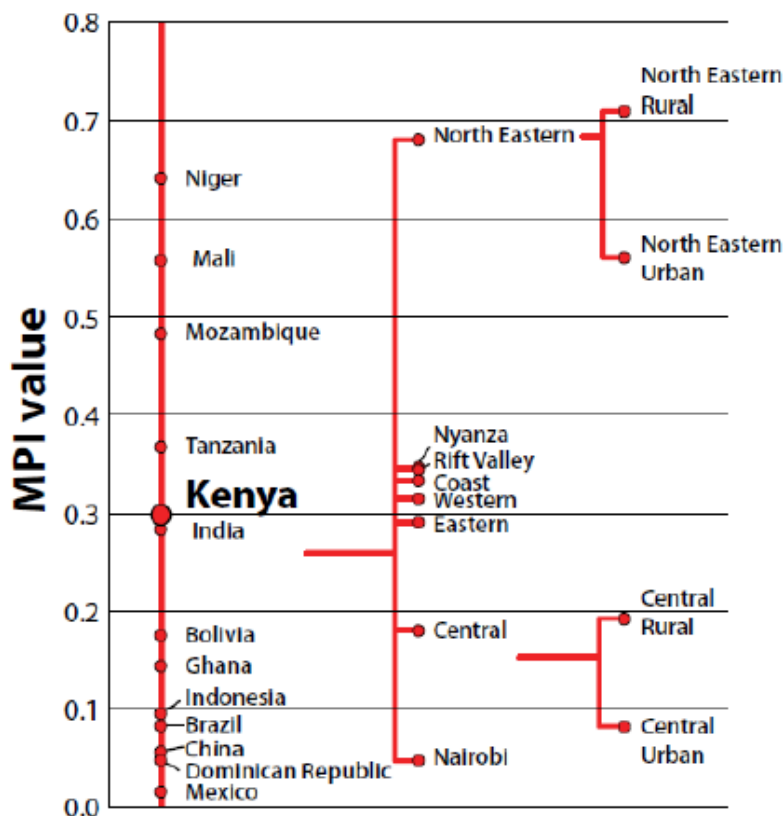
Figure 7. Bubble chart showing the relationship between the percentage of MPI poor people, average intensity of MPI poverty and income. Low income countries are spread across the chart, from Kyrgyzstan to Niger. Countries with greatest MPI poverty (highest incidence and greatest intensity) are located in the top right.



IV. -2. Customized MPIs

The margin of discretion that policy makers have when approaching the steps (3,4, 5) of the calculation process for a tailored national or regional MPI reflects the flexibility of this measurement method since it allows adjustments in order to incorporate alternative indicators, cut-offs, and weights that may be more appropriate for a specific context (regional, national or subnational.) For some countries the indicator-level deprivation cut-offs may be higher if not being deprived requires higher minimum values – education offers a good example, since the minimum years of schooling required to secure a job might be higher in some countries than others.

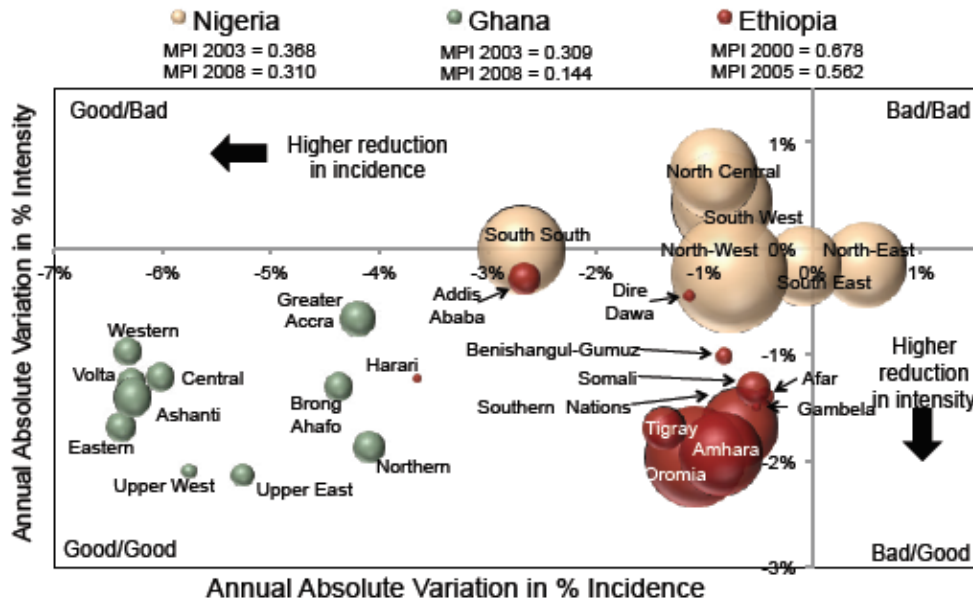
Poverty measures are often important political tools, serving to shape public perceptions of poverty and to generate public debates about national or regional development/ poverty-reduction priorities. Reliable and robust empirical support may prove especially crucial for politically sensitive issues, including competition over government resource allocation between social groups or subnational regions. Policy-makers and development practitioners can then use this information to gain insights into the specific challenges that need to be addressed, and they can use the MPI to establish policy priorities both through the selection of indicators as well as the distribution of weights. For example, if health is a priority and a higher weight is given to this dimension, any subsequent policy achievement/on-the-ground impact will have a direct effect on the MPI value (as opposed to the delayed effect for income-based poverty measures), and it will also have a stronger effect due to the higher weight. This direct correlation can serve as a powerful political incentive. The ultimate result, then, can be to optimize policy design and resource allocation, and then to more precisely assess the impact of targeted projects or programs – by degree as well as by geographic distribution. The two following graphs provide an illustration.



Source: HDR 2010, Figure 5.11, p. 99, from Alkire and Santos (2010), revised.

In the first figure (above), we see how the MPI measurements for Kenya can be disaggregated – first down to sub-national regions, and then further to differentiate between the rural and urban areas of each region. Meanwhile, the way the information is displayed facilitates a direct assessment of how levels of poverty vary throughout the country while also making a comparison with the poverty levels of other countries.

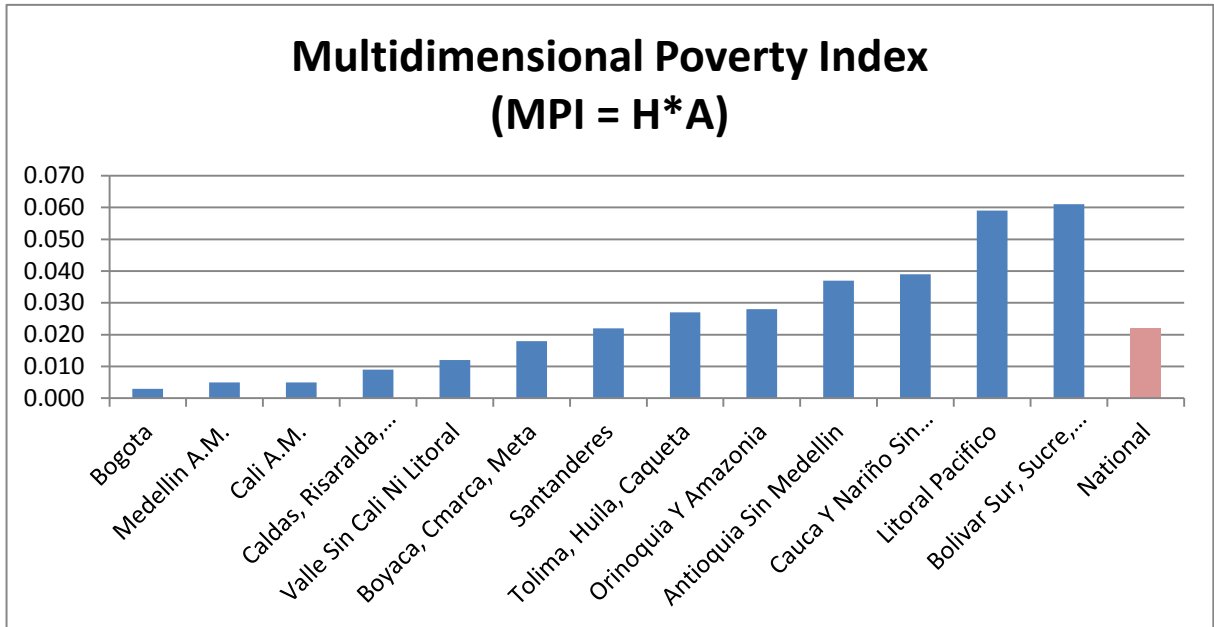
Figure 4. Changes in incidence and intensity of MPI poverty at the sub-national level in Nigeria, Ghana and Ethiopia. The regions at the bottom left of the graph show the most positive reductions (in both incidence and intensity), while the regions at the top right show the least change in both areas (or, in some cases, increases).



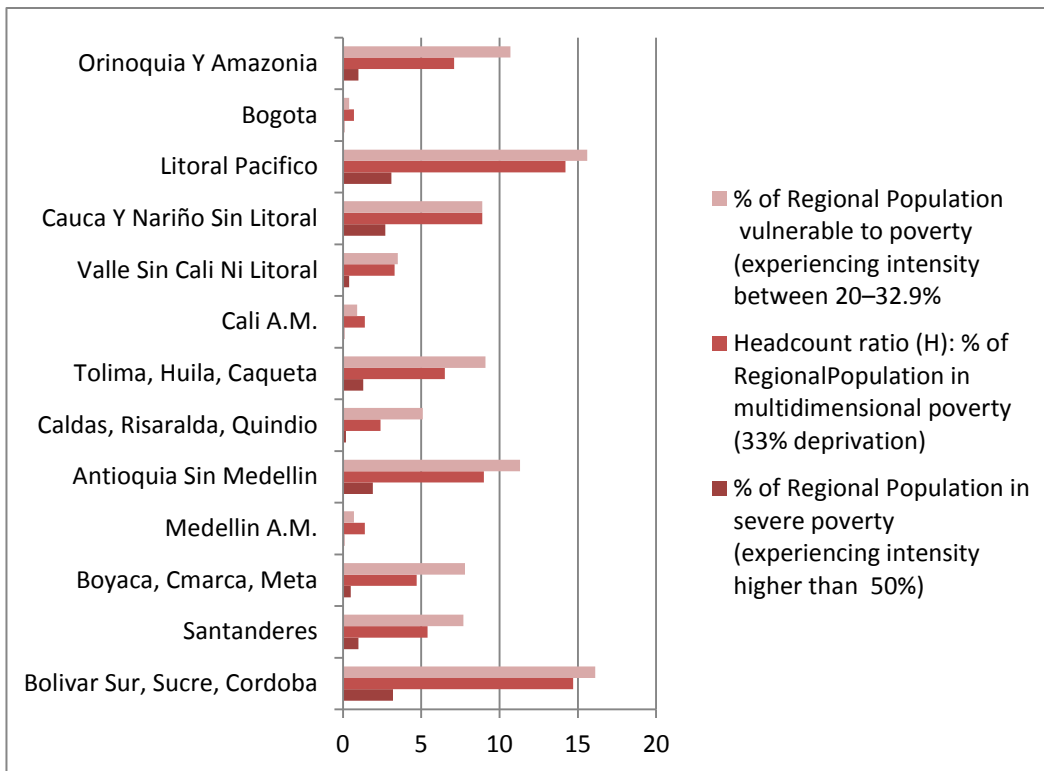
The second figure (above), offers a graphic representation of trends in changes in the incidence and the intensity of poverty (as seen in the preceding section, the product of these two components gives the value for the MPI), showing not only cross-country but also within-country regional comparisons, as well as the impact of each region in terms of population size.

On the following page, two graphs were reproduced using 2010 national and sub-national data from Colombia. While only 2010 data was available and therefore changes across time could not be graphed, this first exercise already allows us to see that focusing on Colombia's national MPI value might actually preclude from appreciating the significant regional variations that exist. Therefore users of the MPI can not only identify which regions face higher levels of deprivation, but also target their policies better by seeing which regions need policies intended to address severe poverty as opposed to those that require more social protection-type programs for higher % of population not yet 'deprived' but nonetheless at risk of becoming so soon.

Colombia 1. Regional variations in MPI values, 2010 (data from OPHI)



Colombia 2. Shares of population facing different intensities of deprivation, by region. 2010



V. Conclusion

As we have seen, the newly developed Multidimensional Poverty Index offers some very important innovations. In comparison to previous poverty measurement methodologies, the MPI is a reflection of both our understanding of the nature and dynamics poverty, as well as our capacity to use data effectively to improve both data-based policy planning and policy impact assessment. Of course, while this represents a step in the right direction, it nonetheless still faces a number of limitations and shortcomings. Among the most important constraints is the reliability and availability of data – the stricter requirements of the MPI both serve to highlight current weaknesses affecting data collection and information management activities in developing countries, but in doing so it also serves to pressure public entities into making progress in the right direction and offers them a better idea of what is specifically required.

Instead of creating MPIs as a compromise between desired indicators and available data, several countries have first designed ideal MPIs fully reflecting national priorities, and then developed new recurring surveys to collect this data. This process is often an integral part of establishing Socio-Economic Monitoring Systems (SEMS) for developing countries.

However, one important risk must be mentioned in relation to the MPI – because the measure offers so much flexibility to governments to pick-and-choose indicators, weights and cut-off lines, it also allows them to easily manipulate the design process to come up with a final outcome that might not reflect reality. (I personally assisted OPHI/UNDP/Government of Iraq workshops to develop the MPI for Iraq, and in this case the role that political considerations played in shaping the design of the MPI and its final value was not always very clear.)