Multidimensional Poverty Index (MPI)

First Draft ~ 4 March 2011

Comments, suggestions, and other inputs are warmly welcome at:
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Purpose: To measure simultaneous deprivation in multiple dimensions

Components: Health, Education and Living Standards

Data required: Household Surveys that contain information on Health, Education and Living Standard Variables

For international comparisons:

- Demographic and Health Survey (DHS)
- Multiple Indicators Cluster Survey (MICS)
- World Health Survey (WHS)

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1 This draft was prepared by OPHI for UNDP, and use with the joint 2011 Oxford Human Development Training Course Participants. It will be revised considerably drawing on their responses, insights and suggestions. This document was compiled with information from different Human Development Reports and other publications by UNDP. Diego Zavaleta and Melissa Friedman collated source materials for this draft, with support from Sebastian Silva Leander, Sabina Alkire, Maria Emma Santos, and others at HDRO including Amie Gaye and Tim Scott. Graphics are in progress for the next draft, and comments are warmly welcomed!
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i. OVERVIEW

The Multidimensional Poverty Index (MPI) is a measure designed to capture acute deprivations that people face at the same time. The MPI reflects both the incidence of multidimensional deprivation (the number of people that suffer deprivations in multiple aspects of life at the same time within a given population), and its intensity (how many deprivations they experience at the same time on average). It can be used to create a comprehensive picture of people living in poverty, and permits comparisons both across countries, regions and the world and within countries by ethnic group, urban/rural location, as well as other key household and community characteristics. The MPI builds on recent advances in theory and data to present the first global measure of its kind, and offers a valuable complement to traditional income-based poverty measures. The 2010 Human Development Report (HDR) presents estimates for 104 countries with a combined population of 5.2 billion (92 percent of the population in developing countries). About 1.7 billion people in the countries covered – a third of their entire population - live in multidimensional poverty.

BOX 1: How can the MPI be interpreted?

The MPI identifies overlapping deprivations at the household level across the same three dimensions as the Human Development Index (living standards, health, and education) and adjusts the proportion of people that are poor by the average proportion of weighted deprivations they experience. An easy way to interpret the MPI is that it provides the proportion of (weighted) deprivations that the poor experience in a society from all the potential deprivations the society could experience in the ten considered indicators.
**BOX 2: ‘Poverty’ and ‘multidimensional’ poverty**

Poverty has traditionally (yet not exclusively) been measured in one dimension (income or consumption). Yet one deprivation alone may not represent an accurate picture of poverty. The MPI requires a household to be deprived in multiple indicators simultaneously in order to be considered poor. More precisely, a person is multidimensionally poor if the weighted indicators in which he or she is deprived add up to at least 30 percent.

The MPI does not include income due to data constraints. Income poverty data come from different surveys than those used for the MPI, and these surveys often do not have information on health indicators such as mortality and nutrition. For most countries it was impossible to identify whether the same people are income poor and also deprived in all the MPI indicators so could not include income. However, income could be incorporated for national measures if data is available and there are reasons to think it would add value to the poverty estimate.

**BOX 3: Acute poverty and Extreme poverty**

The MPI reflects the severe deprivations that people face at the same time. Because it was designed to internationally compare across developing nations, it is most relevant to developing countries. We have described the MPI as a measure of ‘acute’ poverty to avoid confusion with the World Bank’s measure of ‘extreme’ poverty that captures those living with less than $1.25 a day.

Poverty has been measured in the Human Development Reports through the Human Poverty Index (HPI) since 1997. The MPI now replaces the HPI. Pioneering in its day, the HPI used country averages to reflect aggregate deprivations in health, education, and standard of living. It could not identify specific individuals, households or larger groups of people as jointly deprived. The MPI addresses this shortcoming by capturing the proportion of people that experience overlapping deprivations (incidence) and the average proportion of weighted deprivations they suffer (intensity). Indeed, each household has its own profile of multidimensional poverty. The MPI can be broken down by indicator to show the composition of multidimensional poverty across different regions, ethnic groups or any other population sub-group, with useful implications for policy.
BOX 4: What are the main limitations of the MPI?

The MPI has some drawbacks, due mainly to data constraints.

First, the indicators include both outputs (such as years of schooling) and inputs (such as cooking fuel) as well as one stock indicator (child mortality, which could reflect a death that was recent or long ago), because flow data are not available for all dimensions.

Second, the health data are relatively weak and overlook some groups’ deprivations especially for nutrition, though the patterns that emerge are plausible and familiar.

Third, as is well known, intra-household inequalities may be severe, but these could not be reflected. Fourth while the MPI goes well beyond a headcount to include the intensity of poverty experienced, it does not measure inequality among the poor, although decompositions by group can be used to reveal group-based inequalities.

Finally, the estimates presented here are based on publicly available data and cover various years between 2000 and 2008. Not all countries have all indicators (3 countries lack 3 indicators; 8 countries lack 2 indicators), also the respondents for the nutrition variable vary across countries, which limits direct cross-country comparability.

The MPI allows for innovative analysis:

To be added: Examples of decomposition and trends

ii. Indicators

The MPI has ten indicators: two for health, two for education, and six for living standard. The MPI uses the household as a unit of analysis due to data limitations (ideally, the MPI would have used the person as a unit of analysis as this would have enabled us to compare across gender and age groups, and to document intra-household inequalities).

The ten indicators are almost the only set of indicators that could have been used to compare around 100 countries. In fact, one of the main lessons of this first exercise of estimating multidimensional poverty for developing countries is the urgent need to start collecting information on key internationally comparable indicators at the individual level.

TABLE SUMMARY
Education

The MPI uses two indicators that complement each other within the education dimension: whether someone in the household has five years of schooling and whether all children of school age are attending grades 1 to 8 of school. Years of schooling acts as a proxy for the level of knowledge and understanding of household members. While years of schooling is an imperfect proxy, not capturing the quality of education nor the level of knowledge attained, nor skills, it is a robust indicator, widely available, and provides the closest feasible approximation to levels of education for household members.

Note that households with no school-aged children are considered non-deprived. Hence incidence of deprivation in this indicator will reflect the demographic structure of the household and country as well as the educational attainments.

Health

Health was the most difficult dimension to measure. Comparable indicators of health for all household members are generally missing from household surveys. The MPI uses two health indicators that, although related, depart significantly from standard health indicators. The first identifies a person as deprived in nutrition if anyone in their household is malnourished. For children, malnutrition can have life-long effects in terms of cognitive and physical development. Adults or children who are malnourished are also susceptible to other health disorders; they are less able to learn and to concentrate and may not perform as well at work.

In the MPI all household members are considered to be deprived in nutrition if at least one undernourished person is observed in the household. Therefore, it is fundamental to note that when we present deprivation rates by indicator (censored headcounts), these estimates depart from the standard nutritional statistics. The standard measures refer to the percentage of undernourished population (number of malnourished people divided by total set people under consideration, such as percentage of underweight children). In our measure they refer to those identified as multidimensionally poor and who live in a household where at least one member is undernourished (both the numerator and the denominator of our indicators are different).

The second indicator uses data on child mortality. Most, although not all, child deaths are preventable, being caused by infectious disease or diarrhea; child malnutrition also contributes to child death. In the MPI all household members are considered to be deprived if there has been at least one observed child death (of any age) in the household. It is fundamental to note that this indicator differs from the standard mortality statistics. The standard under-five mortality rate is the number of deaths of children 0-5 years per 1000 children born alive. Here, it is the percentage of people identified as poor and who live in a household where at least a child died.

Living standards
The MPI considers and weights standard of living indicators individually. The present measure uses six indicators which, in combination, arguably represent acute poverty. It includes three standard MDG indicators that are related to health, as well as to standard of living, and particularly affect women: clean drinking water, improved sanitation, and the use of clean cooking fuel. The justification for these indicators is adequately presented in the MDG literature. It also includes two non-MDG indicators: electricity and flooring material. Both of these provide some rudimentary indication of the quality of housing for the household. The final indicator covers the ownership of some consumer goods, each of which has a literature surrounding them: radio, television, telephone, bicycle, motorbike, car, truck and refrigerator. We are aware that all the living standard indicators are means rather than ends; they are not direct measures of functionings. Yet, they have two strengths. In the first place, unlike income, which can serve an incredibly wide range of purposes (and one never knows whether it is used effectively to accomplish the needs considered to be basic), these are means very closely connected to the end (functioning) they are supposed to facilitate. Access to safe drinking water serves directly to satisfy the need of hydration and hygiene (hygiene is also facilitated by the access to improved sanitation and flooring material). Clean cooking fuel prevents respiratory diseases, which are a leading cause of preventable death, and contributes to a healthy home environment. Electricity is fundamental to pursue a number of activities. It allows lighting, which in turn allows people to be independent during the night time. Power also enables a wide range of work and leisure activities ranging from refrigeration to drilling to blending, sewing, and so forth. Electricity is also usually a safer means of lighting. And the set of considered assets are directly linked to the ability to communicate with other people, to be mobile, and even to have access to safe food. Secondly, most of the indicators are related to the MDGs, which provides stronger grounds for their inclusion in our index.

Of the ten indicators, all but one (mortality) are relatively sensitive to policy change and measure ‘flow’, which means they will reflect changes in-country with as little as one year between surveys. Other relatively stable indicators are years of schooling – which will be stable for many households who have no one in full-time education.

**BOX 5: International comparability versus context specific measures**

The MPI has been designed for international comparability and thus its dimensions and indicators are fixed across countries. This is a useful exercise as seeing the multidimensional poverty levels in a country vis-à-vis the rest of the world provides relevant information for both national governments and the international community for the design of policies. Yet poverty is context specific. Thus, while national teams are encouraged to adopt this methodology, they are also urged to make use of indicators relevant to their countries’ specific context. This is an easy procedure (if data is available) as the functional form of the MPI allows easy extension to more indicators and dimensions. Thus, a national team can produce the MPI for international comparison and a national MPI that is more relevant to the specific context.
Mexico, for example, has produced a local multidimensional poverty measure that includes educational gaps, access to healthcare, access to social security, basic services at home, access to food and the current income per capita. According to this measure, a person is considered in situation of multidimensional poverty when his or her income is insufficient to acquire the goods and services he or she requires for his or her needs and presents deprivation in at least one of the six indicators defined as basic social rights (CONEVAL, 2009). They complement this measure with an indicator of the degree of social cohesion.

Colombia, in turn, has elaborated a local MPI that includes educational conditions of the household, conditions for children and youth, employment, health and access to public services and housing conditions indicators, all equally weighted. A person is considered in situation of multidimensional poverty when deprived in at least 33% of the variable analysed.

iii. Measurement

The Multidimensional Poverty Index (MPI) identifies multiple deprivations at the household level in health, education and standard of living. It uses micro data from household surveys, and—unlike the Inequality-adjusted Human Development Index—all the indicators needed to construct the measure must come from the same survey.

Each person in a given household is classified as poor or non-poor depending on the number of deprivations his or her household experiences. These data are then aggregated into the national measure of poverty.

DATA SOURCES for the MPI

The MPI relies on three main datasets that are publicly available and comparable for most developing countries:

- The Demographic and Health Survey (DHS) WEBSITE
- The Multiple Indicators Cluster Survey (MICS) WEBSITE
- The World Health Survey (WHS) WEBSITE
Methodology

Each person is assigned a score according to his or her household’s deprivations in each of the 10 component indicators, \(d\). The maximum score is 10, with each dimension equally weighted (thus the maximum score in each dimension is \(3\frac{1}{3}\)). The health and education dimensions have two indicators each, so each component is worth \(5/3\) (or 1.67). The standard of living dimension has six indicators, so each component is worth \(5/9\) (or 0.56).

Someone is considered deprived in nutrition if at least one household member is malnourished. Someone is considered deprived in the other health indicator if one or more children in the household have died. A person is considered deprived in years of education if there is no household member who has completed five years of schooling and she is considered deprived in the child school attendance indicator if at least one school-age child (up to grade 8) in the household is not attending school. The standard of living thresholds are not having electricity, not having access to clean drinking water, not having access to adequate sanitation, using “dirty” cooking fuel (dung, wood or charcoal), having a home with a dirt floor, and owning no car, truck or similar motorized vehicle, and owning at most one of these assets: bicycle, motorcycle, radio, refrigerator, telephone or television.

To identify the multidimensionally poor, the deprivation scores for each household are summed to obtain the household deprivation, \(c\). A cut-off of 3, which is the equivalent of one third of the indicators, is used to distinguish between the poor and nonpoor. If \(c\) is 3 or greater, that household (and everyone in it) is multidimensionally poor. Households with a deprivation count between 2 and 3 are vulnerable to or at risk of becoming multidimensionally poor.

The MPI value is the product of two measures: the multidimensional headcount ratio and the intensity (or breadth) of poverty.

The headcount ratio, \(H\), is the proportion of the population who are multidimensionally poor:

\[
H = \frac{q}{n}
\]

where \(q\) is the number of people who are multidimensionally poor and \(n\) is the total population.

The intensity of poverty, \(A\), reflects the proportion of the weighted component indicators, \(d\), in which, on average, poor people are deprived. For poor households only, the deprivation scores are summed and divided by the total number of indicators and by the total number of poor persons:

\[
A = \frac{\sum c}{qd}
\]

where \(c\) is the total number of weighted deprivations the poor experience and \(d\) is the total number of component indicators considered (10 in this case).
Weighted count of deprivations in household 1:

\[ \left( 1 \cdot \frac{5}{3} \right) + \left( 1 \cdot \frac{5}{9} \right) = 2.22 \]

Headcount ratio

\[ \left( \frac{7 + 5 + 4}{4 + 7 + 5 + 4} \right) = 0.80 \]

(80 percent of people live in poor households)

Intensity of poverty

\[ \left( \frac{7.22 \cdot 7 + (3.89 \cdot 5) + (5.00 \cdot 4)}{(7 + 5 + 4) \cdot 10} \right) = 0.56 \]

(the average poor person is deprived in 56 percent of the weighted indicators).

\[ \text{MPI} = H \cdot A = 0.450 \]

In sum, the basic intuition is that the MPI represents the share of the population that is multidimensionally poor, adjusted by the intensity of the deprivations suffered.
BOX 6: Why are income, empowerment, and other dimensions not included in the MPI?

We could not include income or work or violence or empowerment or other dimensions. Why? First, income and consumption data are not gathered in DHS or MICS surveys. Nor are the data on occupation good enough quality at the household level to be used, and the surveys do not include violence against person or property. The DHS surveys do in some cases collect data on women’s empowerment and on domestic for some countries, but not every DHS survey includes these modules, and the other surveys do not have these data. Data on men’s empowerment or on political freedom are missing.

Box 7: Why are there such wide discrepancies between MPI poverty estimates and $1.25/day poverty estimates in so many countries?

The MPI complements income poverty measures. It measures various deprivations directly. In practice, although there is a clear overall relationship between MPI and $1.25/day poverty, the estimates do differ for many countries. This is a topic for further research, but some possibilities can include failure/success in providing public services (for countries with higher/lower MPI than $1.25/day figures correspondingly), as well as different abilities to convert income into outcomes such as good nutrition.

The MPI, like the $1.25/day line, is a globally comparable measure of poverty. It measures acute multidimensional poverty, and only includes indicators that are available for many countries. National poverty measures are typically monetary measures, and thus capture something different. The fact that

NOTES
1 Lower values have occurred during some crisis situations (such as the Rwandan genocide) but were obviously not sustainable.
2 The inequality aversion parameter guides the degree to which lower achievements are emphasized and higher achievements are de-emphasized.
3 $A_j$ is estimated from survey data using the survey weights,

$$A_j = 1 - \frac{\prod_{i=1}^{n} X_i^{w_i} \cdot \prod_{j=1}^{p} X_j^{w_j}}{\sum_{i,j} w_i X_i}, \text{ where } \sum w_i = 1.$$

4 Technically this would be 3.33. Because of the weighting structure, the same household is identified as poor if a cut-off of 3 is used.
there are differences does not mean that the national poverty number, or the MPI headcount is wrong – these simply measure different conceptions of poverty. At the same time, just as national income poverty measures are designed to reflect the national situation more accurately than the $1.25 measure, considerably some countries may wish to build a national multidimensional poverty index that is tailored to their context, to complement this international MPI.

### BOX 8: Is the MPI intended to replace the standard $1.25 a day measure of poverty used for the MDGs and other international purposes?

No. The MPI is intended to complement monetary measures of poverty, including $1.25 a day estimates. The relationship between these measures, as well as their policy implications and methodological improvement, are priorities for further research.

### iv. Analysis

The MPI methodology shows aspects in which the poor are deprived and helps to reveal the interconnections among those deprivations. This enables policymakers to target resources and design policies more effectively. This is especially useful where the MPI reveals areas or groups characterized by severe deprivation. Examples where this has been done in practice already include Mexico’s poverty targeting program, as described in the upcoming HDR.

The MPI constitutes a family or set of poverty measures. These measures can be unpacked to show the composition of poverty both across countries, regions and the world and within countries by ethnic group, urban/rural location, as well as other key household and community characteristics. This is why the MPI is sometimes described as a high resolution lens on poverty: it can be used as an analytical tool to identify the most prevailing deprivations. The MPI measures:

- **Incidence of poverty**: the proportion of people who are poor according to the MPI (those who are deprived in at least 30% of the weighted indicators).

- **Average intensity of poverty**: the average number of weighted deprivations people experience at the same time.

- **MPI value**: The MPI value summarises information on multiple deprivations into a single number. It is calculated by multiplying the incidence of poverty by the average intensity of poverty.

### BOX 9: Some findings:
• About 1.75 billion people in the 104 countries covered by the MPI—a third of their population—live in multidimensional poverty—that is, with at least 30 percent of the indicators reflecting acute deprivation in health, education and standard of living. This exceeds the estimated 1.44 billion people in those countries who live on $1.25 a day or less (though it is below the share who live on $2 or less). The patterns of deprivation also differ from those of income poverty in important ways: in many countries—including Ethiopia and Guatemala—the number of people who are multidimensionally poor is higher. However, in about a fourth of the countries for which both estimates are available—including China, Tanzania and Uzbekistan—rates of income poverty are higher.

• Sub-Saharan Africa has the highest incidence of multidimensional poverty. The level ranges from a low of 3 percent in South Africa to a massive 93 percent in Niger; the average share of deprivations ranges from about 45 percent (in Gabon, Lesotho and Swaziland) to 69 percent (in Niger). Yet half the world’s multidimensionally poor live in South Asia (844 million people), and more than a quarter live in Africa (458 million).

These new measures yield many other novel results—and insights—that can guide development policy debates and designs. Large HDI losses due to inequality indicate that society has much to gain from concentrating its efforts on equity-improving reforms. And a high MPI coinciding with low income poverty suggests that there is much to gain from improving the delivery of basic public services. The measures open exciting new possibilities for research, allowing us to tackle critical questions. Does reduced income poverty bring about reduced multidimensional poverty, or vice versa?

Some of the key findings of the analysis of MPI poverty in the world are as follow. In 19 of the 72 countries in the sample that have both the MPI and the income poverty measure—including China, Sri Lanka, Tanzania and Uzbekistan—the headcount rate for income poverty is higher than that for multidimensional poverty. In general, the lower the national HDI, the more likely that multidimensional poverty exceeds income poverty. Our aggregate estimate of 1.75 billion multidimensionally poor people exceeds the 1.44 billion people estimated to be living on less than $1.25 a day in the same countries, but it is below the 2.6 billion people estimated to be living on less than $2 a day. For most countries the estimates differ, for several reasons. First, the measures capture different concepts, so they would not be expected to fully converge. Second, in many developing countries income and consumption are difficult to measure, especially because of the size of the informal sector and home-produced consumption.

How are the multidimensional poverty headcount and its intensity related? The relationship is surprisingly consistent: countries with higher multidimensional poverty headcounts tend to have more deprivations. At the same time, interesting outliers emerge—countries with a low poverty headcount but high intensity of poverty (such as Myanmar, Philippines and Viet Nam) and
countries with a high headcount but low intensity of poverty (such as Bangladesh, Cambodia and the Democratic Republic of the Congo).

The regional rates of multidimensional poverty vary from around 3 percent in Europe and Central Asia to 65 percent in Sub-Saharan Africa. South Asia is home to the largest number of people living in multidimensional poverty, followed by Sub-Saharan Africa.

Within-country variation is of great policy interest. In India Delhi’s rate of multidimensional poverty is close to Iraq’s and Viet Nam’s (about 14 percent), while the state of Bihar’s is similar to Sierra Leone’s and Guinea’s (about 81 percent).