

Technical note 5. Multidimensional Poverty Index

The global 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. More details about the general methodology can be found in Alkire and Jahan (2018). Programmes (Stata do-files) for computing the MPI and its components for all countries with appropriate data will be available in due course at <http://hdr.undp.org/en/content/mpi-statistical-programmes>.

Data sources

- ICF Macro Demographic and Health Surveys.
- United Nations Children’s Fund Multiple Indicator Cluster Surveys.
- For several countries, national household surveys with the same or similar content and questionnaires: Brazil, 2015 Pesquisa Nacional por Amostra de Domicílios; China, 2014 China Family Panel Studies; Ecuador, 2013–2014 Encuesta de Condiciones de Vida; Jamaica, 2014 Jamaica Survey of Living Conditions; Libya, 2014 Pan Arab Population and Family Health Survey; Mexico, 2016 Encuesta Nacional de Salud y Nutrición; Morocco, 2011 Pan Arab Population and Family Health Survey; and Syrian Arab Republic, 2009 Pan Arab Population and Family Health Survey.

Methodology

The 2019 global MPI has the same functional form and indicators as in 2018. It continues to use 10 indicators in three dimensions—health, education and standard of living—following the same dimensions and weights as the Human Development Index.

Each person is assigned a deprivation score according to his or her household’s deprivations in each of the 10 indicators. The maximum deprivation score is 100 percent, with each dimension equally weighted; thus, the maximum deprivation score in each dimension is 33.3 percent or, more accurately, 1/3. The health and education dimensions have two indicators each, so each indicator is weighted as 1/6. The standard of living dimension has six indicators, so each indicator is weighted as 1/18.

Dimension	Indicator	Deprived if...	Weight
Health	Nutrition	Any adult under age 70 or any child for whom nutritional information is available is undernourished. Adults over age 20 are considered undernourished if their body mass index is below 18.5 m/kg ² , individuals ages 15–19 are considered undernourished based on World Health Organization age-specific body mass index cutoffs and children are considered undernourished if the z-score of their height-for-age (stunting) or weight-for-age (underweight) is more than two standard deviations below the median of the reference population.	1/6
	Child mortality	Any child under age 18 has died in the five years preceding the survey. When a survey lacks information about the date of child deaths, deaths that occurred at any time are taken into account. ^a	1/6
Education	Years of schooling	No household member age 10 or older has completed six years of schooling.	1/6
	School attendance	Any school-age child ^b is not attending school up to the age at which he or she would complete class 8.	1/6
Standard of living	Electricity	The household has no electricity.	1/18
	Sanitation	The household does not have access to improved sanitation (according to Sustainable Development Goal guidelines), or it is improved but shared with other households. A household is considered to have access to improved sanitation if it has some type of flush toilet or latrine or ventilated improved pit or composting toilet that is not shared. When a survey uses a different definition of adequate sanitation, the survey report is followed.	1/18
	Drinking water	The household does not have access to an improved source of drinking water (according to Sustainable Development Goal guidelines), or safe drinking water is at least a 30-minute walk from home, roundtrip. A household is considered to have access to an improved source of drinking water if the source is piped water, a public tap, a borehole or pump, a protected well, a protected spring or rainwater. When a survey uses a different definition of safe drinking water, the survey report is followed.	1/18
	Housing	At least one of the household’s three dwelling elements—floor, walls or roof—is made of inadequate materials—that is, the floor is made of natural materials and/or the walls and/or the roof are made of natural or rudimentary materials. The floor is made of natural materials such as mud, clay, earth, sand or dung; the dwelling has no roof or walls; the roof or walls are constructed using natural materials such as cane, palm, trunks, sod, mud, dirt, grass, reeds, thatch, bamboo or sticks or rudimentary materials such as carton, plastic or polythene sheeting, bamboo or stone with mud, loosely packed stones, uncovered adobe, raw or reused wood, plywood, cardboard, unburnt brick, or canvas or tent.	1/18
	Cooking fuel	The household cooks with dung, wood, charcoal or coal.	1/18
	Assets	The household does not own a car or truck and does not own more than one of the following assets: radio, television, telephone, computer, animal cart, bicycle, motorbike or refrigerator.	1/18

a. Information about child deaths is typically reported by women ages 15–49. When information from an eligible woman was not available, information from a man was used when the man reported no death in the household, and information was coded as missing when the man reported a death (because the date of the death was unknown).

b. Official school entrance age is from UIS.Stat (<http://data.uis.unesco.org>).

To identify multidimensionally poor people, the deprivation scores for each indicator are summed to obtain the household deprivation score. A cutoff of 1/3 is used to distinguish between poor and nonpoor people. If the deprivation score is 1/3 or higher, that household (and everyone in it) is considered multidimensionally poor. People with a deprivation score of 1/5 or higher but less than 1/3 are considered to be vulnerable to multidimensional poverty. People with a deprivation score of 1/2 or higher are considered to be in severe multidimensional poverty.

The headcount ratio, H , is the proportion of multidimensionally poor people in the population:

$$H = \frac{q}{n}$$

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

The intensity of poverty, A , reflects the average proportion of the weighted component indicators in which multidimensionally poor people are deprived. For multidimensionally poor people only (those with a deprivation score s greater than or equal to 33.3 percent), the deprivation scores are summed and divided by the total number of multidimensionally poor people:

$$A = \frac{\sum_i^q s_i}{q}$$

where s_i is the deprivation score that the i th multidimensionally poor person experiences.

The deprivation score s_i of the i th multidimensionally poor person can be expressed as the sum of the weights associated with each indicator j ($j = 1, 2, \dots, 10$) in which person i is deprived, $s_i = c_{i1} + c_{i2} + \dots + c_{i10}$.

The MPI value is the product of two measures: the multidimensional poverty headcount ratio and the intensity of poverty:

$$MPI = H \cdot A$$

The contribution of dimension d to multidimensional poverty can be expressed as

$$Contrib_d = \frac{\sum_{j \in d} \sum_1^q c_{ij}}{n} / MPI$$

where d is health, education or standard of living.

The MPI can also be expressed as the weighted sum of the censored headcount rates h_j of each indicator j . The censored headcount rate of indicator j refers to the proportion of people who are multidimensionally poor and deprived in this indicator.

$$MPI = \sum_{j=1}^{10} c_j \cdot h_j$$

where c_j is the weight associated with indicator j (either 1/6 or 1/18), and the weights sum to 1.

The variance of deprivation scores of multidimensionally poor people is used to measure inequality among those people:

$$V = \sum_1^q (s_i - A)^2 / (q - 1)$$

All parameters defined above are estimated using survey data and sampling weights according to the rules of the sampling theory (Lohr 2010).

Example using hypothetical data

Indicator	Indicator weight	Household			
		1	2	3	4
Household size		4	7	5	4
Health					
At least one member is undernourished	$(1/5) \div 2 = 16.7\%$	0	0	1	0
One or more children have died	$(1/5) \div 2 = 16.7\%$	1	1	0	1
Education					
No one has completed six years of schooling	$(1/5) \div 2 = 16.7\%$	0	1	0	1
At least one school-age child not enrolled in school	$(1/5) \div 2 = 16.7\%$	0	1	0	0
Standard of living					
No electricity	$(1/5) \div 6 = 5.6\%$	0	1	1	1
No access to improved sanitation	$(1/5) \div 6 = 5.6\%$	0	0	1	0
No access to an improved source of drinking water	$(1/5) \div 6 = 5.6\%$	0	1	1	0
House built with inadequate materials	$(1/5) \div 6 = 5.6\%$	0	0	0	0
Household cooks with dung, wood, charcoal or coal	$(1/5) \div 6 = 5.6\%$	1	1	1	1
Household does not own a car or truck and does not own more than one of the following assets: radio, television, telephone, computer, animal cart, bicycle, motorbike or refrigerator.	$(1/5) \div 6 = 5.6\%$	0	1	0	1
Results					
Individual deprivation score, c (sum of each deprivation multiplied by its weight) for each household member		22.2%	72.2%	38.9%	50.0%
Is the household multidimensionally poor ($c \geq 1/3$)?		No	Yes	Yes	Yes

Note: 1 indicates deprivation in the indicator; 0 indicates nondeprivation.

Weighted deprivations:

- Household 1: $(1 \cdot 16.67) + (1 \cdot 5.56) = 22.2$ percent.
- Household 2: 72.2 percent.
- Household 3: 38.9 percent.
- Household 4: 50.0 percent.

Based on this hypothetical population of four households:

Headcount ratio (H) =

$$\left(\frac{0 + 7 + 5 + 4}{4 + 7 + 5 + 4} \right) = 0.80$$

(80 percent of people are multidimensionally poor).

Intensity of poverty (A) =

$$\frac{(72.2 \cdot 7) + (38.9 \cdot 5) + (50.0 \cdot 4)}{(7 + 5 + 4)} = 56.3 \text{ percent}$$

(the average multidimensionally poor person is deprived in 56.3 percent of the weighted indicators).

$$\text{MPI} = H \cdot A = 0.8 \cdot 0.563 = 0.450.$$

Contribution of deprivations in:

Health:

$$\text{contrib}_1 = \frac{16.67 \cdot 5 + 16.67 \cdot (7 + 4)}{4 + 7 + 5 + 4} / 0.450 = 29.6 \text{ percent}$$

Education:

$$\text{contrib}_2 = \frac{16.67 \cdot (7 + 4) + 16.67 \cdot 7}{4 + 7 + 5 + 4} / 0.450 = 33.3 \text{ percent}$$

Standard of living:

$$\text{contrib}_3 = \frac{5.56 \cdot (7 \cdot 4 + 5 \cdot 4 + 4 \cdot 3)}{0.450} = 37.1 \text{ percent.}$$

Calculating the contribution of each dimension to multidimensional poverty provides information that can be useful for revealing a country's deprivation structure and can help with policy targeting.

Variance of deprivation scores among the poor (V) =

$$\frac{(0.722 - 0.563)^2 \cdot 7 + (0.389 - 0.563)^2 \cdot 5 + (0.500 - 0.563)^2 \cdot 4}{16 - 1} = 0.023$$

References

- Alkire, S., and S. Jahan. 2018.** "The New Global MPI 2018: Aligning with the Sustainable Development Goals." Human Development Research Paper. UNDP-HDRO, New York. <http://hdr.undp.org/en/content/new-global-mpi-2018-aligning-sustainable-development-goals>.
- ICF Macro. Various years.** Demographic and Health Surveys. www.measuredhs.com. Accessed 15 July 2018.
- Lohr, S. 2010.** *Sampling: Design and Analysis, 2nd ed.* Boston, MA: Brooks/Cole.
- UNICEF (United Nations Children's Fund). Various years.** Multiple Indicator Cluster Surveys. New York. <http://mics.unicef.org>. Accessed 15 July 2018.

Censored headcount rates for each indicator

	People who are multidimensionally poor and deprived in each indicator	Proportion of people who are multidimensionally poor and deprived in each indicator	Proportion of people who are multidimensionally poor and deprived in each indicator multiplied by the indicator weight
Nutrition	5	0.250	0.042
Child mortality	11	0.550	0.092
Years of schooling	11	0.550	0.092
School attendance	7	0.350	0.058
Electricity	16	0.800	0.044
Sanitation	5	0.250	0.014
Drinking water	12	0.600	0.033
Housing	0	0.000	0.000
Cooking fuel	16	0.800	0.044
Assets	11	0.550	0.031
Sum			0.450