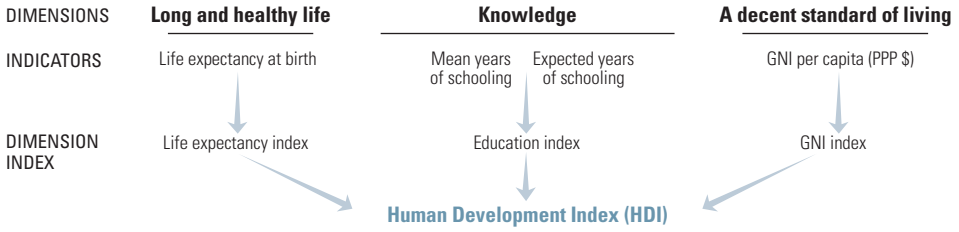
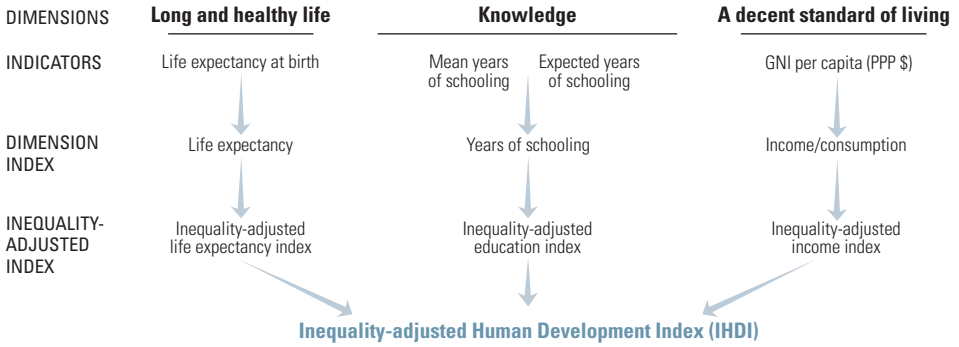
Technical notes

Calculating the human development indices—graphical presentation

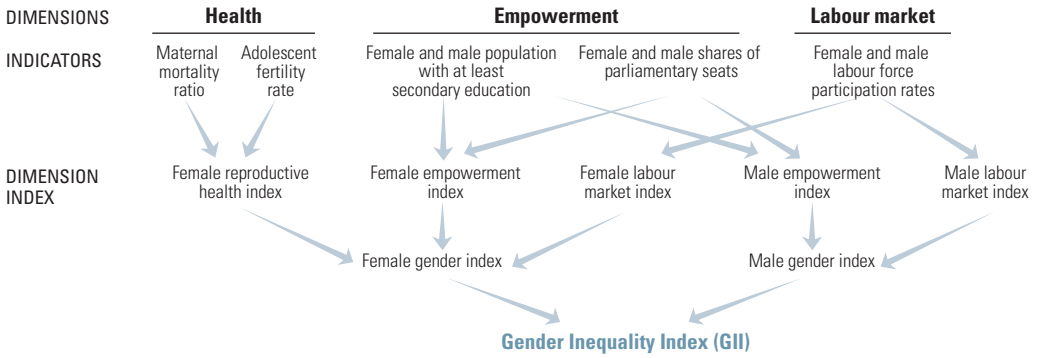
Human Development Index (HDI)



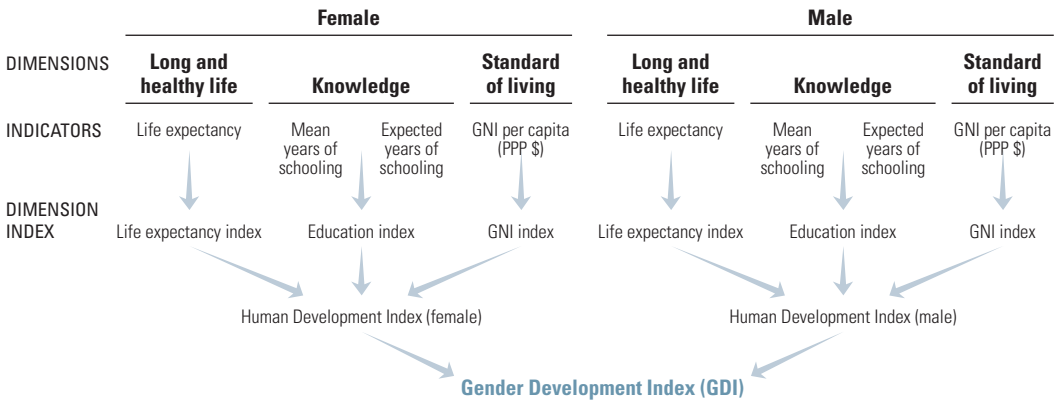
Inequality-adjusted Human Development Index (IHDI)



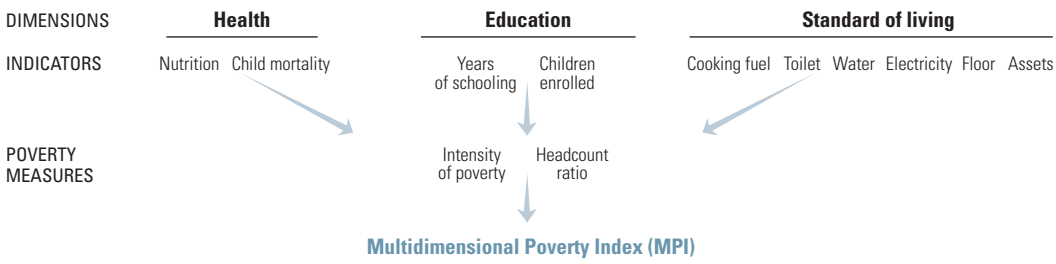
Gender Inequality Index (GII)



Gender Development Index (GDI)



Multidimensional Poverty Index (MPI)



Technical note 1. Human Development Index

The Human Development Index (HDI) is a summary measure of achievements in key dimensions of human development: a long and healthy life, access to knowledge and a decent standard of living. The HDI is the geometric mean of normalized indices for each of the three dimensions. This technical note describes the steps to calculating the HDI, data sources and the methodology used to estimate missing values.

Steps to calculate the Human Development Index

There are two steps to calculating the HDI.

Step 1. Creating the dimension indices

Minimum and maximum values (goalposts) are set in order to transform the indicators expressed in different units into indices between 0 and 1. These goalposts act as the 'natural zeroes' and 'aspirational goals', respectively, from which component indicators are standardized.[1] They are set at the following values:

Dimension	Indicator	Minimum	Maximum
Health	Life expectancy (years)	20	85
Education	Expected years of schooling	0	18
	Mean years of schooling	0	15
Standard of living	Gross national income per capita (PPP 2011 $)	100	75,000

The justification for placing the natural zero for life expectancy at 20 years is based on historical evidence that no country in the 20th century had a life expectancy of less than 20 years (Oeppen and Vaupel 2002; Maddison 2010; Riley 2005).

Societies can subsist without formal education, justifying the education minimum of 0 years. The maximum for mean years of schooling, 15, is the projected maximum of this indicator for 2025. The maximum for expected years of schooling, 18, is equivalent to achieving a master's degree in most countries.

The low minimum value for gross national income (GNI) per capita, $100, is justified by the considerable amount of unmeasured subsistence and nonmarket production in economies close to the minimum, which is not captured in the official data. The maximum is set at $75,000 per capita. Kahneman and Deaton (2010) have shown that there is a virtually no gain in human development and well-being from annual income beyond $75,000. Assuming annual growth rate of 5 percent, only three countries are projected to exceed the $75,000 ceiling in the next five years.

Having defined the minimum and maximum values, the dimension indices are calculated as:

$$\text{Dimension index} = \frac{\text{actual value} - \text{minimum value}}{\text{maximum value} - \text{minimum value}}. \quad (1)$$

For the education dimension, equation 1 is first applied to each of the two indicators, and then the arithmetic mean of the two resulting indices is taken.

Because each dimension index is a proxy for capabilities in the corresponding dimension, the transformation function from income to capabilities is likely to be concave (Anand and Sen 2000)—that is, each additional dollar of income has a smaller effect on expanding capabilities. Thus for income, the natural logarithm of the actual, minimum and maximum values is used.

Step 2. Aggregating the dimensional indices to produce the Human Development Index

The HDI is the geometric mean of the three dimensional indices:

$$HDI = (I_{Health} \cdot I_{Education} \cdot I_{Income})^{⅓} \quad (2)$$

Example: Costa Rica

Indicator	Value
Life expectancy at birth (years)	79.93
Mean years of schooling	8.37
Expected years of schooling	13.50
Gross national income per capita (PPP 2011 $)	13,011.7

Note: Values are rounded.

$$\text{Health index} = \frac{79.93 - 20}{85 - 20} = 0.922$$

$$\text{Mean years of schooling index} = \frac{8.37 - 0}{15 - 0} = 0.558$$

$$\text{Expected years of schooling index} = \frac{13.50}{18} = 0.750$$

$$\text{Education index} = \frac{0.558 + 0.750}{2} = 0.654$$

$$\text{Income index} = \frac{\ln(13{,}011.7) - \ln(100)}{\ln(75{,}000) - \ln(100)} = 0.735$$

$$\text{Human Development Index} = (0.922 \cdot 0.654 \cdot 0.735)^{⅓} = 0.763$$

Data sources

- Life expectancy at birth: UNDESA (2013).
- Mean years of schooling: Barro and Lee (2013), UNESCO Institute for Statistics (2013) and Human Development