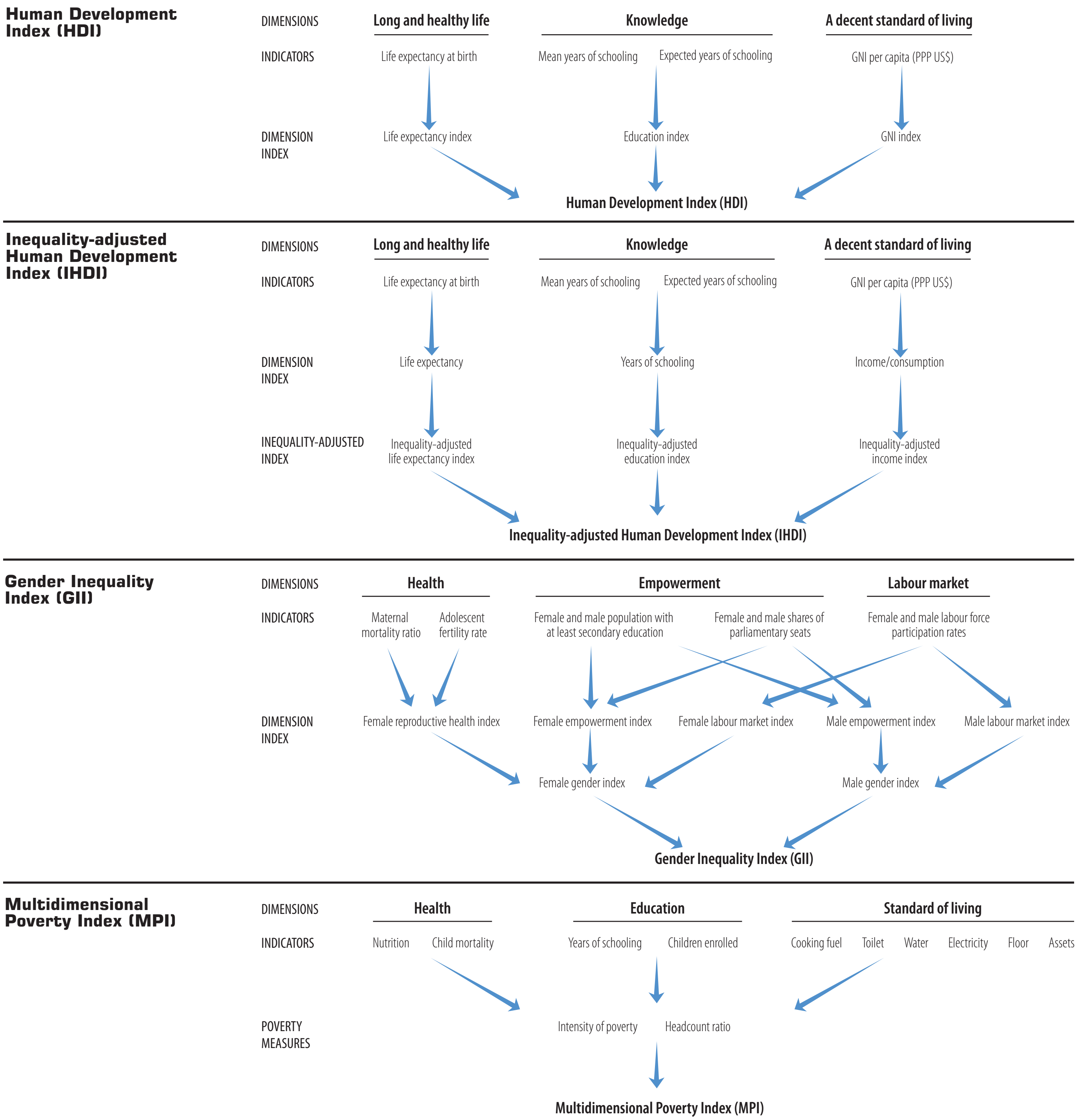
Technical notes

Calculating the human development indices—graphical presentation



Technical note 1. Calculating the Human Development Index

The Human Development Index (HDI) is a summary measure of human development. It measures the average achievements in a country in three basic 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 measuring achievements in each dimension.

Data sources

- Life expectancy at birth: UNDESA (2009d)
- Mean years of schooling: Barro and Lee (2010)
- Expected years of schooling: UNESCO Institute for Statistics (2010a)
- Gross national income (GNI) per capita: World Bank (2010g) and IMF (2010a)

Creating the dimension indices

The first step is to create subindices for each dimension. Minimum and maximum values (goalposts) need to be set in order to transform the indicators into indices between 0 and 1. Because the geometric mean is used for aggregation, the maximum value does not affect the relative comparison (in percentage terms) between any two countries or periods of time. The maximum values are set to the actual observed maximum values of the indicators from the countries in the time series, that is, 1980–2010. The minimum values will affect comparisons, so values that can be appropriately conceived of as subsistence values or "natural" zeros are used. Progress is thus measured against minimum levels that a society needs to survive over time. The minimum values are set at 20 years for life expectancy, at 0 years for both education variables and at $163 for per capita gross national income (GNI). The life expectancy minimum is based on long-run historical evidence from Maddison (2010) and Riley (2005).[1] Societies can subsist without formal education, justifying the education minimum. A basic level of income is necessary to ensure survival: $163 is the lowest value attained by any country in recorded history (in Zimbabwe in 2008) and corresponds to less than 45 cents a day, just over a third of the World Bank's $1.25 a day poverty line.

Goalposts for the Human Development Index in this Report

Dimension	Observed maximum	Minimum
Life expectancy	83.2 (Japan, 2010)	20.0
Mean years of schooling	13.2 (United States, 2000)	0
Expected years of schooling	20.6 (Australia, 2002)	0
Combined education index	0.951 (New Zealand, 2010)	0
Per capita income (PPP $)	108,211 (United Arab Emirates, 1980)	163 (Zimbabwe, 2008)

Having defined the minimum and maximum values, the subindices are calculated as follows:

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

For education, equation 1 is applied to each of the two subcomponents, then a geometric mean of the resulting indices is created and finally, equation 1 is reapplied to the geometric mean of the indices, using 0 as the minimum and the highest geometric mean of the resulting indices for the time period under consideration as the maximum. This is equivalent to applying equation 1 directly to the geometric mean of the two subcomponents. 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 2000c). Thus, for income the natural logarithm of the actual minimum and maximum values is used.

Aggregating the subindices to produce the Human Development Index

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

$$(I_{Life}{}^{1/3} \cdot I_{Education}{}^{1/3} \cdot I_{Income}{}^{1/3}). \qquad (2)$$

Expression 2 embodies imperfect substitutability across all HDI dimensions. It thus addresses one of the most serious criticisms of the linear aggregation formula, which allowed for perfect substitution across dimensions. Some substitutability is inherent in the definition of any index that increases with the values of its components.

Example: China

Indicator	Value
Life expectancy at birth (years)	73.5
Mean years of schooling (years)	7.5
Expected years of schooling (years)	11.4
GNI per capita (PPP US$)	7,263

Note: Values are rounded.

$$\text{Life expectancy index} = \frac{73.5 - 20}{83.2 - 20} = 0.847$$

$$\text{Mean years of schooling index} = \frac{7.5 - 0}{13.2 - 0} = 0.568$$

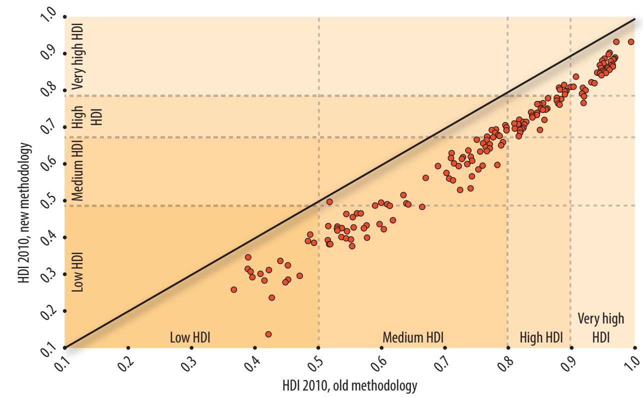
$$\text{Expected years of schooling index} = \frac{11.4 - 0}{20.6 - 0} = 0.553$$

$$\text{Education index} = \frac{\sqrt{0.568 \cdot 0.553} - 0}{0.951 - 0} = 0.589$$

$$\text{Income index} = \frac{\ln(7{,}263) - \ln(163)}{\ln(108{,}211) - \ln(163)} = 0.584$$

$$\text{Human Development Index} = \sqrt[3]{0.847 \cdot 0.589 \cdot 0.584} = 0.663$$

FIGURE T1.1 **Human Development Index 2010: new and old methodologies**



Source: HDRO calculations using data from the HDRO database.

Overall effects of the Human Development Index methodological improvements

The methodological improvements in the HDI, using new indicators and the new functional form, result in substantial changes (figure T1.1). Adopting the geometric mean produces lower index values, with the largest changes occurring in countries with uneven development across dimensions. The geometric mean has only a moderate impact on HDI ranks. Setting the upper bounds at actual maximum values has less impact on overall index values and has little further impact on ranks.

Analysis of historical trends in this Report

The analysis of historical trends in chapters 2 and 3 uses a different version of the HDI, the hybrid HDI, which applies the same aggregation formula as the new HDI to the set of indicators and sources used in previous Reports (since 1995) in order to allow more extensive analysis over time. Linear interpolation was used to fill missing values when both earlier and later values were present. When unavailable for the whole time period, gross enrolment ratios were projected using the last available value (for forward projections) and the first available value (for backward projections). A sensitivity analysis showed that the results of the analysis were robust to alternative extrapolation techniques. See Gidwitz and others (2010) for further details on the construction of this data set.

The analysis in chapters 2 and 3 also uses the deviation from fit criterion to comparatively evaluate changes over time in the hybrid HDI. This measure evaluates the progress of countries compared with the average progress of countries with a similar initial HDI level. It is calculated as the residual of a second degree fractional polynomial regression of the annual percentage growth rate of the HDI on the logarithm of its initial HDI value. Statistical table 2 reports the country rank in the deviation from fit for the HDI for 1980–2010. See Royston and Altman (1994) for a description of regression models based on fractional polynomial functions of a continuous covariate.

Technical note 2. Calculating the Inequality-adjusted Human Development Index

The Inequality-adjusted Human Development Index (IHDI) adjusts the Human Development Index (HDI) for inequality in distribution of each dimension across the population. It is based on a distribution-sensitive class of composite indices proposed by Foster, Lopez-Calva, and Szekely (2005), which draws on the Atkinson (1970) family of inequality measures. It is computed as a geometric mean of geometric means, calculated across the population for each dimension separately (for details, see Alkire and Foster 2010). The IHDI accounts for inequalities in HDI dimensions by "discounting" each dimension's average value according to its level of inequality. The IHDI equals the HDI when there is no inequality across people but is less than the HDI as inequality rises. In this sense, the IHDI is the actual level of human development (accounting for this inequality), while the HDI can be viewed as an index of "potential" human development (or the maximum level of HDI) that could be achieved if there was no inequality. The "loss" in potential human development due to inequality is given by the difference between the HDI and the IHDI and can be expressed as a percentage.

Data sources

Since the HDI relies on country-level aggregates such as national accounts for income, the IHDI must draw on alternative sources of data to obtain the distribution of each dimension.

The distributions have different units—income and years of schooling are distributed across individuals, while expected length of life is distributed across age intervals. Available distributional data are not necessarily for the same individuals or households.

The inequality in distribution of the HDI dimensions is estimated for:

- Life expectancy, which uses data from abridged life tables provided by UNDESA (2009d). This distribution is available across age intervals (0–1, 1–5, 5–10, ... , 85+), with the mortality rates and average age at death specified for each interval.
- Years of schooling and household income (or consumption), which use household survey data harmonized in international databases: Luxembourg Income Study, Eurostat's European Union Survey of Income and Living Conditions, the World Bank's International Income Distribution Database, the United Nations Children's Fund's Multiple Indicators Cluster Survey, the US Agency for International Development's Demographic and Health Survey, the World Health Organization's World Health Survey and the United Nations University's World Income Inequality Database.
- The inequality in standard of living dimension, which uses disposable household income per capita, household consumption per capita or income imputed based on an asset index matching methodology (Harttgen and Klasen 2010).

For a full account of data sources used for estimating inequality, see Kovacevic (2010a).

Computing the Inequality-adjusted Human Development Index

There are three steps to computing the IHDI.

Step 1. Measuring inequality in underlying distributions

The IHDI draws on the Atkinson (1970) family of inequality measures and sets the aversion parameter ε equal to 1.[2] In this case the inequality measure is A = 1– g/μ, where g is the geometric mean and μ is the arithmetic mean of the distribution. This can be written:

$$A_x = 1 - \frac{\sqrt[n]{X_1 \ldots X_n}}{\bar{X}} \qquad (1)$$

where $\{X_1, \ldots , X_n\}$ denotes the underlying distribution in the dimensions of interest. A_x is obtained for each variable (life expectancy, years of schooling and disposable income or consumption per capita) using household survey data and the life tables.[3]

The geometric mean in equation 1 does not allow zero values. For mean years of schooling one year is added to all valid observations to compute the inequality. Income per capita outliers—extremely high incomes as well as negative and zero incomes—were dealt with by truncating the top 0.5 percentile of the distribution to reduce the influence of extremely high incomes and by replacing the negative and zero incomes with the minimum value of the bottom 0.5 percentile of the distribution of positive incomes.

For more details on measuring inequality in the distribution of the HDI indicators, see Alkire and Foster (2010).

Step 2. Adjusting the dimension indices for inequality

The mean achievement in a dimension, $\bar{X}$, is adjusted for inequality as follows:

$$\bar{X}^* = \bar{X}\,(1 - A_x) = \sqrt[n]{X_1 \ldots X_n}\ .$$

Thus $\bar{X}^*$, the geometric mean of the distribution, reduces the mean according to the inequality in distribution, emphasizing the lower end of the distribution.

The inequality-adjusted dimension indices, I_{I_X}, are obtained from the HDI dimension indices, I_X, by multiplying them by $(1 - A_x)$, where A_x is the corresponding Atkinson measure:

$$I_{I_X} = (1 - A_x) \cdot I_X\,.$$

The inequality-adjusted income index, $I^*_{I_{Income}}$, is based on the unlogged gross national income (GNI) index, I^*_{Income}. This enables the IHDI to account for the full effect of income inequality.

Step 3. Computing the Inequality-adjusted Human Development Index

The IHDI is the geometric mean of the three dimension indices adjusted for inequality. First, the IHDI that includes the unlogged income index (IHDI*) is calculated:

$$IHDI^* = \sqrt[3]{I_{I_{Life}} \cdot I_{I_{Education}} \cdot I^*_{I_{Income}}} =$$

$$\sqrt[3]{(1 - A_{Life}) \cdot I_{Life} \cdot (1 - A_{Education}) \cdot I_{Education} \cdot (1 - A_{Income}) \cdot I^*_{Income}}\ .$$

The HDI based on unlogged income index (HDI^*) is then calculated. This is the value that $IHDI^*$ would take if all achievements were distributed equally:

$$HDI^* = \sqrt[3]{I_{Life} \cdot I_{Education} \cdot I^*_{Income}} .$$

The percentage loss to the HDI^* due to inequalities in each dimension is calculated as:

$$Loss = 1 - \frac{IHDI^*}{HDI^*} = 1 - \sqrt[3]{(1-A_{Life}) \cdot (1-A_{Education}) \cdot (1-A_{Income})}.$$

Assuming that the percentage loss due to inequality in income distribution is the same for both average income and its logarithm, the IHDI is then calculated as:

$$IHDI = \left(\frac{IHDI^*}{HDI^*}\right) \cdot HDI$$

which is equivalent to

$$IHDI = \sqrt[3]{(1-A_{Life}) \cdot (1-A_{Education}) \cdot (1-A_{Income})} \cdot HDI.$$

Notes on methodology and limits

The IHDI is based on an index that satisfies subgroup consistency. This ensures that improvements or deteriorations in distribution of human development within a certain group of society (while human development remains constant in the other groups) will be reflected in changes in the overall measure of human development. This index is also path independent, which means that the order in which data are aggregated across individuals, or groups of individuals, and across dimensions yields the same result—so there is no need to rely on a particular sequence or a single data source. This allows estimation for a large number of countries.

Although the IHDI is about human development losses from inequality, the measurement of inequality in any dimension implicitly conflates inequity and inequality due to chance, choice and circumstances. It does not address the ethical and policy-relevant issues around whether these aspects should be distinguished (see Roemer 1998 and World Bank 2005b for applications in Latin America).

The main disadvantage of the IHDI is that it is not association sensitive, so it does not capture overlapping inequalities. To make the measure association sensitive, all the data for each individual must be available from a single survey source, which is not currently possible.

Example: Slovenia

	Indicator	Dimension index	Inequality measure (A1)	Inequality-adjusted index
Life expectancy	78.8	0.930	0.043	$(1-0.043) \cdot 0.930 = 0.890$
Mean years of schooling	9	0.682		
Expected years of schooling	16.7	0.811		
Education index		0.782	0.040	$(1-0.040) \cdot 0.782 = 0.751$
Logarithm of GNI	10.16	0.780		
GNI	25,857	0.238	0.122	$(1-0.122) \cdot 0.238 = 0.209$

	Human Development Index	Inequality-adjusted Human Development Index	Percent loss
HDI with unlogged income	$\sqrt[3]{0.930 \cdot 0.782 \cdot 0.238} = 0.557$	$\sqrt[3]{0.890 \cdot 0.751 \cdot 0.209} = 0.519$	$1-0.519/0.557 = 0.068$
HDI	$\sqrt[3]{0.930 \cdot 0.782 \cdot 0.780} = 0.828$	$(0.519 / 0.557) \cdot 0.828 = 0.772$	

Note: Values are rounded.

Technical note 3. Calculating the Gender Inequality Index

The Gender Inequality Index (GII) reflects women's disadvantage in three dimensions—reproductive health, empowerment and the labour market—for as many countries as data of reasonable quality allow. The index shows the loss in human development due to inequality between female and male achievements in these dimensions. It ranges from 0, which indicates that women and men fare equally, to 1, which indicates that women fare as poorly as possible in all measured dimensions.

The GII is computed using the association-sensitive inequality measure suggested by Seth (2009). The index is based on the general mean of general means of different orders—the first aggregation is by the geometric mean across dimensions; these means, calculated separately for women and men, are then aggregated using a harmonic mean across genders.

Data sources

- Maternal mortality ratio (*MMR*): United Nations Children's Fund (2010c)
- Adolescent fertility rate (*AFR*): United Nations Department of Economic and Social Affairs (2009d)
- Share of parliamentary seats held by each sex (*PR*): Inter-parliamentary Union's Parline database (2010)

- Attainment at secondary and higher education (*SE*) levels: Barro and Lee (2010)
- Labour market participation rate (*LFPR*): International Labour Organization (2010d)

Computing the Gender Inequality Index

There are five steps to computing the GII.

Step 1. Treating zeros and extreme values

The maternal mortality ratio is truncated symmetrically at 10 (minimum) and at 1,000 (maximum). The maximum of 1,000 is based on the normative assumption that countries where the maternal mortality ratio exceeds 1,000 are not different in their ability to create conditions and support for maternal health. Similarly, it is assumed that countries with 1–10 deaths per 100,000 births are essentially performing at the same level.

The female parliamentary representation of countries reporting 0 percent is coded as 0.1 percent because the geometric mean cannot have zero values and because these countries do have some kind of political influence by women.

Step 2. Aggregating across dimensions within each gender group, using geometric means

Aggregating across dimensions for each gender group by the geometric mean makes the GII association sensitive (see Seth 2009).

For women and girls, the aggregation formula is

$$G_F = \sqrt[3]{\left(\frac{1}{MMR} \cdot \frac{1}{AFR}\right)^{1/2} \cdot (PR_F \cdot SE_F)^{1/2} \cdot LFPR_F},$$

and for men and boys the formula is

$$G_M = \sqrt[3]{1 \cdot (PR_M \cdot SE_M)^{1/2} \cdot LFPR_M}.$$

Step 3. Aggregating across gender groups, using a harmonic mean

The female and male indices are aggregated by the harmonic mean to create the equally distributed gender index

$$HARM\,(G_F, G_M) = \left[\frac{(G_F)^{-1} + (G_M)^{-1}}{2}\right]^{-1}.$$

Using the harmonic mean of geometric means within groups captures the inequality between women and men and adjusts for association between dimensions.

Step 4. Calculating the geometric mean of the arithmetic means for each indicator

The reference standard for computing inequality is obtained by aggregating female and male indices using equal weights (thus treating the genders equally) and then aggregating the indices across dimensions:

$$G_{\overline{F},\overline{M}} = \sqrt[3]{\overline{Health} \cdot \overline{Empowerment} \cdot \overline{LFPR}}$$

$$\text{where } \overline{Health} = \left(\sqrt{\frac{1}{MMR} \cdot \frac{1}{AFR}} + 1\right)/2,$$

$$\overline{Empowerment} = \left(\sqrt{PR_F \cdot SE_F} + \sqrt{PR_M \cdot SE_M}\right)/2 \text{ and}$$

$$\overline{LFPR} = \frac{LFPR_F + LFPR_M}{2}.$$

$\overline{Health}$ should not be interpreted as an average of corresponding female and male indices but as half the distance from the norms established for the reproductive health indicators—fewer maternal deaths and fewer adolescent pregnancies.

Step 5. Calculating the Gender Inequality Index

Comparing the equally distributed gender index to the reference standard yields the GII,

$$1 - \frac{Harm\,(G_F, G_M)}{G_{\overline{F},\overline{M}}}.$$

Example: Brazil

	Reproductive health		Empowerment		Labour market
	Maternal mortality ratio	Adolescent fertility rate	Parliamentary representation	Attainment at secondary and higher education	Labour market participation rate
Female	110	75.6	0.094	0.488	0.640
Male	na	na	0.906	0.463	0.852
(F+M)/2	$\left(\sqrt{(1/110)\cdot(1/75.6)}+1\right)/2=0.50$		$\left(\sqrt{0.094\cdot 0.488}+\sqrt{0.906\cdot 0.463}\right)/2=0.431$		$(0.640+0.852)/2=0.746$

na is not applicable.

Using the above formulas, it is straightforward to obtain:

$$G_F \quad 0.115=\sqrt[3]{\sqrt{\left(\frac{1}{110}\cdot\frac{1}{75.6}\right)}\cdot\sqrt{0.094\cdot 0.488}\cdot 0.640}$$

$$G_M \quad 0.820=\sqrt[3]{1\cdot\sqrt{0.906\cdot 0.463}\cdot 0.852}$$

$$Harm\,(G_F, G_M) \quad 0.201=\left[\frac{1}{2}\left(\frac{1}{0.115}+\frac{1}{0.820}\right)\right]^{-1}$$

$$G_{\overline{F},\overline{M}} \quad 0.546=\sqrt[3]{0.505\cdot 0.431\cdot 0.746}$$

$$\text{GII} \qquad 1-0.201/0.546=0.632.$$

Technical note 4. Calculating the Multidimensional Poverty Index

The Multidimensional Poverty Index (MPI) identifies multiple deprivations at the individual 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 nonpoor depending on the number of deprivations his or her household experiences. These data are then aggregated into the national measure of poverty.

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 3⅓). 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).

The health thresholds are having at least one household member who is malnourished and having had one or more children die. The education thresholds are having no household member who has completed five years of schooling and having at least one school-age child (up to grade 8) who is not attending school. The standard of living thresholds relate to 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.[4] 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:

$$A = \frac{\sum_1^q c}{qd}$$

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).

Example using hypothetical data

Indicators	Household 1	Household 2	Household 3	Household 4	Weights
Household size	4	7	5	4	
Health					
At least one member is malnourished	0	0	1	0	5/3=1.67
One or more children have died	1	1	0	1	5/3=1.67
Education					
No one has completed five years of schooling	0	1	0	1	5/3=1.67
At least one school-age child not enrolled in school	0	1	0	0	5/3=1.67
Living conditions					
No electricity	0	1	1	1	5/9=0.56
No access to clean drinking water	0	0	1	0	5/9=0.56
No access to adequate sanitation	0	1	1	0	5/9=0.56
House has dirt floor	0	0	0	0	5/9=0.56
Household uses "dirty" cooking fuel (dung, firewood or charcoal)	1	1	1	1	5/9=0.56
Household has no car and owns at most one of: bicycle, motorcycle, radio, refrigerator, telephone or television	0	1	0	1	5/9=0.56
Results					
Weighted count of deprivation, c (sum of each deprivation multiplied by its weight)	2.22	7.22	3.89	5.00	
Is the household poor ($c > 3$)?	No	Yes	Yes	Yes	

Note: 1 indicates deprivation in the indicator; 0 indicates non-deprivation.

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

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

(80 percent of people live in poor households)

Intensity of poverty

$$(A) = \frac{(7.22 \cdot 7) + (3.89 \cdot 5) + (5.00 \cdot 4)}{(7+5+4) \cdot 10} = 0.56$$

(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.

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_x is estimated from survey data using the survey weights,

$$\hat{A}_x = 1 - \frac{X_1^{w_1} \ldots X_n^{w_n}}{\sum_1^n w_i X_i}, \text{ where } \sum_1^n w_i = 1.$$

4 Technically this would be 3.33. Because of the weighting structure, the same households are identified as poor if a cut-off of 3 is used.

Definitions of statistical terms

Adjusted net savings Rate of savings in an economy after taking into account investments in human capital, depletion of natural resources and damage caused by pollution, expressed as a percentage of gross national income (GNI). Negative adjusted net saving implies that total wealth is declining and that the economy is on an unsustainable path.

Births attended by skilled health personnel Percentage of deliveries attended by personnel (including doctors, nurses and midwives) trained to give the necessary care to women during pregnancy, labour and the postpartum period. Excludes traditional birth attendants, whether trained or not.

Civil war, fatalities Average number of fatalities resulting from civil war per year of conflict, expressed per million people. For countries with multiple wars, the best estimates for the total number of battle deaths from conflict are used.

Civil war, intensity Score indicating the level of intensity of civil war conflict. A score of 0 indicates no conflict; 1 is a sign of minor civil war where the number of deaths in a year is less than 1,000; 2 indicates a major civil war where the number of deaths in a year is at least 1,000.

Consumer price index Average price of a basket of goods and services purchased by households; the basket varies by country and may be fixed or may change at specified intervals. Changes in the consumer price index indicate the change in the real value (purchasing power) of money.

Contraceptive prevalence rate, any method Percentage of women of reproductive age (ages 15–49) who are using, or whose partners are using, any form of contraception, whether modern or traditional.

Debt service, public expenditure on Sum of principal repayments and interest actually paid in foreign currency, goods or services on long-term debt (having a maturity of more than one year), interest paid on short-term debt and repayments to the International Monetary Fund, expressed as a percentage of GNI.

Degraded land, people living on Percentage of people living on severely and very severely degraded land. Land degradation is based on four aspects of ecosystem services: biomass, soil health, water quantity and biodiversity. Severe degradation indicates that biotic functions are largely destroyed and that land is nonreclaimable at the farm level. Very severe degradation indicates that biotic functions are fully destroyed and that land is nonreclaimable.

Democratic decentralization measure Score published by the Database of Political Institutions indicating whether elections were held for the legislature and executive at the lowest subnational (municipal) level. Scores range from 0 (no local elections) to 2 (legislators and executives are locally elected).

Dependency ratio Ratio of the population ages 0–14 and ages 65 and older to the working-age population (ages 15–64), expressed as dependants per 100 people ages 15–64.

Ecological footprint of consumption Amount of biologically productive land and sea area that a country requires to produce the resources it consumes and to absorb the waste it generates, expressed in hectares per capita.

Enrolment ratio, gross Total enrolment in a given level of education, regardless of age, expressed as a percentage of the official school-age population for the same level of education.

Enrolment ratio, net Enrolment in a given level of education of the official age for that level, expressed as a percentage of the total population of the same age group.

Expected years of schooling Number of years of schooling that a child of school entrance age can expect to receive if prevailing patterns of age-specific enrolment rates were to stay the same throughout the child's life.

Fertility rate, adolescent Number of births to women ages 15–19, expressed per 1,000 women of the same age.

Fertility rate, total Number of children that would be born to each woman if she were to live to the end of her child-bearing years and bear children at each age in accordance with prevailing age-specific fertility rates.

Food deprivation, intensity of Average shortfall in kilocalories suffered by malnourished people, expressed as a percentage of the minimum daily requirement of dietary energy intake. The lower the value, the less intense food deprivation is.

Foreign direct investment, net inflows Net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital and short-term capital, expressed as a percentage of GDP.

Formal employment Wage and salaried workers, plus employers, expressed as a percentage of total employment.

GDP (gross domestic product) Sum of value added by all resident producers in the economy plus any product taxes (less subsidies) not included in the valuation of output, calculated without making deductions for depreciation of fabricated capital assets or for depletion and degradation of natural resources. Value added is the net output of an industry after adding up all outputs and subtracting intermediate inputs. When expressed in US dollar terms, it is converted using the average official exchange rate reported by the International Monetary Fund. An alternative conversion factor is applied if the official exchange rate is judged to diverge by an exceptionally large margin from the rate effectively applied to transactions in foreign currencies and traded products. When expressed in purchasing power parity (PPP) US dollar terms, it is converted to international dollars using PPP rates. An international dollar has the same purchasing power over GDP that the US dollar has in the United States.

GDP per capita Gross domestic product (GDP) in US dollar terms, divided by midyear population. When expressed as an average annual growth rate, the least squares annual growth rate is used with constant GDP per capita data in local currency units.

Gender Inequality Index A composite index measuring loss in achievements in three dimensions of human development—reproductive health, empowerment and labour market, due to inequality between genders. For details on how the index is calculated, see *Technical note 4.*

Gini coefficient, income Measure of the deviation of the distribution of income (or consumption) among individuals or households within a country from a perfectly equal distribution. A Lorenz curve plots the cumulative percentages of total income received against the cumulative number of recipients, starting with the poorest individual or household. The Gini index measures the area between the Lorenz curve and a hypothetical line of absolute equality, expressed as a percentage of the maximum area under the line. A value of 0 represents absolute equality, a value of 100 absolute inequality.

GNI (gross national income) per capita Sum of value added by all resident producers in the economy plus any product taxes (less subsidies) not included in the valuation of output plus net receipts of primary income (compensation of employees and property income) from abroad, divided by midyear population. Value added is the net output of an industry after adding up all outputs and subtracting intermediate inputs. When expressed in PPP US dollar terms, it is converted to international dollars using PPP rates. An international dollar has the same purchasing power over GDP that a US dollar has in the United States.

Human Development Index (HDI) A composite index measuring average achievement in three basic dimensions of human development—a long and healthy life, knowledge and a decent standard of living. For details on how the index is calculated, see *Technical note 1.*

Human Development Index—hybrid An index that uses the same functional form as the HDI but uses literacy and gross enrollment to build the education index and GDP per capita for the income indicator. This index is used in the trends analysis presented in chapters 2 and 3.

Human Development Index, Inequality-adjusted Human development index value adjusted for inequalities in the three basic dimensions of human development. For details on how the measure is calculated, see *Technical note 2.*

Human rights violations Score published by the Database of Political Institutions (which calls it the Political Terror Scale) measuring human rights violations, as classified in Gibney, Cornett, and Wood (2010) and based on sanctioned killing, torture, disappearance and political imprisonment. The score is based on expert coding of the scope (type), intensity (frequency) and range of violence.

Income poverty line, population below Percentage of the population living below the specified poverty line (PPP $1.25 a day and the national poverty line). The national poverty line is the poverty line deemed appropriate for a country by its authorities. National estimates are based on population-weighted subgroup estimates from household surveys.

Labour force participation rate Percentage of the working-age population (ages 15–64) that actively engages in the labour market, by either working or actively looking for work.

Life expectancy at birth Number of years a newborn infant could expect to live if prevailing patterns of age-specific mortality rates at the time of birth were to stay the same throughout the infant's life.

Life satisfaction, overall Score based on responses to a question about satisfaction with life in a Gallup World Poll.

Literacy rate, adult Percentage of people ages 15 and older who can, with understanding, both read and write a short simple statement on their everyday life.

Mean years of schooling Average number of years of education received by people ages 25 and older in their lifetime based on education attainment levels of the population converted into years of schooling based on theoretical durations of each level of education attended.

Military, public expenditure on All expenditures of the defence ministry and other ministries on recruiting and training military personnel and on the construction and purchase of military supplies and equipment, expressed as a percentage of GDP.

Mortality rate, adult Probability per 1,000 that a 15-year-old person will die before reaching age 60.

Mortality rate, infant Probability of dying between birth and exactly age 1, expressed per 1,000 live births.

Mortality rate, under-five Probability per 1,000 that a newborn baby will die before reaching age five, if subject to current age-specific mortality rates.

Mortality ratio, maternal Number of maternal deaths, expressed per 100,000 live births. Maternal death is defined as the death of a woman while pregnant or within 42 days after terminating a pregnancy, regardless of the length and site of the pregnancy, due to any cause related to or aggravated by the pregnancy itself or its care but not due to accidental or incidental causes.

Multidimensional poverty, headcount Percentage of the population that suffers deprivation in at least 3 of the 10 weighted indicators used to construct the Multidimensional Poverty Index.

Multidimensional Poverty Index The share of the population that is multidimensionally poor adjusted by the intensity of the deprivations.

Multidimensional poverty, intensity of deprivation Average percentage of deprivation experienced by people in multidimensional poverty.

Negative experience index Scale indicating the percentage of survey respondents in a Gallup World Poll who experienced a negative emotion such as physical pain, worry, sadness, stress, depression and anger the day before the survey. Responses were coded 1 for "yes" and 0 for "no" and then averaged and multiplied by 100.

Nonincome HDI value Value of Human Development Index computed from life expectancy and education index only.

Official development assistance Disbursements of loans made on concessional terms (net of repayments of principal) and grants by official agencies of the members of the Development Assistance Committee (DAC), by multilateral institutions and by non-DAC countries to promote economic development and welfare in countries and territories in part I of the DAC list of aid recipients, expressed as a percentage of the recipient country's GNI. It includes loans with a grant element of at least 25 percent (calculated at a discount rate of 10 percent).

Physician density Number of medical doctors (physicians), including generalist and specialist medical practitioners, expressed per 10,000 people.

Political engagement Percentage of respondents who answered "yes" to the Gallup World Poll question, "Have you voiced your opinions to a public official in the past month?"

Political freedom, democracy Score on the Democracy and Dictatorship measure of political regimes, which distinguishes between regimes in which executive and legislative offices are filled through contested elections and those in which they are not.

Repetition rate, primary Number of primary school students enrolled in the same grade that they attended in the previous school year, expressed as a percentage of total enrolments in the school in the previous year.

Seats in parliament held by gender Percentage of seats held by a respective gender in a lower or single house or an upper house or senate, where relevant.

Tax revenue Total receipts from compulsory transfers to the central government for public purposes, including income and property taxes and excluding fines, penalties and most social security contributions, expressed as a percentage of GDP.

Trained teachers, primary Percentage of primary school teachers who have received the minimum organized teacher training (pre-service or in-service) required for teaching at the primary level of education.

Undernourishment, prevalence of Percentage of the population whose dietary energy consumption is continuously below a minimum dietary energy requirement for maintaining a healthy life and carrying out light physical activity with an acceptable bodyweight for attained height.

Unemployment rate Percentage of the labour force (the employed and unemployed population) ages 15 years and older who are not in paid employment nor self-employed but who are available for work and have taken specific steps to seek paid employment or self-employment.

Vulnerable employment Percentage of employed people engaged as unpaid family workers and own-account workers.

Country groupings

Developed countries

Developed Organisation for Economic Co-operation and Development (OECD)
(28 countries)

Australia
Austria
Belgium
Canada
Czech Republic
Denmark
Finland
France
Germany
Greece
Hungary
Iceland
Ireland
Italy
Japan
Korea, Republic of
Luxembourg
Netherlands
New Zealand
Norway
Poland
Portugal
Slovakia
Spain
Sweden
Switzerland
United Kingdom
United States

Developed non-OECD
(16 countries or areas)

Andorra
Bahrain
Barbados
Brunei Darussalam
Cyprus
Estonia
Hong Kong, China (SAR)
Israel
Liechtenstein
Malta
Monaco
Qatar
San Marino
Singapore
Slovenia
United Arab Emirates

Developing countries

Arab States
(17 countries or areas)

Algeria
Djibouti
Egypt
Iraq
Jordan
Kuwait
Lebanon
Libyan Arab Jamahiriya
Morocco
Occupied Palestinian Territories
Oman
Saudi Arabia
Somalia
Sudan
Syrian Arab Republic
Tunisia
Yemen

East Asia and the Pacific
(24 countries)

Cambodia
China
Fiji
Indonesia
Kiribati
Korea, Democratic People's Rep. of
Lao People's Democratic Republic
Malaysia
Marshall Islands
Micronesia, Federated States of
Mongolia
Myanmar
Nauru
Palau
Papua New Guinea
Philippines
Samoa
Solomon Islands
Thailand
Timor-Leste
Tonga
Tuvalu
Vanuatu
Viet Nam

Europe and Central Asia
(23 countries)

Albania
Armenia
Azerbaijan
Belarus
Bosnia and Herzegovina
Bulgaria
Croatia
Georgia
Kazakhstan
Kyrgyzstan
Latvia
Lithuania
Moldova, Republic of
Montenegro
Romania
Russian Federation
Serbia
Tajikistan
The former Yugoslav Republic of Macedonia
Turkey
Turkmenistan
Ukraine
Uzbekistan

Developing countries

Latin America and the Caribbean
(32 countries)

Antigua and Barbuda
Argentina
Bahamas
Belize
Bolivia, Plurinational State of
Brazil
Chile
Colombia
Costa Rica
Cuba
Dominica
Dominican Republic
Ecuador
El Salvador
Grenada
Guatemala
Guyana
Haiti
Honduras
Jamaica
Mexico
Nicaragua
Panama
Paraguay
Peru
Saint Kitts and Nevis
Saint Lucia
Saint Vincent and the Grenadines
Suriname
Trinidad and Tobago
Uruguay
Venezuela, Bolivarian Republic of

South Asia
(9 countries)

Afghanistan
Bangladesh
Bhutan
India
Iran, Islamic Republic of
Maldives
Nepal
Pakistan
Sri Lanka

Sub-Saharan Africa
(45 countries)

Angola
Benin
Botswana
Burkina Faso
Burundi
Cameroon
Cape Verde
Central African Republic
Chad
Comoros
Congo
Congo, Democratic Republic of the
Côte d'Ivoire
Equatorial Guinea
Eritrea
Ethiopia
Gabon
Gambia
Ghana
Guinea
Guinea-Bissau
Kenya
Lesotho
Liberia
Madagascar
Malawi
Mali
Mauritania
Mauritius
Mozambique
Namibia
Niger
Nigeria
Rwanda
São Tomé and Príncipe
Senegal
Seychelles
Sierra Leone
South Africa
Swaziland
Tanzania, United Republic of
Togo
Uganda
Zambia
Zimbabwe

Least Developed Countries
(49 countries)

Afghanistan
Angola
Bangladesh
Benin
Bhutan
Burkina Faso
Burundi
Cambodia
Central African Republic
Chad
Comoros
Congo, Democratic Republic of the
Djibouti
Equatorial Guinea
Eritrea
Ethiopia
Gambia
Guinea
Guinea-Bissau
Haiti
Kiribati
Lao People's Democratic Republic
Lesotho
Liberia
Madagascar
Malawi
Maldives
Mali
Mauritania
Mozambique
Myanmar
Nepal
Niger
Rwanda
Samoa
São Tomé and Príncipe
Senegal
Sierra Leone
Solomon Islands
Somalia
Sudan
Tanzania, United Republic of
Timor-Leste
Togo
Tuvalu
Uganda
Vanuatu
Yemen
Zambia