Human Development Measurements

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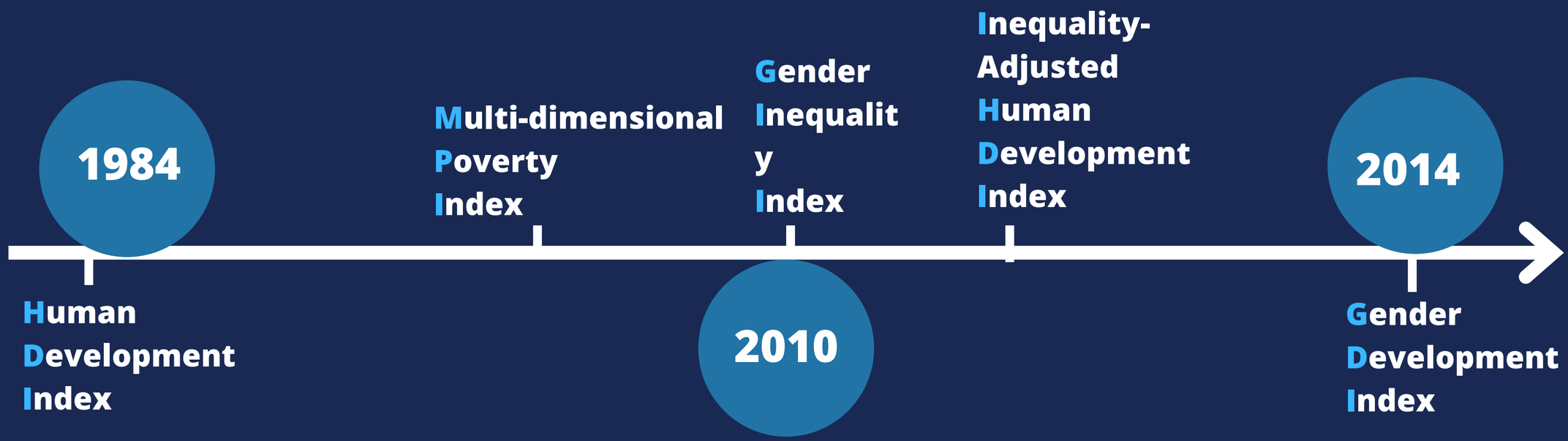

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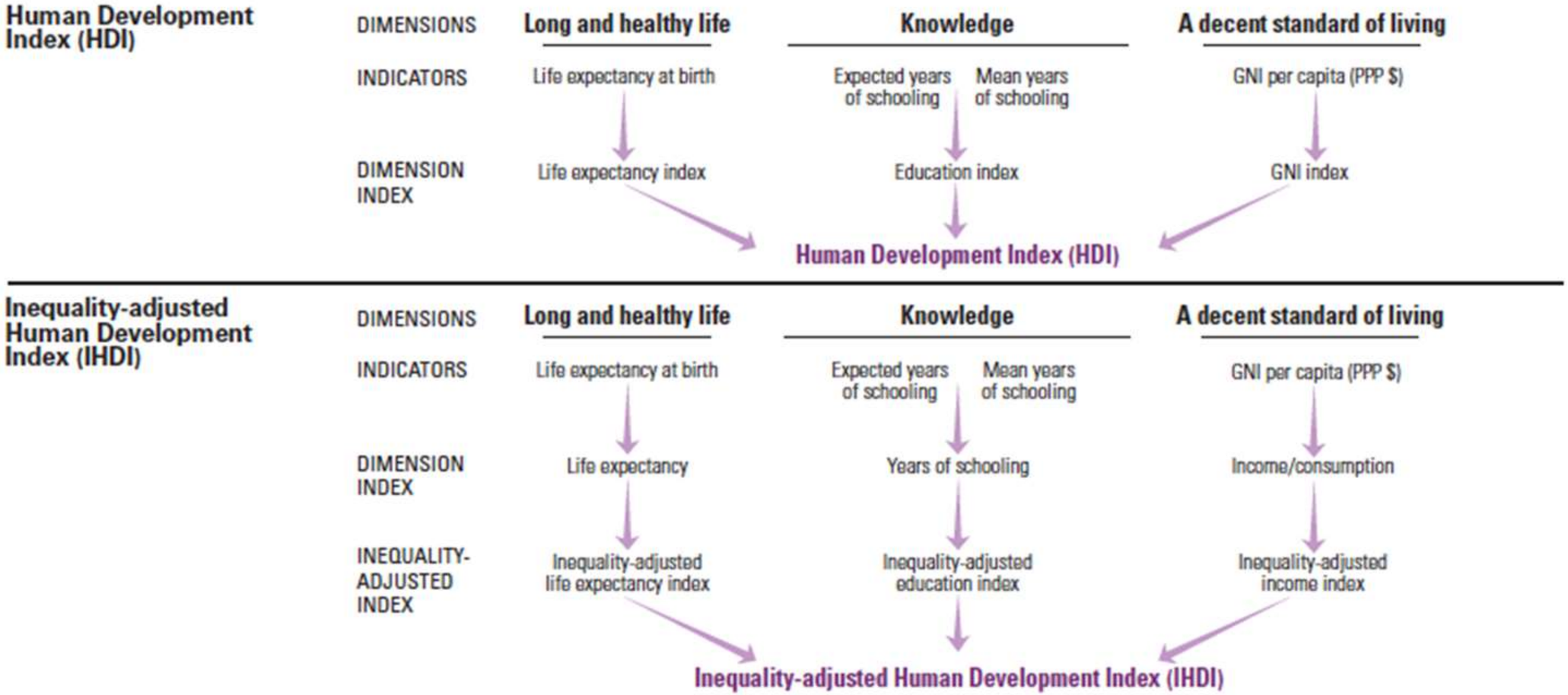

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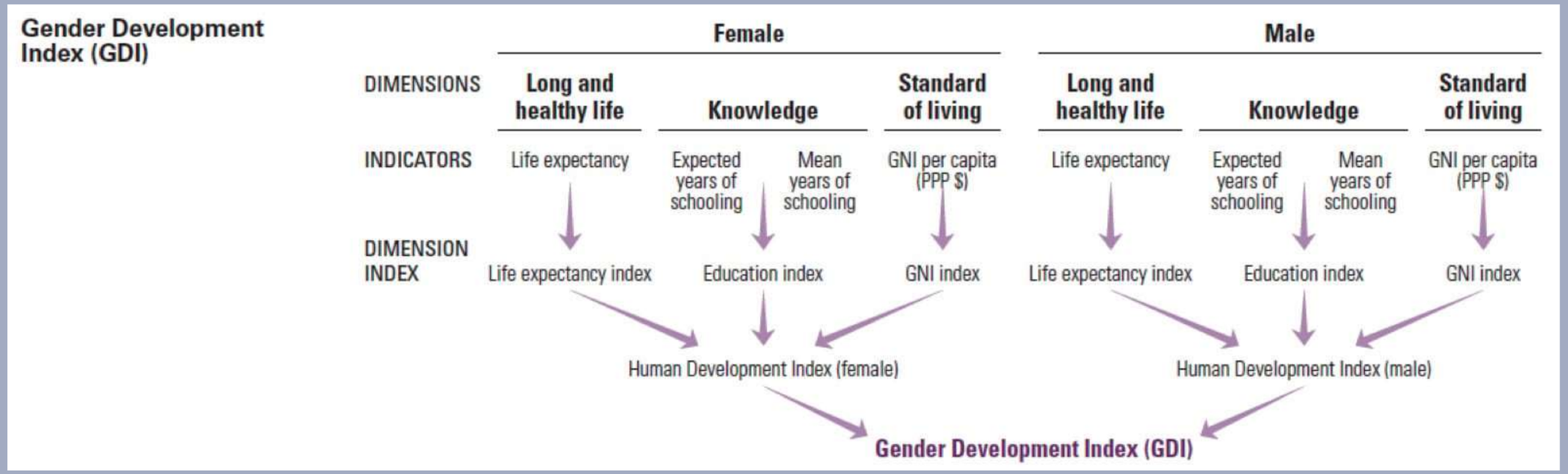
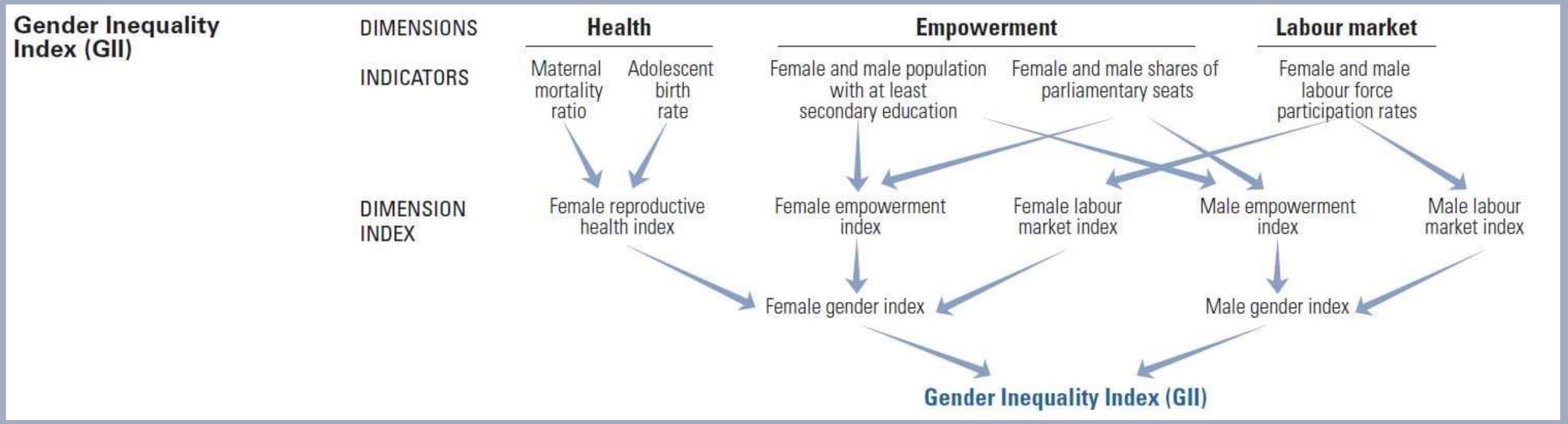
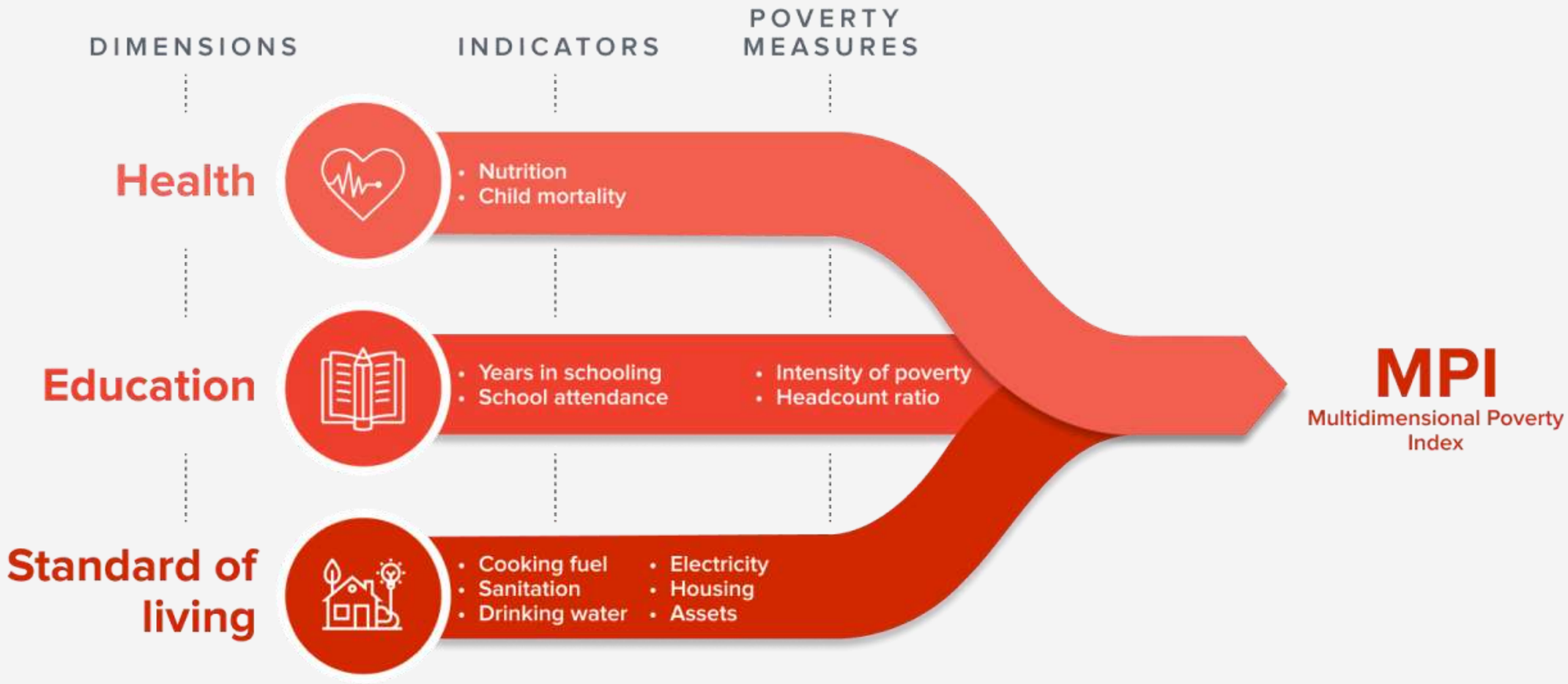




Multidimensional Poverty Index (MPI)



Human Development Index (HDI)

3 Dimensions

Long and Healthy life

Life Expectancy at birth

Knowledge

It **was**: adult literacy rate (2/3)
+ gross enrolment ratio (1/3))

in **2010** years of schooling + expected years of schooling

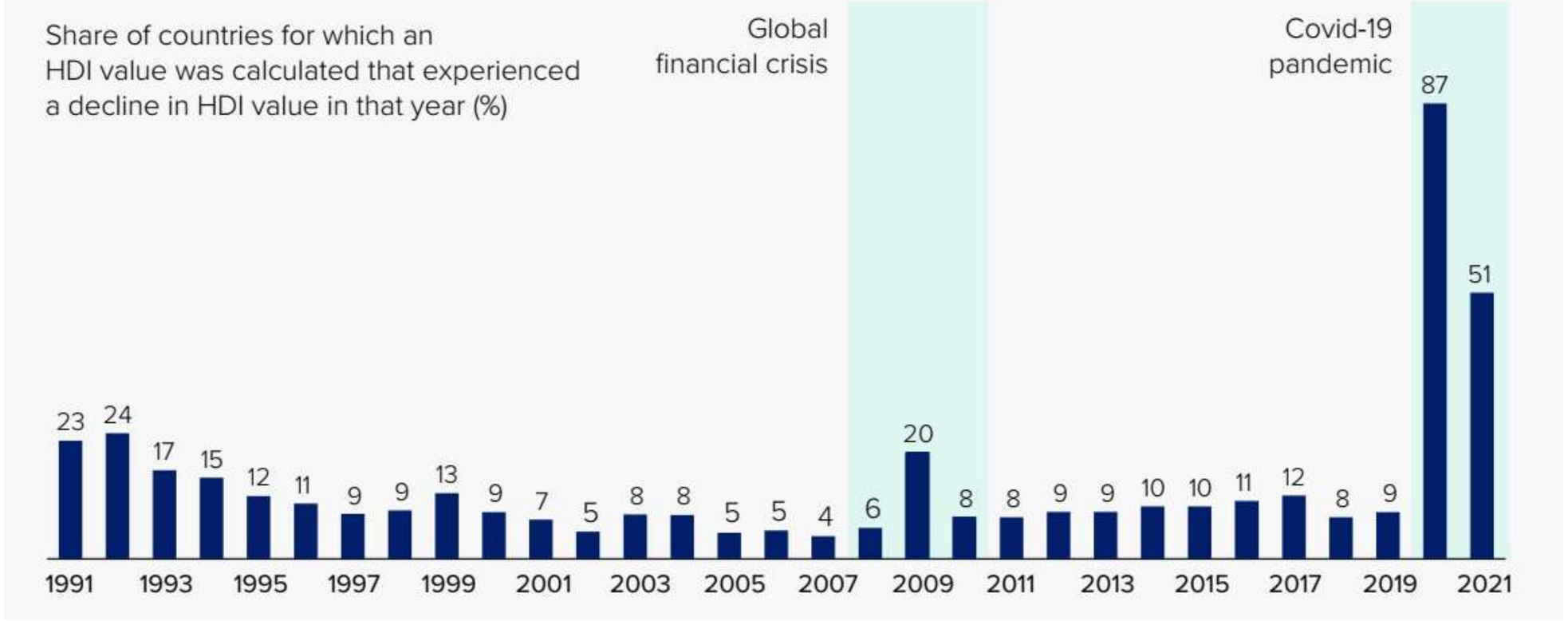
Decent Standard of living

It **was**: GDI per capita

in **2010** GNI per capita

...HDI during COVID-19

Figure 1.2 Drops in Human Development Index values were widespread during the Covid-19 pandemic, with over 90 percent of countries suffering a decline in either 2020 or 2021



Note: The period of the global financial crisis is indicative.
Source: Human Development Report Office calculations based on data from Barro and Lee (2018), IMF (2021c, 2022), UNDESA (2022a, 2022b), UNESCO Institute for Statistics (2022), UNSD (2022) and World Bank (2022c).

HDI Goalspots 2018

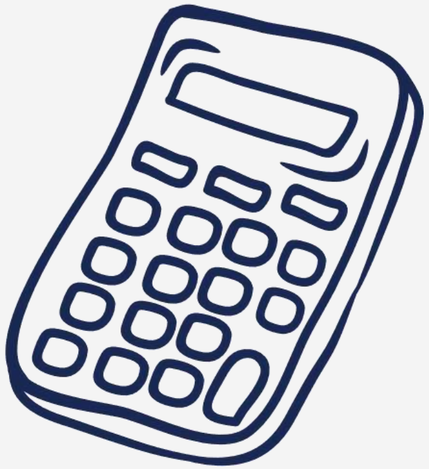
Dimension	Indicator	Minimum	Maximum
Health	Life expectancy (years)	20	85
Education	Expected years of schooling (years)	0	18
	Mean years of schooling (years)	0	15
Standard of living	Gross national income per capita (2011 PPP $)	100	75,000

Example

Let's calculate HDI of **India**

$$\sqrt[3]{LEI \bullet EI \bullet II}$$

Life Expectancy Index = **LEI**
Education Index = **EI**
Income Index = **II**
Mean Years of Schooling Index **= MYSI**
Expected Years of Schooling Index **= EYSI**



$$LEI = \frac{LE - Min\ LE}{Max\ LE - Min\ LE}$$

$$EI = \frac{MYSI + EYSI}{2}$$

$$II = \frac{\ln(GNI\ p.c.) - \ln(Min\ GNI\ p.c.)}{\ln(Max\ GNI\ p.c.) - \ln(Min\ GNI\ p.c.)}$$

Example

DATA

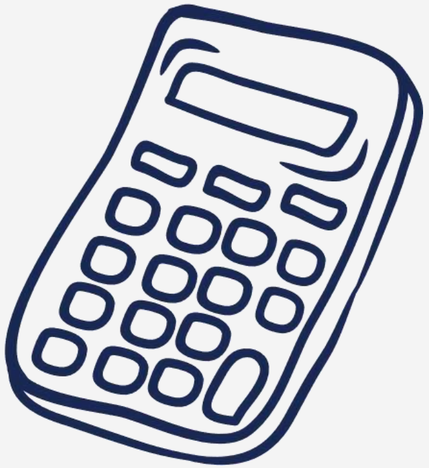
Average Indian Life Expectancy - 65

Mean Years of Schooling - 4.4

Expected Years of Schooling - 10.7

GNI p.c. - 5,350$

$$\sqrt[3]{0{,}692 \cdot 0{,}443 \cdot 0{,}60115} = 0{,}5695$$



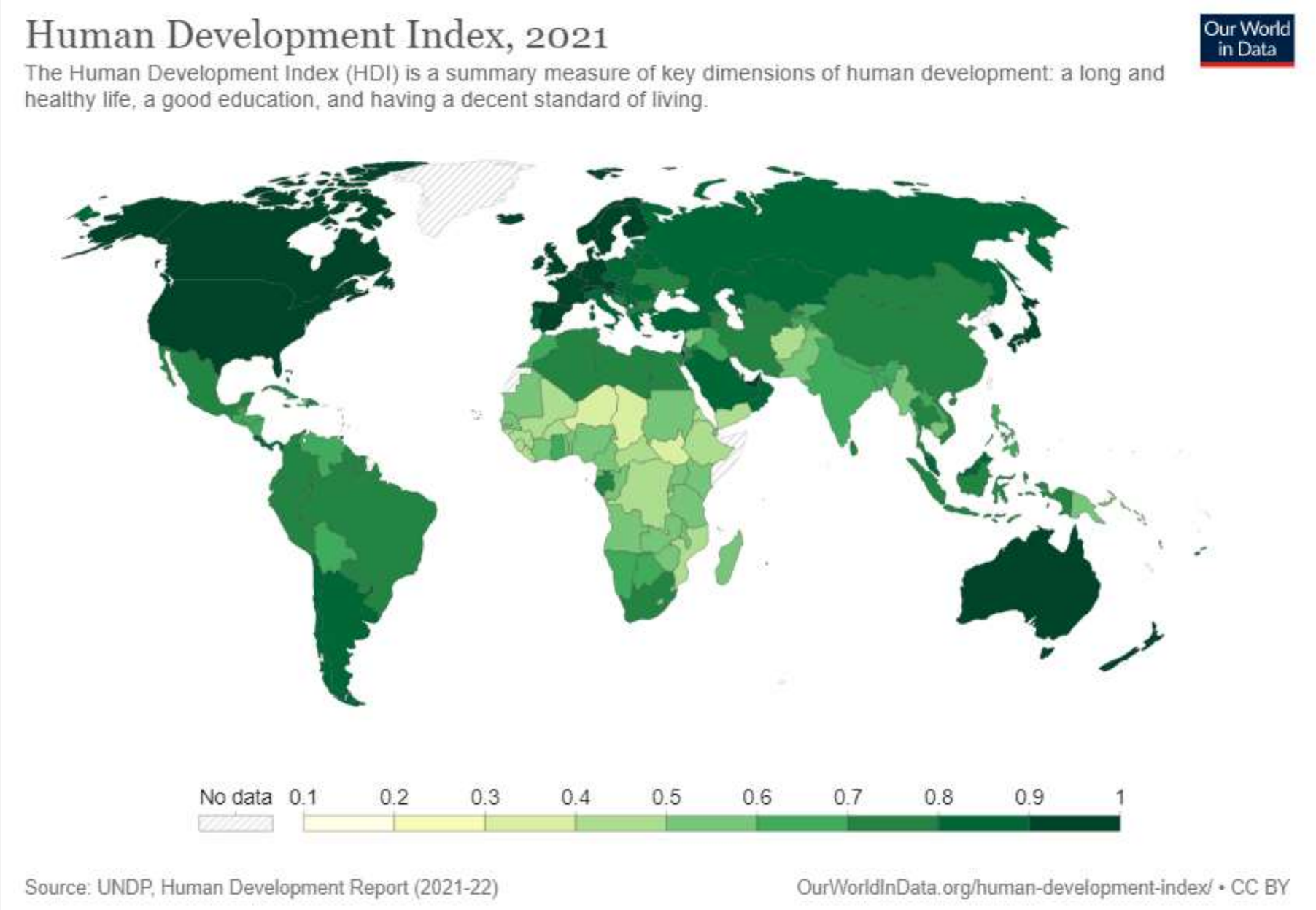
$$LEI = \frac{65 - 20}{85 - 20} = 0{,}692$$

$$EI = \frac{(4{,}4/15) + (10{,}7/18)}{2} = 0{,}443$$

$$II = \frac{\ln(5{,}350) - \ln(100)}{\ln(75{,}000) - \ln(100)} = 0{,}60115$$

HD Ranges

- **Very High HD =** > 0.8
- **High HD =** 0.70 > X < 0.79
- **Medium HD =** 0.55 > X < 0.69
- **Low HD =** < 0.55



IHDI - Inequality-adjusted Human Development Index

Since **2010** it adjusts HDI for inequality in each dimension across the population based on a distribution-sensitive class of composite indexes

- **IHDI =HDI** when there is no inequality across people
- **IHDI < HDI** in case of inequality

Interpretation:

IHDI = actual human development
HDI =potential human development
HDI - IHDI = “loss” in the potential human development due to inequality

The Example of Madagascar

Example: Madagascar

Indicator	Value	Dimension index	Inequality measure[a] (*A*)	Inequality-adjusted index (*I'*)
Life expectancy (years)	66.3	0.7125	0.213	(1–0.213) · 0.7125 = 0.5607
Expected years of schooling (years)	10.6	0.5872	—	—
Mean years of schooling (years)	6.1	0.4097	0.350	—
Education index	—	0.4985	0.350	(1–0.350) · 0.4985 = 0.3240
Gross national income per capita (2011 PPP $)	1,358	0.3940	0.204	(1–0.204) · 0.394 = 0.3136

Human Development Index	Inequality-adjusted Human Development Index
$(0.7125 \cdot 0.4986 \cdot 0.3940)^{1/3} = 0.5191$	$(0.5607 \cdot 0.3240 \cdot 0.3136)^{1/3} = 0.3848$
Loss due to inequality (%)	**Coefficient of human inequality (%)**
$100 \cdot \left(1 - \frac{0.385}{0.519}\right) = 25.9$	$\frac{100 \cdot (0.213 + 0.350 + 0.204)}{3} = 25.6$

Note: Values are rounded.
a. Inequalities are estimated from micro data.

Gender Development Indexes

It's similar to HDI

⇒ same dimensions,

⇒ same indicators,

⇒ same normalization formula

but

- ✓ slightly different goalposts for life expectancy (82,5 for male and 87,5 for female)
- ✓ Income earned estimated for female and male by taking into account their participation rates to the labour force

$GDI = (HDI_F/HDI_M)$;

It ranges from 0 (worst) to 1 (best, when $GDI_F = GDI_M$)

GDI - Japan Example

Indicator	Female value	Male value
Life expectancy at birth (years)	87.1	80.7
Expected years of schooling (years)	15.17	15.29
Mean years of schooling (years)	12.87	12.53
Wage ratio (female/male)	0.7297	
GNI per capita (2020 PPP $)	38,986.15	
Share of economically active population	0.4322	0.5678
Share of population	0.51166	0.48334

Female wage bill:
$S_f = (0.7297 \cdot 0.4322) / [(0.7297 \cdot 0.4322) + 0.5678] = 0.357$

Estimated female earned income pet capita:
$GNIpc_f = 38{,}986.15 \cdot 0.35709 / 0.51166 = 27{,}208.6$

Male wage bill:
$S_m = 1 - 0.35709 = 0.64291$

Estimated male earned income pet capita:
$GNIpc_m = 38{,}986.15 \cdot 0.64291 / 0.48834 = 51{,}326.1$

Female health index = $(87.1 - 22.5) / (87.5 - 22.5) = 0.993$

Male health index = $(80.7 - 17.5) / (82.5 - 17.5) = 0.9723$

Female education index = $[(15.17 / 18) + (12.87 / 15)] / 2$
0.8504

Male education index = $[(15.29 / 18) + (12.53 / 15)] / 2$
0.8424

Estimated female earned income index:
$[\ln(27{,}208.6) - \ln(100)] / [\ln(75{,}000) - \ln(100)] = 0.8468$

Estimated male earned income index:
$[\ln(51{,}326.1) - \ln(100)] / [(\ln(75{,}000) - \ln(100)] = 0.9427$

Female HDI = $(0.9938 \cdot 0.8504 \cdot 0.8468)^{1/3} = 0.894$

Male HDI = $(0.9723 \cdot 0.8424 \cdot 0.9427)^{1/3} = 0.917$

GDI = $0.894 / 0.917 = 0.975$

Gender Inequality Indexes

The gender-based disadvantage in 3 dimensions:

- **Reproductive Health** (Maternal mortality ratio + Adolescent fertility rate)
- **Empowerment** (Educational Attainment: F-M; Parliamentary Representation: F-M)
- **Labour market** (F-M labor force participation rate).

→ **Loss in** potential **HD due to inequality between M and F**

it ranges between:

0 (no inequality)

1 (max inequality)

Multidimensional Poverty Index

(only for developing countries)

Since 2010 - Multiple deprivations in the same three dimensions by using 10 indicators:

- **Health:** nutrition, child mortality
- **Education:** years of schooling, children enrolled
- **A decent standard of living:** cooking fuel, improved sanitation, electricity, safe drinking water, assets, etc.

→ product of headcount ratio **H** and average intensity of deprivation **A**
(proportion of dimensions in which households are on average deprived)

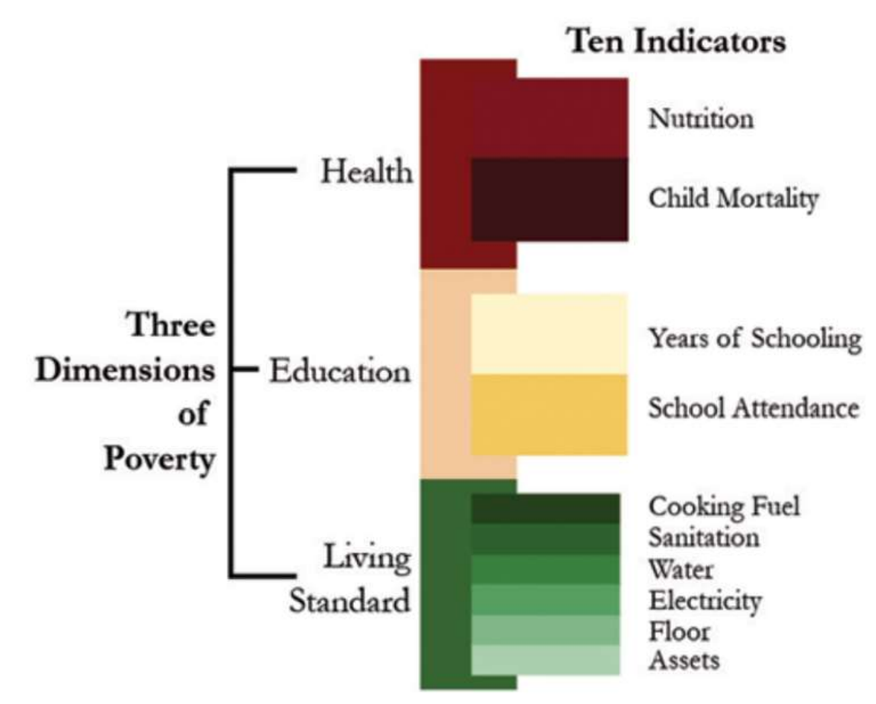
$$H = \frac{q}{n}$$

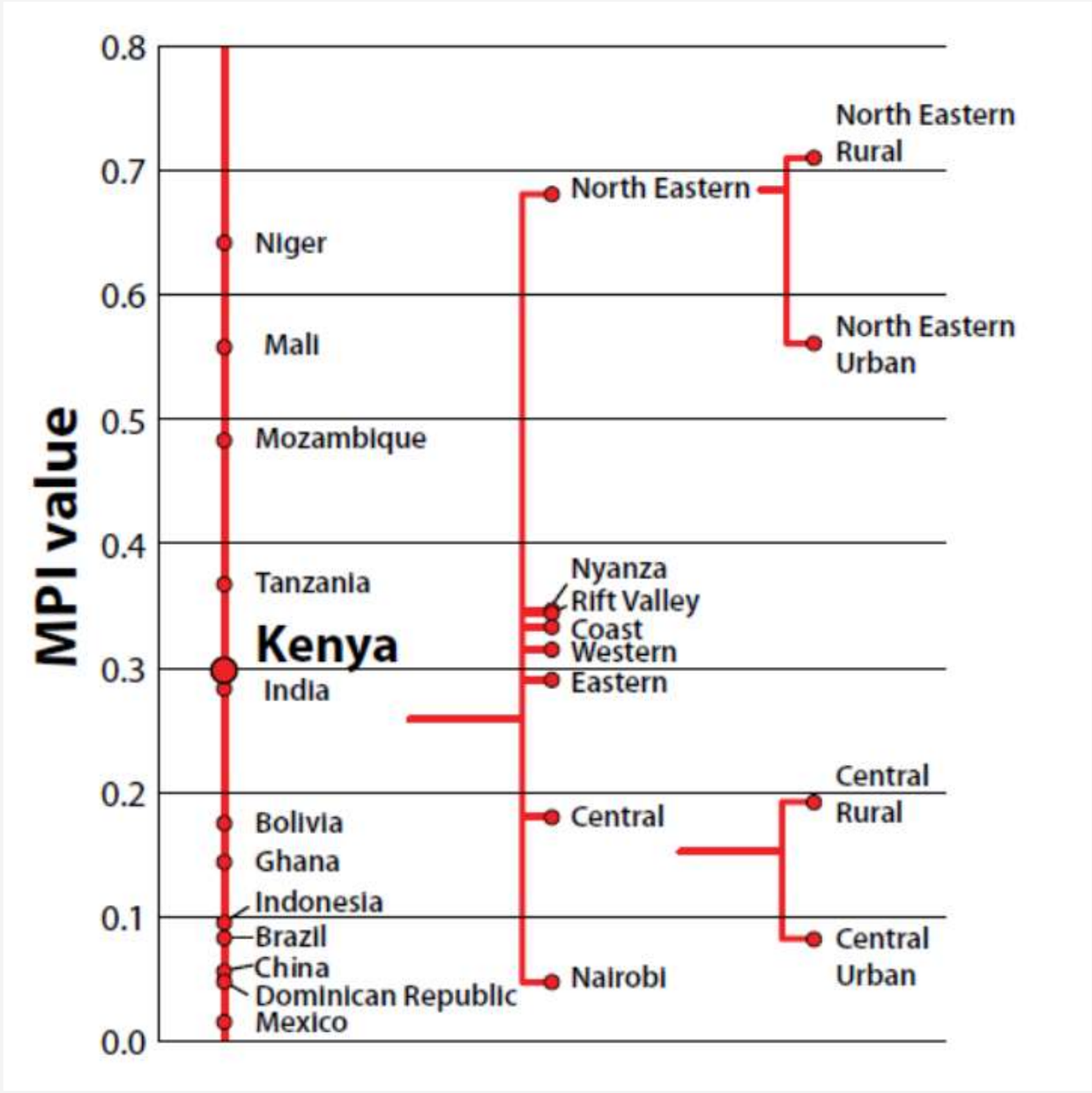
$$A = \frac{\sum_{i=1}^{n} c_i(k)}{q}$$

MPI = H x A

A brief example...

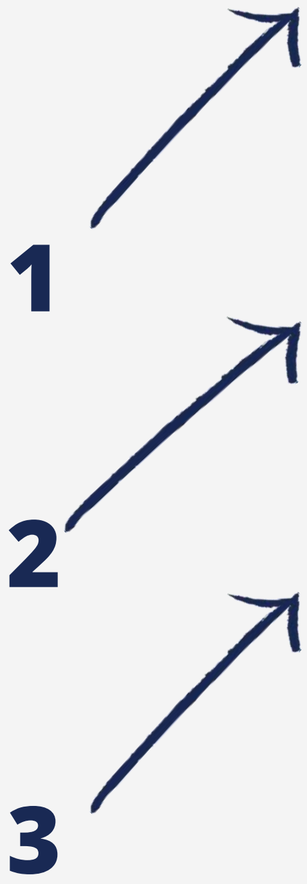
MPI values for Kenya regions in comparison with other countries (2015)





https://hdr.undp.org/system/files/documents//mpitrainingmaterial2015pdf.pdf

Indicators and Thresholds



1. **Education** (each indicator is weighted equally at 1/6)

   Years of Schooling: deprived if no household member has completed five years of schooling

   School Attendance: deprived if any school-age child is not attending school in years 1 to 8

2. **Health** (each indicator is weighted equally at 1/6)

   Child Mortality: deprived if any child has died in the family

   Nutrition: deprived if any adult or child for whom there is nutritional information is malnourished

3. **Living standards** (each indicator is weighted equally at 1/18)

   Electricity: deprived if the household has no electricity

   Drinking Water: deprived if the household does not have access to clean drinking water or clean water is more than 30 minutes walk from home (roundtrip)

   Sanitation: deprived if the household lacks adequate sanitation or if their toilet is shared

   Flooring: deprived if the household has a dirt, sand or dung floor

   Cooking Fuel: deprived if the household cooks with wood, charcoal or dung

   Asset ownership: deprived if the household does not own more than one of: radio, TV, telephone, bicycle, motorcycle, or refrigerator; and does not own a car or tractor

Indicators and Thresholds/2

- **Weights**: each dimension is equally weighted (1/3) and each indicator within a dimension is also equally weighted [nb: education and health (each indicator=1/6); standard of living (each indicator=1/18)]
- **Multidimensional poverty thresholds**: cut-off of 3 (=1/3 of the indicators). A household is identified as multidimensionally poor if it is deprived in some combination of indicators whose weighted sum exceeds 30% of all deprivations.
- **MPIndex** = product of headcount ratio and average intensity of deprivation (proportion of dimensions in which households are on average deprived)

Example using Hypothetical Data

Indicators	People in Households				Weights
	1	2	3	4	
Household size	4	7	5	4	
Education					
No one has completed five years of schooling	0	1	0	1	1/6=0.167
At least one school-age child 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
Score c_i (sum of each deprivation multiplied by its weight)	**0.222**	**0.722**	**0.389**	**0.500**	
Is the household poor ($c \geq 1/3 = 0.333$)?	**No**	**Yes**	**Yes**	**Yes**	
Censored score $c_i(k)$	**0**	**0.722**	**0.389**	**0.500**	

$$\text{Multidimensional Headcount ratio } (H) = \left(\frac{7+5+4}{4+7+5+4}\right) = 0.800$$

$$\text{Intensity of poverty } (A) = \frac{(0\times 4)+(0.722\times 7)+(0.389\times 5)+(0.500\times 4)}{(7+5+4)} = 0.5625$$

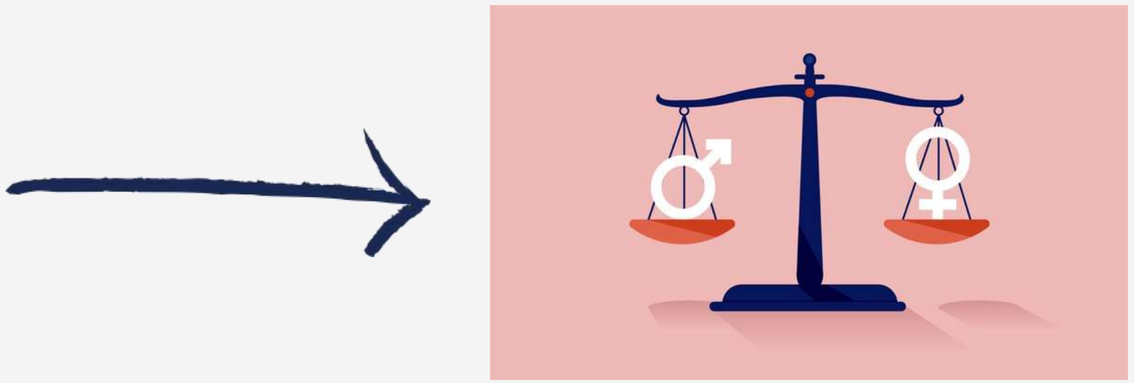
$$\text{MPI} = H \times A = 0.450.$$

Useful links

- https://hdr.undp.org/content/calculating-multidimensional-poverty-index
- https://hdr.undp.org/data-center
- https://hdr.undp.org/data-center/country-insights#/ranks
- https://hdr.undp.org/content/2022-global-multidimensional-poverty-index-mpi#/indicies/MPI
- https://hdr.undp.org/data-center/thematic-composite-indices/gender-inequality-index#/indicies/GII

"Two steps forward, one step back - where are we heading with gender equality?"

https://hdr.undp.org/content/two-steps-forward-one-step-back-where-are-we-heading-gender-equality



Problem set

Let us calculate the HDI for Kenya on the basis of the following indicators:

- Life expectancy at birth = 61.6
- Expected years of schooling = 11.0
- Mean years of schooling = 6.3
- GNI per capita (2011 PPP $) = 2762