

OPHI

Oxford Poverty & Human Development Initiative
Department of International Development
Queen Elizabeth House, University of Oxford

www.ophi.org.uk



**Acute Multidimensional Poverty:
A New Index for Developing Countries
Sabina Alkire & Maria Emma Santos**

Who are we?

Calculating MPI – team coordinated by Maria Emma Santos

involving Mauricio Apablaza, Yele Batana, Marta Barazzetta, Mauro Caselli, Ivan Gonzalez DeAlba, Enrique Hennings, Salvatore Morelli, Juan Pablo Ocampo Sheen, Uma Pradhan, Jose Manuel Roche, Maria Emma Santos, Suman Seth, Shabana Singh, Babak Somekh, Ana Vaz, Rosa Vidarte, Zheng Zhi, and Shuyang. Uma Pradhan, Sarah Malik, Gisela Robles Aguilar, Ale Ratazzi, and Gaston Yalonetzky have also contributed.

Ground Reality Check: Philomena Wanjiru (Kenya), Karen Daka (Madagascar), Carlos & Jessica (Peru), Indrajit Roy (India), Monica Wihardja (Indonesia), Elise Klein, John Hammock, and James Jewell.

Other contributors include: Karin Eli (Indicators); Paddy Coulter (Communications), Natalie Cresswell (Administration & Finance).

Background: the MPI

- An international measure of acute poverty for 104 developing countries.
- Launched by UNDP's HDRO and OPHI on 14 July 2010, as an experimental series that supplants HPI-I
- Will be updated annually if new data
- MPI-2 to be developed for middle-high HD countries
- Some analysis is ongoing

- Aims to encourage the development of better national measures of multidimensional poverty

Multidimensional Poverty Index

(MPI) *acute poverty in developing countries*

1. **Data**
2. **MPI Components**
3. **Methodology** (JEF *has done*)
4. **Results**
5. **Checks**
6. **Key Issues**

1. Data: Surveys

Demographic & Health Surveys (*DHS - 48*)

Multiple Indicator Cluster Surveys (*MICS - 35*)

World Health Survey (*WHS - 19*)

Additionally we used 2 special surveys covering Mexico and urban Argentina.

2. Dimensions of MPI

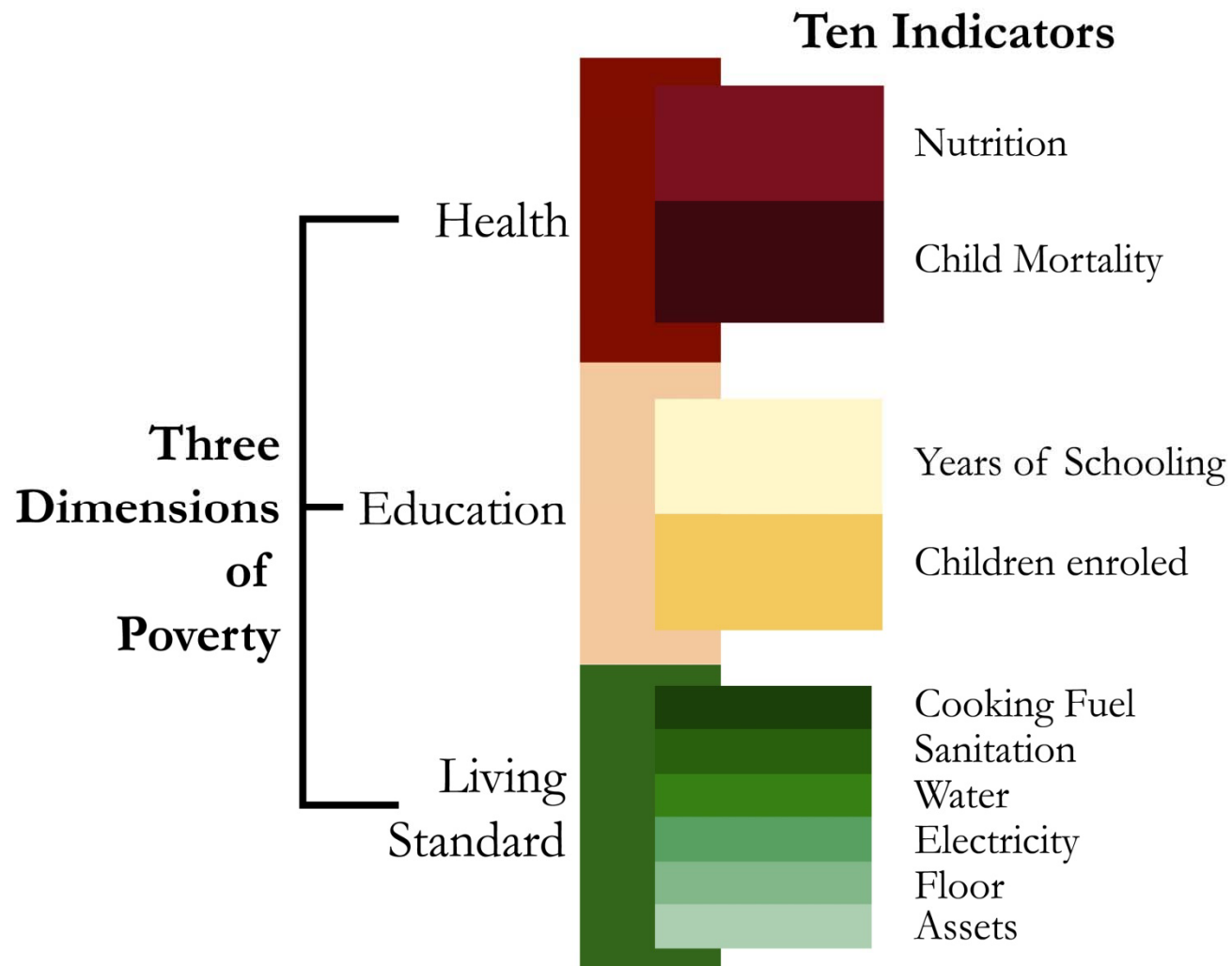
- Health**
- Education**
- Standard of living**

2. Missing Dimensions

Data are not available to incorporate any of these into the MPI for 100+ countries :

- **Work**
- **Empowerment / Political Freedom**
- **Safety from Violence**
- **Relationships**
(social capital, inclusion, cohesion, dignity)

2. Dimensions and Indicators of MPI



2. Measurement: Indicators & Cutoffs

- **Health**

- **Child Mortality:** If any child has died in the family
- **Malnutrition:** If any interviewed adult in the family has low Body Mass Index; if any child is more than 2 standard deviations below the reference normal weight for age, WHO standards) [*WHS has male & female data but no child data; MICS has child data but no adult data; DHS has women 15-49 & child*]

These are distinctly formulated; mortality is a stock.

2. Measurement: Indicators & Cutoffs

- **Education**

- **Years of Schooling:** if no person in the household has completed 5 years of schooling
- **Child Enrolment:** if any school-aged child is out of school, where school-aged is an eight year period from the national starting age.

2. Measurement: Indicators & Cutoffs

- **Standard of Living**
 - **Electricity** (no electricity is deprived)
 - **Drinking water** (MDG definitions)
 - **Sanitation** (MDG definitions + not being shared)
 - **Flooring** (dirt/sand/dung are deprived)
 - **Cooking Fuel** (wood/charcoal/dung are deprived)
 - **Assets** (deprived if do *not* own a car/truck and do *not* own *more than one* of these: radio, tv, telephone, bike, motorbike, or refrigerator)

2. Measurement: Indicators reflect MDGs

*MDG omissions: gender, infectious disease,
income, maternal mortality, environment, tenure*

– Health

- Nutrition = MDG 1 (Eradicate Extreme Poverty and Hunger)
- Mortality = MDG 4 (Reduce Child Mortality)

– Education

- Enrolment = MDG 2 (Achieve Universal Primary Education)
- Years Schooling = MDG 2

– Standard of Living

- | | | |
|---|------------------|-------|
| • Electricity <i>not MDG</i> | • Cooking Fuel | MDG 7 |
| • Sanitation MDG 7
(Ensure Environmental Sustainability) | • Drinking Water | MDG 7 |
| • Floor <i>not MDG</i> | • Assets | MDG 1 |

2. Measurement: data constraints

The MPI is deeply affected by the lack of **comparable** data.

key **indicators** are not collected (stock, quality)

- data for some dimensions are **missing**
- **missing values** lead to sample size reduction/biases
- **respondent(s)** vary; individual level data is sparse
- surveys **updated** every 3-5 years, and in different **years**
- data exclude certain populations (elders, institutionalized)
- **income/consumption** surveys lack MPI health indicators.

These can be addressed at a national level for national measures.

“Improving data gathering and its quality in all countries should be a central focus ...”

Bourguignon *et al.* 2008 page 6

2. Measurement: data constraints

Examples of the constraints:

62 countries have 10 indicators;

93 have 9 or 10 indicators

101 have 8-10 indicators (8 lack two indicators)

3 countries lack three indicators (Latvia, Myanmar, Surinam)

Biases from sample size reduction:

15 countries are lower or upper bound estimates of poverty.

These include China, S Africa, Pakistan (all lower bound).

2. Measurement Components: Weights

Each dimension is equally weighted:

- Health = $1/3$
- Education = $1/3$
- Standard of Living = $1/3$

“the interpretation of the set of indicators is greatly eased where the individual components have degrees of importance that, while not necessarily exactly equal, are not grossly different.”

Atkinson, Cantillon, Marlier, Nolan and Vandenbroucke 2002, p 25.

2. Measurement Components: Weights

- **Each indicator is equally weighted:**
 - **Health** (1/3)
 - Nutrition = 1/6;
 - Mortality = 1/6
 - **Education** (1/3)
 - Enrolment = 1/6
 - Years Schooling = 1/6
 - **Standard of Living** (1/3)
 - Electricity 1/18
 - Sanitation 1/18
 - Floor 1/18
 - Cooking Fuel 1/18
 - Drinking Water 1/18
 - Assets 1/18

3. MPI's Methodology: Identification (dual cutoff)

- MPI's mathematical structure corresponds to the first measure of the Alkire & Foster (2007) family of multidimensional poverty measures, called M_0 .
- MPI specifies dimensions, indicators, & weights.
- The deprivation cutoffs (z_j) are as detailed above.
- The poverty cutoff (k) is set at 3 (out of 10); 30%.

3. Methodology: Identification

Recall the weights on indicators vary

Health and Education: 1.67 each (10/6)

Standard of Living: 0.55 each (10/18)

A person is identified as poor if deprived in:

- * any two Health or Education indicators;
- * all six Standard of Living indicators;
- * 1 Health/Ed plus 3 Standard of Living

3. Methodology: Aggregation

- We construct the MPI using the AF method:

$$\text{Formula: } \text{MPI} = M_0 = H \times A$$

- ***H*** is the percentage of people who are poor. It shows the *incidence* of multidimensional poverty.
- ***A*** is the average proportion of weighted deprivations people suffer at the same time. It shows the *intensity* of people's poverty.

3. Methodology: MPI $g_0(k)$ matrix

Adjusted Headcount Ratio = M_0 = HA = **.442**

k=3

(have MPI for all k values)

	Indicators										$c(k)$	$c(k)/d$
$g^0(k) =$	0	0	0	0	0	0	0	0	0	0	0	0
	1.67	1.67	1.67	1.67	.55	0	0	0	0	.55	7.76	.776
	0	1.67	0	1.67	.55	0	.55	.55	.55	0	5.53	.553
	0	0	0	1.67	.55	.55	.55	0	.55	.55	4.42	.442

H = headcount = $\frac{3}{4}$ = **75%**

A = average deprivation share among poor = **.59** = **59%**

HA = **.442**

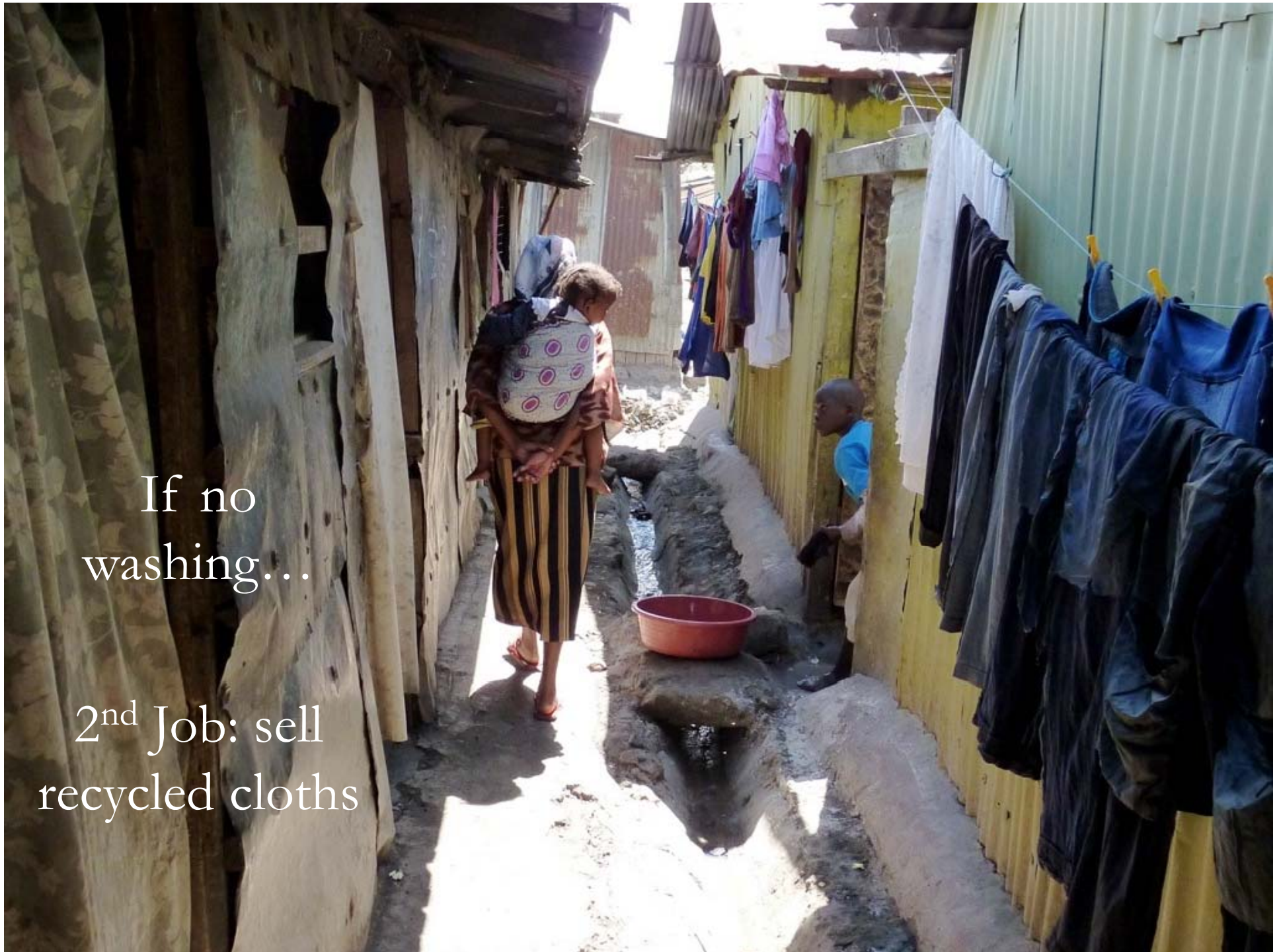
Example: Tabitha



OPHI has done
ground reality checks
in Kenya, Madagascar,
Indonesia, and India.

Washing job:
\$0.66 per wash





If no
washing...

2nd Job: sell
recycled cloths









Preparing recycled
cloth to sell



Tabitha's MPI

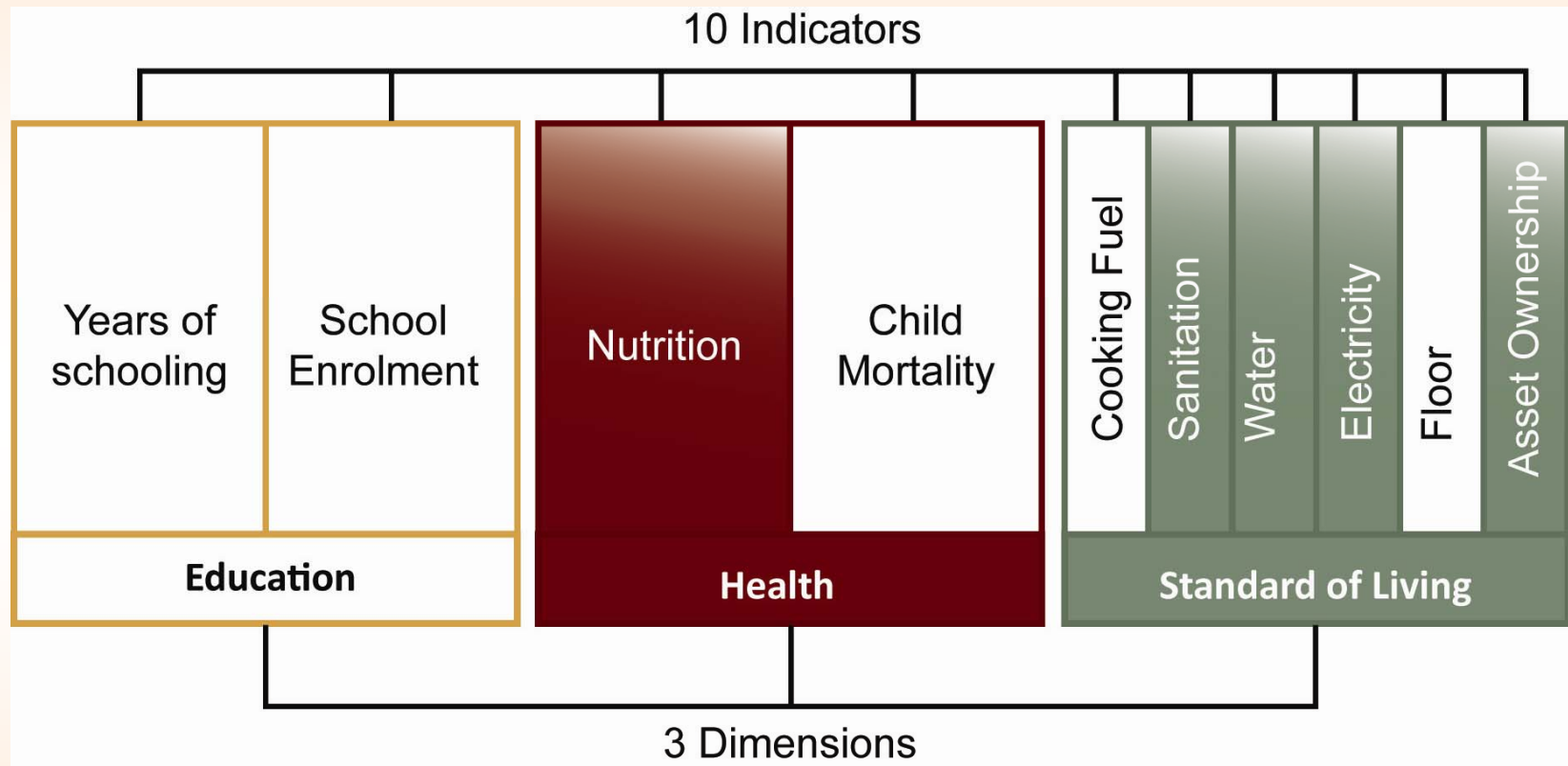
We know Tabitha is income poor.

But what does her life look like?

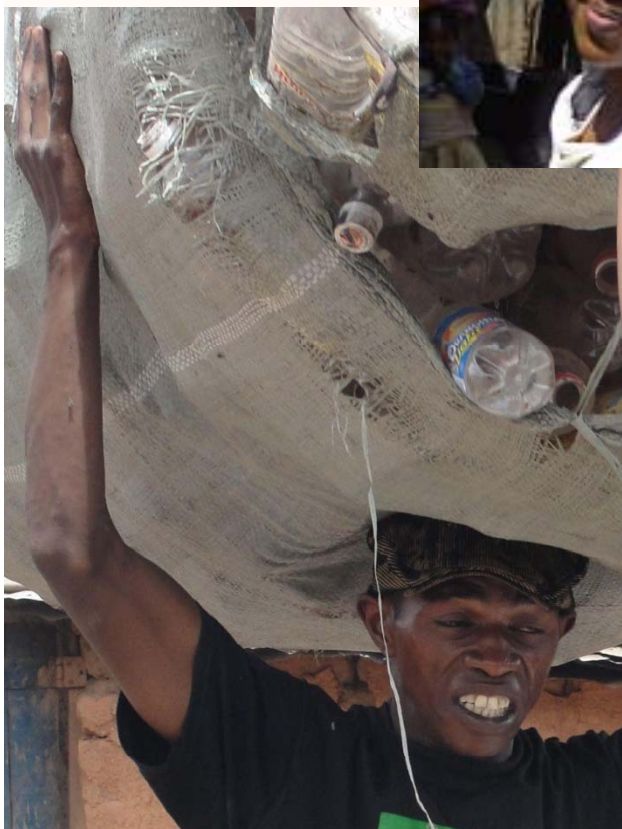
- One of her children is malnourished-
- She has to buy and carry her water-
- She has to pay to use a group toilet-
- She has no electricity-
- She does not own more than one asset.

Tabitha's MPI

Tabitha is deprived in nutrition and 4 other indicators.



Others' Stories



4. Results:

These results are for **104 developing countries**, selected because they have DHS, MICS or WHS data since 2000. Special surveys were used for Mexico and urban Argentina.

They cover **78.5% of the world population** (2007).

104 Developing Countries:

- ~ 24 **Central and E Europe and CIS**,(400M)
- ~ 11 **Arab States**, (217.5 M)
- ~ 18 **Latin America and the Caribbean** (491M)
- ~ 5 **South Asia** (1544M)
- ~ 9 **East Asia and the Pacific** (1868M)
- ~ 37 **Sub-Saharan Africa** (710.4M)

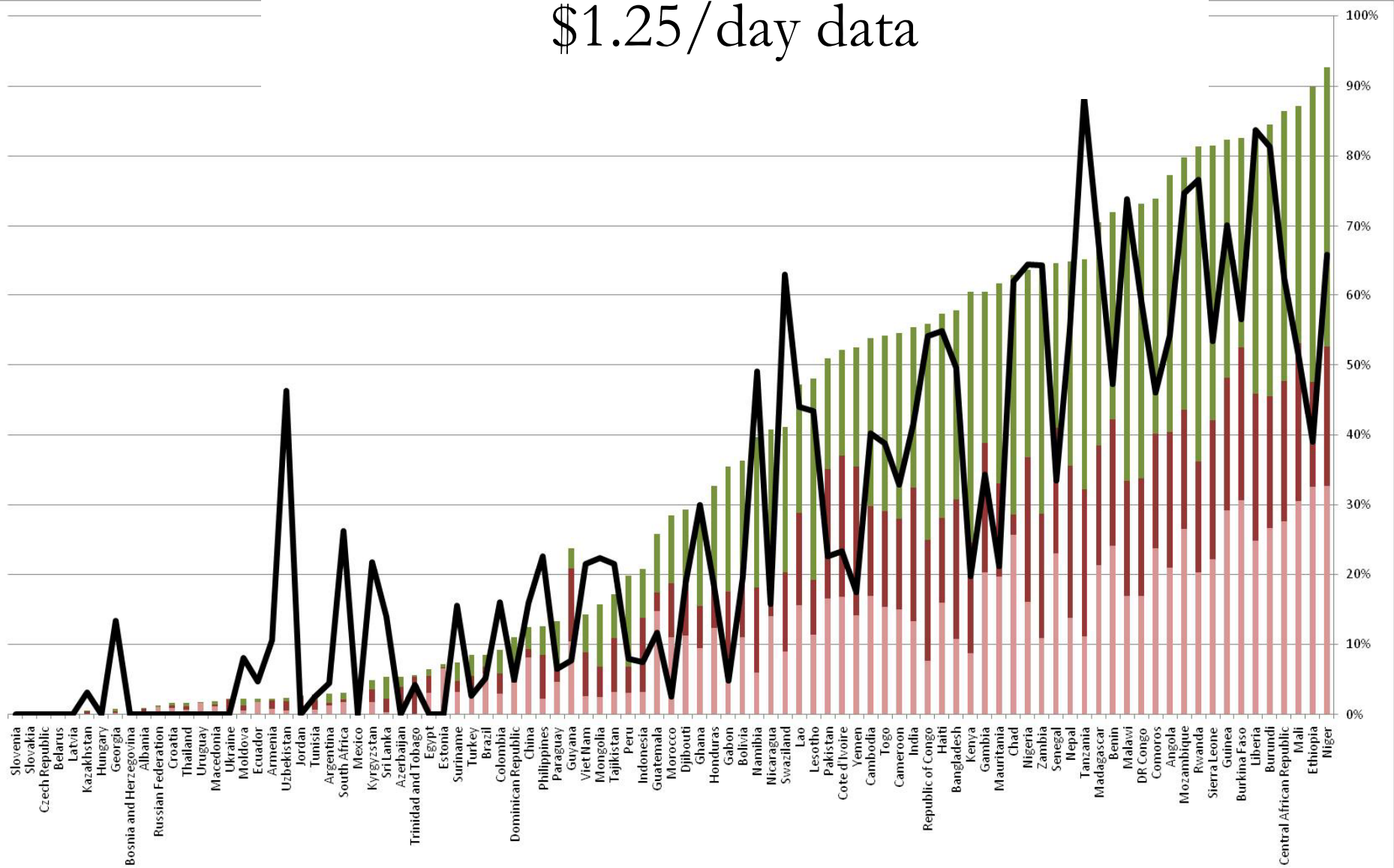
Total Population: 5.230M people

(population figures from 2007; poverty from 2000-2008).

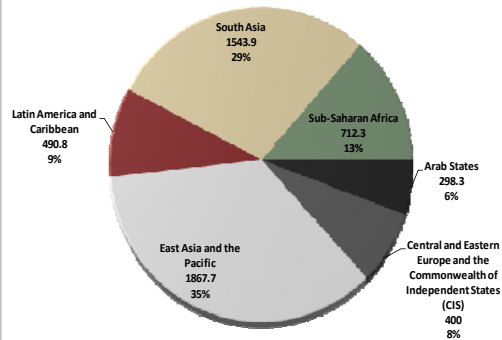
The MPI headcounts fall between \$1.25 and \$2.00/day headcounts.

- ~ of the 5230M people living in the 104 countries, **1659M** are identified as multidimensionally poor (**32%** of people)
- ~ this is between \$1.25 and \$2 a day

The MPI headcounts and the \$1.25/day data

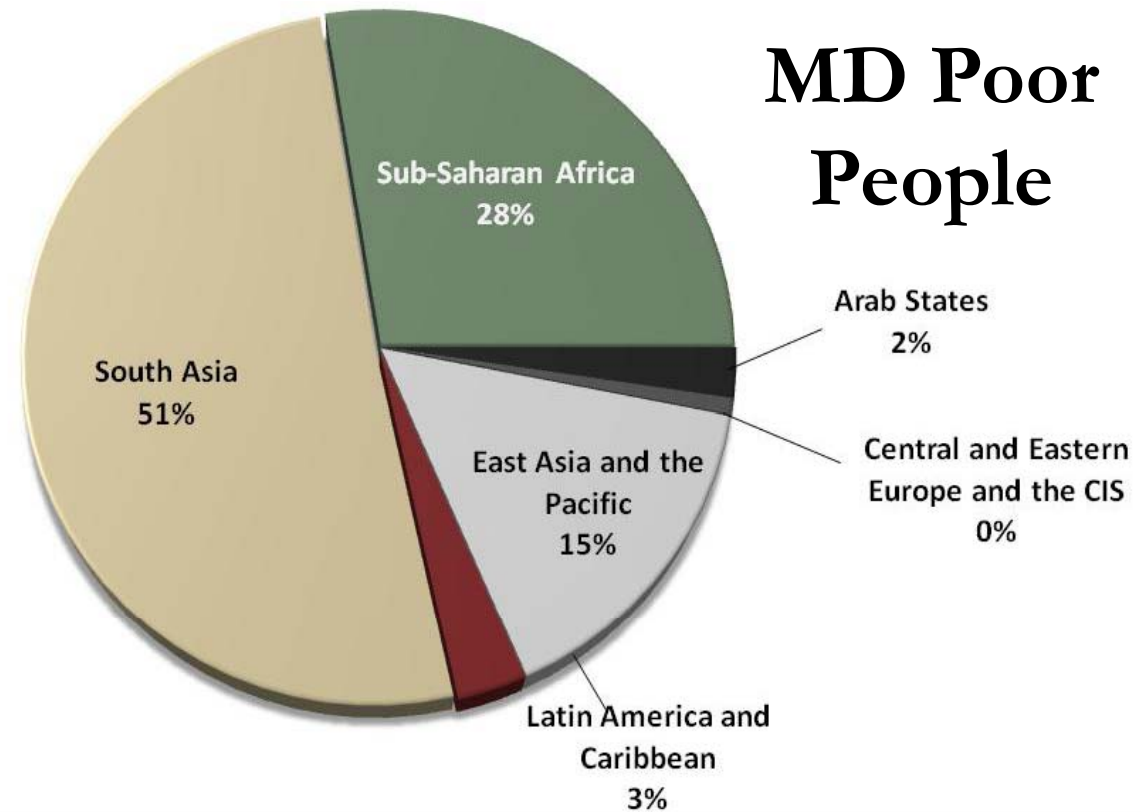


Total Population

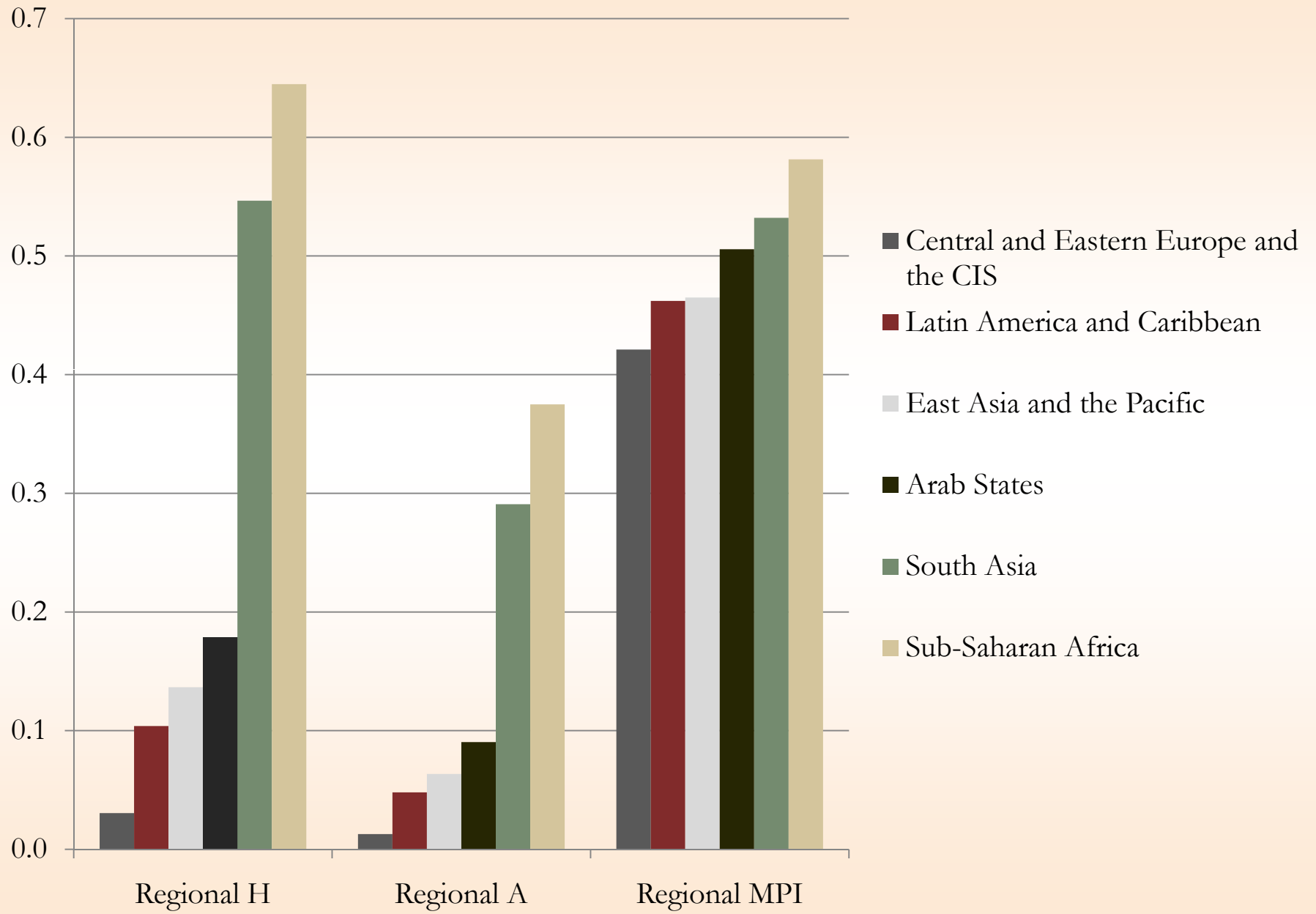


Most poor people in the world by MPI live in South Asia, followed by Sub-Saharan Africa.

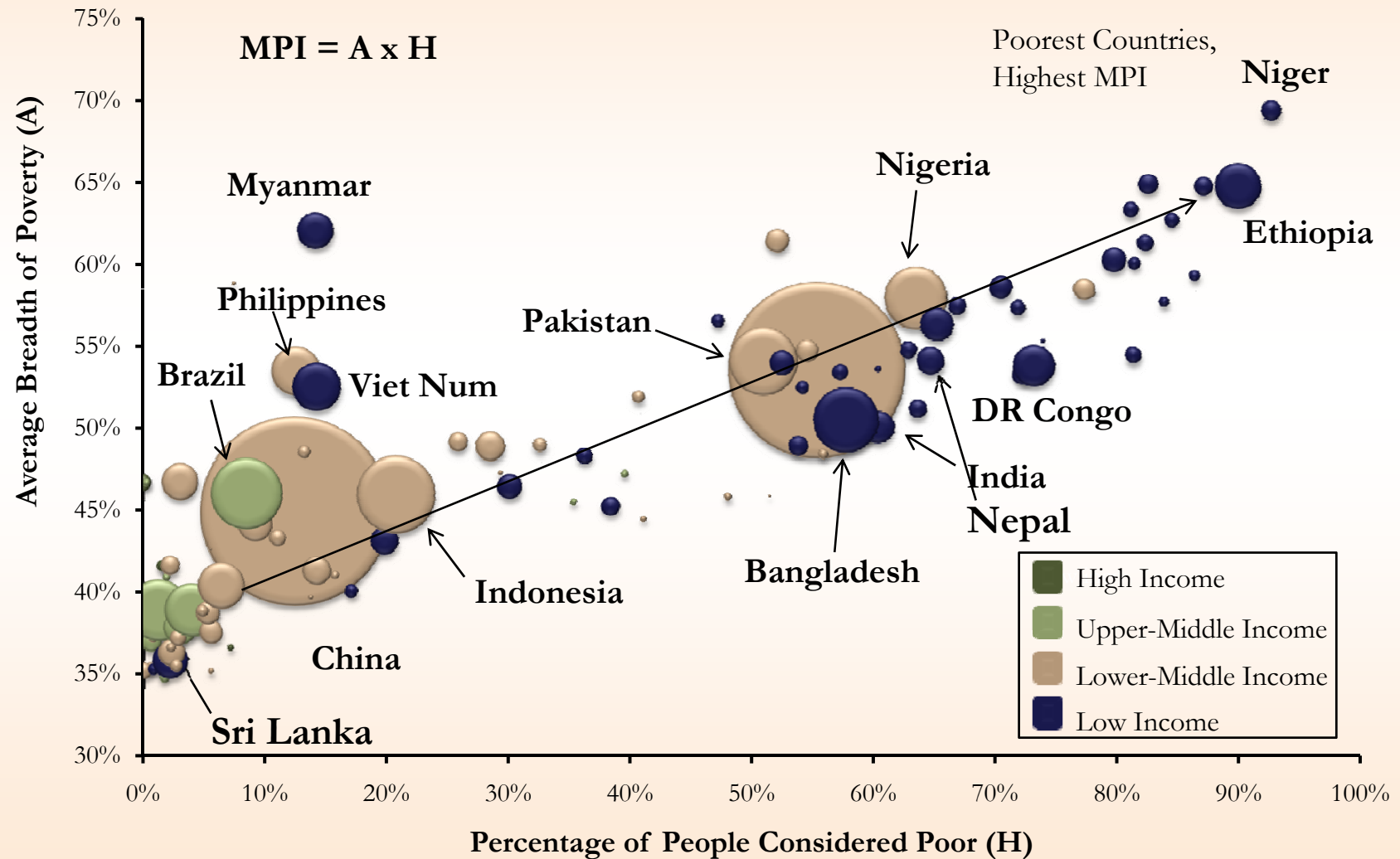
Regional Distribution of the World's Poor (%)



MD Poor People



Intensity tends to be highest with high Incidence



The MPI differs from and complements income poverty.

Of the 93 countries for which we have information on income poverty headcounts:

- The MPI headcount of poor persons is **higher** than \$1.25/day headcount in 57 countries
- The MPI headcount is **lower** than \$1.25 headcounts in 36 countries.
- Higher than \$2 headcounts in 24 countries, lower in 69.
- **The MPI is measuring a related but different underlying phenomenon than income poverty**
Further research is required.

Cross-Tab of MPI with Income Poverty

Do income and MPI identify the same poor?

		MPI	
		Non-Poor	Poor
Income	Non-Poor	A	B (Exclusion Error)
	Poor	C (Inclusion Error)	D

Ordinary Cross-tabs: India NSS 2004

Capability poverty measured as:	Education		
	Children 5-12	Adults (Illiterate)	Adults (<5 years)
Education Poor Not Income Poor	45%	62%	64%
Income Poor Not Educ. Poor	70%	46%	36%

We were able to do this only with the 19 WHS countries because WHS has a brief consumption module.

Chad

	Not MPI Poor	MPI Poor	Total
Not Income Poor	23.12	33.45	56.56
Income Poor	13.98	29.45	43.44
Total	37.10	62.90	100.00

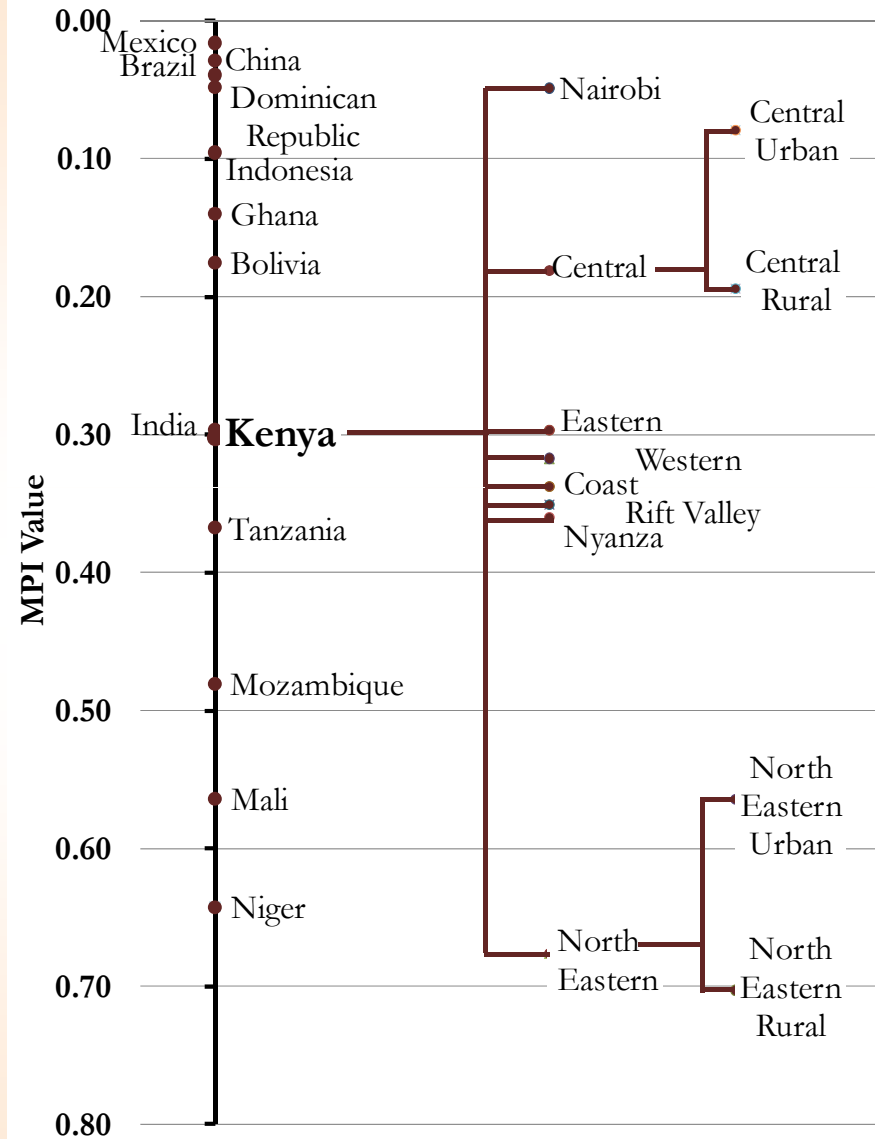
43% are income poor; 63% are MPI poor

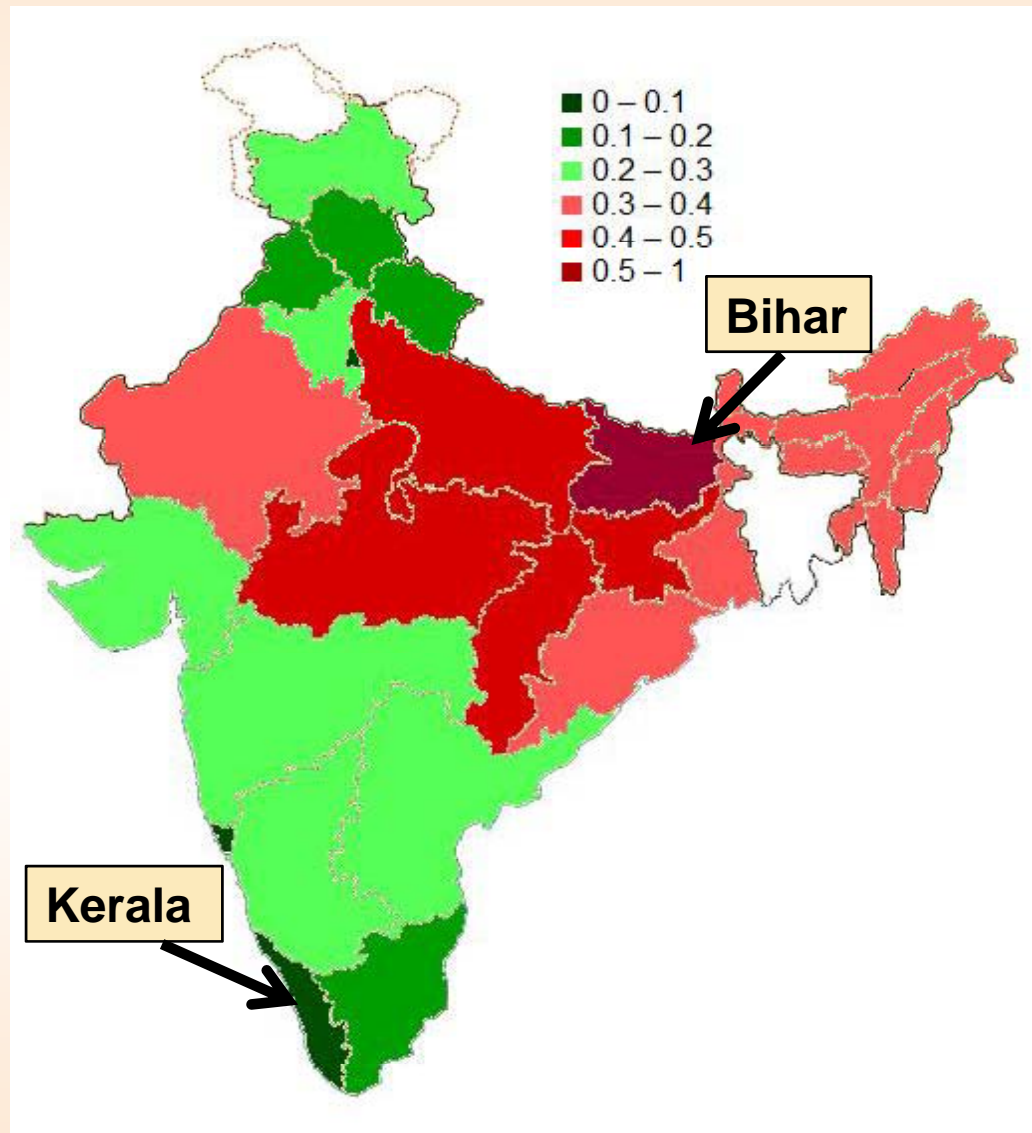
However, 37% of income poor people are not MPI poor
(we might expect 0%)

And 53% of MPI poor people are not income poor
(we could expect 31%)

Why?

4. Decompositions uncover large variation in MPI.



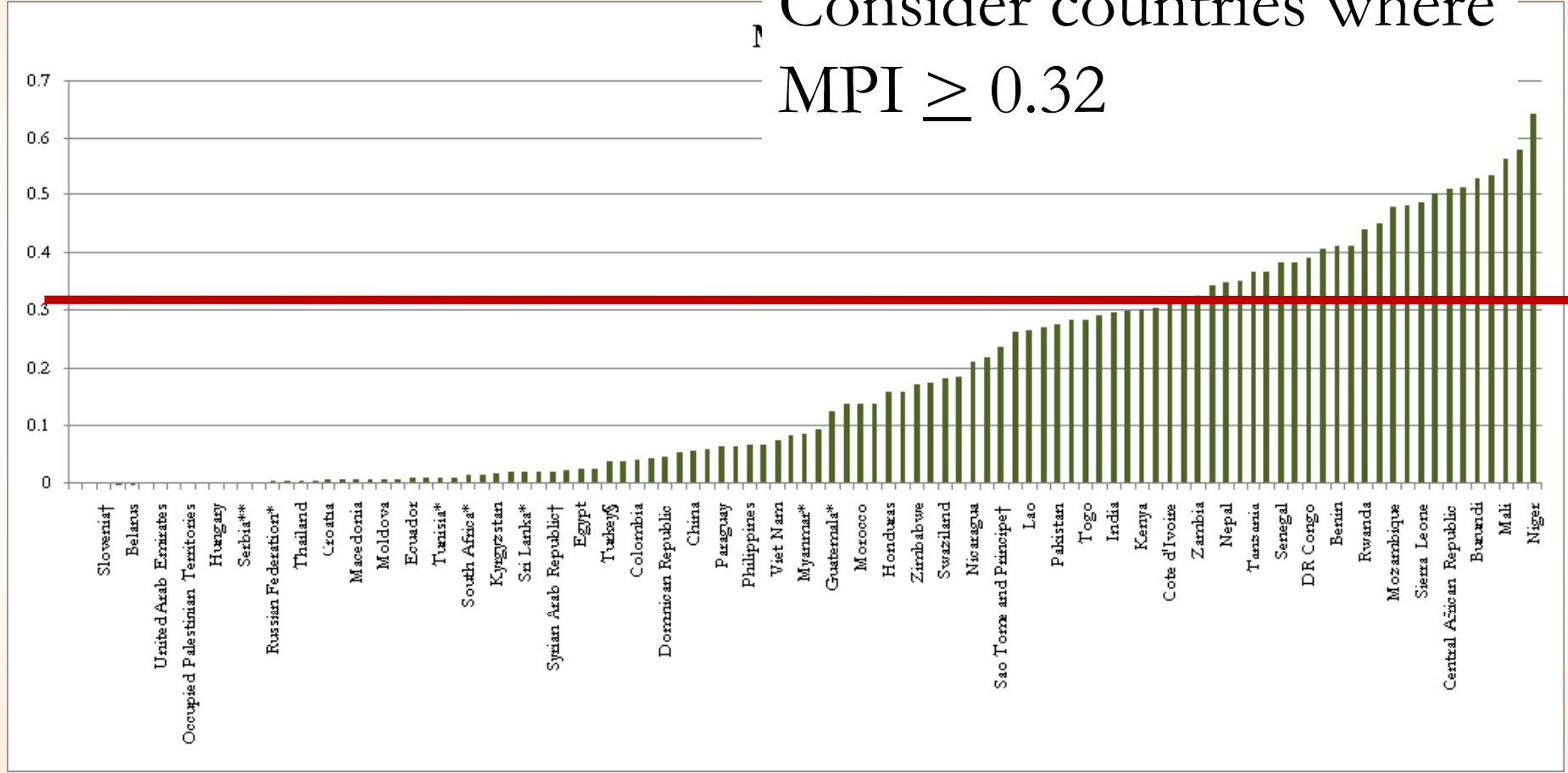


4. MPI varies greatly by region & ethnicity

- In Kerala India 16% of the population is MPI poor; in Bihar it is 81%.
- The poorest 8 Indian states are home to more MPI poor people than the 26 poorest African countries: 421M vs. 410 M.

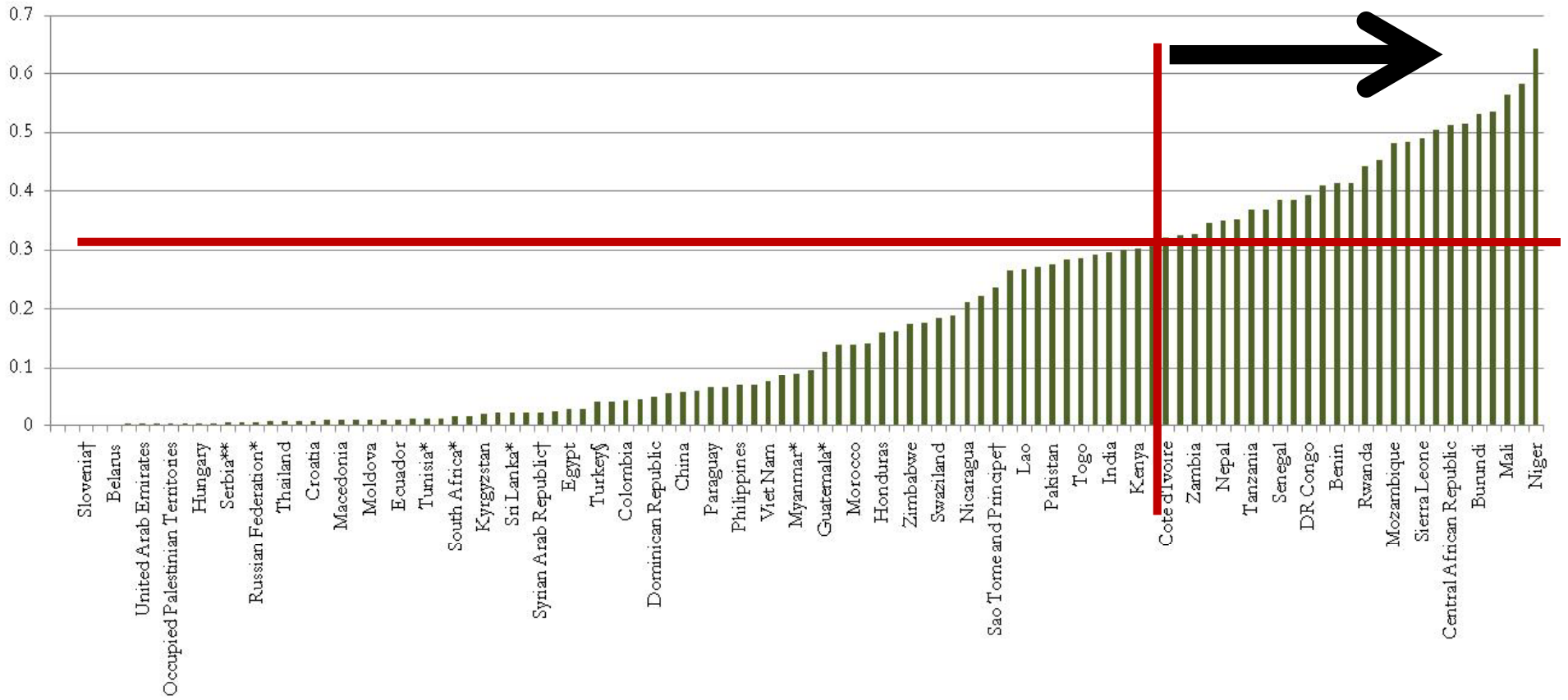
MPI ranges 0 to 0.64

Consider countries where
 $MPI \geq 0.32$

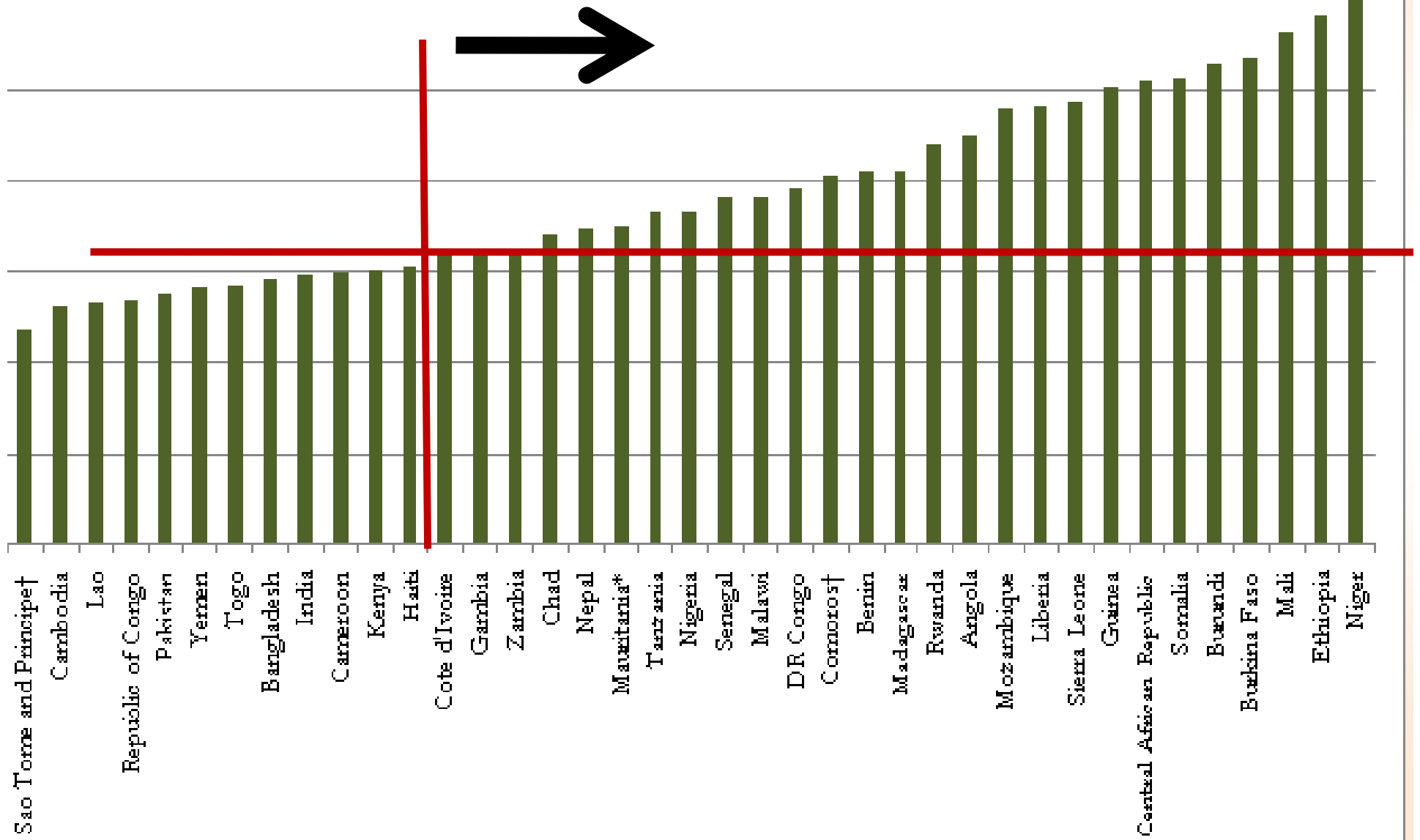


These countries have
an MPI ≥ 0.32

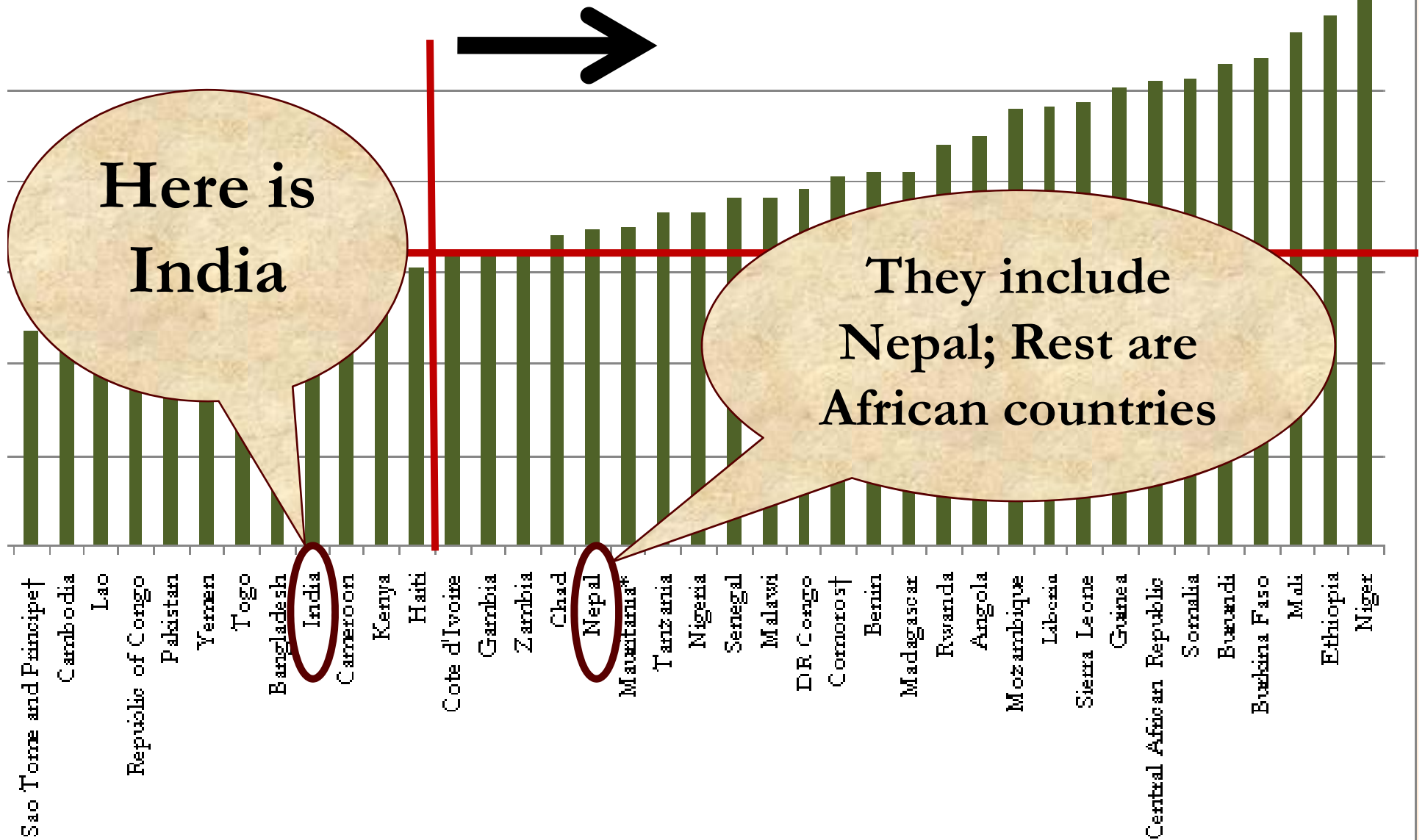
MPI



These countries have
an MPI ≥ 0.32



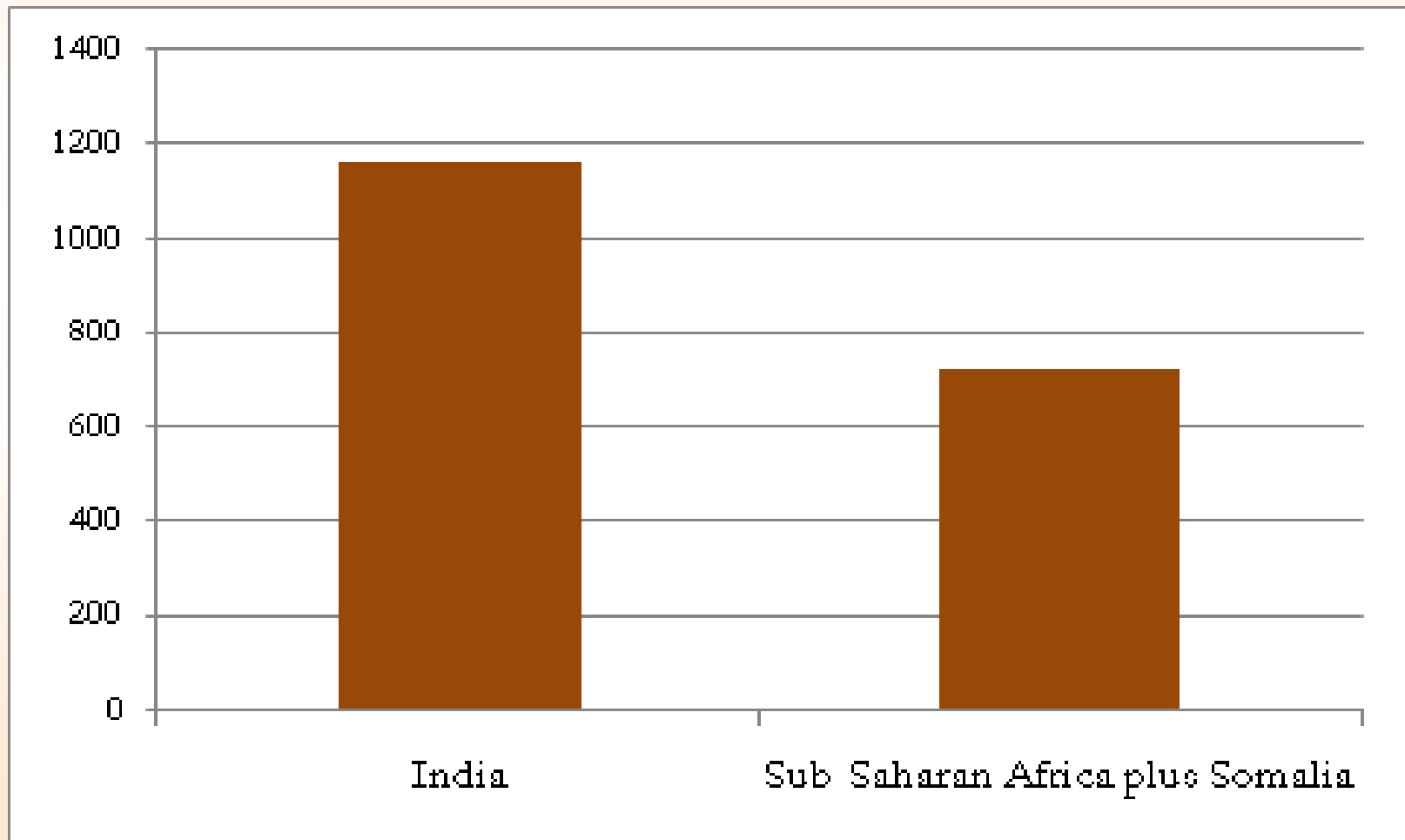
These countries have
an MPI ≥ 0.32



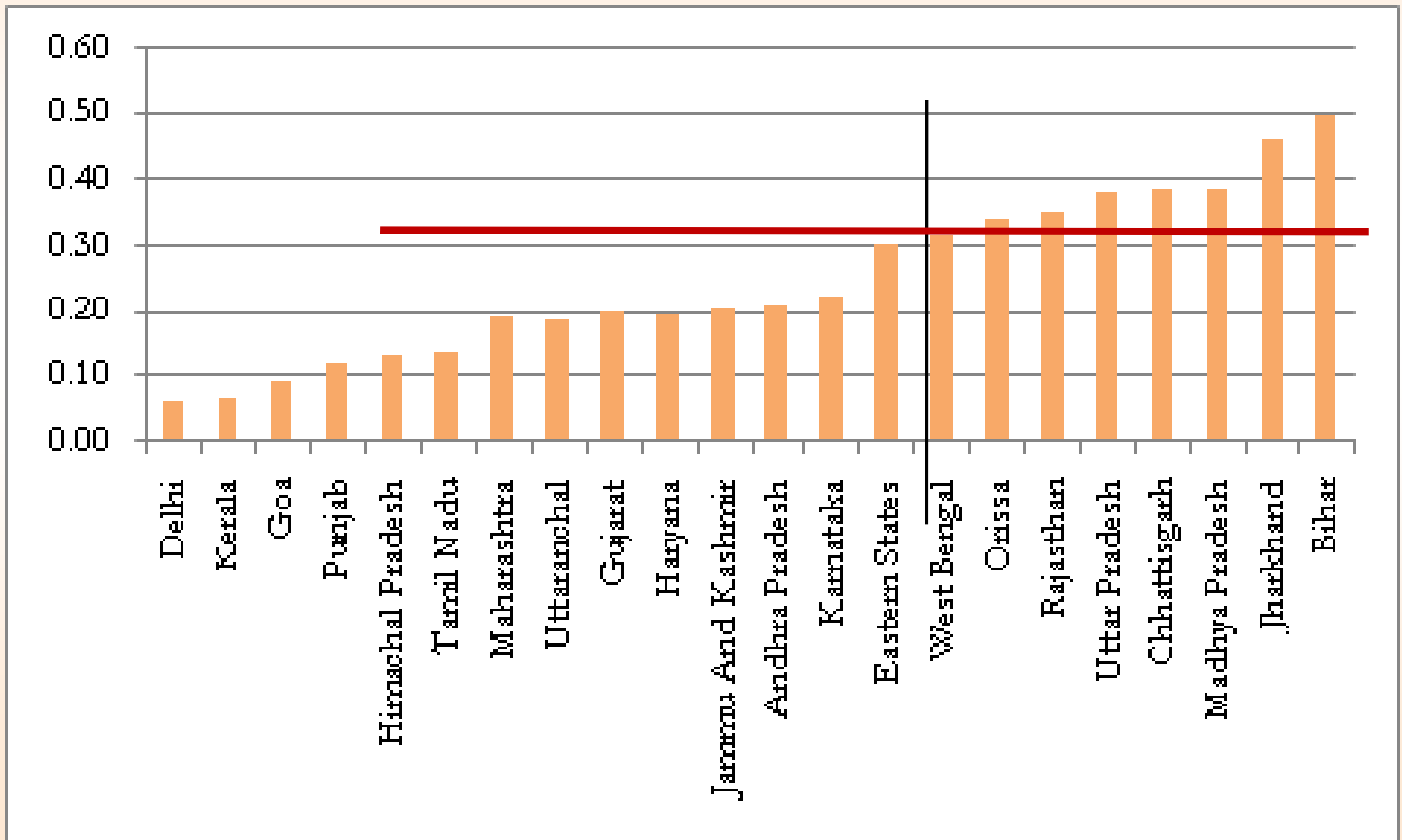
There are 26 African Countries

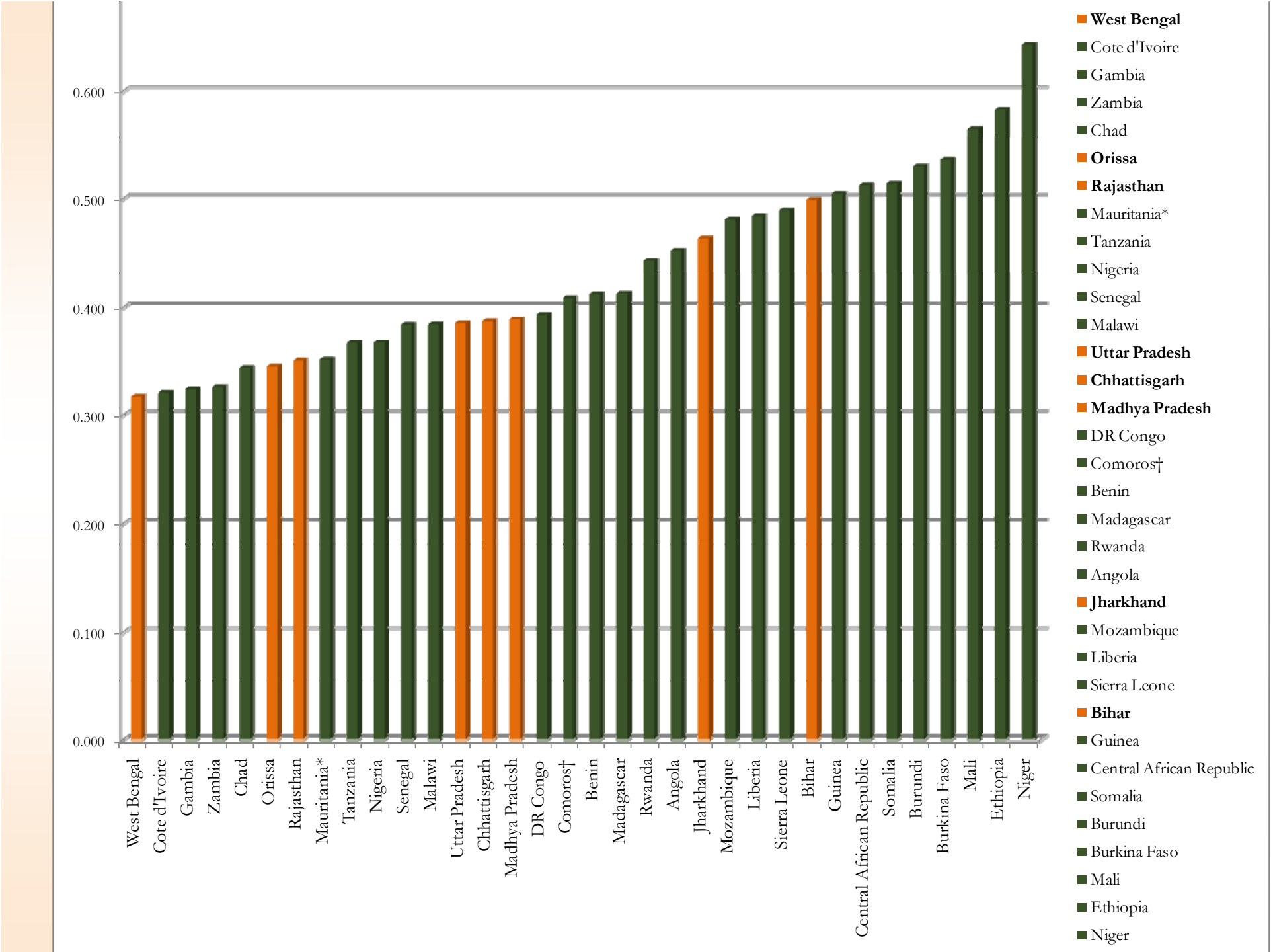
- Focus: poor people
- India is a very populous country.
- And we know that MPI varies a lot *within* countries
- **Where do the *people* whose $MPI \geq 0.32$ live?**
- We take India as an example of a large country, and decompose it to see where such people live within India.

Total Population of India compared with pop of 37 African countries (Millions, 2007)

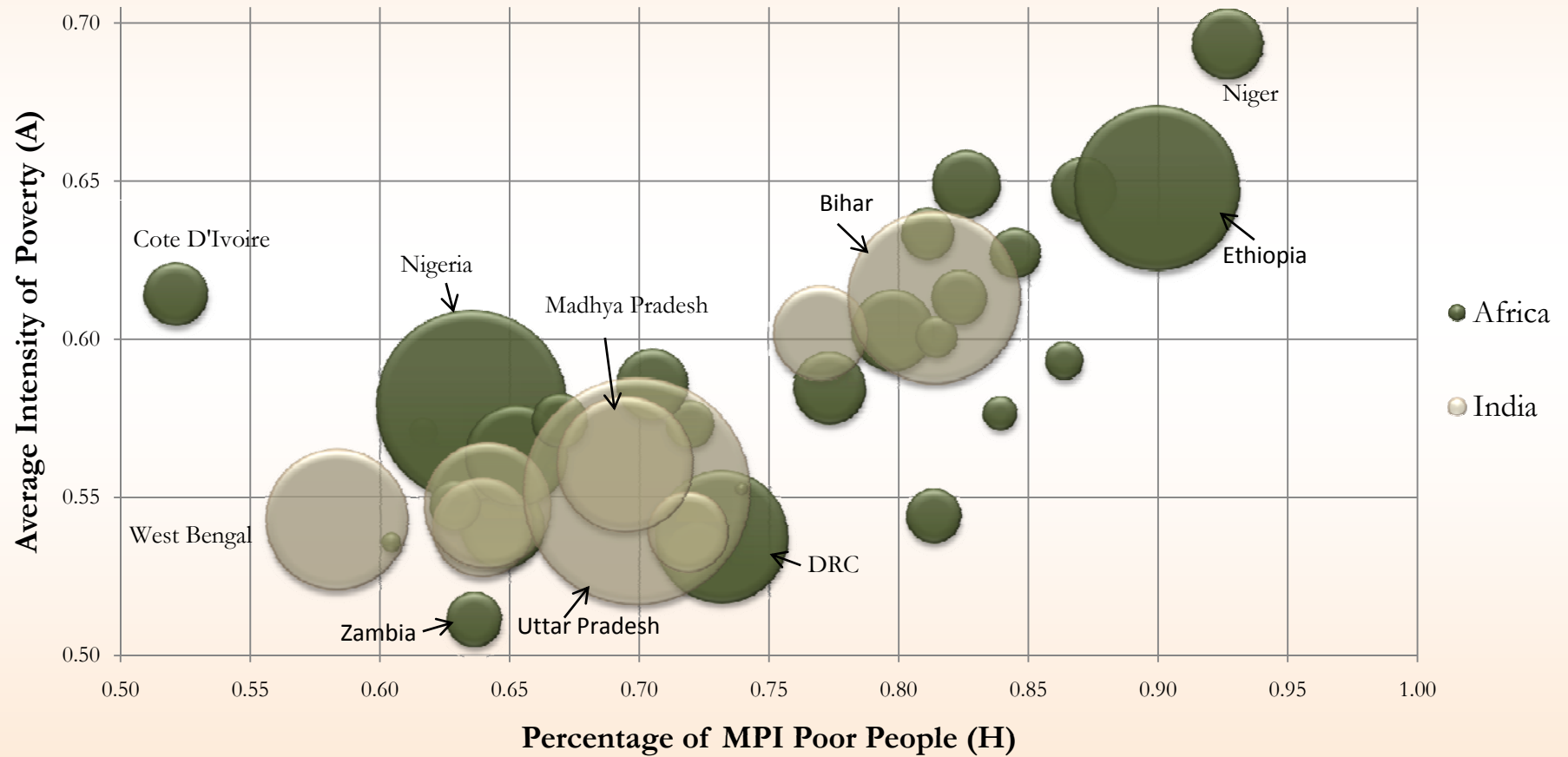


What Indian States' MPI ≥ 0.32 ?

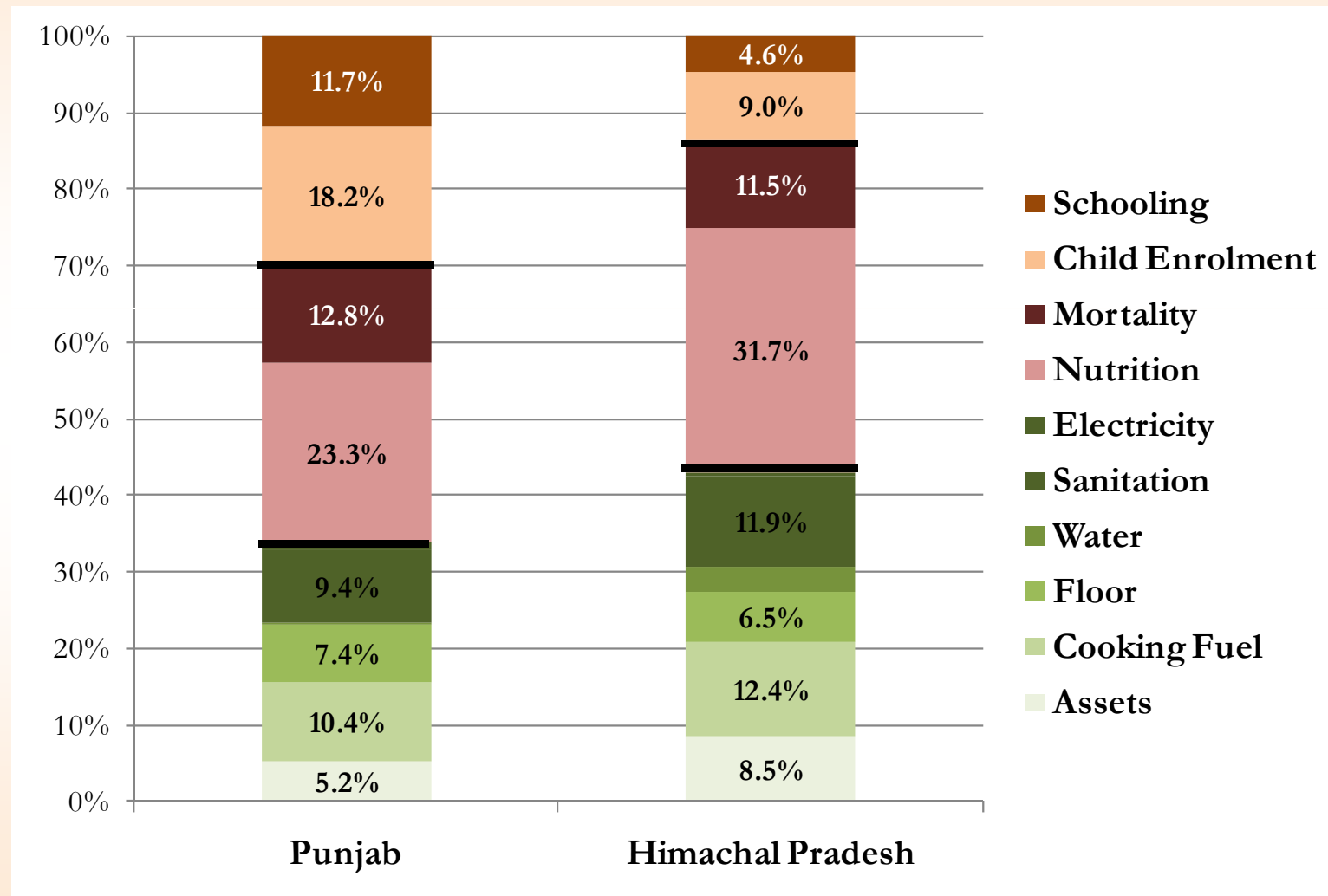




Visual comparison: Size = Number of Poor



Composition by Indicator

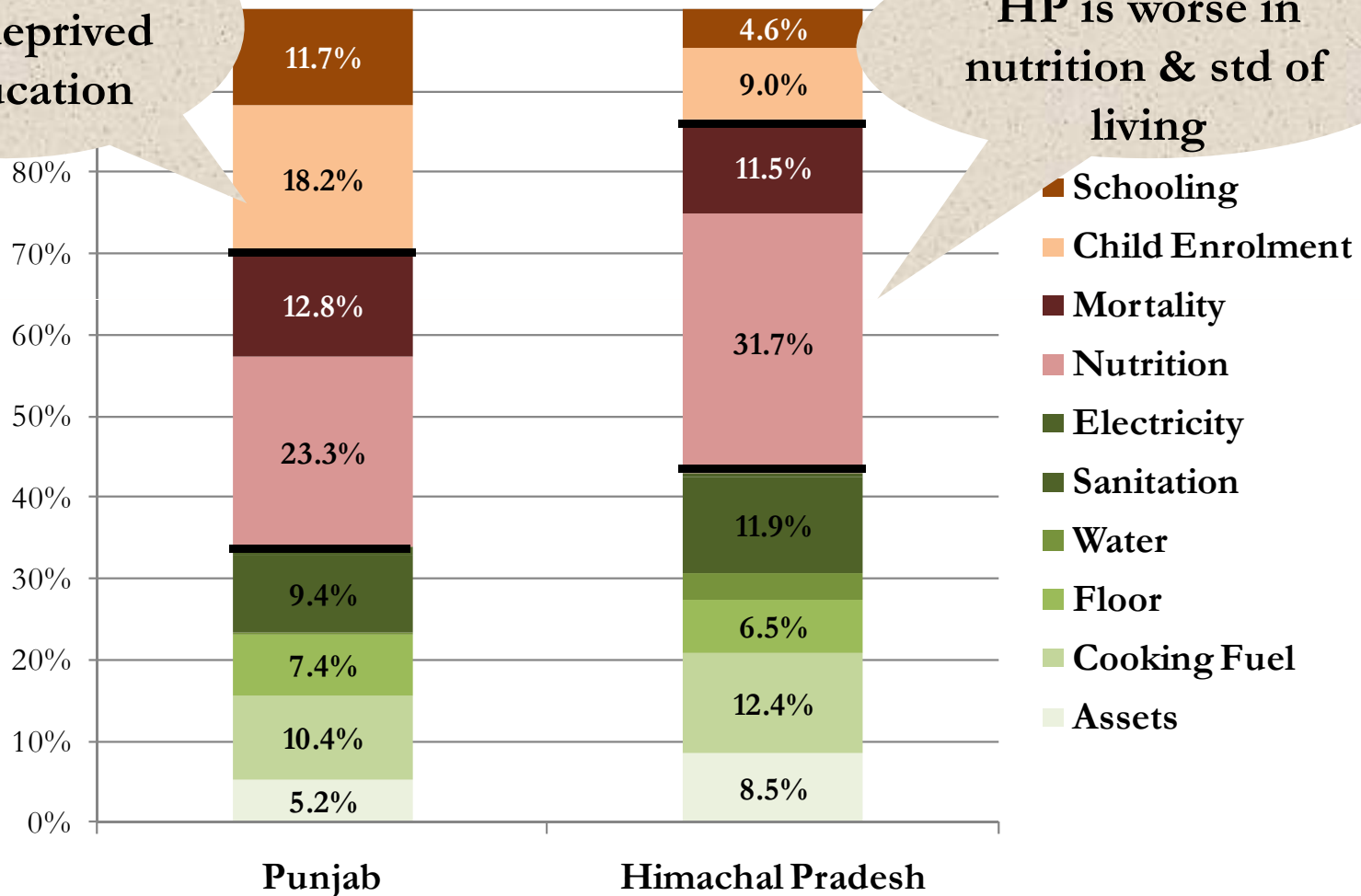


MPIs are similar 0.12-P & 0.13-HP; Composition differs

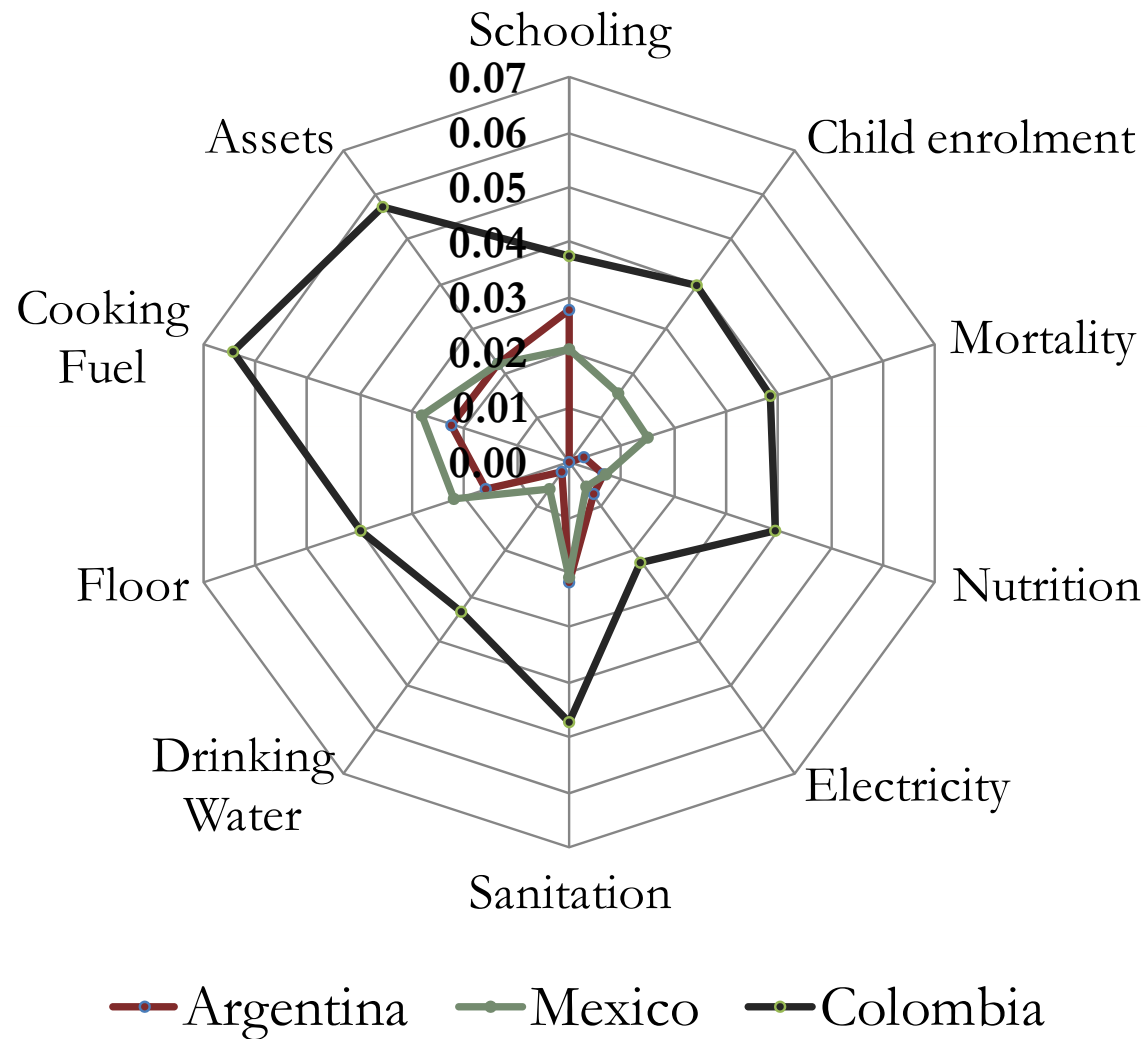
Composition by Indicator

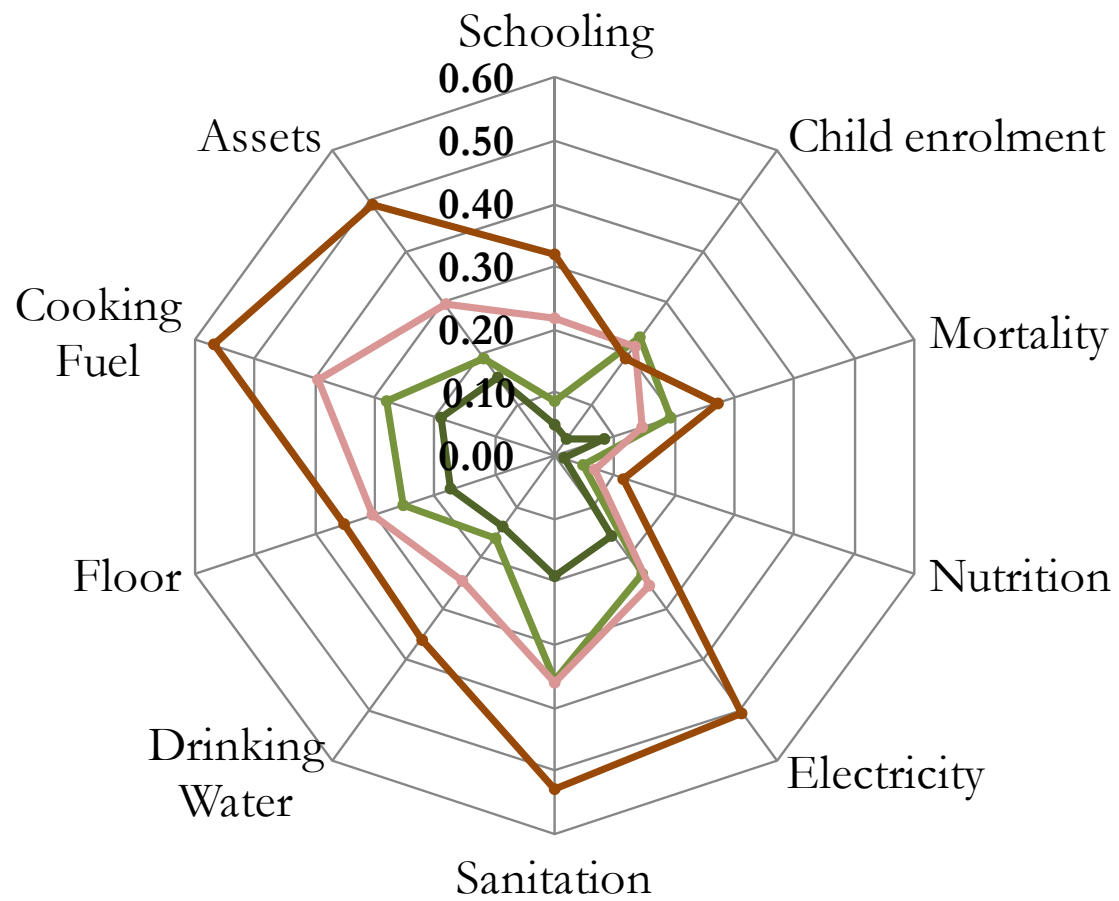
Punjab is more deprived in education

HP is worse in nutrition & std of living



MPIs are similar 0.12-P & 0.13-HP; Composition differs



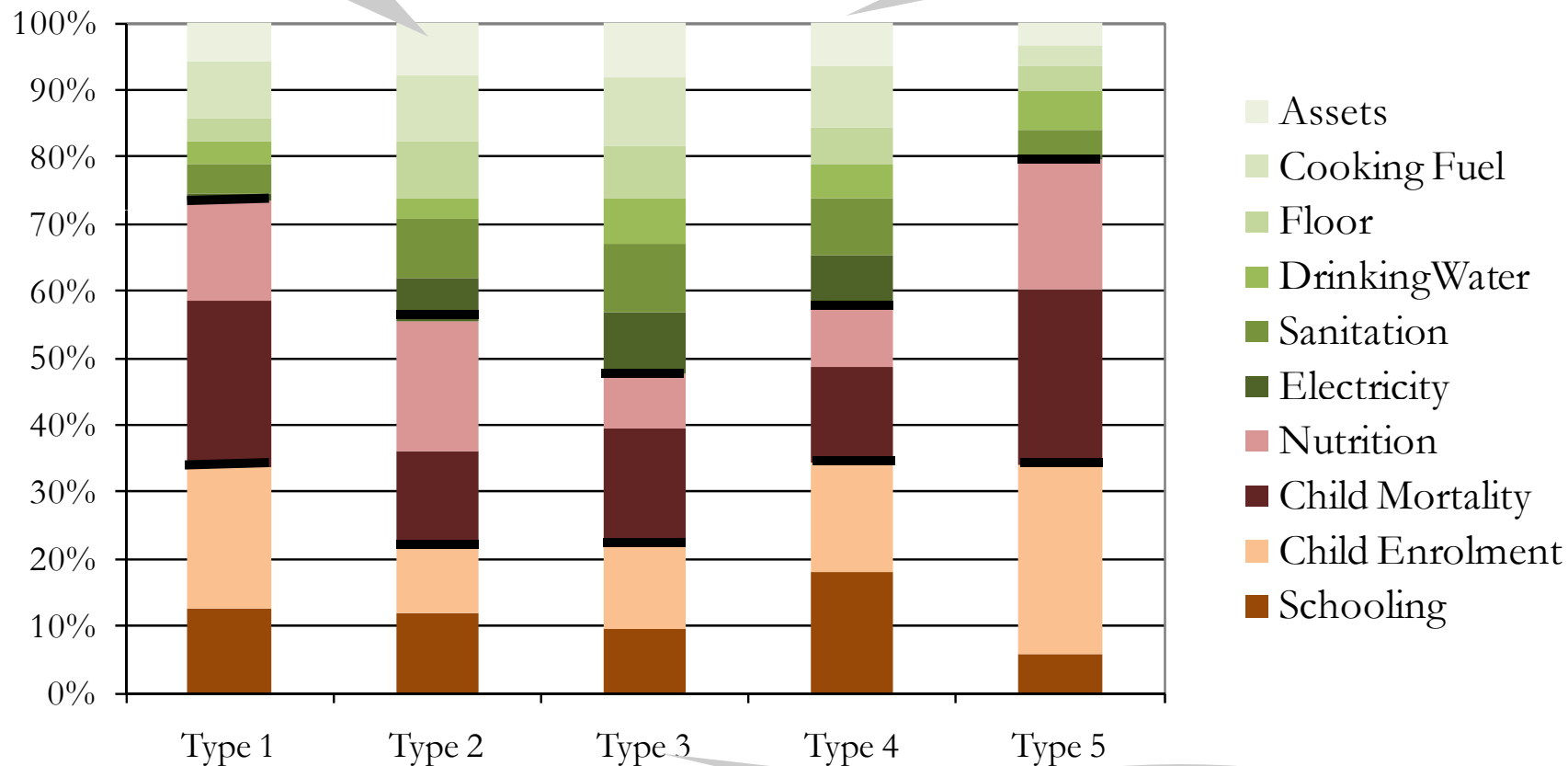


—●— Peru —●— Bolivia —●— Nicaragua —●— Haiti

Typologies of Poverty

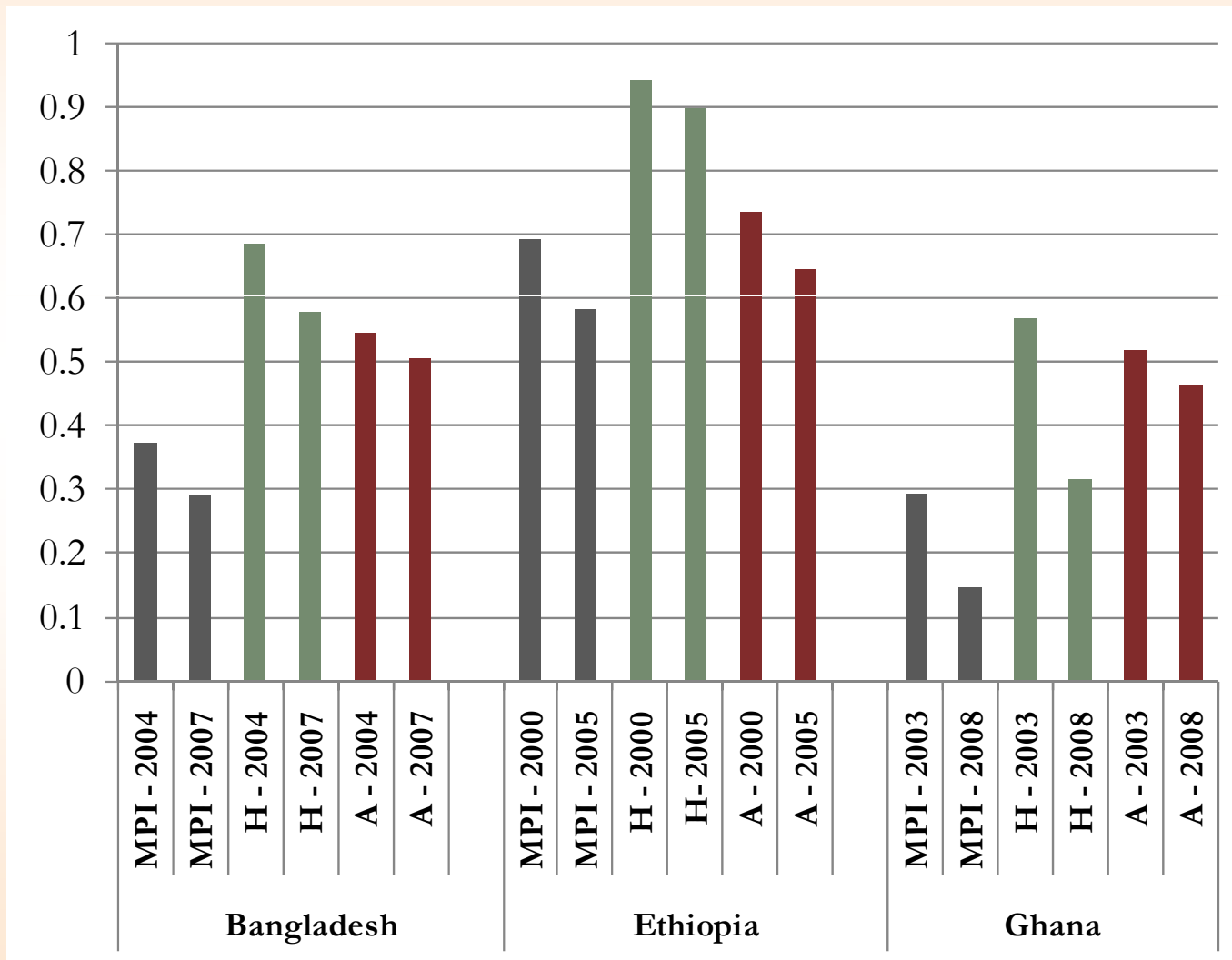
South Asia

SS Africa



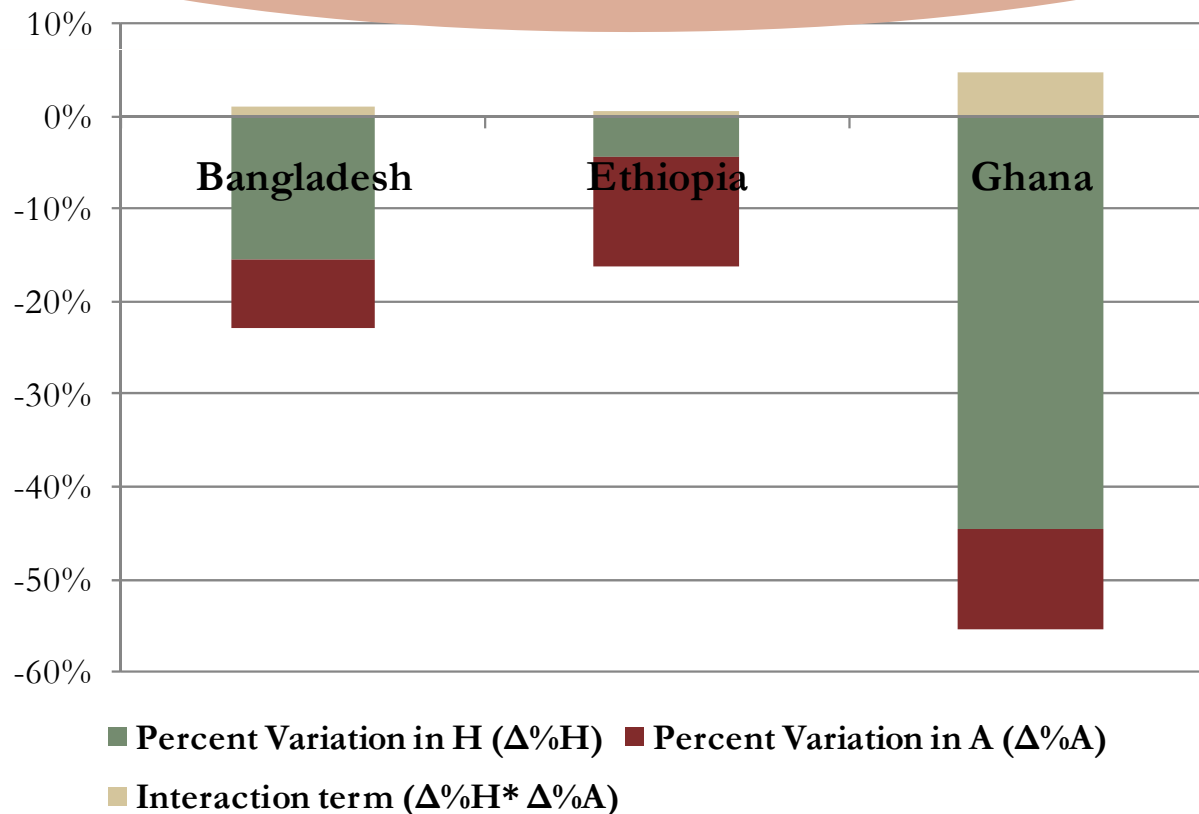
SS Africa

MPI over time...

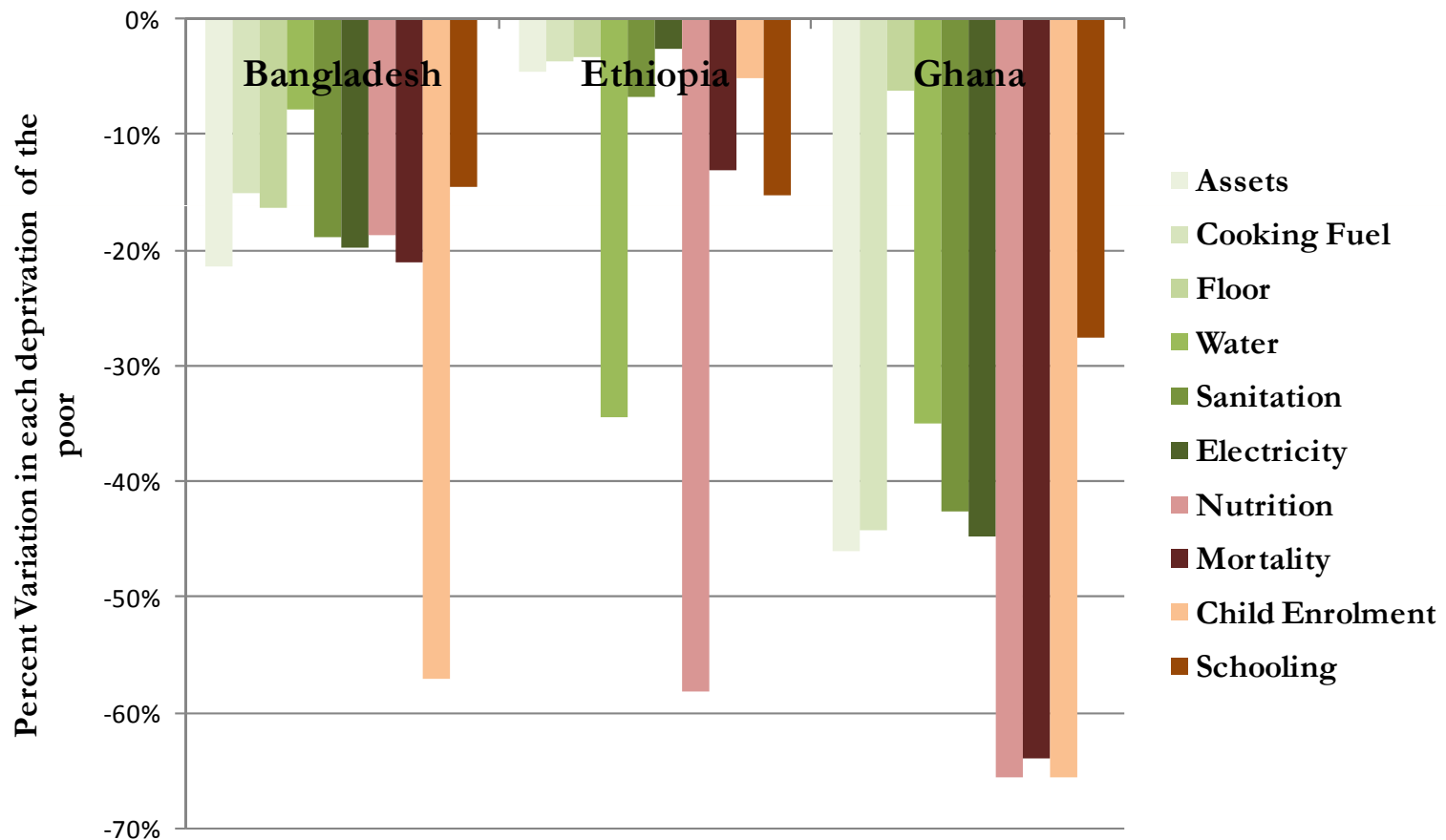


Pathways to Poverty Reduction

Ghana and Bangladesh reduced H relatively more than A, Ethiopia the other way round.



Bangladesh improved child enrolment, Ethiopia nutrition and water, Ghana many at the same time.



5. Robustness Checks

- An international measure of multidimensional poverty is quite a crude instrument.
- As this is a new methodology, we tried to scrutinize the measure, and tune it to reflect multidimensional poverty with sufficient accuracy to add value for policy.

Some basic checks:

- **Quality Checks** – triangulating our results with other data sources
- **Robustness** of measure to different z cutoffs (we implemented a total of 18 measures, having different indicators and cutoffs)
- **Robustness** to changes in the k cutoff
- **Identification of the poor**: does it identify the same households as poor as a) income poor; and b) bottom quintile by the DHS wealth index?

MPI is robust to changes in key to indicators & cutoffs

			MPI 1	MPI 2	MPI 3
			Excluding Enrolment	Using weight-for-age	Using weight-for-height
			Selected Measure		
MPI 2	Using weight-for-age (Selected Measure)	Pearson	0.989		
		Spearman	0.977		
		Kendall (Taub)	0.884		
MPI 3	Using weight-for-height	Pearson	0.986	0.999	
		Spearman	0.974	0.998	
		Kendall (Taub)	0.872	0.975	
MPI 4	Using height-for-age	Pearson	0.987	0.998	0.996
		Spearman	0.976	0.996	0.994
		Kendall (Taub)	0.881	0.960	0.946
Number of countries:		85 (All DHS and MICS countries)			

All MPI 1-4 use the New Reference Population to calculate children's nutritional indicators

In all cases a cutoff of being deprived in 30% of the weighted indicators was used

MPI is robust to changes in key to indicators & cutoffs

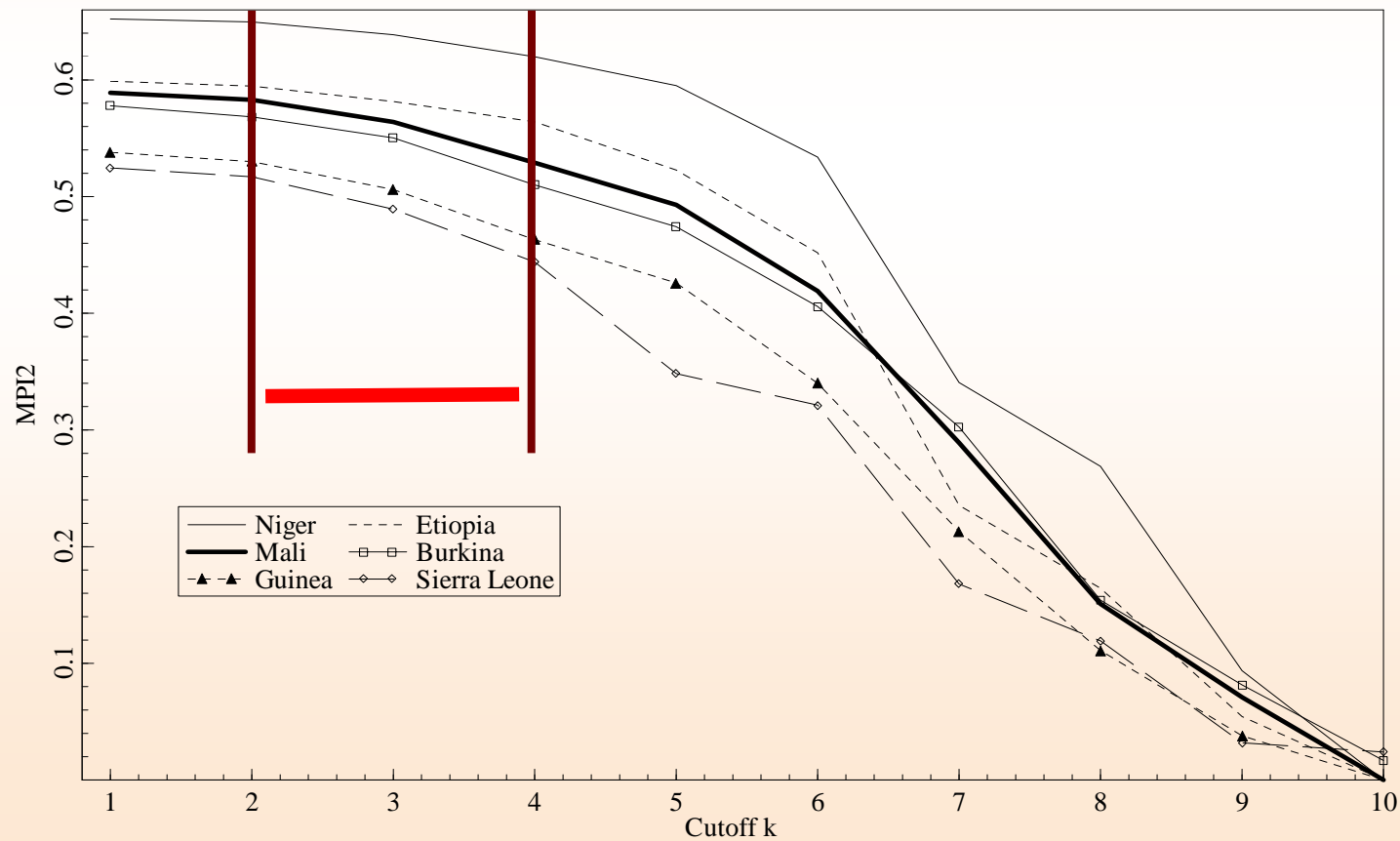
			MPI 1	MPI 2	MPI 3	MPI 4
			Excluding Enrolment	Using weight-for-age	Using weight-for-height	Using height-for-age
			Selected Measure			
MPI 2	Using weight-for-age (Selected Measure)	Pearson	0.989			
		Spearman	0.988			
		Kendall (Taub)	0.920			
MPI 3	Using weight-for-height	Pearson	0.986	0.996		
		Spearman	0.985	0.999		
		Kendall (Taub)	0.908	0.984		
MPI 4	Using height-for-age	Pearson	0.987	0.998	0.996	
		Spearman	0.987	0.998	0.996	
		Kendall (Taub)	0.917	0.969	0.962	
MPI 5	Using under 5 mortality (rather than age non-specific mortality)	Pearson	0.991	0.998	0.997	0.996
		Spearman	0.989	0.997	0.995	0.996
		Kendall (Taub)	0.920	0.975	0.966	0.959

Number of countries: 51 (All DHS and three MICS countries which have Birth History)

All MPI 1-4 use the New Reference Population to calculate children's nutritional indicators

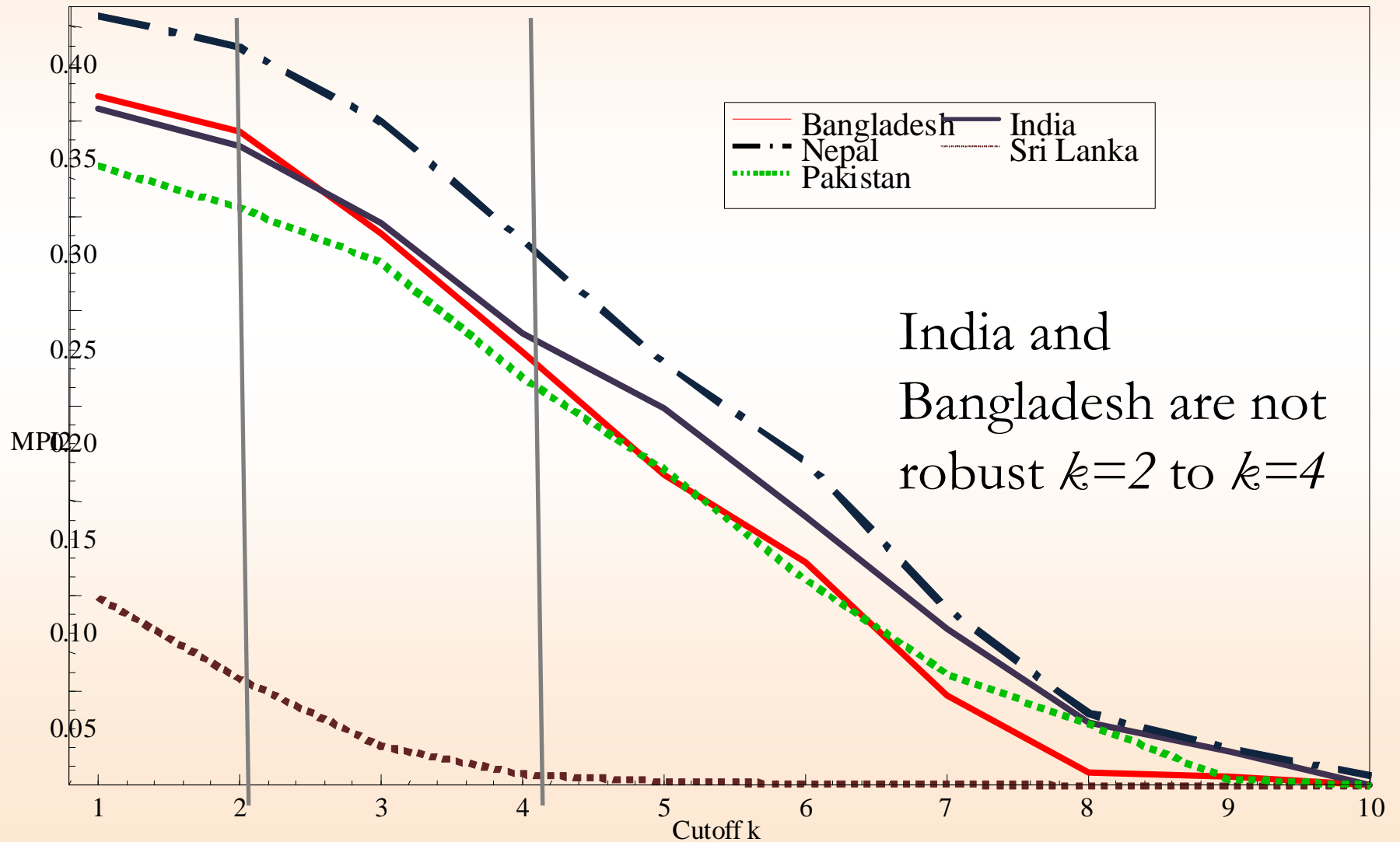
In all cases a cutoff of being deprived in 30% of the weighted indicators was used

Robustness to poverty cutoff from 20% to 40% - AFR



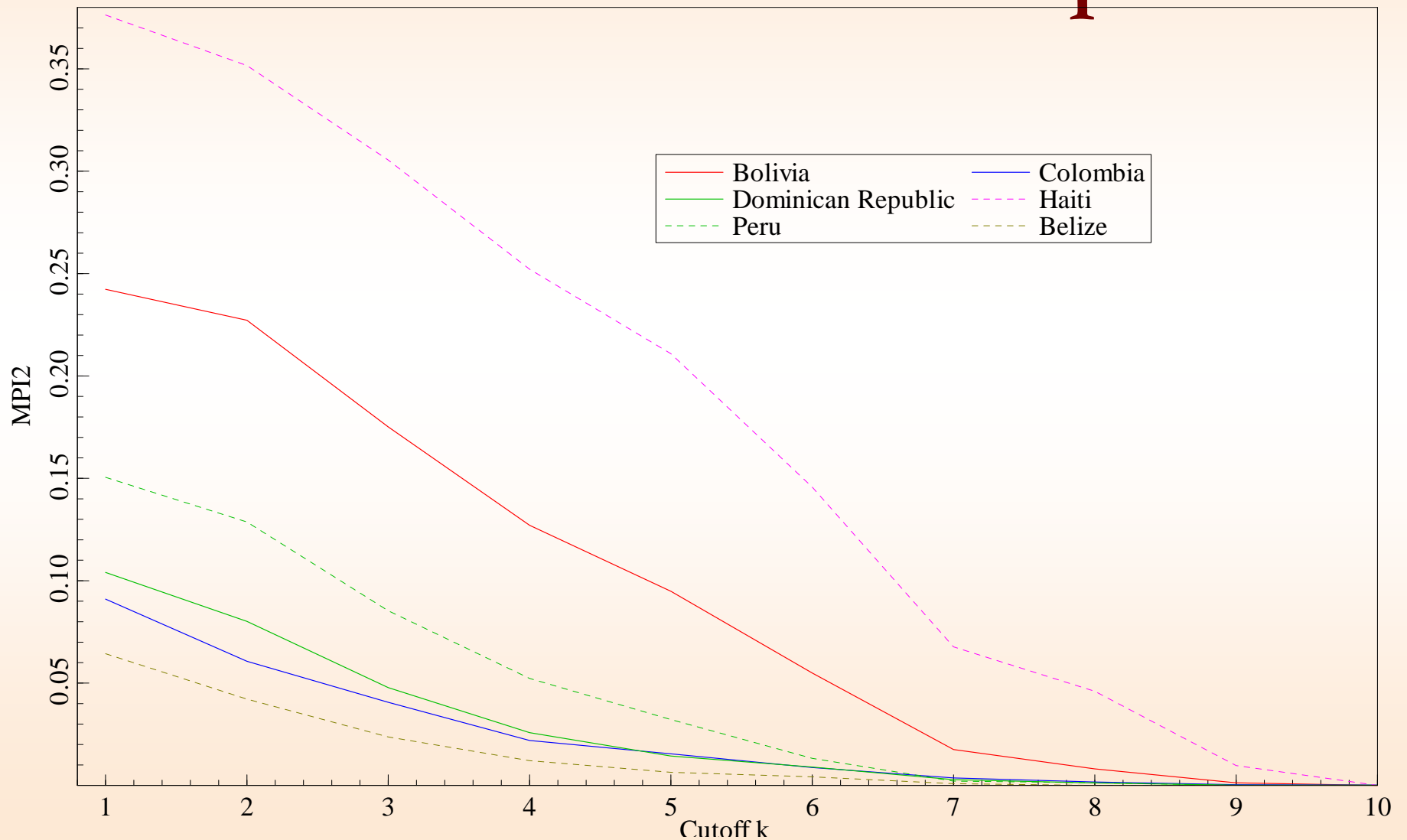
Robustness of MPI in South Asia

MPI comparisons for some South Asian countries as k is varied



MPI is robust to varying $k=2$ to 4

Latin American example



MPI is robust to varying $k=2$ to 4

- 95% of the possible pairs of countries have a dominance relation for $k=2$ to 4. That is, we can say that one country is unambiguously poorer than another regardless of whether we require to be poor in 20, 30 or 40% of the weighted indicators.

Illustrative Example: Weights Robustness

- Recall: Indian states' MPI varies from .06 to .5 and headcounts vary from 17-81% MPI poor
- Re-weight each dimension:

– 33%	50%	25%	25%
– 33%	25%	50%	25%
– 33%	25%	25%	50%
- How does this affect:
 - MPI, H, A
 - Ranking of Indian states

Illustrative Example: Weights Robustness

- With re-weights, India's MPI varies

– .	.296	.302	.251	.332
– H	33%	50%	25%	25%
– E	33%	25%	50%	25%
– S	33%	25%	25%	50%

- Headcount in Kerala varies 16% - 20.5%
- Headcount in Bihar varies 74%-86%
- Rankings robust (next slide).
- Possible conclusion: Set wts and keep stable.

Illustrative Example: Weights Robustness

Rank correlations across regions for different weighting structures

		Spearman			Kendall			
	=	H	E	S	=	H	E	S
=	1.00	0.99	0.99	0.98	1.00	0.94	0.94	0.92
H	0.99	1.00	0.98	0.96	0.94	1.00	0.91	0.86
E	0.99	0.98	1.00	0.98	0.94	0.91	1.00	0.88
S	0.98	0.96	0.98	1.00	0.92	0.86	0.88	1.00

Ongoing analysis

- **Bootstrapping** to estimate confidence intervals
- **Robustness** tests on weights
- **Household Size** effect

6. Some key issues: data

- **Data Constraints:** Most criticisms address these (*why don't you include _____?*). How to respond well?
- 'new' questionnaires on standard surveys
- 'new' dimensions
- individual level data, excluded populations
- combination of surveys, administrative data, mapping
- combination of data for different reference groups

6. Some key issues: implementation

- **International MPI**
 - Robustness (weights, bootstrapping, hh size, indicators)
 - Updating & Improving existing MPI
 - MPI-2 for an overlapping set of middle-high HD countries
- **National Measures: *some questions***
 - What is the purpose of the measure?
 - Targeting the poorest (for services / cash transfers)
 - National Poverty Reporting (akin to Income)
 - Monitoring and Evaluation
 - How choose dimensions/indicators/cutoffs/weights?
 - Should income be included or kept separate?
 - Who decides, implements, designs survey, reports

6. Some key issues: research

- **Methodological**
 - Time series, Panel data methodologies, Chronic Poverty
 - Robustness tests (weights, cutoffs, indicators)
 - Test statistics, measurement error, uncertainty
 - Appropriate validation ‘tests’ for national measures
- **Poverty Analysis**
 - Sequence of interventions
 - How decompositions inform allocation/policy design
 - Income poverty & deprivations in other dimensions
 - Analysis methods & endogeneity

Finally

“Achieving the MDGs will require increased attention to those most vulnerable.”

UNDP Millennium Development Goal Report 2010

“Acceleration in one goal often speeds up progress in others;”
to meet MDGs strategically we need to see them together.
Roadmap towards the Implementation of the MDGs

www.ophi.org.uk



Policy Applications of MPI

- **Target** groups/regions with the greatest MD poverty.
- **Identify coupled deprivations** – common patterns
- **Show impacts** of policy interventions quickly.
- **Design policy** according to structure of MD poverty

National MPIs could be tailored to the context. OPHI has preliminary enquiries/ conversations with countries