Multidimensional Poverty Index: Methodology and Results for 104 countries

Sabina Alkire & Maria Emma Santos

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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 – team coordinated by Sarah Valenti, including 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).
Since 1997 the *Human Development Reports* have included a Human Poverty Index (HPI), created by Sudhir Anand and Amartya Sen.

The HPI
- reflected the importance of poverty reduction
- portrayed poverty as multidimensional

The HPI takes two forms, appropriate for more and less developed countries.
Background: the MPI

– builds on HPI and its roots in the capability approach

– goes beyond HPI in two ways:
  • Reflects the joint distribution of deprivations
  • Unlike any previous HDR indices, uses micro data

– ranks 100+ developing countries (parallel to HPI-I)
– aims to influence policy
– aims to influence national poverty measures
Background: the MPI

– Will be launched on 14 July 2010, as an experimental series that supplants HPI-I

– May be reported annually

– May be extended to middle and high human development countries, including Europe

– These results are hot off the press

– Some analysis is still ongoing

– Query: claims for this year; improvements for next year and for national MD poverty measures
Multidimensional Poverty Index (MPI)  
*acute poverty in developing countries*

1. **Data**
   - Missing data; surveys used

2. **Measurement Components**
   - Dimensions, indicators, cutoffs, weights.

3. **Identification and Aggregation**
   - Using the adjusted MD headcount $M_0$

4. **Results**
   - Global trends, income comparisons, regional

5. **Checks**
   - Robustness, Comparisons, bootstrapping
1. Data: Surveys

Demographic & Health Surveys \((DHS - 48)\)
Multiple Indicator Cluster Surveys \((MICS - 34)\)
World Health Survey \((WHS – 19 countries)\)

We used 3 special surveys covering Mexico, South Africa and urban Argentina.
2. Measurement Components: Dimensions

• Health
• Education
• Standard of living

– *intrinsic* value (h/e) in capability space
– *instrumental* value ~ in the short and longer term.
– some comparable *data available*
2. Missing Dimensions

*We considered incorporating some of the following dimensions:*

- Work
- Empowerment
- Safety from Violence (crime, conflict)
- Political Freedom
- Relationships (social capital, inclusion, dignity)
- (Cultural/Spiritual/Subjective Well-being)

*Data are not available to incorporate any of these into the MPI for 100+ countries.*
2. Measurement Components of MPI
2. Measurement: Indicators & Cutoffs - A

• 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 data but no child data; MICS has child data but no adult data]

*These are health functioning indicators; mortality is a stock.*
2. Measurement: Indicators & Cutoffs – B

• 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.

Both are *very* rough indicators of achieved functionings
2. Measurement: Indicators & Cutoffs - C

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

*All indicate resources rather than functionings.*
2. Measurement: Indicators reflect MDGs

MDG omissions are due to data: gender, infectious disease, income, maternal mortality, environment, tenure

- **Health**
  - Nutrition = MDG 1
  - Mortality = MDG 4

- **Education**
  - Enrolment = MDG 2
  - Years Schooling = MDG 2

- **Standard of Living**
  - Electricity *not MDG*
  - Sanitation MDG 7
  - Floor *not MDG*
  - Cooking Fuel MDG 7
  - Drinking Water MDG 7
  - Assets MDG 1
2. Measurement: flawed indicators

The MPI is deeply affected by the lack of comparable data. Despite the proliferation of data, standard indicators for health or quality of education are not collected. Data for violence, empowerment, informal work, etc are missing.

Also, consumption surveys do not include MPI indicators.

“Improving data gathering and its quality in all countries should be a central focus of the second half of the MDG time frame and beyond.”

Bourguignon et al. 2008 page 6
2. Measurement: flawed indicators

In particular

– The indicators vary in strength and in international comparability (e.g. Flooring material, cooking fuel).
– Health data for nutrition and mortality are particularly problematic
  • Different respondents in different surveys (m, f, child)
  • Mortality is a stock variable; Household size effect?
  • Blind to deprivation of elderly and males (nutrition)
  • Partly blind to deprivations in childless households (mort)
– Consumption data for standard of living are absent
– Some countries lack indicators
2. Measurement Components: Weights

Weights are normative, and represent the respective contribution in capability space.

- Each dimension is equally weighted*:
  - Health = 1/3
  - Education = 1/3
  - Standard of Living = 1/3

*Following HDI precedent, & literature on its weights.
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. Method: Multidimensional Data

Now we turn to present how the MPI is constructed, using a matrix of well-being scores for 4 persons in 10 indicator domains.

\[
y = \begin{bmatrix}
1 & 19 & 0 & 0 & 0 & 0 & 1 & 0 & 1 & 3 \\
0 & 18 & 1 & 1 & 1 & 4 & 2 & 0 & 0 & 2 \\
1 & 17.8 & 0 & 1 & 1 & 5 & 3 & 2 & 1 & 3 \\
20 & 28 & 0 & 1 & 1 & 2 & 1 & 0 & 1 & 2 \\
\end{bmatrix}
\]
3. Method: Multidimensional Data

We will simplify this illustration to 6 indicators, equally weighted – two for each dimension.

\[
y = \begin{bmatrix}
1 & 19 & 0 & 0 & 0 & 0 \\
0 & 18 & 1 & 1 & 1 & 4 \\
1 & 17.8 & 0 & 1 & 1 & 5 \\
20 & 28 & 0 & 0 & 1 & 2
\end{bmatrix}
\]
3. Method: Multidimensional Data

Matrix of well-being scores for $n$ persons in $d$ indicator domains

$$y = \begin{bmatrix}
1 & 19 & 0 & 0 & 0 & 0 \\
1 & 18 & 1 & 1 & 1 & 4 \\
1 & 17.8 & 0 & 1 & 1 & 5 \\
20 & 28 & 0 & 0 & 1 & 2 \\
\end{bmatrix}$$

$z = (1 \ 18.5 \ 1 \ 1 \ 1 \ 3)$ Cutoffs
3. Method: Deprivation Matrix

Replace entries: 1 if deprived, 0 if not deprived

\[
y = \begin{bmatrix}
1 & 19 & 0 & 0 & 0 & 0 \\
1 & 18 & 1 & 1 & 1 & 4 \\
1 & 17.8 & 0 & 1 & 1 & 5 \\
20 & 28 & 0 & 0 & 1 & 2 \\
\end{bmatrix}
\]
3. Method: Deprivation Matrix

Replace entries: 1 if deprived, 0 if not deprived

\[
g^0 = \begin{bmatrix}
1 & 0 & 1 & 1 & 1 & 1 \\
0 & 1 & 0 & 0 & 0 & 0 \\
0 & 1 & 1 & 0 & 0 & 0 \\
0 & 0 & 1 & 1 & 0 & 1 \\
\end{bmatrix}
\]
3. Method: Identification

Indicators

\[
g^0 = \begin{bmatrix}
1 & 0 & 1 & 1 & 1 & 1 & 1 \\
0 & 1 & 0 & 0 & 0 & 0 & 0 \\
0 & 1 & 1 & 0 & 0 & 0 & 0 \\
0 & 0 & 1 & 1 & 0 & 1 & 0 \\
\end{bmatrix}
\]

Persons

Matrix of deprivations
3. Method: Identification – Counting Deprivations

\[ g^0 = \begin{bmatrix} 1 & 0 & 1 & 1 & 1 & 1 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 & 1 \end{bmatrix} \]

<table>
<thead>
<tr>
<th>Indicators</th>
<th>( c )</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Persons</td>
</tr>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>
3. Method: Identification – Counting Deprivations

Q/ Who is poor?

\[ g^0 = \begin{bmatrix}
1 & 0 & 1 & 1 & 1 & 1 \\
0 & 1 & 0 & 0 & 0 & 0 \\
0 & 1 & 1 & 0 & 0 & 0 \\
0 & 0 & 1 & 1 & 0 & 1 \\
0 & 0 & 1 & 1 & 0 & 1 \\
\end{bmatrix} \]

Indicators

\[ c \]

\[ \begin{array}{cccc}
5 \\
1 \\
2 \\
3 \\
\end{array} \]

Persons
3. Method: Identification – Counting Deprivations

Q/ Who is poor?
A/ Fix cutoff \( k \), identify as poor if \( c_i \geq k \)

<table>
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<tr>
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<th>( c )</th>
</tr>
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</table>
| \[
\begin{bmatrix}
1 & 0 & 1 & 1 & 1 & 1 & 1 \\
0 & 1 & 0 & 0 & 0 & 0 & 0 \\
0 & 1 & 1 & 0 & 0 & 0 & 0 \\
0 & 0 & 1 & 1 & 0 & 1 & 0
\end{bmatrix}
\] | 5  |
| Persons | \( g^0 \) |
| 1   | | 1 |
| 2   | | 2 |
| 3   | | 3 |
3. Method: Identification – Counting Deprivations

Q/ Who is poor?

A/ Fix cutoff \( k \), identify as poor if \( c_i \geq k \) (Ex: \( k = 2 \))

\[
g^0 = \begin{bmatrix}
1 & 0 & 1 & 1 & 1 & 1 \\
0 & 1 & 0 & 0 & 0 & 0 \\
0 & 1 & 1 & 0 & 0 & 0 \\
0 & 0 & 1 & 1 & 0 & 1
\end{bmatrix}
\]

\( c \)  Persons

\begin{align*}
5 \\
1 \\
2 \\
3
\end{align*}
3. Method: Identification – Counting Deprivations

Q/ Who is poor?

A/ Fix cutoff $k$, identify as poor if $c_i \geq k$ (Ex: $k = 2$)

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>$g^0 = \begin{bmatrix} 1 &amp; 0 &amp; 1 &amp; 1 &amp; 1 &amp; 1 \ 0 &amp; 1 &amp; 0 &amp; 0 &amp; 0 &amp; 0 \ 0 &amp; 1 &amp; 1 &amp; 0 &amp; 0 &amp; 0 \ 0 &amp; 0 &amp; 1 &amp; 1 &amp; 0 &amp; 1 \end{bmatrix}$</td>
<td>5</td>
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Persons

1

2

3

<table>
<thead>
<tr>
<th>Cutoff (k)</th>
<th>MPI Headcount (H)</th>
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<tbody>
<tr>
<td>1</td>
<td>93.5%</td>
</tr>
<tr>
<td>2</td>
<td>75.8%</td>
</tr>
<tr>
<td>3</td>
<td>57.2%</td>
</tr>
<tr>
<td>4</td>
<td>42.2%</td>
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<tr>
<td>5</td>
<td>24.7%</td>
</tr>
<tr>
<td>6</td>
<td>20.3%</td>
</tr>
<tr>
<td>7</td>
<td>8.1%</td>
</tr>
<tr>
<td>8</td>
<td>5.3%</td>
</tr>
<tr>
<td>9</td>
<td>1.0%</td>
</tr>
<tr>
<td>10</td>
<td>0.8%</td>
</tr>
</tbody>
</table>

Poverty in Haiti for 10 Indicators:

93% of population would be MPI poor using $k=1$

1% using $k=10$

Need something in the middle.
3. Method: Aggregation

Censor data of nonpoor

\[ g^0(k) = \begin{bmatrix}
1 & 0 & 1 & 1 & 1 & 1 \\
0 & 1 & 0 & 0 & 0 & 0 \\
0 & 1 & 1 & 0 & 0 & 0 \\
0 & 0 & 1 & 1 & 0 & 1 \\
0 & 0 & 1 & 1 & 0 & 1 \\
\end{bmatrix} \]

\[ c(k) = \begin{bmatrix}
5 \\
1 \\
2 \\
3 \\
\end{bmatrix} \]
3. Method: Aggregation

Censor data of nonpoor

\[ g^0(k) = \begin{bmatrix}
1 & 0 & 1 & 1 & 1 & 1 \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 1 & 1 & 0 & 0 & 0 \\
0 & 0 & 1 & 1 & 0 & 1 \\
0 & 0 & 1 & 1 & 0 & 1
\end{bmatrix} \]

\[ c(k) = \begin{bmatrix}
5 \\
0 \\
2 \\
3
\end{bmatrix} \]
3. Method: Aggregation – MD Headcount

\[ g^0(k) = \begin{bmatrix} 1 & 0 & 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 & 0 & 1 \end{bmatrix} \]

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<tbody>
<tr>
<td></td>
<td>( 5 )</td>
</tr>
<tr>
<td></td>
<td>( 0 )</td>
</tr>
<tr>
<td></td>
<td>( 2 )</td>
</tr>
<tr>
<td></td>
<td>( 3 )</td>
</tr>
</tbody>
</table>

Persons
3. Method: Aggregation – MD Headcount

$$g^0(k) = \begin{bmatrix} 1 & 0 & 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 & 0 & 1 \end{bmatrix}$$

Indicators $c(k)$

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Three poor persons out of four: $H = 3/4$
3. Method: Critique

Suppose the number of deprivations rises for person 3

Indicators

\[
g^0(k) = \begin{bmatrix}
1 & 0 & 1 & 1 & 1 & 1 \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 1 & 1 & 0 & 0 & 0 \\
0 & 0 & 1 & 1 & 0 & 1 \\
0 & 0 & 1 & 1 & 0 & 1
\end{bmatrix}
\]

\[
c(k) = \begin{bmatrix}
5 \\
0 \\
2 \\
3
\end{bmatrix}
\]

Persons

Three poor persons out of four: \( H = 3/4 \)
3. Method: Critique

Suppose the number of deprivations rises for person 3

\[ g^0(k) = \begin{bmatrix} 1 & 0 & 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 1 & 0 & 1 \end{bmatrix} \]

\[ c(k) = \begin{bmatrix} 5 \\ 0 \\ 3 \\ 3 \end{bmatrix} \]

Three poor persons out of four: \[ H = \frac{3}{4} \]
3. Method: Critique

Suppose the number of deprivations rises for person 3

\[
g^0(k) = \begin{bmatrix}
1 & 0 & 1 & 1 & 1 & 1 \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 1 & 1 & 0 & 1 & 0 \\
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<td>1 0 1 1 1 1</td>
<td>5</td>
</tr>
<tr>
<td>0 0 0 0 0 0</td>
<td>0</td>
</tr>
<tr>
<td>0 1 1 0 1 0</td>
<td>3</td>
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Three poor persons out of four: \( H = \frac{3}{4} \)

No change!

Violates ‘dimensional monotonicity’

(Headcount also not decomposable)
Why not just use the multidimensional H?
If we only used 55% (‘Headcount’) to measure poverty, we could not distinguish X from Y.

\[ H(X) = H(Y) \]
Why not just use H?

If we only used 55% (‘Headcount’) to measure poverty, we could not distinguish X from Y.

$H(X) = H(Y)$

These people are deprived in **two** dimensions each.
Why not just use H?

If we only used 55% (‘Headcount’) to measure poverty, we could not distinguish X from Y.

\[ H(X) = H(Y) \]

People

These people are deprived in **two** dimensions each.

People

These people are deprived in **six** dimensions each!
Why not just use H?

If we only used 55% (‘Headcount’) to measure poverty, we could not distinguish X from Y.

\[ H(X) = H(Y) \]

People

These people are deprived in two dimensions each.

People

These people are deprived in six dimensions each!

Clearly they are different!

People in Y are poorer than people in X.
• MPI = $M_0$ is the **area** of the rectangle.

• It is **incidence** ($H$) x **intensity** ($A$).

$$0.183 < M_0(X) < 0.55$$  

$$M_0(Y)$$
• So first, **what is A?** A conveys how many deprivations a household is experiencing at once. It is the **Average proportion of deprivations** people suffer. It reflects the **Intensity** of MD Poverty.
• Let’s say that on average, people are deprived in 59% of the six dimensions.

• So $A = 0.591$, and shows the average intensity.
• MPI is also the red area.
• It is made up of every household’s data!
• If H stays the same, but A increases because some people become deprived in even more dimensions, then MPI increases.
• If A stays the same, but H increases, MPI increases too!
3. Method: Aggregation

Need to augment information deprivation shares among poor

\[
g^0(k) = \begin{bmatrix}
1 & 0 & 1 & 1 & 1 & 1 \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 1 & 1 & 0 & 0 & 0 \\
0 & 0 & 1 & 1 & 0 & 1 \\
0 & 0 & 1 & 1 & 0 & 1 \\
\end{bmatrix}
\]

<table>
<thead>
<tr>
<th>Indicators</th>
<th>(c(k))</th>
<th>(c(k)/d)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0</td>
<td></td>
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<tr>
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Persons
3. Method: Aggregation

Need to augment information deprivation shares among poor

\[ g^0(k) = \begin{bmatrix}
1 & 0 & 1 & 1 & 1 & 1 \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 1 & 1 & 0 & 0 & 0 \\
0 & 0 & 1 & 1 & 0 & 1 \\
0 & 0 & 1 & 1 & 0 & 1 \\
\end{bmatrix} \]

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<tr>
<td></td>
<td>5</td>
<td>5/6</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>0/6</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>2/6</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>3/6</td>
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Persons
3. Method: Aggregation

Need to augment information

deprivation shares among poor

\[ g^0(k) = \begin{bmatrix} 1 & 0 & 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 & 0 & 1 \end{bmatrix} \]

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<td>1 0 1 1 1 1</td>
<td>5</td>
<td>5/6</td>
</tr>
<tr>
<td>0 0 0 0 0 0 0</td>
<td>0</td>
<td>0/6</td>
</tr>
<tr>
<td>0 1 1 0 0 0 0</td>
<td>2</td>
<td>2/6</td>
</tr>
<tr>
<td>0 0 1 1 0 1 1</td>
<td>3</td>
<td>3/6</td>
</tr>
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</table>

Persons

\[ A = \text{average deprivation share among poor} = 10/18 \]
3. Method: Aggregation

MPI = Adjusted Headcount Ratio = $M_0 = HA$

$$
g^0(k) = \begin{bmatrix}
1 & 0 & 1 & 1 & 1 & 1 \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 1 & 1 & 0 & 0 & 0 \\
0 & 0 & 1 & 1 & 0 & 1 \\
0 & 0 & 1 & 1 & 0 & 1
\end{bmatrix}
$$

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<tr>
<td>1 0 1 1 1 1</td>
<td>5</td>
<td>5/6</td>
</tr>
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<td>0</td>
<td>0/6</td>
</tr>
<tr>
<td>0 1 1 0 0 0</td>
<td>2</td>
<td>2/6</td>
</tr>
<tr>
<td>0 0 1 1 0 1</td>
<td>3</td>
<td>3/6</td>
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$A = \text{average deprivation share among poor} = 10/18$
3. Method: Aggregation

\[ \text{MPI} = \text{Adjusted Headcount Ratio} = M_0 = \text{HA} = \mu(g^0(k)) = \frac{10}{24} = 0.417 \]

\[
g^0(k) = \begin{bmatrix}
1 & 0 & 1 & 1 & 1 & 1 \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 1 & 1 & 0 & 0 & 0 \\
0 & 0 & 1 & 1 & 0 & 1 \\
0 & 0 & 1 & 1 & 0 & 1 \\
\end{bmatrix}
\]

\[
\begin{array}{c|c|c}
\text{Indicators} & c(k) & c(k)/d \\
\hline
1 0 1 1 1 1 & 5 & 5/6 \\
0 0 0 0 0 0 & 0 & 0/6 \\
0 1 1 0 0 0 & 2 & 2/6 \\
0 0 1 1 0 1 & 3 & 3/6 \\
\end{array}
\]

\[ A = \text{average deprivation share among poor} = \frac{10}{18} \]
3. Method: Aggregation

\[ \text{MPI} = \text{Adjusted Headcount Ratio} = M_0 = \text{HA} = \mu(g^0(k)) = \frac{10}{24} = 0.417 \]

\[
g^0(k) = \begin{bmatrix} 1 & 0 & 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 & 0 & 1 \end{bmatrix}
\]

Indicators | \( c(k) \) | \( c(k)/d \) | Persons
--- | --- | --- | ---
5 | 5/6 | \[
0 | 0/6 | \\
2 | 2/6 | \\
3 | 3/6 | \\
10/18 | \\

\[ A = \text{average deprivation share among poor} = \frac{10}{18} \]

\[ H = \text{headcount} = \frac{3}{4} \]

\[ \text{HA} = \frac{30}{72} = \frac{10}{24} \]
3. Methodology: Aggregation Summary

• We construct the MPI using the AF method:

\[ \text{MPI} = M_0 = H \times A \]

• \( H \) is the percentage of people who are poor.

• \( A \) is the average proportion of weighted deprivations people suffer at the same time. It shows the \textit{intensity} of people’s poverty.
3. Methodology: MPI ~ Identification

Multiple Deprivation: The MPI only reflects people who are multiply deprived in at least the equivalent of one dimension.

Triangulation and Cross-Checking: Identification makes the MPI arguably more accurate: isolated deprivations may be due to inaccurate data, or may be voluntary or may not be deprivations in their context.
3. Measurement Methodology: Identification

Health and Education: 1.67 each (1/6 of 10)
Standard of Living: 0.55 each (1/18 of 10)

poor if deprived in: * any 2 of H/E;
* all 6 Std of L, or
* 1 H/E plus 3 S of L
3. Methodology: MPI 10 indicators & wts

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

$$g^0(k) = \begin{bmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
1.67 & 1.67 & 1.67 & 1.67 & .55 & 0 & 0 & 0 & 0 & .55 \\
0 & 1.67 & 0 & 1.67 & .55 & 0 & .55 & .55 & .55 & 0 \\
0 & 0 & 0 & 1.67 & .55 & .55 & .55 & 0 & .55 & .55
\end{bmatrix} \begin{bmatrix}
c(k) \\
c(k)/d
\end{bmatrix} = \begin{bmatrix}
0 \\
7.76 \\
5.53 \\
4.42
\end{bmatrix} \begin{bmatrix}
.776 \\
.776 \\
.553 \\
.442
\end{bmatrix}$$

$H = \text{headcount} = \frac{3}{4}$

$A = \text{average deprivation share among poor} = .590$

$HA = .442$
Example: Grace

OPHI is doing ground reality checks in Kenya, Madagascar, Indonesia, South Africa, India, and Peru.

Feedback welcome
Washing job:
$0.66 per wash
If no washing...

2nd Job: sell recycled cloths
Preparing recycled cloth to sell

$0.13 / kilo
Can find 1-5 kilo/day
($0.13 – $0.65)
Grace is deprived in nutrition and 4 other indicators.
Grace’s MPI

• Grace’s household is food-insecure (1.67), and deprived in sanitation, water, electricity, and assets (4×0.55 = 2.20).

• So she is identified as multidimensionally poor.

• She is deprived in 39% of the MPI dimensions.

• How does her situation compare with MPI in Kenya overall?
Grace and Kenya’s MPI

- Kenya’s MPI is 0.30
- In Kenya, 60% of people are poor by MPI
- Poor people are deprived in 50% of the weighted indicators on average, which is equivalent to 1.54 dimensions.
- \[ \text{MPI} = H \times A = 0.60 \times 0.50 = 0.30 \]
- Grace is less multidimensionally poor than the average MPI poor person in Kenya. She is deprived in 39% of the weighted indicators.
Summary: Why MPI not just $H_{MD}$?

- **The Headcount, $H$,** is the percentage of people who are poor. It is vital, and understandable. However, in a multi-dimensional setting it does not give a complete picture.

MPI is a richer reflection of poverty than $H$ alone because:

- **MPI includes $H$,** so nothing is lost; and critical insights are gained.
- **MPI can be broken down by dimension** to show which dimensions contribute most to poverty. $H$ cannot.
- **MPI is sensitive to the intensity of poverty.** If the number of deprivations a poor people suffers goes up, poverty goes up. $H$ would not change.
- **MPI can be used for targeting** the poor, or certain groups.
<table>
<thead>
<tr>
<th>Country</th>
<th>Year</th>
<th>MPI Value</th>
<th>MPI Rank</th>
<th>H (Fraction of Poor)</th>
<th>A (Average fraction of deprivations)</th>
<th>Value</th>
<th>Rank</th>
<th>Value</th>
<th>Rank</th>
<th>Category</th>
<th>Number of people in 2007 (million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colombia</td>
<td>2005</td>
<td>0.041</td>
<td>40</td>
<td>0.092</td>
<td>0.445</td>
<td>0.160</td>
<td>13</td>
<td>0.279</td>
<td>6</td>
<td>0.640</td>
<td>0.807</td>
</tr>
<tr>
<td>India</td>
<td>2005</td>
<td>0.296</td>
<td>74</td>
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<td>0.535</td>
<td>0.416</td>
<td>25</td>
<td>0.756</td>
<td>2</td>
<td>0.286</td>
<td>0.612</td>
</tr>
<tr>
<td>Niger</td>
<td>2006</td>
<td>0.642</td>
<td>104</td>
<td>0.927</td>
<td>0.693</td>
<td>0.659</td>
<td>38</td>
<td>0.856</td>
<td>5</td>
<td>0.630</td>
<td>0.34</td>
</tr>
</tbody>
</table>

Notes:
- **H** is the fraction of poor.
- **A** is the average fraction of deprivations.
<table>
<thead>
<tr>
<th>Country</th>
<th>Year</th>
<th>MPI Value</th>
<th>MPI Rank</th>
<th>H (Fraction of poor)</th>
<th>$1.25 a day (Fraction of poor)</th>
<th>$2 a day (Fraction of poor)</th>
<th>National poverty line (Fraction of poor)</th>
<th>Value</th>
<th>Rank</th>
<th>Category</th>
<th>Number of people in 2007 (million)</th>
</tr>
</thead>
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<td>5</td>
<td>High</td>
<td>44.4</td>
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<td>0.416</td>
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<td>0.286</td>
<td>20</td>
<td>Medium</td>
<td>1164.7</td>
</tr>
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<td>2006</td>
<td>0.642</td>
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<td>0.927</td>
<td>0.693</td>
<td>0.856</td>
<td>0.630</td>
<td>0.558</td>
<td>45</td>
<td>Low</td>
<td>14.1</td>
</tr>
</tbody>
</table>

**Colombia’s MPI Headcount is < $1.25**

**Niger’s MPI Headcount >$2**

**For India, MPI H > $1.25**
MD Poor countries have higher breadth of MD Poverty

<table>
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<th>Year</th>
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<th>MPI Rank</th>
<th>H (Fraction of Poor)</th>
<th>A (Average fraction of deprivations)</th>
</tr>
</thead>
<tbody>
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<td></td>
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</tr>
<tr>
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<td>5</td>
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<td>1 High</td>
</tr>
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<td></td>
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<td>20</td>
<td>0.612</td>
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<td></td>
<td>0.558</td>
<td>45</td>
<td>0.34</td>
<td>46 Low</td>
</tr>
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<td></td>
<td></td>
<td>0.34</td>
<td>46</td>
<td>Low</td>
<td>14.1</td>
</tr>
<tr>
<td>Country</td>
<td>Year</td>
<td>% Contribution to Overall MPI</td>
<td>MPI Rank</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------</td>
<td>------</td>
<td>------------------------------</td>
<td>----------</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Education</td>
<td>Health</td>
<td>Living Standard</td>
<td></td>
</tr>
<tr>
<td>Colombia</td>
<td>2005</td>
<td>31.74</td>
<td>32.07</td>
<td>36.19</td>
<td>40</td>
</tr>
<tr>
<td>India</td>
<td>2005</td>
<td>23.99</td>
<td>34.68</td>
<td>41.33</td>
<td>74</td>
</tr>
<tr>
<td>Niger</td>
<td>2006</td>
<td>35.31</td>
<td>21.44</td>
<td>43.25</td>
<td>104</td>
</tr>
</tbody>
</table>

In All 3 countries, **living standards** contribute most to MD poverty. In Niger, **Education** contributes more than Health, in Colombia and India, **Health** contributes more.
India has more malnutrition than child mortality.

Niger is just the opposite.
Results:

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

Thus these results are shared to indicate some broad trends and to help plan the presentation of these results and analysis in the future.

Tomorrow’s presentations: more on ‘Ground Reality’, plus ‘Types’ of MD poverty, Decomposition, and Trends across time.
Preliminary results for 104 countries:

- ~ 24 Central and E Europe and CIS, (400M)
- ~ 11 Arab States, (217 M)
- ~ 18 Latin America and the Caribbean (491M)
- ~ 5 South Asia (1544M)
- ~ 9 East Asia and the Pacific (1868M)
- ~ 37 Sub-Saharan Africa (712M)

**Total Population:** 5.230M people

(population figures from 2007; poverty from 2000-2007).
1. The MPI headcounts fall between $1.25 and $2.00/day headcounts.

~ of the 5230M people living in the 104 countries, 1658M are identified as multidimensionally poor (32% of people)

~ this is between $1.25 and $2 a day

~ 1324M live on $1.25/day (25% of people) and
~ 2504M live on $2.00 a day (48% of people)
The 2010 MPI here shown as bars, colored by each dimensional contribution.

MPI complements the $1.25/day measure of income poverty, which is overlaid in black.
Of the 97 countries for which we have income data:

- The MPI headcount of poor persons is **higher** than $1.25/day headcount in 71 countries.
- The MPI headcount is **lower** than $1.25 headcounts in 26 countries.
- The MPI is measuring a related but different underlying phenomenon than income poverty.

2. The MPI differs from and complements income poverty.
3. Most poor people in the world by MPI live in South Asia, followed by Sub-Saharan Africa.
4. The intensity of deprivations tends to be highest in the countries with the highest MPI headcounts.
5. MPI varies by region and ethnicity/caste

- In Kerala India 17% of the population is MPI poor; in Bihar it is 83%.
- In Kenya, state MPI headcounts range from 12% to 97%; in Bolivia from 27% to 52%.
- Decompositions by caste and ethnic group show stark differences.
6. The intensity of MPI poverty is greatest in South Asia and Sub-Saharan Africa.

- The poorest 20 countries are in Sub-Saharan Africa (plus Somalia, technically an Arab State). They are home to 430 million MPI poor people.

- But that does not mean Africa is the poorest, because African states are small compared to South Asian.

- The 7 poorest states in India have comparable MPI values to the 20 poorest countries in SSA. The states are home to 413 million MPI poor people.
The MPI headcount of countries with GDP less than $1,700/capita ranges from 2% to 92%.

7. Low GDP countries can have low MPI
Section 5: 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 of our 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)

• **Household size**: are bigger hh poorer due to data issues?

• **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?
Are MPI rankings robust to changes in \( k \)?

MPI country rankings for \( k=2 \) to \( k=4 \) are robust for 95% of country comparisons.
Does MPI identify different households than income poverty?

Using WHS data we compare which hh are identified as income poor and MPI poor.

<table>
<thead>
<tr>
<th></th>
<th>Not Poor (MPI k=3)</th>
<th>Poor (MPI k=3)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Income Poor</td>
<td>20.31</td>
<td>14.80</td>
<td>35.11</td>
</tr>
<tr>
<td>Income Poor</td>
<td>19.55</td>
<td>45.33</td>
<td>64.89</td>
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<tr>
<td>Total</td>
<td>39.87</td>
<td>60.13</td>
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</tbody>
</table>
Does MPI identify different households than income poverty?

In Kenya, 65% of people are income poor, and 60% are MPI poor.

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</table>
**Does MPI identify different households than income poverty?**

In Kenya, 30% of income poor households are not MPI poor.

And 42% of MPI poor are not income poor.

<table>
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</table>

**Conclusion:** even in countries with similar poverty headcounts, MPI and Income poor households are not the same! (targeting)
Does the DHS Wealth Index identify as poor the same as MPI?

- DHS Wealth Index uses data on services, and amenities to tabulate health, population, nutrition, education, and other indicators according to economic status. It is standard in DHS and UNICEF Multiple Indicator Cluster Survey (MICS) final reports and data sets.
- Has been criticized as being too urban in its construction and not able to distinguish the poorest of the poor from other poor households. Rutstein & Johnson (2004).
DHS Wealth Index and MD Poverty

• The DHS wealth index treats wealth (and economic status) as an underlying unobserved dimension that is estimated using latent variable techniques such principal components analysis.

• In contrast, the MPI is an ‘absolute’ indicator, whose components and weights are exactly the same across years and countries.

• Do they identify the same people as poor?
### Table 1. Assets and Services Usually Asked in DHS Surveys

<table>
<thead>
<tr>
<th>Left Column</th>
<th>Right Column</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Flooring</td>
<td>Persons per sleeping room</td>
</tr>
<tr>
<td>Type of Roofing</td>
<td>Ownership of agricultural land and size</td>
</tr>
<tr>
<td>Wall material</td>
<td>Ownership of farm animals by type and number</td>
</tr>
<tr>
<td>Water Supply</td>
<td>Domestic servant</td>
</tr>
<tr>
<td>Sanitation Facilities</td>
<td>Telephone (fixed and mobile)</td>
</tr>
<tr>
<td>Electricity</td>
<td>Cooking fuel</td>
</tr>
<tr>
<td>Radio</td>
<td>Bank account</td>
</tr>
<tr>
<td>Television</td>
<td>Windows</td>
</tr>
<tr>
<td>Refrigerator</td>
<td>— With shutters</td>
</tr>
<tr>
<td>Watch</td>
<td>— With glass</td>
</tr>
<tr>
<td>Type of Vehicle</td>
<td>— With screens</td>
</tr>
<tr>
<td>At least five items of furniture:</td>
<td>— With curtains</td>
</tr>
<tr>
<td>— Table</td>
<td>Appliance items, including at least</td>
</tr>
<tr>
<td>— Chair</td>
<td>— 3 that a poor household may have:</td>
</tr>
<tr>
<td>— Sofa</td>
<td>Clock, water pump, grain grinder, sewing machine,</td>
</tr>
<tr>
<td>— Bed</td>
<td>— 3 that a middle wealth household may have:</td>
</tr>
<tr>
<td>— Armoire</td>
<td>Fan, blender, water heater, camera, color TV, cassette/CD player, VCR/DVD player</td>
</tr>
<tr>
<td>— Cabinet</td>
<td>— 3 that a rich household may have:</td>
</tr>
<tr>
<td></td>
<td>Electric generator, washing machine, microwave oven, computer, air conditioner</td>
</tr>
</tbody>
</table>

The items in bold have been added to better distinguish the wealth of rural households.
Spearman Correlation Wealth Index (reversed) - MD Poverty - Living Standard Deprivation

Correlation MD Poverty & LS Deprivation
Correlation Wealth Index and LS Deprivation

H2
Identification: Wealth vs MPI

These countries have MPI H<20%, so we expect the light lines to be high.

These countries have MPI H>80%, so we expect these dark lines to be high.
Additional analysis on final results

• **Bootstrapping** to estimate confidence intervals
• **Robustness** tests on weights
• **Robustness** tests on different dimensional cutoffs

• **Policy** analysis: case studies connecting MPI and other assessments of key policy interventions
Key issues

• **Data Constraints:** Most criticisms address these (*why don’t you include _____?*). How to respond well?

• **MDGs:** How can this measure strengthen work on the MDGs – emphasising service delivery – and data gaps?

• Shall we claim, ‘the MPI complements income’?
  – Shows systemic deprivations
  – Will reflect change more quickly than income
  – Only considers households with multiple deprivations
  – Responsive to public, private, or NGO actions
Key issues

• **Next year:** Improvements in MPI?

• **Next year:** Extensions to OECD and middle HD countries: what parallel processes? How synergise?

• **National Measures:** What would an ‘ideal’ national poverty measure look like?
  - Include Income (Mexico), or Complement it?
  - What other dimensions
  - Different techniques for measures focused on:
    • Targetting
    • National Poverty measures akin to Income
    • Monitoring and Evaluation
Thank you!
South Asia –

• MPI Headcounts $H$: 51% in Pakistan, 55% in India, 58% in Bangladesh, and 65% in Nepal.

• The MD poor average ranges from .38 in Sri Lanka (the only country less than .50) to .54 in Nepal.

• Deprivation in living standard is the highest poverty contributor, followed by health except in Pakistan where health is the highest.

• Deprivation in nutrition is 40% in Nepal, 39% in India and 3% in Bangladesh (no data for Pakistan).
SS Africa - examples

• In Chad, Burkina Faso, Guinea, Mali and Niger, Liberia and Sierra Leone, more than 50% of poor people live in a household where at least one child has died.

• In Liberia, CAR, Burkina Faso, Mali, Ethiopia, Senegal, Guinea and Niger, more than 55% of poor people live in a household where there is at least one school-aged child not attending school.

• In Mozambique, Guinea, Burundi, Burkina Faso, Mali, Ethiopia, Somalia and Niger, more than 50% of poor people live in a household where no household member has completed five years of education.
### States Population MD Poverty Index Rank MD Headcount Average deprivation share (A) Contribution to Overall Poverty

<table>
<thead>
<tr>
<th>States</th>
<th>Population</th>
<th>MD Poverty Index</th>
<th>Rank</th>
<th>MD Headcount</th>
<th>Contribution to Overall Poverty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delhi</td>
<td>1.1%</td>
<td>0.068</td>
<td>1</td>
<td>0.153</td>
<td>0.440</td>
</tr>
<tr>
<td>Kerala</td>
<td>2.6%</td>
<td>0.070</td>
<td>2</td>
<td>0.170</td>
<td></td>
</tr>
<tr>
<td>Goa</td>
<td>0.1%</td>
<td>0.096</td>
<td>3</td>
<td>0.220</td>
<td>0.454</td>
</tr>
<tr>
<td>Punjab</td>
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**Let’s go inside a country: India. What happens?**

Headcount varies from 15% to 83% in different states! Overall it is 57%
## Decomposition 1: State Matters

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Breadth varies from 41% in Kerala to 62% in Bihar
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UP is home to the most poor persons followed by Bihar.
We can also look at Caste. What is the picture?

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Scheduled tribes are the poorest
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Headcount varies from 35% to 83%!

A is highest for the poorest
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