Global Poverty Measures

The 2015 World Bank Poverty Update

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The Research group of The World Bank

* This presentation draws on the efforts of a Working Group at the World Bank
Outline

1. Background
   i. A brief history of global poverty monitoring at the World Bank

2. Data and methods -- constructing a comparable welfare measure
   i. Comparability across welfare measures – differences in consumption, income
   ii. Comparability over time – accounting for inflation
   iii. Comparability across countries -- 2011 Purchasing Power Parities
   iv. Comparability within countries -- Within-country spatial price adjustments
   v. Shifting distributions to same point in time – the lineup year

3. Setting poverty lines with the 2011 PPPs
   i. Updating the $1.25 line to 2011 PPPs (comparability of poverty lines)

4. Results
A brief history of global poverty monitoring at the World Bank

1. Ahluwalia, Carter and Chenery (JDE, 1979):
   - Use India’s poverty line (46th percentile of per capita income) and the 1975 PPPs (from the ICP covering 16 countries) to estimate the developing world’s poverty headcount.
   - Use consumption & income data from 25 countries, and predicted PPPs from Kravis, Heston, Summers to estimate poverty for 36 countries (covering “80% of the developing world excluding China”).

2. Ravallion, Datt and van de Walle (RIW, 1991) and the WDR 1990:
   - Generate the original $1-a-day poverty line, using 1985 PPPs from the Penn World Tables.
   - This line (actually $31 per month) was “typical of poor countries” in the sense that it was shared to the nearest dollar by six low-income countries (Bangladesh, Indonesia, Kenya, Morocco, Nepal and Tanzania) and close to this range for two others (Philippines and Pakistan) from a sample of 33 national poverty lines. Two other lines much lower.
   - RDvW use data from 22 countries (predict to 64 countries), estimated global poverty based on 86 countries (covering 3.4 billion people).
WDR 1990: National poverty lines are the data for setting the Bank’s international line

- International line should not fall outside the range of national lines.
- Richer people – and richer countries – tend to have higher poverty lines (Ravallion, Datt and van de Walle, 1992).
  - Amongst poor countries, there is very little income gradient across countries in their poverty lines — absolute consumption needs dominate.
  - But the gradient rises as incomes rise.
- Also idiosyncratic effects, so we take averages =>
3. Chen and Ravallion (RIW, 2001):

- Update the line to $1.08-a-day using 1993 PPPs for consumption.
- Global line chosen as the median poverty line of the lowest 10 lines from WDR 1990 set.
- Those 10 countries are Bangladesh, China, India, Indonesia, Nepal, Pakistan, Tanzania, Thailand, Tunisia and Zambia.
- All numbers revised back in time to ensure consistency. Estimates based on data from 83 countries (265 national sample surveys)
A brief history of global poverty monitoring at the World Bank

4. Ravallion, Chen and Sangraula (WBER, 2009):
   
   • Update the line to $1.25-a-day using 2005 PPPs for consumption.
   
   • New compilation of national poverty lines from the Bank’s country-level Poverty Assessments (for 74 countries)
     • Poverty lines considered appropriate to living standards in each country,
     • Consultation with Government, or Government’s own poverty line.
   
   • Reference group of the poorest 15 countries.
     • Malawi, Mali, Ethiopia, Sierra Leone, Niger, Uganda, Gambia, Rwanda, Guinea-Bissau, Tanzania, Tajikistan, Mozambique, Chad, Nepal and Ghana.

Figure 1: National poverty lines for 74 developing countries plotted against mean consumption using consumption PPPs for 2005

Note: Fitted values use a lowess smoother with bandwidth=0.8
# Revisions to the international poverty line

<table>
<thead>
<tr>
<th>Update:</th>
<th>1979 “India line”</th>
<th>1990 “Dollar-a-day”</th>
<th>2001 1.08/day</th>
<th>2008 1.25/day</th>
<th>2015 1.90/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poverty lines used</td>
<td>1 (India)</td>
<td>6 countries</td>
<td>10 countries</td>
<td>15 countries</td>
<td>15 (same lines as 2008)</td>
</tr>
<tr>
<td>Method</td>
<td>India’s poverty line (46th pctile)</td>
<td>Inspection</td>
<td>Median</td>
<td>Mean</td>
<td>Mean</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$0.56</td>
<td>$1.01</td>
<td>$1.08</td>
<td>$1.25</td>
<td>$1.90</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$1.12</td>
<td>$1.01</td>
<td>$0.80</td>
<td>$0.69</td>
<td>$0.91</td>
<td></td>
</tr>
</tbody>
</table>

Source: Ahluwalia et al (1979); 1990 WDR, Ravallion, et al (1991); Chen and Ravallion (2001); Ravallion, Chen and Sangraula (2009); This paper.
PovcalNet – The data tool for global poverty estimates

• Global poverty estimates are based on 1,195 income & consumption distributions in PovcalNet from national household surveys from 132 ‘developing’ countries. Database now also contains data from rich countries, but not used for global poverty estimates.

• Increasing use of microdata in 2015 update, declining use of grouped data.

• Survey data from 2010 to 2013 used in the 2012 estimate cover:
  • 86% of the developing world’s population
  • >90% in EAP, ECA, LAC and SAR
  • 68.7% in AFR
  • 37.4% in MENA

### 2014 Poverty Update – Distribution types

<table>
<thead>
<tr>
<th></th>
<th>Grouped</th>
<th>Microdata</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income</td>
<td>6</td>
<td>26</td>
<td>32</td>
</tr>
<tr>
<td>Consumption</td>
<td>68</td>
<td>26</td>
<td>94</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>74</strong></td>
<td><strong>52</strong></td>
<td><strong>126</strong></td>
</tr>
</tbody>
</table>

### 2015 Poverty Update – Distribution types

<table>
<thead>
<tr>
<th></th>
<th>Grouped</th>
<th>Microdata</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income</td>
<td>3</td>
<td>29</td>
<td>32</td>
</tr>
<tr>
<td>Consumption</td>
<td>3</td>
<td>97</td>
<td>100</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>6</strong></td>
<td><strong>126</strong></td>
<td><strong>132</strong></td>
</tr>
</tbody>
</table>

New countries added in 2015 update: Kiribati, Kosovo, Samoa, Solomon Islands, Tonga and Vanuatu.
National Household Surveys – the foundation of the global poverty estimate

• NSOs collect household survey data for national poverty policies, not global poverty measurement.
  • Typically reflecting country context, some countries collect data on consumption, expenditure, and/or income
  • Data is collected at the household level, differing adjustments for adult-equivalence (and/or economies of scale)

• Some efforts to standardize
  • Some regional efforts to bring more uniformity of instrument
  • WB staff often ‘teach’ Deaton-Zaidi guidelines for consumption
  • PovCal requests data in per-capita terms, nominal terms

• But, important comparability issues remain...
Comparability, issue 1: Income and consumption

- Income and consumption are different concepts (savings, volatility)

- Surveys often have zero incomes; seldom zero consumption.
  - Zeros exert significant influence on extreme poverty measures; more so as goal of eliminating poverty nears.
  - Example: Poverty in Mexico 2012 (at $1.25/day, 2005 PPPs) was 3% based on income, 1% based on consumption.

<table>
<thead>
<tr>
<th>Income Consumption per capita per day (2005 PPPs USD)</th>
<th>CDF (share of pop living below X)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1.25/day</td>
<td>0.05</td>
</tr>
<tr>
<td>Inc: 3.3 %</td>
<td>Cons: 1.0 %</td>
</tr>
<tr>
<td>$3/day</td>
<td>0.2</td>
</tr>
<tr>
<td>Inc: 16.5 %</td>
<td>Cons: 11.7 %</td>
</tr>
</tbody>
</table>

Source: PovcalNet
Comparability, issue 2: Measured consumption differs (both between and within countries)

• Differences in questionnaire affect consumption:
  • Diaries vs. recall
  • Nonfood varies (some include rent, durables, and/or health; others do not)
  • Count of pre-coded food items affects aggregate
  • Recall frame affects responses (eg. Telescoping, “Great Indian Debate”)
    • INDIA EXAMPLE: Since 1950s - India used uniform 30-day recall period (URP), then switched recall frame twice. In 2009, switched to “modified mixed reference period” (MMRP), short for some, long for others.
    • =>
      • MMRP-based consumption gives poverty rate of 12 percent for 2011/12.
      • URP results in poverty rate of 21 percent for 2011/12 (used in WB estimate)
      • Difference of 109 million poor people in India’s and global estimates.

• Many other important differences: Timing of fieldwork, Training, Supervision, Cleaning/editing rules; etc.
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   ii. Alternatives, robustness

4. Results
Adjusting for inflation, comparability over time

• National distributions of welfare and select poverty lines are adjusted for inflation and expressed in real local currency for ICP base years (e.g. 2005, 2011) before converting to PPPs.

• Current global poverty line is sensitive to the choice of CPIs
  • National poverty lines are moved from 2005 to 2011, then converted
  • Using only WDI CPIs, the $1.25 poverty line converts into $1.70/day at 2011 PPPs
  • Using PovcalNet CPIs, the latest calculation is $1.90/day

• Example: Tajikistan, CPI vs hh survey-based measure
  • Large divergence between Povcal and WDI CPIs in 2005-2006
  • Official CPI implies 18% annualized growth of household survey
  • mean from 2004 to 2009, Povcal “CPI” implies 6% growth
  • Implication for poverty lines:
    • Brings Tajik poverty line (in PPP2011 USD) from 1.82 to 3.18
    • Raises global poverty line by 9 cents.
    • This change adds 110 million people to the count of the global poor.

![Tajikistan's CPIs](chart.png)
## Choice of inter-temporal price deflators

<table>
<thead>
<tr>
<th>Price Deflator Description</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>WDI annual CPI – general</td>
<td>104</td>
</tr>
<tr>
<td>Monthly CPI from NSO (consistent with annual number in WDI)</td>
<td>20</td>
</tr>
<tr>
<td>CPI disaggregated by urban-rural areas (official CPI for China and India)</td>
<td>2</td>
</tr>
<tr>
<td>CPI adjustment for 6 countries using alternative price indices (Bangladesh, Cambodia, Ghana, Lao, Malawi and Tajikistan).</td>
<td>6</td>
</tr>
</tbody>
</table>

Countries in **blue** are among the countries that define poverty line, thus choice of CPI also affects international poverty line.
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4. Results
2011 International Comparisons Program

• Price data collected in 2011 (released in 2014)
• Increased coverage of countries: 146 economies in 2005, to 199 in 2011 covering 99% of world nominal GDP
• Increased coverage of rural prices, particularly in China, India, Indonesia (as compared to 2005)
• 18-ring-country approach from 2005 replaced by subset Global Core List of items from all countries for linking in 2011.
2011 Purchasing Power Parities

- 2011 PPPs indicate shift in regional profile of relative price levels:
  - 2011 PPPs suggest lower relative price levels in poor countries (relative to US) => higher PPP-adjusted USD values of consumption & income.

- Convert 2005 PPP value => 2011 PPP value:
  - \( \frac{CPI_{11}}{CPI_{05}} \) / \( \frac{PPP_{11}}{PPP_{05}} \), Change in CPI relative to change in PPPs. Can be thought of as country-specific PPP05 -> PPP11 deflators.

- Mean \( \Delta CPI / \Delta PPP > 1 \), perhaps due to \( \Delta \) ICP methodology or increased rural coverage.

- Poverty line ratio = 1.52, so if ratio greater than this, consumption increasing more than poverty line => decrease in poverty
Food inflation is higher than total inflation 2005 to 2011

Annual rate of inflation 2005-11 (% per annum)

<table>
<thead>
<tr>
<th></th>
<th>Food prices (ILO)</th>
<th>Non-food prices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poorest quarter of countries</td>
<td>15.2</td>
<td>4.7</td>
</tr>
<tr>
<td>The rest</td>
<td>7.7</td>
<td>5.3</td>
</tr>
</tbody>
</table>

Note: Poorest quarter are those with log consumption per capita in 2011 less than 5.
Inflation rate for non-food is backed out using mean food share and overall CPI inflation rate.
Two Engel curves

For poor countries the ICP understates the household food share and so under-estimates the welfare effects of higher food prices.

Sources: Food shares based on HH survey around 2011 and from the members of GPWP.
Change of price levels during 2005 to 2011:
PPP and CPI

Cambodia  Lao  Egypt  Iraq  Yemen  Bangladesh  Nepal

156%  137%  191%  265%  194%  206%  165%

ppp 11/05  cpi 11/05
Within-country spatial cost-of-living adjustments (COLA)

• Chen and Ravallion (QJE, 2010) and PovcalNet make urban-rural adjustments to PPPs for China, India & Indonesia in 2005 estimates.

• Adjustments motivated by:
  • A concern for (urban) bias in collection of prices in the 2005 ICP
  • Desire to report rural and urban poverty separately for select countries

• 2012 estimates continue to use COLAs. Adjustments re-estimated, based on ratio of more recent rural/urban national poverty lines.
  • Adjustments are not done for all countries due to limited data on rural-urban price differences, ICP sampling, and PovcalNet historical data mostly containing national distributions.
National, urban and rural poverty lines – $1.25/day in 2008 round

• For China, the ICP survey was confined to 11 cities, the $1.25 a day international poverty line is treated as an urban poverty line and use the ratio of urban to rural national poverty lines to derive the corresponding rural poverty line in local currency units;

• For India, the ICP included rural areas, the derived urban and rural $1.25 a day poverty lines consistent with both the urban-rural differential in the national poverty lines and the relevant features of the design of the ICP samples for India;

• For Indonesia, the international poverty line is first converted to LCUs using the consumption PPP from the 2005 ICP, then unpack that poverty line to derive implicit urban and rural lines that are consistent with the ratio of the national urban-to-rural lines for Indonesia.
National, urban and rural poverty lines – $?/day in 2015 round

Assuming $Z_n$ is the international poverty line in local currency

$$Z_n = W_r Z_r + W_u Z_u \quad (1)$$

Where $Z_u$ and $Z_r$ are urban to rural international poverty lines in local currency

$$W_r + W_u = 1$$

Let $K = \frac{Z_u}{Z_r} \quad (2)$

$K$ is the ratio of urban to rural national poverty lines and

$$\frac{Z_u}{Z_r} = \frac{Z_u}{Z_r}$$

Then

$$Z_r = \frac{Z_n}{(W_r + W_u K)} \quad ; \quad Z_u = \frac{(Z_n - W_r Z_r)}{W_u}$$
Within-country spatial price adjustments

### 2011 PPPs

<table>
<thead>
<tr>
<th>Country</th>
<th>National PPP (ICP)</th>
<th>Urban PPP</th>
<th>Rural PPP</th>
<th>Urban/Rural price ratio (from poverty lines)</th>
<th>ICP Urban/Rural sampling shares Wu &amp; Wr</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>3.696</td>
<td>3.93</td>
<td>2.95</td>
<td>1.33</td>
<td>[add]</td>
</tr>
<tr>
<td>India</td>
<td>14.98</td>
<td>15.7</td>
<td>12.91</td>
<td>1.22</td>
<td>[add]</td>
</tr>
<tr>
<td>Indonesia</td>
<td>4091.9</td>
<td>4360.5</td>
<td>3666.16</td>
<td>1.19</td>
<td>[add]</td>
</tr>
</tbody>
</table>

### 2005 PPPs [UPDATE]

<table>
<thead>
<tr>
<th>Country</th>
<th>National PPP (ICP)</th>
<th>Urban PPP</th>
<th>Rural PPP</th>
<th>Urban/Rural price ratio (from poverty lines)</th>
<th>ICP Urban/Rural sampling shares Wu &amp; Wr</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>4.09</td>
<td>4.09</td>
<td>2.98</td>
<td>1.37</td>
<td>100/0</td>
</tr>
<tr>
<td>India</td>
<td>15.6</td>
<td>17.24</td>
<td>11.4</td>
<td>1.51</td>
<td>[add]</td>
</tr>
<tr>
<td>Indonesia</td>
<td>4192</td>
<td>4795.9</td>
<td>3399.7</td>
<td>1.41</td>
<td>[add]</td>
</tr>
</tbody>
</table>
Other within-country adjustments in PovcalNet

• Socioeconomic Database for Latin America and the Caribbean (SEDLAC):
  • PPP price collection in LAC is urban only.
  • Rural incomes from SEDLAC are adjusted to urban levels (15% uniform adjustment)

• World Bank poverty database for ECA (ECAPOV) adjusts for price differences (based on unit values from food consumption in hh surveys, which then is applied it to consumption aggregate).
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4. Results
Alignment of survey data to ICP reference years

- To estimate poverty at a common point in time, surveys are lined up to ICP reference year (e.g. 2005, 2011)
- If a survey is not available in the reference year, closest survey(s) are extrapolated to reference year using adjusted NAS growth rates.
  - GDP growth used in AFR, Private Consumption Expenditures used in other regions.
  - Using adjustment factors between survey and NAS growth from Ravallion (2003): 0.87 for most countries; lower for China, India.

Example 1: Survey only available before reference year

Example 2: Surveys available before/after reference year

Source: Policy Research Report; Ravallion & Chen, 2004
Aggregation and reporting of regional and global numbers

• Regional numbers aggregated to global number with their populations shares. Countries without poverty numbers are in effect assigned regional average.

• For calculating global estimates, rich countries are assumed to have 0 extreme poor.

• For 2012, poverty estimates suppressed for some MENA countries.
  • Based on feedback from country economists
  • Limited survey coverage of MENA region, regional estimates are not reported
  • However, MENA countries are included in global count.
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4. Results
Updating the RCS15 $1.25/day line to 2011 PPPs

- Goal to ‘end’ global poverty by 2030 based on $1.25 poverty line.
- Desire to keep the line fixed in real terms (“Don’t move the goal line”)
- We start with the 2005 LCU value of the national poverty lines for the RCS15.
- Use 2005PPP => 2011 PPP scaling factor (previous slide).
- This yields an average of $1.90.

<table>
<thead>
<tr>
<th>Country</th>
<th>Year</th>
<th>2005 PPP</th>
<th>2011 PPP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malawi*</td>
<td>2004-05</td>
<td>0.86</td>
<td>1.34</td>
</tr>
<tr>
<td>Mali</td>
<td>1988-89</td>
<td>1.38</td>
<td>2.15</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>1999-2000</td>
<td>1.35</td>
<td>2.03</td>
</tr>
<tr>
<td>Sierra Leone</td>
<td>2003-04</td>
<td>1.69</td>
<td>2.73</td>
</tr>
<tr>
<td>Niger</td>
<td>1993</td>
<td>1.10</td>
<td>1.49</td>
</tr>
<tr>
<td>Uganda</td>
<td>1993-98</td>
<td>1.27</td>
<td>1.77</td>
</tr>
<tr>
<td>Gambia, The</td>
<td>1998</td>
<td>1.48</td>
<td>1.82</td>
</tr>
<tr>
<td>Rwanda</td>
<td>1999-2001</td>
<td>0.99</td>
<td>1.50</td>
</tr>
<tr>
<td>Guinea-Bissau</td>
<td>1991</td>
<td>1.51</td>
<td>2.16</td>
</tr>
<tr>
<td>Tanzania</td>
<td>2000-01</td>
<td>0.63</td>
<td>0.88</td>
</tr>
<tr>
<td>Tajikistan*</td>
<td>1999</td>
<td>1.93</td>
<td>3.18</td>
</tr>
<tr>
<td>Mozambique</td>
<td>2002-03</td>
<td>0.97</td>
<td>1.26</td>
</tr>
<tr>
<td>Chad</td>
<td>1995-96</td>
<td>0.87</td>
<td>1.28</td>
</tr>
<tr>
<td>Nepal</td>
<td>2003-04</td>
<td>0.87</td>
<td>1.47</td>
</tr>
<tr>
<td>Ghana*</td>
<td>1998-99</td>
<td>1.83</td>
<td>3.44</td>
</tr>
</tbody>
</table>

Average: 1.25 | 1.90

*Countries use category 4 price deflators in conversion.
Robustness: $1.25 line converted to 2011 PPPs for all countries

Across 101 countries in which we measure global poverty and which are ICP benchmark countries across both rounds.
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4. Results
Global patterns largely maintained: 2011 estimate goes from 14.5% to 14.2% poor
Regional trajectories and levels 1990-2011 maintained

--- 2014 estimates (2005 PPPs, $1.25 line)      ── 2015 estimates (2011 PPPs, $1.90 line)
Has the goal of ending poverty by 2030 become ‘easier’?

Assumes 10 year historic growth rate
Progress for the poorest in the aggregate

The % below $1.9 a day was more than halved, falling from 54% to 15% over 1981-2012.
- Trend decline of one % point per year.

- Number of poor fell by 1.1 billion, from 1.997 billion to 897 million
- Poverty rate fell in all years
- Robust to choice of poverty line
Regional aggregation using 2011 PPP and $1.9/day poverty line

The latest estimates at regional level are the same regional groupings of countries as in past work. The estimates are lined-up in time according to “reference years” as indicated. (See the background paper on how this is done).

### 2012

<table>
<thead>
<tr>
<th>Region</th>
<th>Pov line (PPP/day)</th>
<th>Headcount</th>
<th>Pov. gap (%)</th>
<th>Squared pov. gap</th>
<th>Num of pov (mil.)</th>
<th>Population (mil.)</th>
<th>Survey coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Asia and Pacific</td>
<td>1.50</td>
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**Survey data coverage is too low, the result is suppressed**

### 2011

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**Survey data coverage is too low, the result is suppressed**