# Measuring Global Poverty Past, Present and Future

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This presentation draws in part on "A Global Count of the Extreme Poor in 2012: Data issues, methodology and initial results", *Journal of Economic Inequality*, 14(2): 141-172, with Shaohua Chen, Andrew Dabalen, Yuri Dikhanov, Nada Hamadeh, Dean Jolliffe, Ambar Narayan, Espen Beer Prydz, Ana Revenga, Prem Sangraula, Umar Serajuddin, and Nobuo Yoshida.

#### The question:

# How much poverty is there in the world as a whole?

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# How much poverty is there in the world as a whole?

(When poverty is thought of as extreme deprivation in the space of income or consumption expenditures, with respect to an internationally comparable poverty line)

#### Outline

#### **1. Past:** A brief history of global poverty monitoring at the World Bank

#### 2. Present: The 2015 update to the global poverty count

- i. Another new set of PPP exchange rates
- ii. Basic principles for incorporating them
- iii. Updating the poverty line
- iv. Other ingredients: incomes and prices
- v. Alternatives, robustness and remaining caveats
- vi. Results

#### **3. Future**: Whither global poverty measurement?

- 1. <u>Ahluwalia, Carter and Chenery (JDE, 1979):</u>
  - Use India's poverty line (46<sup>th</sup> percentile of per capita income = \$0.56) and the 1975 PPPs (from the ICP covering 16 countries) to estimate the developing world's poverty headcount.
  - Use consumption and 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").
  - Find an in-sample poverty rate of 38% (or 644 million people) in 1975.

- 2. <u>Ravallion, Datt and van de Walle (RIW, 1991) and the WDR 1990:</u>
  - 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.
  - RDvW use data from 22 countries (predict to 64 countries), estimated global poverty based on 86 countries (covering 3.4 billion people).
  - Find an in-sample poverty rate of 33% (or 1,137 million people) in 1985.

#### 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 88 countries (297 national sample surveys)
- Find an in-sample poverty rate of 23% (or 1,175 million people) in 1998.

- 4. <u>Ravallion, Chen and Sangraula (WBER,</u> 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)
- 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.
- Find a poverty rate of 25% (or 1.4 billion people) in 2005.

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



Update:	1979 "India line"	1990 "Dollar-a-day"	2001 1.08/day	2008 1.25/day
Source	Ahluwalia et al (1979)	1990 WDR, Ravallion, et al (1991)	Chen and Ravallion (2001)	Ravallion, Cher and Sangraula (2009)
ICP data	1975 PPPs Kravis et al (1978)	1985 PPPs	1993 PPPs	2005 PPPs
Poverty lines used	1 (India)	8 countries	10 countries	15 countries
Method	India's poverty line (46 <sup>th</sup> pctile)	Inspection	Median	Mean
Poverty line (ICP base year USD)	\$0.56	\$1.01	\$1.08	\$1.25
Country coverage	36 (25)	86 (22)	88	115

#### (Some) critiques of the World Bank's approach

- Deaton (2010) attribute the large increase in global poverty in the 2008 update to a change in the real value of the poverty line (\$1.25 at 2005 PPPs).
- Reddy and Pogge (2010) criticize reliance on national poverty lines as a basis for the global line. They propose agreeing on a core set of capabilities to define global poverty, and then costing them in each country.
- Klasen et al. (2016) query certain specific choices in temporal and spatial price adjustments in the 2015 update. More fundamentally, they critique the apparent lack of robustness of GPM to new PPP rounds. Propose a short-term fix (fixing PPPs at 2011 or 2005 values, and updating lines by domestic inflation) and a longer-term approach, based on internationally-coordinated CBN poverty lines.

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**3. Future**: Whither global poverty measurement?

#### i. The 2011 Purchasing Power Parity exchange rates

- Price data collected in 2011 (released in 2014)
- Increased coverage of countries: from 146 economies in 2005 to 199 in 2011, covering 99% of nominal world 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 regions in 2011.
- Deaton and Aten (2014) and Inklaar and Rao (2014) argue that these are methodological improvements, which correct for errors in the 2005 PPPs that had led to an 20-30% overestimate of the price levels in Africa and Asia

### i. The 2011 Purchasing Power Parity exchange rates

- 2011 PPPs indicate shift in regional profile of relative price levels:
  - 2011 PPPs suggest lower price levels in poor countries (relative to US) => higher PPPadjusted USD values of consumption & income.
- Convert 2005 PPP value => 2011 PPP value:
  - $\frac{CPI_{11}}{CPI_{05}} / \frac{PPP11}{PPP05}$

Change in CPI relative to change in PPPs. Can be thought of as countryspecific PPP05 -> PPP11 deflators. OPENDED SUK OF SAU
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Figure 1: Change in PPP-adjusted dollar values between 2005 and 2011 PPPs

Note: Fitted line uses lowest smoother with bandwith 0.8. Sample limited to countries which participated in both the 2005 and 2011 ICP rounds.  $\delta = 1$  means no change to the PPP-adjusted dollar value between 2005 and 2011 PPPs.

For US,  $\delta$  = 1.15

#### ii. Basic Principles

- 1. Use the most accurate set of prices available to compare the standards of living across countries with very different prices for non-tradable goods and services.
- 2. Acknowledge that the Bank's poverty reduction goal (and the UN's SDG #1) are set explicitly in terms of the \$1.25 line at PPP2005 exchange rates. Minimize changes to the goalpost.
- 3. The price levels most relevant for this exercise are those faced by the world's poorest people

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- 3. The price levels most relevant for this exercise are those faced by the world's poorest people
- Derive the new line by:
  - i. Inflating the 2005 values of the fifteen RCS lines to 2011 using domestic CPIs
  - ii. Convert the resulting values to US dollars (in 2011 prices) using the 2011 PPPs

## iii. Updating the RCS15 \$1.25/day line to 2011 PPPs

Country	Year	2005 PPP	2011 PPP
Malawi*	2004-05	0.86	1.34
Mali	1988-89	1.38	2.15
Ethiopia	1999-2000	1.35	2.03
Sierra Leone	2003-04	1.69	2.73
Niger	1993	1.10	1.49
Uganda	1993-98	1.27	1.77
Gambia, The	1998	1.48	1.82
Rwanda	1999-2001	0.99	1.50
Guinea-Bissau	1991	1.51	2.16
Tanzania	2000-01	0.63	0.88
Tajikistan*	1999	1.93	3.18
Mozambique	2002-03	0.97	1.26
Chad	1995-96	0.87	1.28
Nepal	2003-04	0.87	1.47
Ghana*	1998-99	1.83	3.07
Average		1.25	1.88

\*Countries use category 4 price deflators in conversion.

## iv. Ingredients of the update

#### 1. Distributions of Individual Wellbeing

• Household survey data

#### 2. Prices

- PPP conversion factors
- Consumer price indices to deflate incomes or consumption over time
- Spatial price adjustments in China, India, Indonesia, LAC, ECA

#### 3. Poverty line(s)

• Database of national poverty lines

## Ingredient 1: Distributions of individual wellbeing

- Over 1,100 income and consumption distributions in **PovcalNet**, from national household surveys for 'developing' countries.
- Database now also contains data from rich countries, but these are not used for global poverty estimates.
- 133 countries used in the 2015 update.
- Survey data from 2010 to 2014 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

		Micro	
	Grouped	data	Total
Income	6	26	32
Consumption	68	26	94
Total	74	52	126

#### **2015** Poverty Update – Distribution types

		Micro	
	Grouped	data	Total
Income	3	31	34
Consumption	5	94	99
Total	8	125	133

### Ingredient 2: Prices (changes over time)

#### **PovcalNet uses FOUR different categories of price deflators**

WDI annual CPI – general	104
Monthly CPI from NSO (consistent with annual number in WDI)	20
CPI disaggregated by urban-rural areas (official CPI for China and India)	2
CPI adjustment for 7 countries using alternative price indices (Bangladesh, Cambodia, Ghana, Iraq, Lao PDR, Malawi and Tajikistan).	7

Countries in **blue** are among the countries that define poverty line, thus choice of CPI also affects international poverty line.

## Ingredient 2: Prices (differences within countries)

- Because the collection of price data for constructing PPPs still retains an urban bias – albeit to the different extents in different regions – we follow Chen and Ravallion (QJE, 2010) in making urban-rural cost of living adjustments. In particular:
  - For China, India & Indonesia, we use ratios of urban to rural poverty lines;
  - For LAC, adjust rural incomes up by a uniform factor of 15% (following SEDLAC practice, on the basis of the average cross-country difference in costs of living)
  - For ECA, consumption aggregates are adjusted for observed spatial price differences (based on unit values from food consumption in HH surveys)
- Greater cross-regional harmonization is needed!

## 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: Surveys available before/after reference year



#### This update in historical context

Update:	1979 "India line"	1990 "Dollar-a-day"	2001 1.08/day	2008 1.25/day	2015 1.90/day
Source	Ahluwalia et al (1979)	1990 WDR, Ravallion, et al (1991)	Chen and Ravallion (2001)	Ravallion, Chen and Sangraula (2009)	This paper.
ICP data	1975 PPPs Kravis et al (1978)	1985 PPPs	1993 PPPs	2005 PPPs	2011 PPPs
Poverty lines used	1 (India)	8 countries	10 countries	15 countries	15 (same lines as 2008)
Method	India's poverty line (46 <sup>th</sup> pctile)	Inspection	Median	Mean	Mean
Poverty line (ICP base year USD)	\$0.56	\$1.01	\$1.08	\$1.25	\$1.90
Country coverage	36 (25)	86 (22)	88	115	133

#### v. Alternatives, robustness and caveats

- Jolliffe and Prydz (2016) propose a Low Income Country (LIC) poverty line based on the median of estimated (implicit) national poverty lines from 32 Low Income Countries. Yields \$1.25 in 2005 PPPs and \$1.91 in 2011 PPPs.
- Convert \$1.25 line to 2011 PPP value (ΔCPI/ΔPPP) for each country (for which poverty is measured). Simple average of these values is \$1.90.
  - Similar to the "equivalent line" approach suggested by Kakwani and Son (2016). They prefer a population-weighted average, of \$1.93.

#### Remaining caveats: (i) underlying welfare aggregates

- As noted, PovcalNet includes both consumption and income distributions
  - This is possibly appropriate, given national differences and priorities
  - But the two are very different concepts, and comparability is difficult
  - Existence of zero incomes are a real problem, that is likely to grow
- Differences in questionnaires hamper comparability even among consumption distributions
  - E.g. URP vs. MMRP questionnaires in India
- MENA: Limited coverage, PPP issues, and widespread conflict precluded presentation of regional numbers.

#### Remaining caveats: (ii) PPP outliers

 $\Delta$ CPI and  $\Delta$ PPP both reflect changes in prices, expect to co-move. Large deviations, *potentially* due to data quality issues in CPI and/or PPP, result in large shifts in poverty. 'Outliers' identified by: Ratio of  $\Delta$ CPI (CPI2011/CPI 2005) to  $\Delta$ PPP (PPP2011/PPP2005) for each country. Decisions also reflect concerns from country economists



Mean: 1.466; S.D.: 0.304 (without IRQ: 1.455; 0.277 – same countries excluded )

### vi. Results (Recall basic effect of new PPPs)

- 2011 PPPs indicate shift in regional profile of relative price levels:
  - 2011 PPPs suggest lower price levels in poor countries (relative to US) => higher PPP- adjusted USD values of consumption & income.
- Convert 2005 PPP value => 2011 PPP value:
  - $\frac{CPI_{11}}{CPI_{05}} \times \frac{PPP05}{PPP11}$ Change in CPI relative to change in PPPs. Can be thought of as countryspecific PPP05 -> PPP11 deflators.





Note: Fitted line uses lowest smoother with bandwith 0.8. Sample limited to countries which participated in both the 2005 and 2011 ICP rounds.  $\delta = 1$  means no change to the PPP-adjusted dollar value between 2005 and 2011 PPPs.

 $\delta_z = 1.90/1.25 = 1.52$ 

#### vi. Results: global and regional patterns (mostly) preserved



# vi. Results: Regional headcount trajectories (1990-2011) also largely preserved



--- 2014 estimates (2005 PPPs, \$1.25 line) — 2015 estimates (2011 PPPs , \$1.90 line)

#### vi. Results: Depth of poverty (1990-2011)



--- 2014 estimates (2005 PPPs, \$1.25 line) — 2015 estimates (2011 PPPs , \$1.90 line)

# vi. Results: Absolute numbers of people in poverty (1990-2011)



--- 2014 estimates (2005 PPPs, \$1.25 line) — 2015 estimates (2011 PPPs , \$1.90 line)

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#### **3. Future:** Whither global poverty measurement?

#### The Atkinson Commission on Global Poverty

Set up in June 2015, the 24-member commission was tasked with providing advice to the World Bank's Sr. VP and Chief Economist on:

(A) What should be the interpretation going forward of the definition of extreme poverty, set in 2015 at 1.90 Purchasing Power Parity (PPP)-adjusted dollars a day per person in 2015, in real terms?

(B) What choices should the World Bank make regarding complementary poverty measures to be tracked and made available to policy-makers?

## The Atkinson Commission on Global Poverty

- Final report will be launched on July 13
- 21 recommendations in total. A (non-random) selection includes:

#### Part A:

- Strengthen statistical foundations, on areas such as population statistics and survey coverage; measuring consumption and income; and estimating sampling and nonsampling errors
- Keep monitoring global extreme poverty w.r.t. \$1.90/day at 2011 PPPs, but ignore future PPP updates. Use domestic CPIs

#### Part B:

- Add a set of complementary indicators, including:
  - 1. The poverty gap
  - 2. A measure sensitive to relative deprivation, where appropriate
  - 3. Profiles of the global poor, e.g. by gender and age
  - 4. Deprivations in other dimensions, and some aggregate multi-dimensional index

![](_page_33_Picture_1.jpeg)

This homeless US citizen may well live on U\$2 per day. Should he not be counted as poor in the global measure?

"To the extent that poverty means a low level of welfare and welfare depends on relative consumption as well as own consumption, higher monetary poverty lines will be needed in richer countries to reach the same level of welfare" (Ravallion, 2016)

Figure 1: Poverty lines across countries of the world

![](_page_34_Figure_3.jpeg)

Log private consumption per capita (\$PPP per day)

Source: Ravallion, M. (2016): "Toward Better Global Poverty Measures"

Ravallion (2016) proposes: (i) keeping the current absolute line as a lower bound; (ii) creating an upper-bound international poverty line that is weakly relative - it rises with income with an elasticity lower than one - and is still anchored on observed national poverty lines.

Figure 2: Strongly and weakly relative poverty lines

![](_page_35_Figure_3.jpeg)

Poverty line

Source: Ravallion, M. (2016): "Toward Better Global Poverty Measures"

 We currently plan to adopt a proposal by Jolliffe and Prydz (work in progress) for a daily weakly relative poverty line:

*Max* (1.90, 1 + 0.5 median)

- Best fit estimate from a level-onlevel regression of national implicit poverty lines (for 100+ countries in 2011) on median household incomes
- Official WB counts may be based on a step function derived from a such a line.

![](_page_36_Figure_5.jpeg)

![](_page_37_Figure_1.jpeg)

#### Number of poor

Preliminary and incomplete analysis - NOT TO BE CITED

## ii. Incorporating non-income dimensions?

Multidimensional analysis of poverty is recommended when:

- 1. When there are at least two welfare dimensions of interest between which there are no natural aggregators (e.g. prices)...
- 2. ...and when correlations between them matter.

"It is possible for a set of univariate analyses done independently for each dimension of wellbeing to conclude that poverty in A is lower than poverty in B while a multivariate analysis concludes the opposite, and vice-versa. The key to these possibilities is the interaction of the various dimensions of well-being in the poverty measure and their correlation in the sampled populations" (Duclos, Sahn and Younger, EJ 2006, p.945)

![](_page_38_Figure_5.jpeg)

Source: EU-SILC, Eurostat-CEPS/INSTEAD calculations. Reprinted from Atkinson, A. B., E. Marlier, F. Monatigne, and A. Reinstadler. 2010. "Income Poverty and Income Inequality." In A.B. Atkinson and E. Marlier, eds., *Income and Living Conditions in Europe*, 127. Luxemburg: Eurostat.

## ii. Incorporating non-income dimensions?

- Old debate: aggregation into an index vs. dashboard
- My take (with M.A. Lugo): a middle ground focused on making the association between dimensions explicit.
- But: how to present this information succinctly for 130 countries?
  - If you summarize the population mass in the intersections of the Venn diagram above, you are back at the MPI (Alkire & Foster, 2011):

 $g_{ii}^{\,\alpha}(k)$  Typical entries into which are

$$\left[\frac{y_{ij} - z_j}{z_j}\right]^{\alpha}, i : c_i \ge k$$
$$0, i : c_i < k$$

- Has both attractive and unattractive features.
- May be best option for a reduced, core set of three or four dimensions?

# iii. Individual povertyiv. Chronic poverty

- Two additional directions of interest in advancing global poverty measurement are:
- 1. Given intra-household inequalities, is poverty more severe among women than men? Or children than adults? Or the elderly?
  - Inroads into this question have been made (at the national level), and are usually based on disaggregated consumption patterns.
  - Data requirements for doing this globally are very demanding.
  - In the short run, should one report profiles based on the assumption of intra-household equality?
- 2. Cross-sectional household surveys are snapshots, and we typically care more about the chronically poor than about the transient poor.
  - Assessing the extent of global chronic poverty would require panel (or synthetic panel) data that are currently not available.

# Conclusions (i)

- 1. Given the prevalent view that the 2011 PPPs capture recent price level differences across countries more accurately, global poverty comparisons needed adjusting.
- 2. This adjustment was implemented so as to minimize differences w.r.t. the \$1.25 line at 2005 PPPs, so as to preserve goalposts for international goals.
- 3. Because the 2011 PPPs found lower prices in poorer countries, maintaining purchasing power parity translates into higher incomes (and poverty lines) in dollar terms.
  - On average, \$1.90 at 2011 PPPs has roughly the same purchasing power in poor countries as \$1.25 at 2005 PPPs.
  - As a result, changes to both levels and trends of poverty incidence (regionally and globally) are muted.
  - > But there are substantial changes for some individual countries

# Conclusions (ii)

- Significant challenges remain going forward, including:
  - Better understanding the drivers of periodic changes in PPPs (for which access to ICP micro-level price data is essential)
  - Improving and harmonizing within-country cost-of-living adjustments
  - Defining an upper-bound international poverty line that incorporates the existence of relative deprivation
  - Monitoring deprivation in key non-income dimensions e.g. health and education – as well as associations among them (and with income)
  - Investigating poverty at the individual level, accounting for intra-household differences between genders and age groups
  - Investigating poverty dynamics to separate chronic from transient poverty

Thank you