The Concept of Relative Multidimensional Poverty: An Illustration Using Indian DHS Data

Caroline Dotter (University of Göttingen, Germany)

Stephan Klasen (University of Göttingen, Germany)

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Caroline Dotter[1]

Stephan Klasen[2]

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Abstract

In this paper we develop a relative multidimensional poverty measure. Following our concept, it is possible to adapt the poverty line to different living standards across time and countries in a concise and plausible way. This poverty measure utilizes the DHS surveys and is based on UNDP's global MPI measure. Using this measure, it is thus possible to estimate relative multidimensional poverty for a larger number of countries and comparing outcomes to an absolute poverty measure, the global MPI. We illustrate our concept using the example of India. Poverty outcomes across different Indian states differ vastly, when the global MPI is applied. In addition, culture, ethnicities, and the climate differ across Indian states. India is therefore a good example to illustrate a relative multidimensional poverty. Similar to the global MPI, we apply the Alkire-Foster dual cut-off approach (Alkire and Foster, 2011). Concerns of a relative poverty assessment may affect the choice of indicators, indicator thresholds, weights and the overall cut-off. We broadly follow the global MPI in the choice of indicators, weights, and also set an overall cut-off of one third. However, relative indicator thresholds are considered when appropriate, and weights in the standard of living dimension are adjusted. Indicators in the health dimension are in general not open to a relative assessment, as they reflect specific health functionings (i.e. being well nourished). In the education dimension, we set indicator thresholds at the median. For the standard of living dimension, we set thresholds at the median of the distribution for indicators where a differing quality can be observed (drinking water, floor, cooking fuel, sanitation). For asset indicators and electricity, aspects of relativity enter through the weight attached. Frequency weights are generated for these indicators to account for the importance of the item in the population.

[1] Departement of Economics, University of Goettingen, Germany. Email: cdotter@gwgd.de
[2] Departement of Economics, University of Goettingen, Germany

1. Introduction

Measurement of poverty strongly differs across countries: While absolute poverty lines are typical for poverty measurement in developing countries, the concept of relative poverty is popular especially in richer countries. Relative income poverty lines are prevalent across Europe and the concept of relative poverty is generally accepted as more appropriate for advanced economies. These strongly relative lines are usually set at a fixed proportion (e.g. 40% – 60%) of the mean or median income and try to account for a certain cost of social inclusion. Recently, Ravallion and Chen (2011) also proposed a weakly relative poverty line for developing countries. This poverty line lies in between a fixed absolute line such as the international $1.25 a day line, and a purely relative one, such as the ones' just discussed. Applying a weakly relative poverty line, the income poverty threshold is underproportionately adjusted to an increase in mean incomes.

Sen (1983) postulated the idea that "*absolute* deprivation in terms of a person's capabilities relates to *relative* deprivation in terms of commodities, income and resources" (Sen, 1983, p.153). Ideally a multidimensional approach would thus directly measure available capabilities and functionings. This is however not always possible. While it is relatively straightforward to measure functionings in the health dimension (e.g. being well nourished), most indicators used in multidimensional poverty measurement are rather means than ends (sometimes both). This is particularly the case when trying to measure material living standards and service access (e.g. to electricity and water), which are rather means than ends. As a result, it might well be important to consider relative versions of such multidimensional poverty measures.

Despite the prevalence of multidimensional poverty measures and numerous examples of relative monetary poverty lines, a concept for a relative multidimensional poverty measure has – to our knowledge – so far not been proposed. Multidimensional poverty measures do exist for richer countries and usually they use different indicators so that they are not easily comparable to multidimensional poverty indicators in poor countries. Though these multidimensional poverty assessments co-exist side by side, a clear concept adapting the poverty line to different living standards across time and countries, appears to be missing. This paper tries to fill this gap. We develop a relative multidimensional poverty measure based on UNDP's global MPI (cf. Alkire and Santos, 2010a). We can thus directly compare our measure to the global MPI. Moreover, as the measure uses the DHS survey, one could theoretically measure poverty for a large number of countries in a concise and comparable way.

We will use Indian DHS data to estimate relative multidimensional poverty across states, urban and rural areas. We observe vast differences in poverty outcomes across different Indian states when the global MPI is applied: In Kerala only 15.9% of the population is multidimensional poor, while 81.4% are poor in Bihar (Alkire and Santos, 2010b). Due to the sheer size of India, living conditions, climate, and ethnicities differ vastly across states. Thus, India is a good example to illustrate the effect a relative poverty line has on poverty outcomes.

Following the construction of the global MPI, we consider three equi-weighted dimensions in multidimensional poverty measurement, health, education, and the standard of living. We also apply the Alkire-Foster dual cut-off method of poverty aggregation (cf. Alkire and Foster, 2011). The Alkire-Foster method first applies a cut-off at the indicator level (e.g. BMI below 18.5). Deprivations in each household are then aggregated using weights, and a second cut-off is applied to each person's deprivation score. People are identified as multidimensionally poor if they fall below this second poverty threshold – in this case, if they experience deprivations in one-third or more of the weighted indicators.

When devising a relative poverty measure one could either apply a relative approach at the indicator level, raising the cut-off for not being poor, or by lowering the second threshold of multidimensional poverty. In this empirical exercise, we stick to the global MPI for the second cut-off of one third to qualify for multidimensional poverty. However, relative cut-offs are applied at the *indicator* level, as discussed in detail below. We broadly follow Alkire and Santos (2010a) in the choice of weights and indicators, but adapt these slightly in the living standard dimension. We generate two poverty measures: one uses the state as reference group, while the other allows for different urban and rural poverty lines within the state.

Poverty outcomes differ vastly, depending on which poverty measure is applied. The relative poverty measure using the state as reference group finds a higher poverty incidence (61.30%) compared to the global MPI, while the poverty measure allowing for different thresholds in urban and rural areas finds a lower poverty incidence (42.47%). Poverty outcomes appear reasonable, as they do not exaggerate poverty in better-off states, such as Kerala, or underestimate poverty in poorer states. The relative poverty measures also find a more equal contribution of the different dimensions to overall poverty. This contrasts to the global MPI, where deprivations in the standard of living contribute mostly to overall poverty. Finally, the relative measures appear to account better for the incidence of urban poverty.

The paper is structured as follows: In the next section, multidimensional poverty measurement in general and the global MPI is discussed. Section 3 describes our concept of a relative multidimensional measure. In section 4, poverty outcomes applying a relative

multidimensional poverty measure and the global MPI are presented and compared. Section 5 summarizes and concludes.

2. Multidimensional Poverty Measurement

The concept of the multidimensionality of poverty has been strongly influenced by Amartya Sen in his work on the capability approach (e.g. Sen, 1980; 1984; 1985; 1987; 1992; 1999). He departs from the welfarist, utility-based approach to poverty measurement and suggests focusing on a person's capabilities. Certain commodities may enable an individual to achieve certain functionings, such as a certain amount of food will make the individual capable of achieving the functioning "being well nourished". These capabilities differ however across individuals for a given commodity attainment, as a certain amount of food may feed one individual sufficiently but leave another one hungry. Since these capabilities cannot be reduced to a single number or dimension, it is important to consider multiple dimensions of well-being when examining whether an individual or household is poor in the sense of being deprived in basic capabilities

Nowadays, the multidimensionality of poverty is agreed upon by most policy makers and researchers. Following Sen, multidimensional poverty measures have been proposed for several countries in different formats (e.g. Klasen, 2000; Majumdar and Subramanian, 2001; Bourguignon and Chakravarty, 2003; Qizilbash and Clark, 2005). The most prominent example is certainly the Multidimensional Poverty Index (MPI) introduced by UNDP and Oxford Poverty and Human Development Initiative (OPHI) in the 2010 Human Development Report. It has been the first attempt to calculate a concise and comparable multidimensional poverty measure for a larger number of countries (104) utilizing DHS, MICS, and WHS surveys. Our relative multidimensional poverty measure will build upon the MPI and we will compare our results to it.

The MPI is an index of „acute multidimensional poverty" and reflects deprivations in core human functionings and rudimentary services. It has been developed by Alkire and Santos (2010a) for the 2010 Human Development Report and applies the Alkire and Foster (2011) dual cut-off method for poverty identification. This method employs two cut-offs: First an indicator cut-off is applied to identify who is poor in the specific indicator. Then poverty across dimensions is aggregated using indicator-specific weights, and the second cut-off is applied to this aggregated poverty index identifying the multidimensional poor. The Alkire-Foster method therefore navigates between the traditional approaches of multidimensional poverty measurement, the intersection approach (where only those are multidimensionally poor who are poor in each dimension) and the union approach (where those are multidimensionally poor if they are poor in any dimension).

Alkire and Santos aggregate poverty using the M0 Alkire-Foster poverty index, accounting for the incidence of multidimensional poverty (H) and the average deprivation share among the poor (A). The M0 poverty measure fulfils several desirable poverty axioms and is decomposable by indicator and subgroup (Alkire and Foster, 2011; Alkire and Santos, 2010a). The MPI itself is a product of the MPI headcount H (measuring the share of the population that is multidimensionally poor), and the weighted deprivation share of multidimensionally poor households A (measuring the weighted percentage of indicators, in which the multidimensionally poor are on average deprived).

The MPI includes three dimensions: health, education, and the standard of living. These dimensions mirror the HDI. They have been chosen as there is international consensus that any multidimensional poverty measure should at least include these three dimensions, for the ease of interpretability, and finally for reasons of data availability. While there are sensible arguments to include additional dimensions, there is no agreement about which dimensions are appropriate, there is often no data available to reflect these dimensions, and many of the discussed dimensions are not straightforward to interpret (i.e. empowerment, culture, safety from violence). However, the necessity of health, education, and a decent standard of living for a life free from poverty is undisputed.

Alkire and Santos (2010a) first define cut-offs in each indicator, then aggregate poverty using indicator-specific weights, and finally apply a cross-dimensional poverty cut-off. They apply the same poverty cut-offs across countries and years. The global MPI is therefore an absolute measure.

The three dimensions of the MPI are represented by ten indicators: Health is represented by child mortality and malnutrition. A household is deprived in mortality, if any child in the household has died. Similarly, all household members are deprived in nutrition, if there is at least one malnourished person (child below the age of five or woman) in the household. Education is represented by years of schooling and child enrolment. Years of schooling are considered as proxy for literacy and level of understanding of the household members. An individual is considered literate, if he or she has at least five years of education. Following Basu and Foster (1998) the MPI assumes all household members benefit from one literate household member (of any age). Therefore, the household is considered non-deprived, if at-least one household member has five years of schooling. The household is also deprived, if any school-age child is not enrolled. The living standard is represented by access to electricity, source of drinking water, improved sanitation, flooring (no dirt, sand, or dung floor), clean cooking fuel, and an asset index. Electricity and floor refer to the quality of housing, while drinking water, improved sanitation, and clean cooking fuel have health impacts and are part of MDG7. Finally, the household is deprived, if it does not own more

than one small asset (radio, TV, telephone, bike, motorbike, or refrigerator) and does not own a car or truck.

After determining the indicator cut-offs, the Alkire-Foster method attaches weights to each deprivation. The MPI weighs each dimension equally (1/3) and within each dimension, each indicator is weighed equally. The weighted deprivations are then summed up, and the cross-dimensional cut-off is applied. The MPI uses a cross-dimensional cut-off of one third. Hence, a household is multidimensional poor, if its weighted deprivations sum up to at least 1/3.

In the following section, we will develop a concept of a relative multidimensional poverty measure. Our measure is based upon the global MPI and utilizes the same dataset. It also applies the Alkire-Foster method, reflects the same dimensions and similar indicators.

3. Ideas for a relative multidimensional poverty measure

Our concept of a relative multidimensional poverty measure uses the global MPI as a starting point. For reasons of comparability and data availability some of the constraints of the global MPI also apply to our version of a relative multidimensional poverty measure. We also apply the dual cut-off approach and refer to the same dimensions and indicators as the global MPI. In the standard of living dimension, however, we will allow for additional asset indicators. Similarly to the global MPI, we aggregate using equal weights across dimensions. Since we allow for additional standard of living indicators, the indicator-weights in this dimension are adjusted (see section 3.2).

Following the construction of the global MPI, aspects of relativity may enter at different stages of the poverty estimation. The choice of indicators, indicator thresholds, weights and the overall cut-off are all open to a relative assessment. Applying the Alkire-Foster dual cut-off approach (see section 2) one could set a relative indicator cut-off and/or one could set a relative overall cut-off.

This version of a relative multidimensional poverty measure applies an overall cut-off of one third, identical to the global MPI. Due to the construction of the MPI with three equally weighted dimensions, the threshold of one third is equal to being deprived in one of the three dimensions. An individual deprived in either health, education, or the living standard (reflected through several indicators) is therefore considered to be *absolutely deprived* in the capability space. However, whether an individual is deprived in either dimension or indicator is open to a relative appraisal. We argue that this is a more appropriate way to address the relativity in the resource space implied by Sen's 1983 paper cited above. Whether an individual is considered capability-deprived in a certain dimension or indicator depends on accepted standards of that indicator in the society or community. This is appropriately

captured by changing the indicator cut-offs, instead of lowering the second multidimensional poverty cut-off of one third. This is also the implicit message when comparing indices of multidimensional poverty in rich and poor countries where the cut-offs for individual dimensions seem to be higher in wealthier societies or different indicators are chosen altogether. While in the MPI access to clear water within a short walking distance, and access to basic forms of (non water-borne) sanitation is considered an acceptable living standard, multidimensional poverty measures in richer countries don't even consider these categories. For the example of Europe, D'Ambrosio and Chakravaty (2006) consider a person deprived, if he/she lives in a household without bath or shower, or if the building has damp walls. Similarly, Kuklys (2004) considers the following housing categories for multidimensional poverty measurement in the UK: condensation, keeping it warm, rot in wood, lack of space.

We apply relative thresholds at the indicators where appropriate. Health outcomes are directly measured and reflect specific health functionings (you can only be well nourished or not). Therefore, health outcomes are in general not open to a relative assessment. But we argue relative thresholds are appropriate in the education and standard of living dimension. In these dimensions, indicators do not reflect specific functionings. Indicator outcomes rather enable the individual to do and achieve certain things, such as taking up a fulfilling and well-paid job, or participating in civil society. The capability of an individual to do so will however depend on his /her characteristics and on average levels in the rest of the society.

Take the example of participation in civil society: one may argue, that a certain level of education enables civic participation. However, media, public administration, etc. are not geared towards the least educated member in the society, but at best to the average member. Similarly, a minimum education sufficient in a poorer developing country would not generate certain job prospects in a richer developing or developed country. Such a relative view is even more relevant, if education is mainly a signalling device of ability rather than an absolute measure of human capital (cf. Spence, 1973; Pritchett, 2001).

Likewise, a sufficient standard of living enables you to have a healthy lifestyle and gives you social acceptance. While the same lifestyle may be healthy across countries (allowing for slight differences due to different degrees of urbanization and a different climate), what is socially acceptable differs vastly and is inherently relative. It thus seems reasonable to realign poverty thresholds for these indicators to levels in the rest of the society.

After deciding which dimensions will be examined in a relative fashion, we need to decide how relative assessments should enter at the indicator level. One could either allow for "full" or "strong" relativity by basing the poverty cut-off entirely on the mean or median level of

achievement in a reference group or one could adopt a "weakly" relative version by adjusting the cut-off underprorportionately to the conditions in the mean or median, as suggested by Ravallion and Chen (2011). In this exercise we do the former, largely for ease of clarity in this illustrative exercise.

Our poverty measure can take the average living standard or education within a society into account.[3] As argued above, whether an individual can be considered poor or not in the dimensions living standard and education depends on levels in his/her community. How narrowly to define this group, is open to debate. Relative poverty lines are usually set at the national level. Sometimes a differentiation between rural and urban groups is being made. However, for a country as big as India, a national relative poverty line is disputable: Too large are the differences in ethnicity, culture, living standard, and climate in this subcontinent with more than 1.2 billion people. Applying the same poverty line, when comparing a Bihari farmer with a Bombayite cannot be considered sensible. On the other hand, one does not want to define these groups too narrowly to avoid the threshold being meaningless, i.e. comparing a slum dweller only with other slum dwellers.

In this illustrative exercise, we therefore tried to follow a middle line, taking the state as reference group and allowing for separate urban and rural poverty lines within the state as alternative. These are still relatively big groups as populations in the different states range from 610 577 in Sikkim to nearly 200 million in Uttar Pradesh (Census of India, 2011). In the following sections, we will shortly discuss the relative cut-offs applied in the education and standard of living dimension.

3.1 Education dimension

Indicator thresholds in the education dimension are fixed at the median of the distribution in the reference population (state or state and urban/rural). The global MPI considers a household as not deprived, if at least one household member has at least five years of schooling. This follows the concept of effective literacy defined by Basu and Foster (1998). They argue one literate household member is a kind of public good for illiterate members. This hypothesis is supported by several studies explaining farm-level productivity with household literacy (cf. among other Foster and Rosenzweig, 1996). It is thus assumed, that full economies of scale are observed in the education indicator.

The number of years of schooling necessary to succeed in a society – taking up a meaningful job, apply for government subsidies, or participate in civil society – will however

[3] Nevertheless, we have to ignore the effect individual characteristics have in shaping said individual's capability to convert a given commodity attainment education level into a specific capability or functioning.

depend on levels in the reference population. We therefore consider the median of the distribution as indicator cut-off. Households with education outcomes below the median are considered poor. For the majority of states the indicator cut-off is well above the global MPI cut-off. However, for some states, such Rajasthan and Jharkhand, the threshold is lower than for the global MPI.[4] The threshold is also lower in rural areas in several states.

Table 1: Median levels of maximum years of schooling per household

state	reference group state	Reference group state urban/rural*
Jammu and Kashmir	7	7
Himachal Pradesh	9	9
Punjab	7	7.5
Uttarchanal	8	7.5
Haryana	7	7.5
Delhi	9	9
Rajasthan	2	4
Uttar Pradesh	5	4
Bihar	3	4
Sikkim	6	6.5
Arunchanal Pradesh	4	4.5
Nagaland	7	7
Manipur	9	8.5
Mizoram	7	7.5
Tripura	6	6.5
Meghalaya	7	6
Assam	7	6.5
West Bengal	6	5.5
Jharkhand	4	4.5
Orissa	5	6
Chhattisgarh	4	4
Madhya Pradesh	6	4.5
Gujarat	6	6
Maharashtra	9	7
Andhra Pradesh	6	4.5
Karnataka	6	6
Goa	9	9
Kerala	9	9
Tamil Nadu	7	6.5

Authors' calculation using the 2005 DHS survey for India

The second education indicator is child enrolment. In the global MPI, a household is deprived, if any child at school age is not enrolled. The school age is determined by looking

[4] However, in the global MPI all household members appear to be considered, while we only consider adult household members.

* Simple average of rural and urban threshold.

at the primary school entrance age[5] plus one year[6] and assuming necessary enrolment to be up to grade 8[7]. For India this covers the age group 7-15.

Table 2: Median enrolment ratio

state	Reference group state	Reference group state rural/ urban*
Jammu and Kashmir	1	1
Himachal Pradesh	1	1
Punjab	1	1
Uttarchanal	1	1
Haryana	1	1
Delhi	1	1
Rajasthan	1	1
Uttar Pradesh	1	1
Bihar	0.6666667	0.625
Sikkim	1	1
Arunchanal Pradesh	0.8	0.875
Nagaland	1	1
Manipur	1	1
Mizoram	1	1
Tripura	1	1
Meghalaya	1	0.8333335
Assam	1	1
West Bengal	1	1
Jharkhand	0.8	0.8333335
Orissa	1	1
Chhattisgarh	1	1
Madhya Pradesh	1	1
Gujarat	1	1
Maharashtra	1	1
Andhra Pradesh	1	1
Karnataka	1	1
Goa	1	1
Kerala	1	1
Tamil Nadu	1	1

Authors' calculation using the 2005 DHS survey for India

One can observe that the median enrolment ratio is 100% for most states (cf. table 2). Similar to the years of schooling indicator, I set the threshold at the median enrolment ratio in the reference population. For some states, the threshold is lower than one, not all children need to be enrolled in school for the households to be considered non-deprived. This may be justified with household decisions to only enrol one child into secondary education, or only one child at a time. In the same vein as above, one can argue for economies of scale in education. It may thus be sufficient for the household to only educate one child to benefit

[5] Derived from the UNESCO education statistics.
[6] As children with birthdays in the current school year can only enter school in the next school year.
[7] This covers primary and lower secondary education.
* Simple average between median enrollment rates in rural and urban areas.

from education. Another possibility may be that households do not enrol all children at the same time.

3.2 Standard of living

The standard of living dimension is fully open to a relative assessment. Whether a specific standard of living is deemed sufficient, depends on the environment and the living standard of one's reference group. While some standard of living indicators only distinguish between having an item, or benefitting from a service (electricity); for other indicators, a varying quality is observed.

The global MPI allows for six equi-weighted living standard indicators: type of flooring, source of drinking water, adequacy of sanitation, type of cooking fuel, access to electricity and an asset index. The household is deprived if either indicator does not fulfil MDG standards, or when the household has no access to the electricity grid. The asset index is an asset count, and the household is considered deprived if it does not own more than one small asset (from the list consisting of television, radio, telephone, refrigerator, bicycle, and motorbike), or a car or truck.

We pursue a twofold strategy: For assets and electricity, we only observe whether the household has access to this service or owns an item. It is therefore not possible to apply a relative threshold. A relative assessment will enter however through the weight attached to the indicator. We generate frequency weights, to reflect the importance of owning a specific item in this society. For the living standard indicators of the global MPI where a varying quality can be observed (floor, drinking water, sanitation, cooking fuel), we align the indicators with decreasing quality. We then assess the distribution within the reference population and a household with a quality below the median is considered deprived. For example, if the median in floor is cement, households with a stone floor or worse are considered deprived.

We follow the ordering in the DHS dataset with few changes in the categories floor, sanitation and drinking water.[8] If the household's floor, water source, type of sanitation or cooking fuel does not fit into the existing categories (category "other"), we consider the observation missing. In the original DHS dataset, cement is above ceramic tiles and below carpet. We reorder the category floor, so that cement is below finished and above stone floor. We also consider composting and dry toilet as better than having no access to any sort of sanitation facility.

[8] The global MPI does not change the order in this way.

In the category water, bottled water is considered the poorest category above the category cart with small tank. This, most likely follows the idea that bottled water is no regular source of drinking water such as piped water. In addition it is quite expensive. Households who *have to* use bottled water as their sole source of drinking water could be considered deprived. However, the use of bottled water (instead of piped water) could also be a voluntary choice, rather than a necessity. This hypothesis is confirmed for India when analysing the correlation between the DHS wealth index and the use of bottled water. The highest frequency in use of bottled water is observed for the richer (9.40%) and richest (87.93%) quintile. Thus, the use of bottled water appears to be a voluntary choice by parts of the society who can afford it.

Table 3: Order of the living standard indicators*

Floor	**drinking water**	**sanitation**	**cooking fuel**
polished stone/marble/granit	**bottled water+**	flush toilet	Electricity
Carpet	piped water	flush to piped sewer system	lpg, natural gas
ceramic tiles	piped into dwelling	flush to septic tank	Biogas
vinyl, asphalt strips	piped to yard/plot	flush to pit latrine	Kerosene
parquet, polished wood	Tube well water	flush to somewhere else	**coal, lignite**
Finished	Tube well or borehole	flush, don't know where	**Charcoal**
Cement	Dug well (open/protected)	pit toilet latrine	**Wood**
Stone	protected well	ventilated improved pit latrine	**straw/shrubs/grass**
Brick	unprotected well	pit latrine with slab	**agricultural crop**
palm, bamboo	**surface water**	**open pit**	**animal dung**
raw wood planks	protected spring	**composting toilet**	
Rudimentary	**unprotected spring**	**dry toilet**	
Dung	river / dam /etc	**no facility**	
Sand	rainwater	**no facillity / bush / field**	
mud/clay/earth	**tanker truck**		
Natural	**Cart with small tank**		

We marked the categories considered poor in the global MPI in bold print. The relative thresholds in floor are above the global MPI threshold, for most states.[9] However, in the

* Categories in bold print are considered deprived in the global MPI.
+ In the global MPI, the household is considered deprived in water, if bottled water is the only source of water (drinking and non-drinking water).

indicator cooking fuel the majority of states have “wood” as indicator threshold. The strongest variation across states is observed in the indicator sanitation with the threshold being “flush to piped sewer” in Maharashtra and “no facility / bush / field” in several other states.[10] Similarly to the global MPI these indicators each have a weight of 1/6 in the standard of living dimension and an overall weight of 1/18 (approximately 0.056).

For asset ownership and electricity – for indicators where we only observe whether the household owns or has access to a specific item – a relative threshold cannot be applied. Relative judgments enter through the weight attached to the indicator. Sen (1983, p. 162) argues: “in a society in which most families own cars, public transport services might be poor, so that a carless family in such a society might be absolutely poor in a way it might not have been in a poorer society.” Hence, the importance of owning a specific asset depends on the assets’ commonness in the rest of the society.

We defer judgements about what assets could be considered important and allow for all assets considered in the DHS survey for India.[11] We thus consider a much longer list of assets than the global MPI[12].Atkinson et al. (2005) suggest to develop weights reflecting the frequency of ownership within a society. We thus generate frequency weights to reflect the importance of each item in the society:

The weight W_i for asset i in the standard of living dimension is defined as follows:

$$W_i = \frac{2}{6} \times \frac{q_i/N}{\sum_{i=1} q_i/N}$$

, where N is the total population and q_i is the part of the population owning item i. Thus the weight is the frequency of the item (q_i/N) divided by the sum of frequencies multiplied by 2/6. The frequency weights are multiplied with 2/6, as the weights in the standard of living dimension sum up to one and we attached a weight of 1/6 to the indicators with varying quality. The weights range from 0, for example for owning sheep, horse, or camels to 0.04 (2/6*0.12) for owning a bed in Jharkhand.

[9] List of states with a relative threshold below or equal to „dung floor“: Bihar, Uttar Pradesh, Manipur, Tripura, Assam, Jharkhand, Orissa, Chhattisgarh.
[10] Karnataka, Madhya Pradesh, Jharkhand, Orissa, Chhattisgarh, Bihar, Uttar Pradesh, Rajasthan.
[11] Of course, there is an implicit judgement in the survey design as this is not an open list where the interviewer could list all assets owned by the household.
[12] List of assets: television, black-white television, radio, telephone, mobile telephone, refrigerator, car, bicycle, motorbike, watch, cart, mattress, pressure cooker, chair, bed, table, fan sewing machine, computer, water pump, thresher, tractor, cattle, camels, horse etc, goats, sheep, chicken. We did not consider ownership of land or the house (though this is of course relevant), as land titles appear to be a political issue in India.

To sum up, we use the global MPI as a "starting point" for our relative multidimensional measure and apply the same overall poverty cut-off and broadly the same weights. However, indicator threshold are set following relative considerations where appropriate (education and living standard).

4. Results

We illustrate the theoretical considerations discussed above using the example of India and contrast our results to the global MPI. We use the same dataset as the global MPI, the 2005 DHS survey for India. Indicator thresholds are defined for each state and state-urban/rural groups.

An absolute poverty line is applied in the health dimension, as the health indicators (child mortality and malnutrition) reflect direct functionings. The cut-offs in the education dimension are set at the median of the population. In the standard of living dimension, we include additional asset indicators compared to the global MPI. For living standard indicators where a differing quality can be observed, the poverty line will be set at the median of the distribution.

4.1 Decomposition of multidimensional poverty across states

Analysing the poverty outcomes for the original MPI (Appendix table A1), the relative multidimensional measure with reference group state (Appendix Table A2), and the relative multidimensional measure with reference group rural-/urban-state (Appendix Table A3), we find poverty outcomes differ vastly for the whole country, depending on which measure is applied.[13] The two relative measures also indicate different directions: While the relative measure with reference group state finds a higher poverty incidence than the global MPI (61.30% and 53.79% respectively), the poverty measure allowing for different thresholds in urban and rural areas finds a lower poverty incidence (42.47%). The poverty intensity (A) also decreased, when the second relative poverty measure is applied.

Analysing poverty outcomes across states, we find the relative contribution of poverty from Delhi and Chhattisgarh increased significantly, while the relative contribution from Bihar decreased (for both relative measures). The relative contribution of Maharashtra also increased strongly, when the first relative poverty measure is applied, and to a lesser extent allowing for different poverty thresholds in urban and rural areas. In addition, the poverty incidence in Maharashtra increased from 37.68% to 62.62% when the first relative poverty measure is applied. This also holds for the poverty headcount in Delhi and Himachal

[13] Unfortunately we did not have access to the original OPHI do-files and thus our results differ slightly from the UNDP OPHI results (cf. Alkire and Santos, 2010b). We thank Nicole Rippin for sharing her MPI do-files with us.

Pradesh. Applying the second relative poverty measure, we find a significantly lower poverty incidence in Bihar, Uttar Pradesh, Assam, Jharkhand, and Chattisgarh.

Ranking the states by poverty incidence, we find Kerala is the state with the least poverty incidence when all three measures are applied. Both relative measures find, Madhya Pradesh to be the poorest state, instead of Bihar. Nevertheless, the states considered poor when the global MPI is applied are still at the bottom of the distribution when the relative measures are applied. The largest jumps are observed for Tripura (from global MPI rank 18 to 8) and Maharashtra (from global MPI rank 9 to 24) when the first relative poverty measure is applied. For Maharashtra, we find high relative indicator cut-offs are applied in the standard of living dimension (sanitation, water, cooking fuel), while for Tripura these are on the lower side. This change in cut-offs might explain the reversal of ranks to an extent.

The difference in poverty incidence between Kerala and the following states is notable. When the global MPI is applied, Kerala (12,48%) is followed by Delhi with 13.13% and Goa with 19.26%. Applying the first relative measure, Kerala is followed by Manipur with 34.83% and Goa with 35.30%. The result is similar, when the second relative measure is applied.

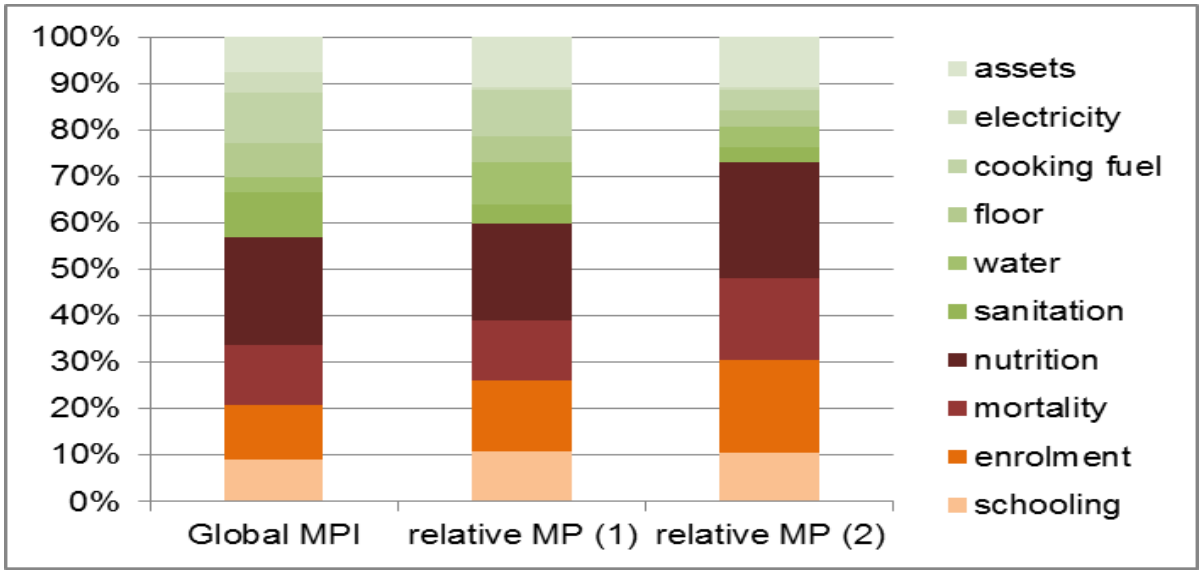
In general, the change in poverty ranking compared to the global MPI rank is less pronounced when the second relative measure applied. States with a comparably high poverty incidence (when the global MPI is applied) are still considerably poorer when the relative measures are applied (Bihar, Jharkhand, Uttar Pradesh. Madhya Pradesh), though Chhattisgarh is somewhat of an exception to that rule. However, no regional trends concerning an over- or underestimation of poverty can be observed.

Overall, these poverty outcomes appear reasonable. They do not exaggerate poverty in better-off states, such as Kerala, or appear to underestimate poverty in poorer states. The poverty rates for the poorer states, such as Bihar are certainly lower (67.75% and 51.71%) than the global MPI rates, but cannot be considered unreasonably low.

4.2 Decomposition of multidimensional poverty by indicator

Analysing the relative contribution each indicator has on the poverty outcome, we find the importance of the education dimension (enrolment & schooling) in explaining poverty increased, while the importance of the standard of living dimension decreased. The contribution of the health dimension also increased when the second relative poverty measure is applied (from 35,98% to 42.72%; cf. Appendix Table A4), even though indicator thresholds in this dimension are identical across the three measures.

Figure 1: Decomposition of poverty by indicator



In the education dimension, the relative contribution of the years of schooling indicator increased only slightly. The contribution of the enrolment indicator, however, increased by 3.5 and over 8 percentage points respectively, although the relative indicator threshold is equal to or lower than the comparable threshold of the global MPI (see section 3.1).

Overall, the contribution of the standard of living dimension decreased for both relative measures. The importance of asset poverty on the total poverty outcome increased however by about 3 percentage points. This may be attributed to the fact that the relative measures allow for a multitude of assets, while the global measure applies an asset count index. The contribution of the indicator drinking water also increased significantly, though the effect is weaker when allowing for different urban and rural thresholds.

Hence, for the global MPI, poverty is to a large extent determined by deprivations in the standard of living dimension. In contrast to this, the contribution of the different dimensions is more similar for the two relative measures. Allowing for different urban and rural poverty lines (Relative MP (2)), deprivations in the standard of living dimension actually have the least effect in determining whether a household is considered poor or not.

On a global scale, Alkire and Santos (2010a) found the standard of living dimension often contributes the most to overall poverty outcomes. For 17 of their 104 countries the living standard dimension contributes even more than 50% to the overall MPI.[14] Applying the same absolute thresholds across countries in this dimension has however the least motivation. Leaving relative concerns aside, these indicators will to a large extent be shaped by environment, climate, and culture.

[14] Sri Lanka, Mongolia, Peru, Gabon, Zimbabwe, Swaziland, Nambia, Lesotho, Republic of Congo, Kenya, Haiti, Zambia, Chad, Tanzania, Malawi, Dr Congo, Rwanda

The harmful effects of cooking with charcoal or wood, for example, are less severe when the cooking takes place out of doors. Similarly, a perceived “poor” type of floor (natural, earth, sand, dung) may be a choice of lifestyle in nomadic societies, while in other societies it would be at least necessary to have cement flooring. One will also observe different needs within countries, as the demand for certain types of sanitation and source of drinking water differs across urban and rural areas. A poverty measure taking these considerations into account could arguably be more relevant in a local context.

4.3 Decomposition of multidimensional poverty by household type

Decomposing the poverty incidence by household type (cf. Table 4), we observe the poverty incidence across groups varies depending on the poverty measure applied. However, analysing the relative contribution these groups have to overall poverty (cf. Appendix Table A5, A6, A7, A8), we find no significant difference across poverty measures except for the differentiation between urban and rural.

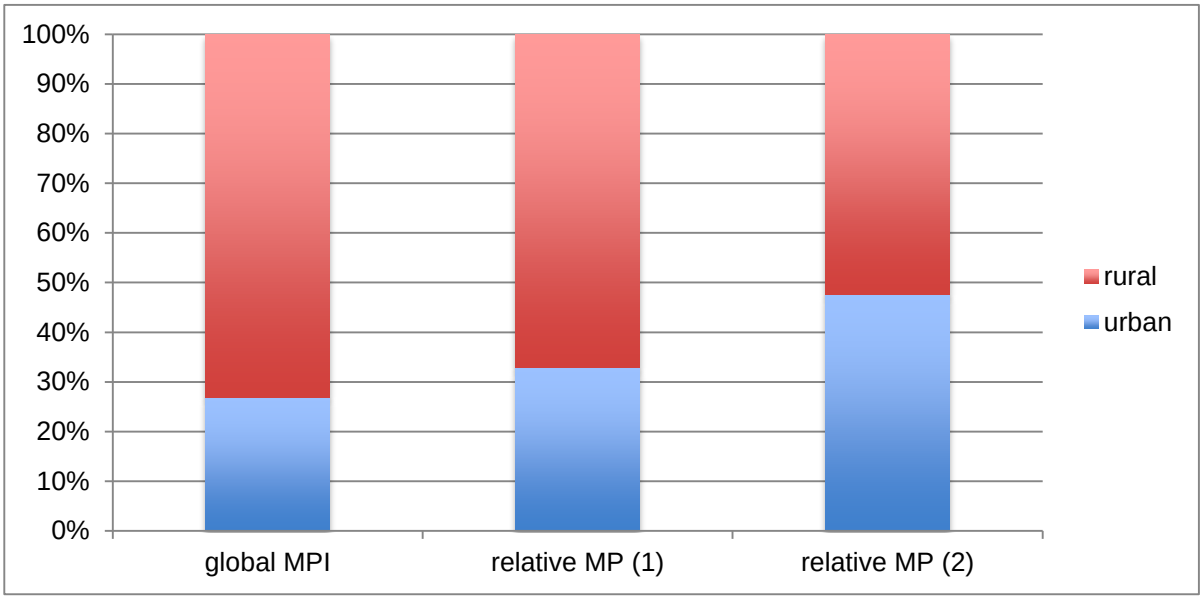
Table 4: Decomposition of poverty incidence by household type

	global MPI	relative MP (1)	relative MP (2)
all India	53.79%	61.30%	42.47%
small hh (1-3)	43.36%	52.20%	29.31%
medium hh (4-6)	49.55%	56.71%	36.89%
large hh (7+)	64.64%	67.65%	50.40%
female-headed hh	56.01%	62.78%	42.01%
male-headed hh	53.52%	61.13%	42.52%
above 25*	41.32%	48.91%	30.26%
below 25	65.80%	69.03%	50.07%
urban	24.60%	34.90%	39.60%
rural	66.80%	71.38%	43.56%

Both relative measures find more poverty in urban areas, compared to the global MPI (cf. Figure 2). Applying the second variant, we unsurprisingly find more urban poverty. This result is intentional, as the second relative poverty measure allows for separate urban and rural poverty lines within each state. Though the share of rural poverty still outweighs urban poverty, we find a more even distribution of poverty across groups when the relative measures are applied. As the relative contribution of the other groups did not change significantly, our two relative measures can be considered unbiased.

* average age of household is above 25

Figure 2: Relative contribution of urban and rural poverty to the overall poverty incidence



To sum up, the overall poverty incidence changes significantly depending on the poverty measure applied. Differences at the state level are also strong, though the overall ranking of states is similar across measures. Decomposing poverty by indicator, we found the contribution of the education dimension to overall poverty increased, the importance of the standard of living to explain poverty decreased, while the relative contribution of the health dimension stayed roughly the same. Finally, there are no significant differences in poverty incidence across household types, except for the differentiation between urban and rural.

5. Conclusion

In this paper, we develop two relative multidimensional poverty measures. Our relative measures build upon the global MPI and apply the same database. Poverty outcomes can be compared to the global MPI. We illustrate our theoretical considerations using the example of India.

Following the construction of the global MPI, we consider three dimensions, health, education, living standard, and apply the Alkire-Foster dual cut-off method. Relative concerns can determine the choice of indicators, indicator thresholds, weights and the overall cut-off. We largely follow the indicator choice of the global MPI for reasons of comparability and data availability. Similarly to the global MPI, we also apply the same weights across dimensions; indicator-specific weights are, however, adapted when necessary and sensible. An overall poverty threshold of one third is applied, equal to being deprived in one dimension. Relative thresholds are applied at the indicators where appropriate.

In the health dimension the same absolute thresholds are applied as in the global MPI, because the indicators measure direct health functionings. Indicator thresholds are set at the median of the population in the education dimension. In the living standard dimension, we set indicator thresholds at the median of the distribution when a varying quality of the indicator can be observed. For asset ownership and electricity, a quality is not observed. A relative assessment of these indicators enters through the indicator-specific weights. We generate normalized frequency weights to account for the relative importance these goods have in the total population.

We generate two relative poverty measures, one uses the state as reference population to set relative indicator thresholds, while the other allows for different urban and rural poverty lines within the state. The first relative poverty measure finds a higher poverty incidence for India than the global MPI. Allowing for separate urban and rural poverty lines, we however find a lower poverty incidence than the global MPI. Differences in poverty incidence at the state level are notable, the changes in the poverty ranking of states are however less striking.

The contribution of the living standard dimension to overall poverty is decreased when the relative measures are applied, while the relative contribution of the education dimension is increased. Overall, the contribution of the three dimensions to poverty is more even when the relative measures are applied.

Decomposing our three measures by household type, we find the different groups contribute similarly to overall poverty across the different poverty measures. Only the urban group contributes more to poverty when the relative measures are applied. The relative measures appear to account better for the incidence of urban poverty. Nevertheless, the relative measures find rural poverty is still significantly higher than urban poverty

We thus developed a well-balanced poverty measure, which can take differences in culture, climate, and living standard into account. These are bound to vary across different communities and societies. The relative measures appear to reflect urban poverty better and can therefore be considered unbiased.

Constructing multidimensional poverty measures one faces limitations of data availability and the impossibility of reflecting the effects individual characteristics have on a person’s ability to translate a given commodity or education achievement into certain functionings. Given these constraints, however, our relative poverty measures can reflect varying commodity requirements of meeting the same absolute needs. They thus fulfil a desirable property of a multidimensional poverty measure.

References:

Alkire, Sabina and James Foster (2011), “Counting and multidimensional poverty measurement”, Journal of Public Economies, 95(7): 476 – 487.

Alkire, Sabina and Maria Emma Santos (2010a), “Acute Multidimensional Poverty: A New Index for Developing Countries”, Human Development Research Paper 2010/11.

Alkire, Sabina and Maria Emma Santos (2010b), “India Country Briefing”, Oxford Poverty & Human Development Initiative (OPHI) Multidimensional Poverty Index Country Briefing Series.

Atkinson, A. B., Cantillon, B., Marlier, E., & Nolan, B. (2005), Taking forward the EU social inclusion process. An Independent Report Commissioned by the Luxembourg Presidency of the Council of the European Union.

Basu, Kaushik and James Foster (1998), “On Measuring Literacy”, The Economic Journal, 108: 1733 – 1749

Bourguignon, Francois and Satya R. Chakravarty (2003), “The measurement of multidimensional poverty”, Journal of Economic Inequality, 1: 25 – 49.

Census of India (2011), accessed online at: http://censusindia.gov.in/

Chakravarty, Satya R., & , C. D'Ambrosio (2006), “The measurement of social exclusion”, Review of income and wealth, 52(3), 377 – 398.

Foster, Andrew and M. R. Rosenzweig (1996), “Technical Change and Human-Capital Returns and Investments: evidence from the Green Revolution.”, The American Economic Review, 86(4): 931 – 953.

Klasen, Stephan (2000), “Measuring poverty and deprivation in South Africa”, Review of Income and Wealth, 46(1): 33 – 58.

Kuklys, Wiebke (2004), “Measuring Standard of Living in the UK - An Application of Sen's Functioning Approach Using Structural Equation Models”, MPI Working Paper on Strategic Interaction, No 11-2004.

Majumdar, Manabi and S. Subramanian (2001), “Capability failure and group disparities: some evidence from India from the 1980s”, Journal of Development Studies, 37(5): 104 – 140.

Pritchett, Lant (2001), “Where has all the education gone?” The World Bank Economic Review, 15(3), 367-391.

Qizilbash, Mozaffar and D. A. Clark (2005), “The Capability Approach and Fuzzy Measures of Poverty: An Application to the South African Context”, Social Indicators Research, 74(1):

103 – 139.

Ravallion, Martin and S. Chen (2011),"Weakly relative poverty", Review of Economics and Statistics, 93(4), 1251 – 1261.

Sen, Amartya (1980), "Equality of What", in Sterling M. McMurrin (Ed.), The Tanner Lectures on Human Value, Salt Lake City: University of Utah Press: 195 – 220.

Sen, Amartya (1984), Resources, Values and Development, Oxford: Basil Blackwell.

Sen, Amartya (1985), Commodities and Capabilities, Oxford: Elsevier Science Publishers.

Sen, Amartya (1987), The Standard of Living: The Tanner Lectures, Cambridge: Cambridge University Press.

Sen, Amartya (1992), Inequality Re-examined, Oxford: Clarendon Press.

Sen, Amartya (1999), Development As Freedom, Oxford: Oxford University Press.

Sen, Amartya (1983), "Poor, Relatively Speaking", Oxford Economic Papers, 35(2): 153 – 169.

Spence, Michael (1973), "Job Market Signalling", The Quarterly Journal of Economics, 87(3): 355 – 374.

Appendix

Table A1: Decomposition of global MPI across states

	H	A	MPI	rank by H
all India	53.79%	52.82%	0.2841	
Jammu and Kashmir	40.82%	46.95%	0.1917	13
Himachal Pradesh	29.32%	41.22%	0.1208	6
Punjab	24.72%	45.91%	0.1135	5
Uttarchanal	39.63%	46.33%	0.1836	11
Haryana	40.10%	47.20%	0.1893	12
Delhi	13.13%	43.12%	0.0566	2
Rajasthan	63.41%	54.11%	0.3431	24
Uttar Pradesh	67.63%	54.26%	0.3669	25
Bihar	79.51%	60.44%	0.4805	29
Sikkim	33.55%	46.82%	0.1571	8
Arunchanal Pradesh	53.68%	51.34%	0.2756	19
Nagaland	48.64%	50.67%	0.2465	17
Manipur	39.57%	46.59%	0.1844	10
Mizoram	19.83%	44.22%	0.0877	4
Tripura	53.23%	49.76%	0.2649	18
Meghalaya	53.72%	52.99%	0.2846	20
Assam	60.32%	52.60%	0.3173	22
West Bengal	57.45%	53.77%	0.3089	21
Jharkhand	74.22%	59.13%	0.4389	28
Orissa	63.06%	53.84%	0.3395	23
Chhattisgarh	69.91%	53.32%	0.3728	27
Madhya Pradesh	68.73%	54.94%	0.3776	26
Gujarat	41.87%	48.65%	0.2037	14
Maharashtra	37.69%	47.56%	0.1792	9
Andhra Pradesh	43.88%	46.84%	0.2055	16
Karnataka	43.56%	47.40%	0.2065	15
Goa	19.26%	42.97%	0.0828	3
Kerala	12.48%	40.19%	0.0502	1
Tamil Nadu	30.99%	42.41%	0.1314	7

Table A2: Decomposition of relative multidimensional poverty (1) across states

	H	A	MPI	rank by H
all India	61.30%	55.16%	0.338	
Jammu and Kashmir	48.05%	51.84%	0.249	11
Himachal Pradesh	48.37%	49.59%	0.240	12
Punjab	38.90%	52.98%	0.206	5
Uttarchanal	50.35%	52.84%	0.266	13
Haryana	47.65%	52.16%	0.249	10
Delhi	35.69%	50.87%	0.182	4
Rajasthan	62.26%	52.77%	0.329	23
Uttar Pradesh	70.86%	54.78%	0.388	28
Bihar	67.75%	56.04%	0.380	25
Sikkim	44.97%	51.82%	0.233	7
Arunchanal Pradesh	57.46%	55.05%	0.316	17
Nagaland	54.06%	55.52%	0.300	16
Manipur	40.30%	51.87%	0.209	6

Mizoram	34.83%	51.37%	0.179	2
Tripura	45.39%	54.21%	0.246	8
Meghalaya	61.22%	57.84%	0.354	22
Assam	60.62%	54.67%	0.331	21
West Bengal	67.90%	61.44%	0.417	26
Jharkhand	69.83%	56.60%	0.395	27
Orissa	57.78%	52.71%	0.305	18
Chhattisgarh	59.42%	52.12%	0.310	20
Madhya Pradesh	71.55%	58.44%	0.418	29
Gujarat	52.52%	54.45%	0.286	15
Maharashtra	62.62%	55.65%	0.348	24
Andhra Pradesh	58.30%	55.19%	0.322	19
Karnataka	51.60%	51.93%	0.268	14
Goa	35.30%	50.98%	0.180	3
Kerala	20.76%	46.10%	0.096	1
Tamil Nadu	46.77%	49.83%	0.233	9

Table A3: Decomposition of relative multidimensional poverty (2) across states

	H	A	MPI	rank by H
all India	42.47%	48.84%	0.207	
Jammu and Kashmir	36.11%	48.77%	0.176	11
Himachal Pradesh	23.09%	45.86%	0.106	2
Punjab	29.54%	50.31%	0.149	8
Uttarchanal	31.57%	48.88%	0.154	10
Haryana	39.12%	51.23%	0.200	18
Delhi	29.77%	50.00%	0.149	9
Rajasthan	47.53%	47.60%	0.226	25
Uttar Pradesh	47.58%	48.53%	0.231	26
Bihar	51.71%	47.87%	0.248	28
Sikkim	26.53%	47.66%	0.126	5
Arunchanal Pradesh	41.97%	53.25%	0.223	20
Nagaland	37.70%	50.76%	0.191	15
Manipur	29.52%	50.33%	0.149	7
Mizoram	24.64%	49.20%	0.121	4
Tripura	36.79%	49.55%	0.182	12
Meghalaya	39.79%	51.51%	0.205	19
Assam	37.85%	49.34%	0.187	17
West Bengal	42.59%	49.87%	0.212	22
Jharkhand	50.48%	48.89%	0.247	27
Orissa	42.73%	51.24%	0.219	23
Chhattisgarh	46.11%	47.10%	0.217	24
Madhya Pradesh	53.15%	50.48%	0.268	29
Gujarat	42.23%	49.86%	0.211	21
Maharashtra	37.35%	49.19%	0.184	14
Andhra Pradesh	37.19%	47.79%	0.178	13
Karnataka	37.73%	48.35%	0.182	16
Goa	29.04%	50.46%	0.147	6
Kerala	14.39%	46.04%	0.066	1
Tamil Nadu	23.37%	46.55%	0.109	3

Table A4: Relative contribution of indicators to overall poverty

	Global MPI	relative MP (1)	relative MP (2)
schooling	9.11%	10.76%	10.40%
enrolment	11.66%	15.18%	19.92%
mortality	12.91%	13.04%	17.76%
nutrition	23.07%	20.91%	24.96%
sanitation	9.84%	3.90%	3.34%
water	3.08%	9.33%	4.14%
floor	7.55%	5.37%	3.69%
cooking fuel	10.62%	9.94%	4.32%
electricity	4.48%	0.61%	0.57%
assets	7.68%	10.97%	10.91%

Table A5: Relative contribution of household size to overall poverty

	global MPI	relative MP (1)	relative MP (2)
small hh (1-3)	27.52%	29.56%	25.14%
medium hh (4-6)	31.45%	32.12%	31.64%
large hh (7+)	41.03%	38.32%	43.22%

Table A6: Relative contribution of household age to overall poverty

	global MPI	relative MP (1)	relative MP (2)
above 25	38.57%	41.47%	37.67%
below 25	61.43%	58.53%	62.33%

Table A7: Relative contribution of place of residence to overall poverty

	global MPI	relative MP (1)	relative MP (2)
urban	26.92%	32.84%	47.62%
rural	73.08%	67.16%	52.38%

Table A8: Relative contribution of sex of household head to overall poverty

	global MPI	relative MP (1)	relative MP (2)
female-headed hh	51.13%	50.66%	49.70%
male-headed hh	48.87%	49.34%	50.30%