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HOW SERIOUS IS THE NEGLECT OF INTRA-HOUSEHOLD INEQUALITY IN MULTIDIMENSIONAL POVERTY AND INEQUALITY ANALYSES? EVIDENCE FROM INDIA

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Monetary poverty measures as well as most existing multidimensional poverty indices (MPI) assume equal distribution within the household and thus are likely to yield a biased assessment of individual poverty, and poverty by age or gender. We show that the direction of the bias of such household-based assessments in measuring poverty or inequality among individuals depends on how these measures use individual data to determine the poverty status of households. We use data from the 2012 Indian Human Development Survey and compare a standard household-based MPI to an individual-level MPI. The poverty rate among women is 14 percent points higher than that of men in our individual MPI measure but almost the same when using the household-based measure. 22 percent of males and 27 percent of females are misclassified as poor or non-poor using the household-based measure. We also show that intra-household inequality is 30 percent of total inequality.

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1. INTRODUCTION

The ultimate objective of measuring poverty and inequality is to determine the wellbeing of individuals. But most empirical analyses of poverty take a household perspective and determine whether entire households are poor. Taking such a household perspective assumes that resources are distributed equally, or according to need, within the household.

But the assumptions of equal or needs-based distribution is inconsistent with the theoretical literature on intra-household bargaining, which has shown that well-being outcomes depend on the bargaining power within the household where equal distribution would be more of the exception than the rule. These bargaining models have received overwhelming empirical support in the literature (e.g. Manser and Brown, 1980; McElroy and Horney, 1981; Chiappori, 1988, 1992;

[†]*Note:* The editors are deeply saddened to inform that Professor Klasen passed away on October 27, 2020 in Göttingen after battling the incurable disease Amyotrophic Lateral Sclerosis (ALS) for five years.

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Grossbard-Shechtman, 1993; Lundberg and Pollak, 1993; Lundberg et al., 1997; Gersbach and Haller, 2001; Edlund and Korn 2002).

More generally, there is overwhelming evidence collected across multiple contexts over the last two decades on intra-household inequalities, all providing evidence against the need-based or equal distribution assumption (e.g. Alderman et al., 1995; Haddad *et al*., 1997; Quisumbing and Maluccio, 2000; Aronsson et al., 2001). In particular, substantial and consequential gender inequalities in the allocation of resources have been shown to exist in many contexts, with particular sizable gaps existing in some regions of the developing world, particularly parts of South and East Asia and the Middle East (e.g. Rosenzweig and Schultz, 1982; Hazarika, 2000; Klasen and Wink, 2002, 2003; Asfaw et al., 2010; World Bank, 2011; Tian *et al*., 2018).

As a result of this, it is likely that household-based assessments of poverty by gender understate the gender gap in poverty, at least in some parts of the developing world.[1] And similarly, often-done analyses of child poverty or poverty among the elderly will yield biased results as the equal distribution assumption is unlikely to hold (e.g. Dreze and Srinivasan, 1997; Deaton and Paxson, 1998; Corak et al., 2008). More generally, poverty rates might be biased and their distribution by region or household type distorted, leading to biased assessments of individual well-being and policies, and biased targeting.

Even though this has been long recognized there have been only a few attempts at measuring poverty and inequality using truly individual level achievements. The dominant approaches in both unidimensional monetary and multidimensional poverty measurement use the household as the unit of analysis to determine the poverty status of individuals.

In 1990, Haddad and Kanbur assessed how serious the neglect of intra-household distribution is when considering poverty in a unidimensional case, using calorie intake as the metric (Haddad and Kanbur, 1990). Using Philippine data they show that 30 percent to 40 percent of all inequality is intra-household inequality and would be missed if individual data were ignored. They also find that ranking between males and females reverses when using individual data, with poverty rates among women being higher when using some individual poverty measures.

In monetary poverty measures using expenditures or consumption, the household perspective has been particularly dominant as it is hard to ascribe household expenditures to individual members, also because of the presence of household-specific public goods (such as housing, durable goods, service access, etc.). Nevertheless, several methods have been developed in recent years that allow one to estimate intra-household inequality using only household-level monetary information (Chiappori et al., 2002; Lise and Seitz, 2011; Browning et al., 2013; Dunbar et al., 2013; Cherchye *et al*., 2015). Case and Deaton (2003) and Chiappori and Meghir (2015) provide an excellent review of the various approaches used in the literature. But first and foremost they note the serious challenges when doing so. This is due to the presence of public goods within the household, the difficulty in identifying the

[1]At the same time, there have also been some unverified claims about gender gaps in poverty, such as the widely made claim in the 1990s that 70 percent of the world's monetary poor are female. If one assumes equal distribution at the household level, it is impossible to arrive at such a figure; but since no information existed on the actual unequal distribution of poverty, this number was a pure conjecture. See Marcoux (1998) and Klasen (2007) for a discussion.

sharing rule within the household given limited data and varying preferences across household members; and lack of sufficient data on individual consumption and time use for household members all of which complicates the estimation of intra-household inequality. Case and Deaton (2003) in their review conclude that most methods in the literature rely on controversial, easily challenged and non-transparent assumptions. Also, none of these methods has gained widespread acceptance.

Monetary poverty measures using income can, in principle, be ascribed to individual members.[2] But doing so ignores that incomes are shared within households. Members who have no income (e.g. children, elderly, non-working adults) still consume and assuming that individual incomes reflect the poverty status of individuals vastly overstate intra-household inequality in poverty (Bardhan and Klasen, Bardhan1999).

In contrast to the monetary dimensions where household-specific public goods or the sharing problem make an assessment of individual monetary poverty particularly difficult (Klasen, 2007), many non-monetary deprivations, e.g. in the health and education dimensions, can, in principle, be attributed to individuals so that an individual non-monetary multidimensional poverty measure appears more feasible at first sight. And in fact, these individual-level data are typically available in standard survey instruments. Yet in existing popular multidimensional poverty measures for developing countries such as the Multidimensional Poverty Index (MPI) used by UNDP and OPHI (Chakravarty and D'Ambrosio, 2006; Alkire and Foster, 2011; Duclos, 2011; Alkire and Santos, 2014; Kovacevic and Calderon, 2014), deprivations are also determined at the household level; and all individuals within the household are assigned the deprivation and poverty status of the household without any differentiation within the household. This problem is less acute in some of the MPI literature for developed countries where individual data collected in surveys has been directly used without aggregating that first at the household level (Rippin, 2012; Dhongde and Haveman, 2017; White and Yamasaki, 2017). In those assessments, individual data in health and education are aggregated to arrive at this household-level assessment. Consequently, the gender or age-segregated poverty numbers obtained from these calculations are unreliable at best, and deeply misleading at worst. And even overall poverty numbers, trends, and correlates, as well as inequality estimates, might be similarly affected.

The bias this generates in household-based multidimensional poverty assessments depends on how the individual-level data are combined to create a household-level indicator. The deprivation thresholds can be defined in a *restrictive* way where the achievement of the worst-off member of the household has to be above the deprivation threshold for the entire household to be non-deprived. In these cases, the deprivation rates among individuals would be *higher* in the household-based analysis (as long as not all households are indeed equally deprived in that dimension) than in an individual-level analysis.

But deprivation thresholds could also be defined in an *expansive* way, where only the achievement of the best-off individual has to be above the threshold for the entire household to be non-deprived. In such cases, the deprivation rates among individuals would be *lower* in the household-based analysis (if not all are as

[2]Transfer incomes or incomes from household production are usually not easy to assign to individual members.

well off as the best-off) as compared to an individual-based analysis. UNDP and OPHI's MPI use a mix of indicator threshold definitions—restrictive and expansive—so that the net bias of their neglect of intra-household inequality is not clear a priori. The way these thresholds are defined also determines whether inequality in multidimensional deprivation is understated or overstated in a household-based analysis, compared to an individual-level analysis.

There have been some survey-based individual multidimensional measures proposed exclusively for different demographic groups within the population (Alkire *et al*., 2013; Roche, 2013; Espinoza-Delgado and Klasen, 2018; Guio and Van den Bosch, 2020), but most focus only on a subset of the population like women or children or couples. Vijaya et al. (2014) construct an individual level multidimensional poverty measure for adults in Karnataka, India. They found substantial gender differences in poverty that are absent when using household measures. Bessell (2015) proposes an individual deprivation measure for adults based on custom-made surveys in the Philippines, finding a rather little gender inequality in this deprivation measure. While these studies are instructive, they are only focused on particular groups and thus cannot assess poverty at the individual level for the entire population or assess to what extent household-based analyses under- or overstate individual poverty and inequality. Also, they are mostly based on particularly detailed, unique, and often custom-made surveys using small samples, making replication at higher scales and across contexts difficult (and costly). Though none of these papers consider the biases associated with *restrictive* and *expansive* definitions of household-level poverty, either theoretically or empirically. Guio and Van den Bosch (2020) is an exception as they investigate intra-couple inequality in deprivation among EU couples using large-scale EU Statistics on Income and Living Conditions survey across 27 countries. They find small but significant intra-couple gender deprivation gap that is systematically biased to the disadvantage of women. And that work status of the partners and their share of joint income are key determinants of this gap.

In this paper, we present a multidimensional poverty measure at the individual-level that accounts for intra-household inequality across the entire population using a standard multi-topic survey. We aim to ascertain if individual poverty and inequality among them is under- or overstated when using a household-based analysis as compared to an analysis based on individual level data. We also the first to show theoretically and empirically how the use of *restrictive* and *expansive* thresholds biases poverty and inequality using household-level assessments.

Using data from India, we use our measure to estimate individual poverty and inequality as well as the size of the bias of household-based analyses. In our application, we find that women and older individuals in India are far more deprived and poor than men and younger individuals. This simple fact is obscured, and gender and generational differences are largely absent when measuring poverty and inequality using the standard household-based approach. In particular, the poverty rate of females is higher by 14 percentage points than men in our individual MPI measure but only 2 percentage points higher when using the household-based measure. The poverty rate among individuals aged fifty and over is higher by 46 percentage points than among children aged between 7 and 18 years of age in the individual measure, compared to only 2 percentage points when using the household-based measure. 22 percent of males and 27 percent of females are

misclassified as poor or non-poor using the household-based measure, and the household-based measure underemphasizes the contribution of the education dimension to multidimensional poverty. Using a decomposable inequality measure, we find the contribution of intra-household inequality to the total inequality in the individual deprivation score to be around 30 percent, and total (relative) inequality is also some 10 percent higher using the individual-based measure. We also find that in over 60 percent of households the average deprivation level of women in the household is greater than the average deprivation level of men.

With our approach, we succeed in at least partly individualizing our multidimensional poverty measure. But we also note that, due to difficult conceptual issues as well as data limitations, we face some challenges. The most serious conceptual challenge is the adequate treatment of children in the health and education dimensions where we need to rely on comparisons with other groups; we thoroughly investigate the impact of these choices on our individual multidimensional MPI. Finally, by mostly relying on the household-level information in the standard of living dimension, we may underestimate inequality in access and use of household-specific public goods, including particularly also durable goods and assets.

Our approach to individualize poverty measurement can thus only be seen as the first attempt in this direction and is hampered by insufficient data on individual well-being in standard household surveys; improved data would likely lead to even larger differentials in poverty by age and gender, at least in a country such as India.

2. Theoretical Framework

We adapt the theoretical framework for assessing the impact of neglecting intra-household differences in the unidimensional setting presented in Haddad and Kanbur (1990) to a multidimensional setting.

2.1. *Poverty Based on Individual Deprivations*

Let's assume that the wellbeing of individuals is measured by y. In a unidimensional setting, wellbeing is generally measured by consumption, income or nutrition. In a multidimensional scenario let d (≥2 represent the number of dimensions in which wellbeing is assessed and y_{ij} (≥0 represent the achievement of an individual i in dimension j. Let the total number of individuals be N (n = 1, 2, … N) from H households (h = 1, 2 … H). The dimensions used in multidimensional poverty analysis commonly include education, health, and indicators of standard of living. Each dimension j is assigned a weight w_j. The weights represent the relative importance assigned to each dimension. Let z_j denote the threshold below which an individual is deemed deprived in dimension j, and let z be the row vector of dimension thresholds. For each individual i, let g_i^0 denote the deprivation vector of d elements, whose elements g_{ij}^0 are defined by $g_{ij}^0 = w_j$ when $y_{ij} < z_j$, while $g_{ij}^0 = 0$ otherwise. We assume, for simplicity and keeping with existing multidimensional poverty measures such as the MPI, that information on individual's deprivation with respect to any particular dimension is binary i.e. 1 if deprived and 0 if non-deprived.

As discussed above, in household-based multidimensional poverty assessments thresholds are not defined based on achievements of each individual but

collectively for the household, denoted by z_j^h. All members of the household then are assumed to have the identical deprivation vector g^{0h}. We can construct a weighted deprivation count vector c, whose entry for the ith individual is the sum of the weights for the dimensions in which the individual is deprived, $c_i = \sum_{i=1}^{d} g_{ij}^0$. When using household data, the deprivation score for all individuals in the household is identical and given by $c^h = \sum_{i=1}^{d} g_j^{0h}$. The difference between c and c^h for individuals within and across households and their distribution is the main object of interest in this paper.

Are the levels of c and c^h systematically different, and are individuals of certain groupings favoured to have higher well-being in one over the other? Do the differences in c and c^h impact multidimensional poverty and inequality analysis? The answers to these questions depend on how the underlying dimension thresholds are defined in the household-based analysis, the extent of within-household disparity in achievements for the dimensions, and the poverty line.

Household deprivation thresholds can be defined in various ways. For some indicators, there exists only a household-based indicator and the implicit assumption is that, in this dimension, we are dealing a household-specific public good, even though in some cases these might be excludable and/or rivalrous. This is, for example, the case the standard of living dimensions of UNDP's MPI that examine electricity, water and sanitation access for the household, or the ownership of durable goods to determine household-level deprivation in these dimensions. In these cases, individual data are not available on these household-specific goods. While of course, one cannot be sure that all household members profit equally from access to these public goods (esp. use of some of the durable goods might be quite unequal), it is very hard and information-intensive to assess intra-household inequality in access to these public goods. As a result, most surveys do not contain individual-level information on these dimensions. We will return to this issue in the empirical assessment below.

More important for our purposes here, however, is that for some dimensions, household-level assessments and thresholds are built up from individual-level data that *is* available in the surveys. We classify the most commonly used thresholds of using individual-level data to assess household-level deprivation into two types, restrictive and expansive.

The deprivation threshold is said to be *restrictive* when the achievement of the *least* well-off person has to be above the threshold for the household to be non-deprived. In other words, all have to be above the threshold for the household to be non-deprived and a single individual below the threshold makes the entire household deprived in this dimension. In these cases, the least well-off member of the household is given an implicit weight of one and other members of the household have no weight. For example, in UNDP's MPI, the threshold that deems the entire household to be deprived of nutrition if any one member of the household is undernourished is such a *restrictive* one. This could generally be represented by a deprivation function defined as $g_j^{0h} = w_j \,\text{if}\, min\left(y_j^h\right) \leq z_j^h \wedge 0 \,\text{otherwise}.$

In such instances, the average value of the deprivation score across the population for the dimension would be equal or higher than if individual data were used

to define deprivations i.e. $\mu\left(c_j^h\right) \geq \mu\left(c_j\right)$. In other words, the number of individuals with the deprivation would be *higher* using household thresholds than individual-specific thresholds unless there is perfect equality among all household members in this dimension. Individuals within the household who are better off would be deemed deprived due to deprivation of the worst-off household members. In the Indian example below, men on average are better off than women in most wellbeing dimensions, and would more likely be misidentified as deprived in such dimensions.

The deprivation threshold is said to be *expansive* when the achievement of only one has to be above the threshold for all individuals in the household to be non-deprived. In this way the best-off member of the household is given an implicit weight of one, while other members of the household have no weight. For example, in the MPI, the entire household is deemed non-deprived in education if at least one household member has five years of education. This can be generally represented as $g_j^{0h} = w_j \,\text{if}\, max\left(y_j^h\right) \leq z_j^h \wedge 0\,\text{otherwise}$. In such instances, the average value of the deprivation score across the population for the dimension would be equal or lower than if individual data were used instead to define deprivations i.e. $\mu\left(c_j^h\right) \leq \mu\left(c_j\right)$, unless there is perfect equality among all household members in this dimension. For example, women in India, who on average are worse off than men, are likely to be misidentified as non-deprived using such thresholds.[3]

The extent of the disparity in the individual deprivation status within the household in each dimension would determine the amount of under- or overstatement. For example, if the within household disparity in nutrition deprivation, which is defined in a restrictive way, is large and many households have only one undernourished person while others in the household are not undernourished then the extent of overstatement would be large. On the other hand, if within household disparity is small and in deprived households most members are undernourished then the extent of overstatement would be small. An analogous argument can be made in case of expansive deprivation thresholds. The aggregate impact of various dimensions on the difference between c and c^h would depend also on the type of thresholds, weighting and to what extent each deprivation misidentifies individuals. In most popular multidimensional measures some indicators are defined restrictively while others are defined expansively, so some of the over- and under-statement of deprivation rates would lead to opposing biases and thus partially cancel each other in the aggregate measure. For example, as discussed above, in the MPI

[3]The household-based MPI uses a third method to assess household-level deprivation based on individual-level achievement. In the mortality indicator, a household is deemed deprived if a child has died in the last 10 years. While this sounds like a restrictive definition, it defines poverty in this dimension by an event that also removes the person in question (the dead child) from the analysis which is based on persons currently alive. This raises different conceptual issues beyond the scope of this paper which are discussed, for example, by Kanbur and Mukherjee (2003). We use the same procedure for that component in the individual MPI. In theory, a household deprivation threshold can be constructed in different ways from individual data, such as using a linear or some other combination of data on individual household members. For example, one could deem the entire household as deprived in education if the average number of years of education for all adult members of the household is below five years. But in the standard household MPI measures, none of the thresholds is defined in this way and thus we do not consider this case.

proposed by OPHI and UNDP, the educational achievement dimension is defined expansively, while the educational enrollment and the undernutrition dimensions are defined in a restrictive way.

To create an aggregate measure of the incidence of multidimensional poverty based on these dimensional deprivation data, a recently proposed influential approach by Alkire and Foster (2011) is to select a cutoff value k and any individual with a weighted deprivation score above k is considered multidimensional poor i.e. $\rho_k\left(y_i, k\right) = 1$ if $c_i \geq k \wedge \rho_k\left(y_i, k\right) = 0$ if $c_i < k$ where ρ_k is the identification function. For aggregating poverty over the population, one simple approach is to measure the percentage of population that is poor. The headcount can be formally defined as H(y) = q/n where = $q \sum_{i=1}^{n} \rho_k\left(y_i, k\right)$ is the number of persons who are identified as poor. UNDP's MPI has, for example, adopted this approach for identification and aggregation (Kovacevic and Calderón, 2014).

The impact of differences between c and c^h on the poverty headcount or any of the other poverty measures depends on the distribution of deprivation scores when restrictive or expansive definitions are used, as well as k. If, for example, the overstatement of poverty in the household-based analysis using the restrictive definition pushes many households above k, the overstatement in multidimensional poverty will be large. Conversely, if the understatement of poverty in the household-based analysis using the expansive definition pushes many households' deprivation vector to be below k, the understatement of multidimensional poverty will be large.

2.2. *Inequality in Individual Deprivation Scores*

What about inequality in deprivation scores? Is the distribution of the total deprivation score of individual deprivation scores c more or less unequal than compared to when deprivation scores are based on a household-level assessment c^h? And how do the intra-household and inter-household components of inequality change? In the unidimensional case Haddad and Kanbur (1990) show that relative inequality (using all Lorenz-consistent inequality measures) is understated when using household-level data. The individual deprivation level c can be seen as the result of a mean-preserving spread that is bound to increase inequality.

This is, however, not always true in the multidimensional case. In the MPI measures that are based on a household-based analysis, all individuals within the household are assigned the same status and hence intra-household inequality is assumed to be zero by definition, and all inequality is inter-household. Thus intra-household inequality is underestimated. But when moving from a household-based assessment to an individual assessment, *inter*-household inequality is also affected. The change in inter-household inequality and thus total inequality among individuals depends again on the use of restrictive vs. expansive thresholds as well as the distribution of deprived individuals across households.

As shown and illustrated with examples in Appendix 1, all one can say about relative inequality using these three approaches is that inequality using the restrictive threshold will never be larger than using the individual approach. Moreover, whenever inequality using the expansive definition is not 0, it is never smaller than using the individual or restrictive definition. Thus how inequality changes moving

from a household to an individual perspective is an empirical question, all the more so since the most well-known multidimensional deprivation measures used mix restrictive and expansive thresholds.

In sum, household-based assessments of multidimensional will provide a biased account of individual multidimensional poverty. It will then also bias the assessment of poverty by groups as well as the measured total inequality in deprivations. While for some definitions of household-based assessments and levels of intra-household inequality in deprivation, one can assess the sign of the bias, for others this is not possible a priori and will essentially become an empirical exercise to which we now turn.

3. Data and Methodology

We use data from the 2012 Indian Human Development Survey (IHDS) to construct multidimensional poverty measures. IHDS is a nationally representative, multi-topic panel survey of 42,152 households across India covering all Indian States.[4] IHDS covers a wide range of topics, which include health, education, employment, economic status, marriage, fertility, gender relations and social capital. The information on health and education is gathered at the individual level. The survey also asked a few sex-disaggregated time-use questions about common household chores like collecting water and cooking.

3.1. *Dimensions and Indicators*

We construct a Household MPI we (henceforth called Global Household MPI), which is based on the Global Multidimensional Poverty Index developed by the Oxford Poverty and Human Development Initiative (OPHI) and also used, in a slightly amended version, by Kovacevic and Calderón (2014). An individual MPI measure is constructed using the same dimensions as the Global Household MPI, but by directly measuring individual achievements in some dimensions as opposed to household-level deprivation indicators. The individual MPI measure uses slightly different indicators than the household measure. To facilitate ease of comparisons we construct a second household MPI measure which uses the same indicators as the individual MPI. This new household MPI measure is referred to just as the comparable household MPI. All the MPI measures incorporate education, health and standard of living as the three dimensions. A list of the various indicators, deprivation thresholds and weights used in each of the measures is presented in Table 1.

Education

The education dimension is commonly seen as a central capability Sen's and Nussbaum's versions of the capability approach (e.g. Sen, 1998; Nussbaum, 2003).

[4]IHDS is a panel dataset whose first round was collected in 2004–05. We do not utilize the first round of data as our goal is to demonstrate that individual multidimensional poverty can be measured using standard multi-topic household survey and not to analyze the trends in the MPI in India. OPHI (2017) uses the same data to calculate a household level MPI for India.

TABLE 1
DIMENSIONS, INDICATORS AND WEIGHTS FOR VARIOUS MPI MEASURES

		Global Household MPI		Comparable Household MPI		Individual MPI	
Dimension	Indicator	Deprived if	Weight	Deprived if	Weight	Deprived if	Weight
Education	Years of schooling	No member of the household completed 5 years of education	1/6	No member of the household completed 5 years of education	1/3	Not completed threshold years of education**	1/3
	Children's school enrollment	One or more HH members between 7 to 15 years of age not enrolled in school	1/6	–	–	–	–
Health	Nutrition	One or more adult HH member is underweight, or any children is undernourished	1/6	Same as Global Household MPI	1/6	Individual is malnourished*	1/6
	Mortality among children	One or more children born to interviewed women in the household died after birth	1/6	Same as Global Household MPI	1/6	Same as Global Household MPI	1/6
Standard of living	Electricity	No access to electricity at home	1/18	Same as Global Household MPI	1/18	Same as Global Household MPI	1/18
	Floor	House floor made of mud	1/18	Same as Global Household MPI	1/18	Same as Global Household MPI	1/18
	Sanitation	No access to private toilet	1/18	Same as Global Household MPI	1/18	Same as Global Household MPI	1/18
	Access to safe water	No access to safe water source within 15 minutes one-way distance from the residence	1/18	Same as Global Household MPI	1/36	Same as Global Household MPI	1/36
	Water collection time			Time taken to collect water by all household members is one hour or more	1/36	Same as Comparable MPI	1/36

TABLE 1 (CONTINUED)

		Global Household MPI		Comparable Household MPI		Individual MPI	
Dimension	Indicator	Deprived if	Weight	Deprived if	Weight	Deprived if	Weight
	Cooking stove	HH uses open fire or traditional chulha without chimney to cook	1/18	Same as Global Household MPI	1/18	Same as Global Household MPI	1/36
	Cooking time					Person does most of the cooking with unsafe stove	1/36
	Consumer durables	Owns less than two of a list of assets	1/18	Same as Global Household MPI	1/18	Same as Global Household MPI	1/18

*Adult ages for 18 years or older is undernourished if BMI is less than 18.5. Individuals 6 to 17 years of age are malnourished if BMI-for-age is two or more standard deviations below the median of the reference population. Children between 0 to 5 years of age are deemed malnourished if their weight for height is two or more standard deviations below the median of the reference population).

**The threshold years of education for individuals 12 or more years of age is 5 years of education, for children between 7 to 11 years of age is the age-adjusted years of schooling so that they complete five years of education by age of 12. Children below 7 years of age are deprived if half or more household members 12 or more years of age have not completed 5 years of education.

It also impacts other capabilities such as future employment opportunities, self-confidence and the ability to participate in public and political life.[5]

The indicators used to measure education in the global household MPI are literacy and children's enrollment in school. Basu and Foster (1998) argued that the presence of a literate person provides positive externality for the entire household. In the global MPI a household with at least one member who has completed 5 years of education is considered non-deprived (UNDP's MPI sets the threshold at 6 years but assumes the same externality). This is, therefore, an expansive threshold and would lead to underestimation of the deprivation rate for this indicator. Despite this externality, education provides first and foremost a benefit to the person who possesses it so that an individual perspective seems warranted. In addition, Vijaya et al. (2014) argue that differences in literacy among household members might impact power dynamics. So in the individual MPI index, we measure education separately for each person in the household. We deem an individual above 12 years of age as deprived if she/he has not completed five years of education. For children below age 12, we use a different procedure that we outline presently.

Global MPI uses children's enrollment as a second indicator of education. In the individual MPI measure, we do not use this indicator (as there would be no equivalent indicator for adults and children outside of this age window). Instead, children between the ages of 7 to 12 are deemed deprived if they have not completed the expected age-adjusted years of schooling. The expected age-adjusted years of schooling is calculated so that children should be on track by age 12 to complete five years of education. The age of joining the school in India is 6 years. So children are expected to complete five years of education by 11 years of age. We provide a buffer of one year to account for later entry into schools (Dotter and Klasen, 2014). Since children below 7 years of age have not started schooling, we have no information on them for the schooling indicator. In these cases, we use the information on the schooling status of other household members as a proxy for their potential status. Specifically, children below seven years of age are deemed deprived in education in the individual measure if half or more of household members 12 or more years of age have not completed five years of education. We also test, in later sections, the robustness of our results to modifying the schooling threshold for children below seven.

Health

We use nutrition and child mortality as the two indicators for the health dimension, the same as the ones used by the Global MPI. Nutrition is an especially important indicator for India given the overall poor state of nutrition (both among children and adults) in the country (Klasen, 2008). In the household measures, an individual is considered deprived in the nutrition indicator if any of the adult household members (18 years or more) for whom data is collected are underweight (have a BMI less than 18.5), or if any children are malnourished. Individuals 6 to 17 years of age are undernourished if their BMI-for-age is two or more standard

[5]A recent example is a law passed in the Indian states of Rajasthan and Haryana prohibiting anyone without certain minimum years of education to contest local level elections.

deviations below the median of the reference population. Children between 0 and 5 years of age are deemed deprived if their weight for height is two or more standard deviations below the median of the reference population.[6] We use the reference population defined by WHO to calculate the nutritional status of children.

For the individual MPI measure, we use individual data whenever available to define nutrition deprivation. If weight or height data are not collected for an individual then the status of the group to which the person belongs defines her or his status.[7] Each age group 0–5, 6–17 and 18 and above are divided into two based on sex. If half or more individuals in the household from the group are nutritionally deprived (based on individual data) then the group is deemed as deprived. All individuals in the group for whom nutritional data were not collected get the status of the group.[8] In cases where data are not collected for any individuals of a particular group then all the members of the group within the household get the status of the age group. The age group status is deprived if half or more individuals in the age group (male or female) are deprived based on individual data. In the previous example, if nutritional data are not collected on any of the 5 adult male individuals then they are all deprived if half or more of the adult females for whom data are collected are deprived. Lastly, if data are not collected for an age-group then all individuals for that age group within the household are deprived if half or more individuals in the household for whom data were collected are deprived.

All individuals in the household are considered deprived in child mortality if the interviewed women in the household report one or more child deaths. There is no difference between the household MPI and individual MPI deprivation status for this indicator. Unfortunately, we do not have other reliable individual-level health indicators to replace the child mortality indicator.

Standard of Living

We use the same indicators for our Global household MPI as used by Alkire and Foster (2011). As discussed above, several of the goods are public in nature within the household. This makes it difficult to determine differential access to

[6]Using age in years would yield an inaccurate measure of weight-for-age but this should not have large impact weight-for-height measure. The levels of the two would certainly be different (wasting vs. underweight) and the extent of gender bias might differ, but the bias is likely to be in the same direction.

[7]The data is missing because the survey did not collect information on all adult members of the household. Data only on those men who answered the questionnaire was collected and women who were in 18–59 years of age. Our approach of inferring missing data using group-level information has only a small impact on the deprivation scores in these dimensions, including gender gaps. There is no difference in deprivation rates among those with direct observations on BMI (60 percent of all adults) and the overall imputed sample. The differences in gender bias in nutrition deprivation for children under six for whom we have direct measurement of weight and height (for 69 percent of all children below the age of 6) and the entire population below six years of age (after imputing nutrition status based on their group's status for children) is very small (1 percent vs. 0.10 percent). Our assumptions for imputing status of children between 6 and 17 years of age with no information on nutrition do not change the gender gap substantially as compared to those with direct nutrition information.

[8]For example, if a household has five adult males, and individual nutritional data is collected for three adult men, then the HH adult male group is deprived if two or more of the individuals for whom data is collected are deprived. The two individuals for whom data was not collected get the status of the group and the other three have status based on their own individual data.

these goods. Hence for the individual measure we assume living standards as public goods accessible equally by everyone within the household, similar to the assumption made by Vijaya et al. (2014). At the same time, IHDS collects sex disaggregated time use data on some of these indicators and we include those separately in our individual MPI measure. For example, if adult women or men as a group spend more than an hour collecting water daily, then that group is deemed additionally deprived. To maintain the same overall weight on the standard of living dimension with the addition of indicators, we lower the weight on the household indicator for the same living standard to accommodate the time use-based individual indicator. The comparable household MPI also includes the household time use indicator for water collection. A household is deprived in the indicator if the collective time spent by all household members is greater than one hour.

Other possible dimensions that could be included are empowerment, physical safety and subjective wellbeing among others. In many of these dimensions there is documented gender disparity in favor of men, particularly in countries such as India (Vijaya et al., 2014; Bessell, 2015) We do not include these so as to maintain comparability with the OPHI Global MPI and also most surveys lack data for measuring these dimensions. Excluding these will result in understating the gender disparity in poverty.

3.2. *Weighting*

We follow the Global MPI in adopting an equal weighting approach across dimensions. In robustness analysis, we vary the weighting structure across the three dimensions to test our results to different weights.

Households without eligible population

Based on possible solutions to the problem of ineligible populations in MPI suggested by Dotter and Klasen (2014) we substitute the missing indicator with an indicator from the same dimension, i.e. substitute the nutrition indicator for the child mortality indicator for a household that never had any children. This would double the weight on the nutrition indicator for those households.[9]

4. Results

We first analyze the deprivation levels by sex and age group (Table 2) in the various indicators before delving into the poverty and inequality measures. We find that 26 percentage points more individuals are deprived when using the individual data in the education dimension. As hypothesized, adult women, who are the worst-off group, are more likely to be misclassified as non-deprived when household data are used. Access to schooling for women was very poor in India up until

[9]This is not without problems. It assumes that nutrition indicator is a substitute for child mortality indicator and also we can no longer decompose the MPI measure by indicators. But given the lack of data on any other equivalent indicator for the missing information, this is a reasonable compromise. We can still decompose MPI by dimensions. In cases where there is no information on any of the indicators within a dimension, we chose to drop the household from the sample. We find that in only a small number of instances of this in our data; hence it does not impact the representativeness of the sample.

TABLE 2
PROPORTION OF INDIVIDUALS DEPRIVED IN VARIOUS INDICATORS

Deprivation	Male 0–6	Female 0–6	Male 7–18	Female 7–18	Male 19–50	Female 19–50	Male 50+	Female 50+	Total
Education									
Household schooling	0.15	0.16	0.08	0.08	0.07	0.08	0.14	0.17	0.1
Individual schooling	0.48	0.5	0.14	0.14	0.23	0.42	0.49	0.77	0.36
Children enrollment	0.06	0.07	0.08	0.09	0.07	0.06	0.07	0.06	0.07
Health									
HH nutrition	0.53	0.53	0.52	0.53	0.44	0.45	0.41	0.42	0.47
Individual nutrition	0.2	0.2	0.25	0.22	0.21	0.22	0.23	0.23	0.22
Child mortality	0.21	0.23	0.23	0.25	0.19	0.2	0.21	0.19	0.21
Standard of living									
Access to electricity	0.22	0.22	0.19	0.2	0.14	0.14	0.15	0.15	0.17
Type of house floor	0.48	0.49	0.46	0.46	0.36	0.37	0.36	0.36	0.4
Access to sanitation	0.7	0.71	0.68	0.68	0.61	0.61	0.59	0.6	0.63
Access to safe water	0.1	0.1	0.1	0.1	0.09	0.1	0.1	0.1	0.1
HH water collection time	0.16	0.15	0.18	0.19	0.14	0.13	0.12	0.11	0.15
Individual water collection time	0.01	0.01	0.02	0.04	0.03	0.07	0.03	0.06	0.04
Access to clean cooking stove	0.66	0.67	0.64	0.64	0.56	0.56	0.56	0.56	0.59
Time with unclean cooking stove	0	0	0	0.05	0	0.39	0.01	0.21	0.12
Consumer durables	0.27	0.29	0.22	0.24	0.18	0.19	0.23	0.27	0.22

very recently, which is reflected in the higher gender differential and also an overall higher level of deprivation in the adult age group, and particularly high deprivation among the oldest age group (50+). There is no gender differential in schooling achievement among children in the age group 7 to 18. This is likely due to the concerted push in the last decade by the government to increase school enrollment and the passage of right to education act, which makes education compulsory for this age group. The higher level of deprivation among the below 7 age group children is because their deprivation status is determined by older members of the household, who tend to be more deprived; but note that there is no gender gap here suggesting that our method does not impute a gender gap into the data. We conduct a robustness analysis to test the sensitiveness of our results to changing deprivation level for this age group. As expected, the gender and age differentials are substantially reduced when using the household measure.

The household nutrition indicator is defined in a restrictive way, with all household members considered deprived if any adult or child is undernourished. As predicted, this results in the household measure indicating substantially higher overall deprivation levels (25 percentage points higher) than the individual nutrition indicator. There is no significant gender differential in the nutrition indicator among adults. Among the age group 6 to 17 years, boys are slightly more deprived than girls. Across all age groups, between 20 percent and 25 percent of the individuals are undernourished.[10]

As expected, the household-based standard of living indicators does not show much gender disparity. The time use indicators show the extra burden on women of not having access to basic amenities. 39 percent of adult women below 50 years of age are directly impacted due to smoke from unclean cooking stoves, while none of the men of this age group suffers directly as a result of unsafe cooking stoves in the household (Ezzati and Kammen, 2002). Women are also more likely to spend time collecting water from outside the household. The household-level time use indicator on water collection gives an incorrect picture of no gender differential in time spent which can be discerned from the individual time use indicator.

Table 3 presents the multidimensional poverty measures for the three different MPI definitions. The Global Household MPI measure is directly comparable to the Global MPI constructed by OPHI. The comparable household MPI measure uses only the schooling indicator for education and adds a household water collection time use indicator to make it more comparable with the individual MPI measure. There is no change in the MPI between Global and comparable measures, only minor changes in the headcount and the poverty intensity. Headcount and MPI are slightly higher for females across the age group in these two household-based measures, suggesting that slightly more females reside in multidimensionally poor households.

[10]The level for children below six years of age is lower because we are using the weight-for-height indicator (wasting) instead of the more common weight-for-age measure (underweight). But there is no substantial gender differential reported for both the measures and hence, even though our levels are lower, the conclusion on gender differentials won't be impacted due to the use of the weight-for-height measure. 20.5 percent of boys and 19.1 percent of girls below five years of age have weight-for-height below 2 standard deviations of the median of the reference population and the corresponding numbers for weight-for-age are 41.9 percent and 43.1 percent according to NFHS-3.

TABLE 3
COMPARISON OF VARIOUS MULTIDIMENSIONAL POVERTY INDICATORS CONSTRUCTED USING DUAL-CUTOFF APPROACH (κ = 33%) BY AGE-SEX CATEGORIES

	Male 0–6	Female 0–6	Male 7–18	Female 7–18	Male 19–50	Female 19–50	Male 50+	Female 50+	Total
Global household MPI									
Headcount	0.47	0.49	0.44	0.46	0.34	0.36	0.39	0.41	0.4
Intensity	0.48	0.5	0.47	0.47	0.47	0.47	0.52	0.52	0.48
MPI	0.23	0.24	0.21	0.22	0.16	0.17	0.2	0.21	0.19
Comparable household MPI									
Headcount	0.46	0.48	0.42	0.43	0.33	0.35	0.38	0.4	0.38
Intensity	0.51	0.52	0.48	0.49	0.48	0.48	0.52	0.53	0.49
MPI	0.24	0.25	0.2	0.21	0.16	0.17	0.2	0.21	0.19
Individual MPI									
Headcount	0.54	0.56	0.29	0.29	0.33	0.48	0.54	0.78	0.44
Intensity	0.55	0.56	0.5	0.5	0.52	0.55	0.55	0.54	0.53
MPI	0.3	0.31	0.14	0.15	0.17	0.27	0.3	0.42	0.24

Note: Headcount is measured as the proportion of population that is deemed poor.

But using individual data, the MPI is substantially higher among adult women than men, e.g. by 15 percentage points for the age group 19–50; as shown in Table 2, this is mostly related to higher education deprivation among adult women. The higher MPI is mostly driven by differences in the headcount ratios as poverty intensity varies only slightly across gender and age groupings (see also Dotter and Klasen, 2014). There is no gender differential among children in the MPI which is a promising development and driven by a lack of education differentials between boys and girls. The overall levels of poverty are higher when using the individual as compared to household data. This suggests that the expansive definition used for education is more important for the overall MPI than the restrictive definition used for nutrition. This is not surprising given the strong age-dependence of educational deprivation. Even households where many people are uneducated will often have one young person with at least 5 years of education, making the entire household non-deprived in the household-based MPI. This clearly shows the problems associated with such an expansive definition.

We calculate relative inequality measures (Gini and Generalized Entropy measure) for deprivation scores across the entire population and among the poor (Table 4). Total inequality is decomposed into within and between components for various socio-economic groups. For India, we find that inequality in deprivation scores is higher (between 7 percent and 11 percent, based on the measures used) when using individual rather than household data. This also confirms that the expansive definition of education deprivation is more consequential than the restrictive definition used for nutrition. Also, when decomposing into a within and between household component, 29 percent of total inequality in the individual MPI is due to intra-household disparity, similar to Haddad and Kanbur (1990) for the unidimensional case. This component of inequality, which is the focus of this paper, is absent from household MPI by definition.

When considering within/between decompositions using age, age-gender, states, caste, and place of residence groups, we find that within group-inequality is always much higher than between-group inequality. In the individual MPI, the relative contribution of between age-gender groups is higher than in the household MPI (6 vs. 1 percent) while the reverse is the case for states, and place of residence. We also investigate gender differentials in poverty measures across various socio-economic groups (Appendix 2 Table 1).

Another way to assess the bias of a household-based measure is to investigate the classifications of individuals into poor and non-poor categories using the household and individual MPI to ascertain the degree of overlap between the two (Table 5). 22 percent of men and 27 percent of women are misclassified by the household measure. Men are equally likely to be misclassified as poor or non-poor, while women are more likely to be misclassified as non-poor when using household data. This confirms our hypothesis that the worse off group is more likely to be misclassified as non-poor in the household measure when expansive thresholds are used. Since most disparities are in the expansive education dimension (while there are few gender disparities in the restrictive nutrition category), the education dimension drives the misclassification among women.

In Table 6 we decompose the MPI to obtain the contribution of each dimension. The health dimension is the biggest contributor to the household MPI, while

TABLE 4
INEQUALITY (RELATIVE MEASURES) ACROSS THE POPULATION

				Contribution of Within and Between Components by Various Groupings (%) for GE(2)					
	Gini	GE(2)		Gender	Age-Gender	Household	States	Caste and Religion	Place of Residence
Inequality across the entire population									
Household	0.454	0.339	Within	100	99	0	84	92	83
			Between	0	1	100	16	8	17
Individual	0.487	0.377	Within	99	94	29	89	92	86
			Between	1	6	71	11	8	14

Note: In the household-based assessment, the same procedures for identifying household-level deprivations that are used in the MPI, using the same restrictive and expansive thresholds, are used.

TABLE 5
Classification of Individuals by Household and Individual MPI

Comparable Household MPI	Individual MPI		Total
	Non-Poor	Poor	
Male			
Non-poor	0.51	0.11	0.62
Poor	0.11	0.27	0.38
Female			
Non-poor	0.42	0.19	0.61
Poor	0.08	0.31	0.39
Total			
Non-poor	0.47	0.15	0.62
Poor	0.09	0.29	0.38

education is the biggest contributor to the individual MPI. This is partly because in the household MPI health is defined in the restrictive fashion leading to higher deprivation rates than with the individual MPI, while the education indicator thresholds are defined in an expansive fashion leading to underestimating of deprivation rates in the household as compared to individual MPI. Thus the household-level MPI overemphasizes the health dimension and underplays the education one, explaining the large differences in the decomposition.[11]

4.1. *Correlates of MPI*

In Appendix 3, we delve into the multivariate correlates of the individual versus the household MPI. In all our specifications we find that females have a significantly higher deprivation score than males even after controlling for various other parameters and fixed effects. The gender effect is, as expected, also substantially higher for the individual MPI than for the household MPI. Our regression analysis also finds that female-headed households on average have *lower* deprivation scores than males. This finding holds true for both individual and household MPI measures. Thus while adult women *are* disadvantaged in poverty in India, as demonstrated by our individual MPI, this has nothing to do with household headship but is an intra-household inequality issue. Lastly, widowed women's deprivation score in the household measure is not significantly different from that of married women for most specifications, but in the individual measure, they have significantly higher deprivation scores. In sum, the gendered nature of poverty comes out much more clearly in the individual-poverty measure, while the household-level analysis or proxies of gendered poverty based on headship deliver misleading results.

[11]In rural areas standard of living and health are almost equal contributors to the household MPI and it plays a bigger role than health in the individual MPI. In urban areas standard of living indicators play a smaller role in MPI. This is partly because access to basic services like electricity, sanitation, water and the cooking fuel is more readily available in urban areas. But some other aspects of standard of living as the density of housing are not captured in the indicators and likely to be worse in urban areas than rural areas. Using 2005–06 NFHS data, Alkire and Seth (2015) find the standard of living to be the highest contributor to household MPI. This seems to have changed with better provision of several public goods like electricity, water, cooking fuel etc. and increased standard of living during the high economic growth period between 2006 and 2012.

TABLE 6
Contribution of Each Dimension to MPI Measure (%) (Dual Cutoff Method With $\kappa = 0.33$)

	Rural			Urban			All		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Household MPI									
Education	17	16	17	20	29	17	17	21	17
Health	42	44	42	60	43	50	44	42	44
Standard of living	42	40	42	20	29	33	39	37	39
Individual MPI									
Education	46	50	47	67	64	64	50	52	52
Health	25	21	23	22	21	18	25	22	22
Standard of living	29	29	30	11	14	18	25	26	26

4.2. *Robustness Analysis*

Designing a poverty measure involves a selection of various parameters, and we are interested in determining how sensitive our major results of gender differential in poverty are to these parameter choices.

Table 7 presents the poverty headcount, intensity and MPI for five different individual MPI measures constructed by changing the parameters. In our benchmark individual measure children under 7 years of age are deemed deprived in schooling if half or more members in the household above 12 years of age have not completed five years of education. We do not have any alternate information on education potential of these children and chose to define the deprivation based on other household members. But since access to primary schools is expanding rapidly

TABLE 7
Robustness Checks

				Difference Between Women and Men's Measure	
	Men	Women	Total	Absolute	Relative
Individual MPI					
Headcount	0.38	0.5	0.44	0.12	32%
Intensity	0.53	0.54	0.54	0.01	2%
MPI	0.2	0.27	0.24	0.07	35%
Individual alternate MPI (Children under 7 years are assumed to be non-deprived in education)					
Headcount	0.33	0.46	0.4	0.13	39%
Intensity	0.52	0.53	0.53	0.01	2%
MPI	0.17	0.24	0.21	0.07	41%
Individual alternate MPI (For individuals with missing nutrition information using household nutrition status)					
Headcount	0.4	0.51	0.45	0.11	28%
Intensity	0.54	0.55	0.54	0.01	2%
MPI	0.22	0.28	0.24	0.06	30%
Individual alternate weights MPI (Education 0.5, Health 0.25 and Standard of living 0.25)					
Headcount	0.32	0.45	0.38	0.13	41%
Intensity	0.65	0.66	0.65	0.01	2%
MPI	0.21	0.3	0.25	0.09	43%
Individual alternate weight MPI (Education 0.25, Health 0.5 and Standard of living 0.25)					
Headcount	0.36	0.44	0.4	0.08	22%
Intensity	0.51	0.52	0.52	0.01	2%
MPI	0.18	0.23	0.21	0.05	28%
Individual alternate weights MPI (Education 0.25, Health 0.25 and Standard of living 0.5)					
Headcount	0.4	0.49	0.45	0.09	23%
Intensity	0.51	0.53	0.52	0.02	4%
MPI	0.2	0.26	0.23	0.06	30%
Individual MPI for adults					
Headcount	0.38	0.56	0.47	0.18	47%
Intensity	0.53	0.55	0.54	0.02	4%
MPI	0.20	0.31	0.25	0.11	53%
Individual MPI with imputation for missing values					
Headcount	0.41	0.53	0.47	0.12	29%
Intensity	0.54	0.56	0.55	0.02	4%
MPI	0.23	0.3	0.24	0.07	30%

the likelihood of these children completing five years of education is higher than adults in the household. One alternative assumption we could make in defining deprivation threshold for children below seven would be to assume that they are non-deprived. We do this in our first alternate measure and find that even though the level of MPI decreases from our benchmark individual measure the differential between men and women still exists. The absolute differential between men and women in MPI remains the same and the relative differential increases slightly.

Next, we consider if our conclusions are robust to how health deprivation status of individuals with missing nutrition information is determined. In IHDS survey, we have individual data on nutrition for 65 percent of all individuals and infer deprivation status for the remaining 35 percent of the population based on the status of the demographic group they belong to (as explained previously). We are missing data on 26 percent of females and 44 percent of males. The missing data are concentrated more among adult males (54 percent). In the benchmark version, the deprivation status of these adult males in the household would be determined based on information on the nutrition status of other adult males for whom data were collected (deprived if 50 percent of adult males are underweight). Instead of this, we test if assigning individuals with missing data the same status as they would have been assigned when constructing household MPI makes a difference to our results. For individuals with missing data, we deem them as deprived in nutrition if any one individual in the household is under-nourished just as in Household MPI. But this does not change our results qualitatively; women are still more likely to be deemed as poor than males. We also use a regression-based method to impute the missing values on health deprivation and calculate an Individual MPI (results available on request).[12] The overall conclusion and the extent of the gap between men's and women's poverty rates remain similar.

Next, we ask if our conclusions are robust to a range of weights. To test this, we estimated individual MPI using three additional weighting schemes: (1) giving 50 percent to education and 25 percent each to health and standard of living, (2) giving 50 percent to health and 25 percent each to education and standard of living, to equalize the weight of the expansive education indicator and the restrictive nutrition one to 25 percent each and (3) giving 50 percent to the standard of living and 25 percent each to education and health. Within each dimension, all indicators got equal weights, except aspects that had time use indicators.[13] We find that women are significantly worse off than men in all the three alternative weighting schemes.

We investigate if our findings are robust to changes in the poverty cutoff (k). To do that we use the complementary cumulative distribution function (CCDF)—the complement of a cumulative distribution function introduced for this analysis by Alkire and Seth (2015). The CCDF tells us the proportion of population above any value b and helps us determine the proportion of the population who will be

[12]We use logistic regression with socio-economic indicators (age, sex, education, marital status, caste, religion, household consumption) and information on deprivation of other household members to predict the missing values.

[13]In the case of water and cooking the access indicator and time use indicator got half of the weight assigned to each standard of living indicator.

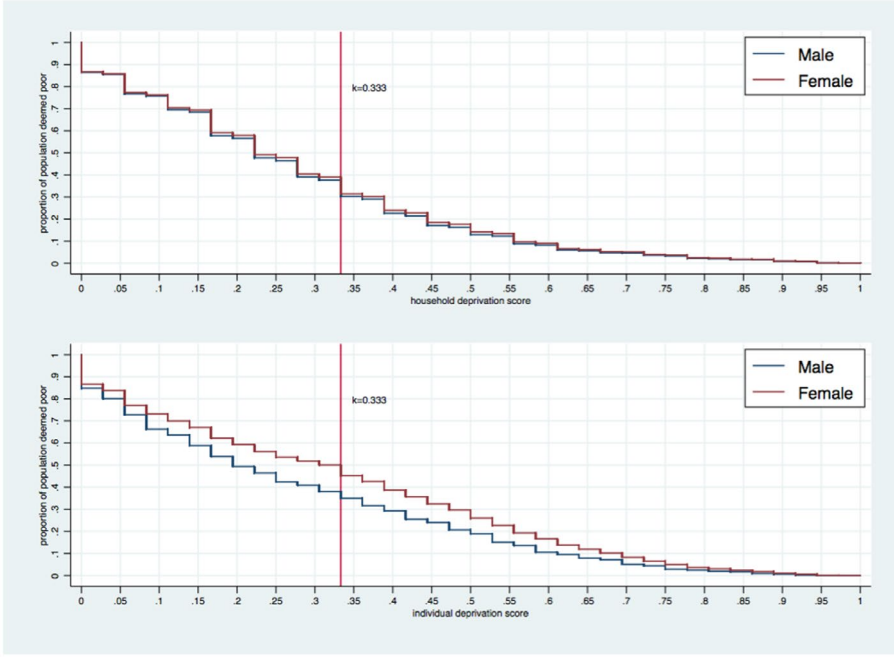

Figure 1. Multidimensional Poverty Headcount for Various Values of Deprivation Score Cutoff by Gender [Colour figure can be viewed at wileyonlinelibrary.com]

deemed poor if the poverty cutoff is set to b i.e. $k = b$. Alkire and Seth (2015) show that if we find first-order stochastic dominance between CCDF's for two distributions c and c', then we can claim that distribution c has no lower multidimensional headcount ratio H and adjusted headcount ratio than distribution c' for all values of k. Figure 1 plots the CCDFs for men and women for various values of k and we find that the distribution for women dominates that of men.

Finally, we investigate whether indicator comparability problems across generations impact our results. We calculate an individual MPI for adults and find that women are more deprived as compared to the case of MPI for all age groups (MPI for women is 51 percent more than men in an adult only MPI measure; Table 7) and also compared to the household MPI.

5. Conclusion

In this paper, we contribute to the literature on multidimensional poverty measurement by proposing and applying an individual multidimensional poverty measure for India. We find that existing multidimensional poverty measures use household-based assessments for multidimensional poverty measurement, even though individual achievement data are available for some dimensions of well-being. The use of household-based thresholds based on individual achievement data leads to biases in multidimensional poverty assessment. In the Indian case, we find

that household-based MPIs substantially understate poverty, gender inequality, inequality in deprivation across the population, and differentials by age groups. Such misclassification could also affect assessments of poverty trends and targeting. While targeting based on regions or groups other than age or gender would not be very seriously biased when using a household-based measure, targeting based on gender and age groups would. And using the incidence of female-headship as a sign of gendered poverty would be deeply misleading.

Our analysis can only be seen as the first step in this direction. We are only able to individualize deprivation data in some dimensions where available data allow such disaggregation. Following our findings from India, we are, therefore, likely to understate inequalities in deprivation, particularly in a developing country context. More data would be required, for example, the individualize deprivation in morbidity as well as possession and use of assets. Moreover, our assessment relies on some assumptions about group-based deprivations that are required to create individual deprivation measures for everyone in the household. Clearly here, alternative approaches (such as assessment of individual deprivation by groups) are a possible alternative, as are different assumptions to create deprivation scores for everyone.

But we have demonstrated that the neglect of intra-household inequality is a serious issue and seriously underestimates in the Indian case multidimensional poverty and inequality in deprivation.

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Supporting Information

Additional supporting information may be found in the online version of this article at the publisher's web site:

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Appendix 1: Inequality in Individual vs. Household-Level Deprivations
Appendix 1 Table 1: Inequality in Deprivations (Scenario b)
Appendix 1 Table 2: Inequality in Deprivations (Scenario c)
Appendix 1 Table 3: Inequality in Deprivations (Scenario d)
Appendix 2 Table 1: MPI Measure for Household and Individual Indicators by Sex and Various Household and Individual Characteristics
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Appendix 3 Table 1: Correlates of Individual MPI Deprivation Score
Appendix 3 Table 2: Correlates of Household MPI Deprivation Score