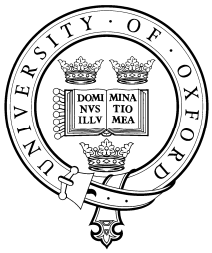
Oxford Poverty & Human Development Initiative (OPHI)
Oxford Department of International Development
Queen Elizabeth House (QEH), University of Oxford



OPHI WORKING PAPER NO. 15

Measuring Multidimensional Poverty in India: A New Proposal

Sabina Alkire[1] and Suman Seth[2]

September 2008 [rev. May 2009]

Abstract

This paper focuses on the methodology by which India's 2002 Below the Poverty Line (BPL) census data identify the poor and construct a BPL headcount. Using the BPL 2002 methodology and NFHS (National Family Health Survey) data, it identifies which rural families would have been considered BPL were NFHS (National Family Health Survey) data used. It compares these to poor families that would be identified using the same variables with the Alkire Foster multidimensional poverty methodology. It finds that up to 12 per cent of the poor sample population and 33 per cent of the extreme poor could be misclassified as non-poor by the pseudo-BPL method.

The paper also develops a sample Index of Deprivation that responds to criticisms regarding BPL data. We compare these results with income poverty and with pseudo-BPL status for sample respondents and disaggregate the index by state and break it down by dimension.

Keywords: India, BPL, poverty measurement, multidimensional poverty, capability approach, poverty indices.

JEL classification: I3, I32.

[1] Oxford Poverty & Human Development Initiative (OPHI), Queen Elizabeth House (QEH), Department of International Development, 3 Mansfield Road, Oxford OX4 1SD, UK +44 1865 271915, sabina.alkire@qeh.ox.ac.uk

[2] Department of Economics, Vanderbilt University, VU Station B#351819 2301 Vanderbilt Place, Nashville, TN 37235, USA, +1 615 383 6910 suman.seth@vanderbilt.edu

This study has been prepared within the OPHI theme on multidimensional measurement.

OPHI gratefully acknowledges support for its research and activities from the Government of Canada through the International Development Research Centre (IDRC) and the Canadian International Development Agency (CIDA), the Australian Agency for International Development (AusAID), and the United Kingdom Department for International Development (DFID).

ISSN 2040-8188 ISBN 978-1-907194-14-6

Acknowledgements

We are grateful to participants in the 16 June 2008 OPHI research meeting, the 2008 HDCA conference in New Delhi, the WIDER conference on Frontiers of Poverty Research, and to Jean Drèze, Reetika Khera, and Abhijit Sen for comments on previous versions of this draft. Errors remain our own.

The Oxford Poverty and Human Development Initiative (OPHI) is a research centre within the Oxford Department of International Development, Queen Elizabeth House, at the University of Oxford. Led by Sabina Alkire, OPHI aspires to build and advance a more systematic methodological and economic framework for reducing multidimensional poverty, grounded in people's experiences and values.

Oxford Poverty & Human Development Initiative (OPHI)
Oxford Department of International Development
Queen Elizabeth House (QEH), University of Oxford
3 Mansfield Road, Oxford OX1 3TB, UK
Tel. +44 (0)1865 271915 Fax +44 (0)1865 281801
ophi@qeh.ox.ac.uk http://ophi.qeh.ox.ac.uk/

1. Introduction

One of the principal objectives of post-independence Indian development planning has been to eradicate poverty, thus improving the lives of those battered by deprivation and suffering. This goal is important in itself and also in turn strengthens social, political, and economic outcomes. Although this objective has remained constant, the mechanisms for addressing it have evolved. To improve the effectiveness and timeliness of policy, recent attention has focused both on direct deprivations and on income poverty. In some cases, this is because data on deprivations can be gathered more quickly than income data and at lower cost; in other cases, this arises from a direct interest in deprivations for which income poverty is an insufficient proxy. This paper explores how the measurement of multiple deprivations may be strengthened and made more relevant for policy.

Initially, Indian poverty measures were unidimensional and based on income or expenditure. From 2002, India identified rural households as 'below the poverty line' (BPL) according to a thirteen-item census questionnaire. The 2002 census process was subsequently accused of corruption and low data quality and coverage. The methodology was subject to criticisms because of the weighting and aggregation processes, and the content of the thirteen-item survey was challenged.

Informed by such criticisms, this paper draws on the 2005/6 National Family Health Survey (NFHS). First, it explores concerns over BPL data quality. Next, we use the NFHS dataset, which is arguably of better quality, to match the dimensions in the rural BPL census and find ten plausible matching indicators. We construct a pseudo-BPL score using the current methodology, and compare this with the identification and aggregation methodology proposed by Alkire and Foster (2007). Their identification strategy addresses some weaknesses of BPL. Also, it goes beyond the BPL, because it can be disaggregated and therefore provide policy guidance at the village, block, or district level as to the components of deprivation. Using a decomposable measure would make much better use of BPL census data at minimal extra cost. For example, poverty in Orissa is driven more by deprivations in the quality of air the household members breathe in and nutrition, whereas deprivation in assets figures more strongly in Rajasthan. In both states, a lack of women empowerment, lack of access to sanitation, and lack of education is widespread. Comparing the BPL and Alkire and Foster methodologies leads to different results. If all else were equal, according to our measure, as many as 33 per cent of extremely poor rural Indians would not have received a BPL card using the 2002 BPL method.

To respond to the criticisms regarding data content in the BPL survey, the paper subsequently presents an illustrative index of multiple deprivations that employs nine variables, each of which represent policy goals in the 11th plan. Once again, the results are compared with income poverty and with pseudo-BPL status. Finally, the poverty rates are disaggregated by state and broken down by dimension. The paper demonstrates that an alternative measurement methodology is able to specify the composition of multidimensional poverty in any given state or group and to guide policy concretely and specifically.

The paper proceeds as follows: The second section provides a brief history of poverty measurement in India and describes how Indian poverty measurement methodologies moved from being single dimensional to multidimensional. In the third section, we provide the theoretical framework of BPL 2002, which is the key approach implemented by the Indian government, and critically evaluate the process drawing on existing literature. The fourth section describes an improved multidimensional methodology for identification and measurement proposed by Alkire and Foster (2007). The fifth section describes the NFHS data and our construction of pseudo-BPL measures and of AF measures.

The sixth section compares the 2002 BPL approach with AF methodology. The seventh section develops an Index of Deprivation, using NFHS data, which responds to criticisms regarding the data content in the BPL. We compare these results with income poverty and with pseudo-BPL status for sample respondents. The final section summarizes our findings and concludes.

2. Poverty Measurement Methodologies: Brief Review

This section provides a brief history of poverty measurement mechanisms since independence. Under the first four quinquennial plans, the government of India aimed to reduce income poverty by pursuing a high rate of economic growth measured solely in terms of the per capita gross domestic product. The rate of economic growth, however, was insufficient to cause a sharp fall in income poverty across all states and, consequently, for the first two and a half decades, the income poverty rate hovered between 38 per cent and 57 per cent without any particular trend. The official measure of poverty for that entire period was based on income.[1]

In the early 1970s for the first time, the basic minimum needs approach gained prominence. The Planning Commission appointed a Task Force on Projections of Minimum Needs and Effective Consumption Demand that defined the rural poverty line as the per capita consumption expenditure level, based on a minimum calorie intake in rural and urban areas. Thus although poverty measurement remained in income space, the basis of poverty measurement evolved from the income-based approach to the basic-needs-based approach (Foster and Sen 1997). According to the recommendation of the task force, the minimum basic food intake requirement for the rural and the urban habitants was 2,400 calories and 2,100 calories, respectively[2]. Based on these minimum calorie requirements, the minimum required subsistence income levels were determined for different regions. These minimum required income levels were used as regional poverty thresholds.

To improve the effectiveness and timeliness of policy, recent attention has focused on specific deprivations besides income poverty. To target services to the most needy, the government developed a measure by which families were categorized as living 'below the poverty line'. Since 1992, three successive BPL censuses (1992, 1997, 2002) identified rural families that are below the poverty line and thus eligible for government support such as subsidized food or electricity and schemes to construct housing and encourage self-employment activities. Each BPL census applied a unique identification technique. The first BPL survey in 1992 gathered self-reported income data and used the all-India income poverty line to identify BPL households. This generated very high estimates of rural poverty (52.5 per cent). Moreover, this approach was based on income data, which may be less accurate than consumption data (Atkinson and Micklewright 1983, Grosh and Glewwe 2000).

To improve upon the 1992 methodology, the 1997 BPL census used expenditure and multiple criteria rather than income data alone and excluded the visibly non-poor. It had two parts. The first part was administered to all rural households and identified as 'visibly non-poor' households who met certain requirements. If the household was not registered as visibly non-poor, it was administered a survey, which gathered basic socio-demographic information, as well as household characteristics and

[1] Radhakrishna and Ray (2005), Ravallion and Datt (2002).

[2] The Planning Commission (1979).

consumption expenditures over the past thirty days. However, critics including a subsequent Expert Review, criticised the 1997 methodology for four reasons. First, the exclusion criteria were too stringent (the possession of a single ceiling fan was grounds for exclusion). Second, poverty lines for all states/union territories were lacking. Third, the BPL criteria were not uniform across states; hence, the interstate comparison was difficult. Finally, there were no procedures available to add new families to the BPL lists for five years.[3] Furthermore, the non-poor households were identified according to their resources rather than what household members were capable of being and doing. This is the fundamental distinction between the needs-based approach and the capability approach of Amartya Sen.

The next section describes the 2002 BPL methodology in detail and identifies both strengths and shortcomings.

3. Below the Poverty Line (BPL) 2002: Methodology and Critiques

In 2002, a set of non-income questions were asked to rural households, and the responses were used to identify those households that were qualified to receive BPL cards. No additional analysis was conducted using the census dataset other than the identification of BPL card holders. How did this proceed?

3.1 2002 BPL Methodology

The 2002 rural BPL census comprises thirteen questions for each household, covering topics such as food, housing, work, land ownership, assets, education, and so on.[4] Depending upon the response category selected, the household is assigned a score (0–4) for each variable. A household's score is then summed to create an aggregate score S_i where $0 \leq S_i \leq 52$. A poverty cut-off z_s is fixed at the state level or at lower levels for the aggregate score. Households falling below that area's z_s are identified as 'BPL'. At the state or union level, a further limit was fixed: the number of households identified as BPL was limited to 10 per cent above the BPL figures estimated in 1999–2000.

Like every other poverty measure, the 2002 BPL methodology involves two components: the identification of the poor and the aggregation of the data into a single poverty index (Sen 1976). Let us define the notation we will use in describing the 2002 BPL method. Let us assume that there are N households in the economy and the welfare of each household is measured using D dimensions. The achievements of the households in the entire society are summarized by an $N \times D$ dimensional matrix X. The set of all $N \times D$ dimensional matrices is denoted by $\mathbf{X}$. The symbol '$\mathcal{N}$' stands for the set of non-negative integers. The sum of entries in any given vector or matrix a is denoted by $|a|$, while $\mu(a)$ is used to represent the mean of a. The achievement of the n^{th} household in the d^{th} dimension is denoted by x_{nd} for all $d = 1,\ldots,D$ and $n = 1,\ldots,N$.

---

[3] Ministry of Rural Development, Government of India (2002); Hirway (2003); Jalan and Murgai, (2007); Sundaram, (2003).

[4] These questions and the response categories are reprinted as Appendix 1 of this paper.

The first stage of the BPL method identifies which households are multidimensionally poor. Let us designate the set of categories for the d^{th} dimension by $I_d \in \mathcal{N}$ with i_d being the highest integer for all d.

At first, an $N \times D$ matrix H is constructed from matrix X, where h_{nd} is the nd^{th} element of H such that $h_{nd} \in I_d$ for all d and for all n. For example, the n^{th} element in the d^{th} dimension can take any value between zero and i_d such that $0 \leq h_{nd} \leq i_d$. Each household is, thus, provided a score in each dimension based on their achievement in that particular dimension. The overall welfare score of the household is calculated by summing the dimensional scores. The welfare score of the n^{th} household is denoted by $S_n = \Sigma_{d=1}^{D} h_{nd}$. The minimum possible welfare score is zero and the maximum possible welfare score is $\hat{S} = \Sigma_{d=1}^{D} i_d$. Therefore, $0 \leq S_n \leq \hat{S}$ for all n. A household is identified as poor if the welfare score of that household lies below a certain threshold, which is called a poverty line or a poverty cut-off and is denoted by z. The n^{th} household is poor and identified as 'below the poverty line' if $S_n < z$ and non-poor otherwise.

After identifying the poor, an N-dimensional vector $s = (s_1,\ldots,s_N)$ is created such that $s_n = 1$ if $S_n < z$ and $s_n = 0$ otherwise for all n. In other words, s is a vector containing only zeros and ones. An element is equal to one if the corresponding household is poor and zero if the household is non-poor. Finally, the BPL poverty rate is equal to:

$$P_{\text{BPL}} = \frac{\left(\Sigma_{n=1}^{N} s_n\right)}{N}.$$

We can think of each BPL question as a dimension of social welfare, i.e. $D = 13$. The response to each question comprises five categories, i.e. $I_d = \{0, 1, 2, 3, 4\}$ for all d. The worst category is assigned a score of zero, whereas the best category is assigned a score of four. In the three intermediate categories a higher value implies a better category. The score for the n^{th} household in the d^{th} dimension is equal to h_{nd}, where $0 \leq h_{nd} \leq 5$ for all d and for all n. The minimum possible overall welfare score is zero and the maximum possible overall welfare score is $\hat{S} = 52$, i.e. $0 \leq S_n \leq 52$ for all n. Households falling below that area's poverty cut-off (these vary by state or district) are identified as 'BPL'.

3.2 Critiques of the BPL Process

The 2002 BPL results have come under fierce criticism from many sides (including Hirway 2003, Jalan and Murgai 2007, Mukherjee 2005, Sundaram 2003, among others). The criticisms might be roughly divided into three kinds: methodological drawbacks in identification and aggregation, data quality and corruption, and issues of data content.

3.2.1 Methodological drawbacks in identification and aggregation

The main methodological criticisms of the BPL indicator are as follows:

1) *Cardinalization* – The method by which the response variables are summed into a welfare score S_n is problematic for the following reasons: First, the raw data are categorical, and their ordering might be disputed. Yet even if one agrees with the ordering of the responses, the *distance* between the responses for each dimension is not known. There is no justification for assuming the distance between each category to be uniform.

Furthermore, the inter-dimensional comparison of scores presumes cardinality across dimensions. For example, a household is assigned a score of two if either the household members enjoy one (not two) square meals per day throughout the year or if the household includes one person with a graduate or professional diploma. However, these two situations do not appear to reflect the same degree of deprivation. In a country where about 60 per cent of students drop out before completing secondary education, a household with a graduate diploma is reasonably well off. Nevertheless, a household seems less likely to be well nourished if the entire household survived on only one square meal a day for the entire year. The cardinalization of ordinal data in this way is, thus, both technically problematic and practically misleading.

2) *Complete substitutability across dimensions* – A second and related problem is that the scores for the 13 dimensions are aggregated into a single overall score such that $S_n = \Sigma_{d=1}^{D} h_{nd}$, and the poor identified according to a cut-off set across the aggregate score, $S_n < z$. This simple aggregation is equivalent to treating all dimensions as perfect substitutes. A one-point gain in one dimension can be compensated by an equivalent one-point decrease in *any* other dimension, at any other level of achievement. Once again, this seems practically misleading. The problem can be explained in terms of the poverty focus axiom and the deprivation focus axiom.[5] According to the poverty focus axiom, if there is an increase in any dimension among the non-poor the poverty rate should remain unchanged. According to the deprivation focus axiom if there is an increase in any dimension in which a household is not deprived (whether the household is poor or non-poor) the poverty rate remains the same. Although the BPL does not identify deprivation thresholds, intuitively the BPL method satisfies the poverty focus axiom, but not the deprivation focus axiom.

   Consider a household in Uttar Pradesh that is marginally poor as it requires only one point to move above the BPL poverty line. Among other achievements, the household owns 5 hectares of un-irrigated land but survives normally on one square meal per day but on less than one square meal occasionally. The household is deprived in terms of food security but is not deprived in terms of land holding. Note that if the household owned 5.1 hectares of land it would score '4' rather than '3' in that dimension. Further, this change in score in a non-deprived dimension would increase its aggregate score, hence pull it *above* the BPL poverty line. The total substitutability among the BPL dimensions at all levels appears to be particularly undesirable given their equal weight and the problems in data content detailed below.

3) *Equal weighting of dimensions* – The thirteen dimensions are combined using equal weights. This implies the normative assumption that each dimension makes an equally important, equally valuable contribution to poverty. But no justification for these weights is provided. Jalan and Murgai argue that the relative weights on dimensions should also be allowed to vary across states, with education being differently weighted in Bihar and Kerala, for example. Alternatively, in a different context, Atkinson argues that the dimensions should be chosen explicitly such that they are roughly equal in normative (ethical) importance.[6] Sen and others argue that the weights, being value judgements, must be subject to public discussion (Sen 1996, 2004).

---

[5] For formal definition of the poverty and deprivation focus axioms, see Alkire and Foster (2007).

[6] A.B. Atkinson et al. (2002).

4) *Varying poverty lines* – No national poverty line is set; rather states and in some cases districts set their own poverty line across the 52-point scale. Jain observes that the district poverty line varies from 12–15 in Madhya Pradesh, driven by the need for each district to match 'the "already declared" proportion of poor in that district'. In that situation, the fact that the BPL status of a family with 14 points depends only upon its district level quota in 2000 seems rather difficult to defend, particularly when the poverty quotas are controversial, which is our next point. While there is no easy response to this situation, the need for flexibility and state autonomy must be balanced against the need to maintain uniform standards.

5) *Imposed Poverty Quotas* – To ensure that the numbers of BPL households did not exceed fiscal resources, the states' BPL estimates were capped such that they could not exceed the NSSO 1999–2000 estimates by more than 10 per cent. This particular cap has been widely disputed, because BPL is not measuring income poverty. Using the 1999–00 and 2004–05 NSS datasets, Jalan and Murgai (2007) find that identification of the poor through the BPL 2002 method is an inadequate proxy for consumption poverty. 'The BPL score misclassifies *nearly half* (49 per cent) of the [consumption] poor as non-poor, and conversely, 49 percent of those identified as BPL poor are actually [consumption] non-poor. Even in the "best" state, Orissa, 32 per cent of the poor are misclassified while in the worst state, Andhra Pradesh, three out of every four poor people are misclassified as non-poor based on the BPL indicator' (p. 7). As Hirway argues, given the multidimensional approach of the BPL census, 'There is no reason why the two estimates should match, and there is no logic in reducing the estimates of poverty of one kind to match the other kind of poverty!' (p. 4804). While clearly there are needs to impose some limits for reasons of fiscal constraints and accuracy, the use of 1999–2000 NSS data creates errors of inclusion and exclusion in states.

In addition to these five criticisms, there are two additional methodological criticisms.

6) *Neglect of Intensity of Poverty Across Households* – The BPL method is not sensitive to the inequality in terms of the range of deprivations BPL households suffer. In a region with high inequality among the poor, the BPL method does not provide the policy maker information on who among the BPL are extremely poor rather than marginally poor. However, the extreme poor might claim special priority either in terms of targeting or level of provision of government services.

7) *High cost; low policy impact* – Fielding a rural census of households is costly and results in potentially powerful data to guide policy even at very local areas. Unfortunately, the BPL measure makes very rudimentary use of the BPL data. The current BPL identification provides an aggregate headcount, but this cannot be decomposed to show the composition of poverty in different villages, blocks, and districts – or for different cultural groups or kinds of households. Such analysis is extremely important for policy as it allows a policy maker to understand the components of poverty for each group and thus to craft an effective and efficient response.

In addition to methodological criticisms of the BPL measure itself, many criticize the data quality, as well as the contents of the BPL survey. Our next two sections survey these criticisms.

3.2.2 Corruption, Data Quality, and Data Coverage

'Targeting', Hirway observed, 'is not a statistical exercise, but is a major political activity' (p. 4804). Because households identified as BPL access multiple benefits, Hirway observes, there is 'a mad rush in

our villages to be enrolled as BPL households'. Concretely, 'the rich and powerful in a village frequently pressurises the talati and the sarpanch to include their names in BPL lists' (p. 4805, see also Khera 2008); poor households may not be interviewed, their interviews may be distorted, and they may not be able to convince the local elite to include their names on the list. Jain gives particular examples of poor data quality: 'Charua Singh was excluded from the BPL list because the enumerator had filled up the form without visiting Charua's house' (Jain p. 4982). Jain also argues that pavement dwellers, who have no address for the BPL ration cards, households displaced by riots and communal violence, manual scavengers, and communities involved in caste-based prostitution, are systematically excluded from BPL status.

Corruption crowds out the poor from BPL card ownership. Drawing on village level studies in Rajasthan, Khera reports the striking finding that 44 per cent of poor households did not have a BPL card, and 23 per cent of those with a BPL card were non-poor. Hirway finds 11–18 per cent of the 1997 BPL list members in Gujarat are clearly local elite, and 14 per cent of the poor households were excluded from the BPL lists. Further, the truly poor (rather than the mis-classified elite) had greater difficulty in using their BPL status effectively to enjoy all its intended benefits. In participatory social assessments in West Bengal, Mukherjee found that 'in some villages the [BPL] list had been manipulated to the extent of 50 per cent with the inclusion of many non-poor households' (Mukherjee p. 12). The manipulation appeared to occur after the survey, through corruption: 'Though door-to-door BPL survey was conducted the final outcomes in terms of the BPL list shocked many genuine poor in terms of not finding their names on the list' (Mukherjee p. 12).

Although some crosschecks were successful in revising BPL lists to correct inaccuracies, others were infiltrated. For example, a triangulation process had been set up to verify the BPL results, in that the BPL list was to be read out in the gram sabha so that inaccuracies could be addressed and a revised list read out at a second meeting. But in Jain's Madhya Pradesh case study, this crosscheck rarely functioned. 'In Petlawad, the block level panchayat officials declared the first list as final and entertained no grievances; the Kotma block panchayat officer refused to disclose the list in public…As per the study of 100 panchayats, it was found that in 67 panchayats, no second gram sabha meeting was organised for approving the list…' (Jain p. 4983).

It is true that the case studies are dispersed and anecdotal. But as the 2002 BPL census did not have explicit mechanisms to correct for distortions in the 'situations where the poor are not powerful enough to assert themselves and the administration is not strong enough to identify the poor correctly' (Hirway p. 4806), the grave doubts about data quality seem worth exploring further.

3.2.3. Data Content and Periodicity

Even if the thirteen 2002 BPL indicators had been implemented accurately and without corruption, a number of authors argue that the outcomes would still be inaccurate. In the case study from Madhya Pradesh, Jain and the Alliance Campaign for Good Governance argue that the BPL 2002 had 'inappropriate indicators'. They argue that even if the dimensions were justifiable (a separate question), the indicators should have taken into account the quality of land, the size of house, whether clothes were provided as gifts, and the quality as well as number of meals eaten per day.

In addition, the BPL census focuses mainly on resources (land, house, clothing, food, bathroom, consumer goods, loans, 'want from government'), rather than on capabilities – the things that households are able to do and be (be nourished, be healthy). The education questions come closest to

approximating capabilities. The difficulty with resources, as Amartya Sen argues, is that the capabilities a physically disabled household or a pregnant mother are able to achieve from a given bundle of resources (2 kgs rice and a bicycle, for example) may be very different than the capabilities others could achieve. Concretely, Jain observes that the BPL systematically excludes certain categories of people such as the disabled, who may score above the poverty line in the space of resources (fan, clothes, or bicycle) but not be able to enjoy basic capabilities. Given the diversity of people's ability to convert resources into capabilities, if development aims at expanding capabilities the constituent indicators should, when possible, focus directly on capabilities (such as nutritional status) rather than resources (number of meals).

Another striking aspect of the BPL survey, which has not received sufficient critical comment, is the response structures. The response structure on the status of the household labour force will systematically regard female-headed households as more deprived, which is understandable (although it is unclear what score will be given if women and men both work and why that might be inferior to men alone working). However, if a household is unable to work because of illness, disability, or unemployment, they may respond 'other' and thus be given the *least* deprived score of four, which seems aberrant. A similar difficulty is evident in the response structure 'means of livelihood'. Both Sunadaram (2003) and Jalan and Murgai find the ordering of the livelihood category problematic – for example, it assumes that a small business household (e.g. an artisan) is *always* better off than one employed in agriculture (e.g. a landowner). Also a household that has 'no indebtedness' scores the value of four, regardless of whether they have no loan because they are socially marginalized (drug addicts), and family and banks will not lend to them, or because they are sufficiently wealthy not to require a loan.

The rankings of the last two dimensions are particularly confusing. In the case of reason for migration from the household, the logic of ordering is not transparent. While many poor households are migrants, the more educated, more empowered are also subject to migratory pressures and many rural poor are 'left behind'. Yet according to this response structure, a nuclear Bengali family whose son is a high profile software engineer residing in Bengaluru (earlier well-known as Bangalore) would receive a score of two, whereas a family of bonded labourers that has not migrated anywhere would receive the score of three.

The final question of BPL is 'preference of assistance from government'. It is not evident how responses will reveal information regarding the respondent's own socio-economic status. There is no proper justification as to why a family seeking assistance on housing would receive higher score than a family seeking assistance for skill upgradation. Moreover, responses will be influenced by respondents' assessment of government capabilities. This is a discrete variable in which the elements are difficult to order at all; the BPL practice of ascribing a cardinal meaning to the resulting scores merits review. From the discussion of the last few paragraphs, it is evident that some of the response structures are in fact misleading and require the introduction of more useful dimensions of social welfare.

A further and distinct set of criticisms refer to the fact that the BPL surveys are only conducted every five years, but households' economic status can shift rapidly, and transient spells of poverty affect many households. Unless there are ways to update the BPL status between surveys, even if the initial identification of BPL households was accurate, it is certain to become inaccurate over time. The likely magnitude of that inaccuracy could be important to consider.

This section has enumerated in detail the tremendous challenges that were encountered in the 2002 BPL census process. A number of these challenges, relating to corruption and to the census instrument, have been the focus of other accounts and surely will be addressed in the next BPL census. The remainder of this paper focuses on the methodological criticisms above and suggests an alternative.

4. Multidimensional Poverty: A New Methodology

A Planning Commission Report from the Working Group on Poverty Alleviation (2006) explicitly took a 'multi-dimensional view of poverty' (p. 18) which it also calls a 'multiple deprivation' view (p. 24) rather than a norm based on calories or income. It interpreted the 2002 BPL not as a proxy means for income or expenditure poverty but rather as a direct measure of multidimensional poverty that encompasses expenditure poverty and goes beyond it.[7] The report explicitly stated that 'the possibility of conflict between the magnitude of poverty as revealed by the BPL surveys and as estimated on the basis of NSS surveys… need not be a major issue…' (p. 25).

This approach is consistent with other empirical work, which has identified the inherent value of multidimensional poverty measures for guiding policy.[8] Many have argued that human poverty and deprivation go beyond income or ownership of material wealth (Drèze and Sen 2002). Yet even in this case, direct attention to other variables such as education, health, and nutrition might not be required if income were a sufficient proxy for these outcomes and if policies to reduce income poverty consistently reduced other deprivations. Unfortunately, this is not necessarily the case now any more than in the early periods after independence. Since liberalization, India has enjoyed a strong rate of economic growth. Yet human development indicators remain uneven weak.[9] The first page of the 11th plan of India states concern: 'the National Family Health Survey-3 (NFHS-3) shows that almost 46 per cent of the children in the 0 to 3 years' age group suffered from malnutrition in 2005–06, and what is even more disturbing is that the estimate shows almost no decline from the level of 47 per cent reported in 1998 by NFHS-2.'[10] More generally, across developing countries, Bourguignon finds 'little or no correlation between growth and the non-income MDGs' (Bourguignon et al. 2008). Another reason to use indicators in addition to income is that some families experience multiple deprivations, whereas others are deprived only in one dimension. Clearly the multiply deprived should be targeted. For these reasons, it is useful to explore measures of human deprivation that can identify households with multiple deprivations. Finally, it is useful to see the leading components of deprivation in different states and districts, as analysis of such data can be used to design the most effective sequence of interventions.

In the previous section, we critically evaluated the BPL approach. In our first criticism towards BPL approach, we pointed out the methodological drawbacks of the identification and aggregation process. This section is devoted to addressing these methodological weaknesses and proposing a recent methodology for multidimensional poverty measurement developed by Alkire and Foster (2007). The

---

7 Government of India Planning Commission (2006).

8 Ruggeri-Laderchi et al. (2003), C. Ruggieri-Laderchi (2008).

9 Right-to-Food-Campaign (2006). See also Drèze et al. (2007) and Drèze and Sen, (2002).

10 Planning Commission, Government of India. (2007).

Alkire and Foster (AF) method was selected because it addresses the methodological concerns of the current BPL aggregation method discussed in the previous section in the following ways:

1) *Valid treatment of ordinal data.* The AF measure is suitable for ordinal data. By applying dimension-specific cut-offs, households are classified as either deprived or non-deprived in that dimension. This has the effect of dichotomising ordinal data and thus avoids the problem of cardinalization.

2) *Poverty and Deprivation Focused.* By applying cut-offs to each dimension, each household is judged to be deprived or not in that household independently of its achievements in other dimensions. Thus, we do not have a situation of perfect substitutability where an increase in landholdings from 5 to 5.1 hectares can compensate a decrease from one square meal per day to complete food insecurity. Rather, multidimensional poverty status only depends upon dimensions in which households are deprived.

3) *Equal or general weights.* It is possible to weight the dimensions equally, or, to weight indicators and dimensions differently, or indeed to explore several weighting structures and the robustness of the BPL status according to variable weights.

4) *Ability to target the poorest of the poor progressively.* By adjusting the second cut-off k, it is possible to identify and target those households that are deprived in three, four, five, or more dimensions.

5) *Poverty lines can be fixed or flexible.* In our example, we have used the same deprivation cut-offs nationally both for each deprivation and across deprivations. However, these could be fixed at district or state levels if that were deemed more appropriate.

6) *Highly informative for policy.* Finally and most importantly, in the current BPL measure, the census data are used solely to designate households as BPL or APL (Above the Poverty Line). However using the AF measure, the BPL population of any state or ethnic group can be scrutinised to see what deprivations drive their multidimensional poverty. This information, taken together with other analyses made possible by the same data hence at minimal extra cost, can inform policy. Using the AF measure, responses can be tailored to the composition of poverty in different states or districts, making them more efficient and effective.

4.1. Alkire and Foster Methodology

As in the discussion of BPL methodology, consider a society with N households[11] and D dimensions. Let $\mathbf{X}$ denote the set of all $N \times D$ matrices and $X \in \mathbf{X}$ represents an achievement matrix of a society[12], where x_{nd} is the achievement of the n^{th} household in the d^{th} dimensions for all $d = 1,\ldots,D$ and $n = 1,\ldots,N$. The n^{th} row and the d^{th} column of X are denoted by $x_{n\bullet} = (x_{n1}, \ldots, x_{nD})$ and $x_{\bullet d} = (x_{1d}, \ldots, x_{Nd})$. The row vector $x_{n\bullet}$ summarizes the achievements of household n in D dimensions; whereas, the column vector $x_{\bullet d}$ represents the distribution of achievements in the d^{th} dimension across N households. We denote the D-dimensional deprivation cut-off vector by $\mathbf{z}$ where the deprivation cut-off for the d^{th} dimension is indicated by z_d .

Corresponding to any $X \in \mathbf{X}$, an $N \times D$ dimensional deprivation matrix g^0 is constructed, where the nd^{th} element is denoted by g^0_{nd} . Any element of g^0 can take only two values as follows:

$$g^0_{nd} = \begin{cases} 1 \text{ if } x_{nd} < z_d \\ 0 \text{ if } x_{nd} \geq z_d \end{cases} .$$

In other words, the nd^{th} entry of the matrix is equal to one when the n^{th} household is deprived in the d^{th} dimension and is equal to zero when the household is not deprived. From matrix g^0, we construct an N-dimensional column vector C of deprivation counts such that the n^{th} element $c_n = | g^0_n |$ represents the number of deprivations suffered by the n^{th} household. If the dimensions in X are cardinal, then we construct a normalized gap matrix g^1, where the nd^{th} element is:

$$g^1_{nd} = \begin{cases} (z_d - x_{nd})/z_d \text{ if } x_{nd} < z_d \\ 0 \qquad\quad \text{otherwise} \end{cases} .$$

By construction, $g^1_{nd} \in [0,1]$ for all n and all d, and each element gives the extent of deprivation experienced by the n^{th} household in the d^{th} dimension. The generalized gap matrix is denoted by g^α, with $\alpha > 0$. The nd^{th} element of g^α is denoted by g^α_{nd} , which is the normalised poverty gap raised to the power α.

Now, we are in a position to provide an outline of the class of multidimensional poverty measure proposed by Alkire and Foster (2007). The first stage of multidimensional poverty measurement is to identify the poor. Most existing poverty measures identify the poor either by the union approach or by the intersection approach. According to the union approach, a household is identified as poor if the household is deprived in at least one dimension. On the other hand, a household is identified as poor according to the intersection approach if the household is deprived in all dimensions. Note that the

---

11 In this paper, we focus on households rather than individuals as the unit of analysis in order to parallel the BPL methodology; it is of course possible to focus instead upon individuals.

12 They could be nations, states, or any geographic region.

2002 BPL method does not follow either of these approaches. If dimensions are equally weighted,[13] the multidimensional approach proposed by Alkire and Foster identifies a household as poor if the household is deprived in at least k dimensions where $k = 1,\ldots,D$.

Let us define the identification method ρ_k such that $\rho_k(x_{n\bullet}, \mathbf{z}) = 1$ if $c_n \geq k$, and $\rho_k(x_{n\bullet}, \mathbf{z}) = 0$ if $c_n < k$. This implies that a household is identified as multidimensionally poor if the household is deprived in at least k number of dimensions. Note that for $k = 1$, the identification criterion is equivalent to the union approach; whereas, the identification criterion is the same as the intersection approach for $k = D$. The set of multidimensional poor, according to this identification criterion, is defined by $Z_k = \{n : \rho_k(x_{n\bullet}, \mathbf{z}) = 1\}$. A censored matrix $g^0(k)$ is obtained from g^0 by replacing the n^{th} row with a vector of zeros whenever $\rho_k(x_{n\bullet}, \mathbf{z}) = 0$. An analogous matrix $g^\alpha(k)$ is obtained for $\alpha > 0$, with the nd^{th} element $g^\alpha_{nd}(k) = g^\alpha_{nd}$ if $\rho_k(x_{n\bullet}, \mathbf{z}) = 1$, while $g^\alpha_{nd}(k) = 0$ if $\rho_k(x_{n\bullet}, \mathbf{z}) = 0$.

Based on this identification method, Alkire and Foster define the following poverty measures: The first natural measure is the percentage of individuals who are multidimensionally poor. Analogous to the single-dimensional headcount ratio, the multidimensional headcount ratio is defined by $H(X; \mathbf{z}) = Q/N$, where Q is the number of individuals in set Z_k. This measure has the advantages of being easily comprehensible and estimable. Moreover, this measure can be applied using ordinal data. Unfortunately, it is completely insensitive to the intensity and distribution of poverty, as first noticed by Watts (1969) and Sen (1976) in the single-dimensional context. It also fails to satisfy the properties of transfer and monotonicity. Moreover, in the multidimensional context, it violates *dimensional monotonicity*. Alkire and Foster describe this problem as follows: if a household already identified as poor becomes deprived in an additional dimension in which the household was not previously deprived, H does not change. Finally, this measure is not flexible to dimensional decomposition, which is often useful for policy recommendation.

To overcome the limitations of the multidimensional headcount ratio, Alkire and Foster propose the class of dimension-adjusted FGT measures, defined by $M_\alpha(X; \mathbf{z}) = \mu(g^\alpha(k))$ for $\alpha \geq 0$. For $\alpha = 0$, the class of measures yields Adjusted Headcount Ratio, defined by $M_0 = \mu(g^0(k)) = HA$. The adjusted headcount ratio is the total number of deprivations experienced by all poor households divided by the maximum number of deprivations that could possibly be experienced by all households and is formulated by $|c(k)|/ND$. It can also be expressed as a product between the percentage of multidimensional poor (H) and the average deprivation share across the poor given by $A = |c(k)|/QD$. In other words, A provides the fraction of possible dimensions D in which the average multidimensionally poor household is deprived. In this way, M_0 summarises information on both the incidence of poverty and the average extent of a multidimensional poor household's deprivation. This measure is as easy to compute as H and can be calculated with ordinal data, but it is indeed superior to H since it satisfies the property of ***dimensional monotonicity*** described above.

When some data are cardinal, the class of dimension-adjusted FGT measures also yields the Adjusted Poverty Gap, given by $M_1 = \mu(g^1(k)) = HAG$, which is the sum of the normalised gaps of the poor ($|g^1(k)|$) divided by the highest possible sum of normalised gaps (ND). It can also be expressed as the product between the percentage of multidimensional poor households (H), the average deprivation

[13] Equal weights are presented first for simplicity; we discuss general weights below.

share across the poor (A) and the average poverty gap (G), where $G = |g^1(k)|/ |g^0(k)|$. M_1 summarises information on the incidence of poverty, the average range of deprivations and the average depth of deprivations of the poor. It satisfies not only dimensional monotonicity, but also monotonicity: if an individual becomes more deprived in any dimension in which they are already deprived, M_1 will increase.

Finally, for $\alpha = 2$, the class of measures yields the Adjusted Squared Poverty Gap, defined by $M_2 = \mu(g^2(k)) = HAS$, which is the sum of the squared normalised gaps of the poor ($|g^2(k)|$) divided by the highest possible number of normalized gaps (ND). It can also be expressed as the product between the percentage of multidimensionally poor (H), the average deprivation share across the poor (A) and the average severity of deprivations (S), which is given by $S = |g^2(k)|/ |g^0(k)|$. M_2 summarises information on the incidence of poverty and the average range and severity of deprivations of the poor. If a poor household becomes more deprived in a certain dimension, M_2 will increase more the larger the initial level of deprivation was for this individual in this dimension. This measure satisfies both types of monotonicity principles, transfer, and is sensitive to the inequality among the poor as it emphasizes the deprivations of the poorest.

All members of the M_α family are decomposable by population subgroups. Given two separate achievement matrices X_1 and X_2, with population size of N_1 and N_2, respectively, the overall poverty level for $N = N_1 + N_2$ individuals is obtained by:

$$M(X_1, X_2; \mathbf{z}) = \frac{N_1}{N} M(X_1; z) + \frac{N_2}{N} M(X_2; \mathbf{z}).$$

Clearly, this can be extended to any number of subgroups. All members of the $M_\alpha(X; \mathbf{z})$ family can be broken down into dimensional subgroups as $M_\alpha(X; \mathbf{z}) = \sum_{d=1}^{D} \mu(g^\alpha_{*d}(k))/D$, where g^α_{*d} is the d^{th} column of the censored matrix $g^\alpha(k)$. It is a very convenient break-down property; $\mu(g^\alpha_{*d}(k))/M_\alpha(X; \mathbf{z})$ can be interpreted as the post-identification contribution of the d^{th} dimension to overall multidimensional poverty.

The M_α family of measures are neutral to inter-dimensional interaction. If one achievement matrix is obtained from another achievement matrix by an *association decreasing rearrangement among the poor* (see also Atkinson and Bourguignon 1982, Boland and Proschan 1988, and Tsui 1999, 2002), both of them yield the same level of poverty. The additive form enables the family of measures to evaluate the achievement of each household in each dimension unrelated to the achievements in the other dimensions. In this sense, the M_α family of measures is analogous to the first group of measures of Bourguignon and Chakravarty (2003).

4.2. Weighting

Apart from identification and aggregation, another important challenge in multidimensional poverty measurement is how to weight different dimensions. The weights implicitly indicate the dimensional importance and/or policy priority. In the analysis, until now, the dimensions were presented as if they were equally weighted. Equal weights is an arbitrary and normative weighting system that is appropriate in some, but not all, situations (A.B. Atkinson et al. 2002). In many other cases, some dimensions are believed to be more important than others, hence are to receive a relatively higher weight. Thus, we

move from equal weights to unequal weights. Fortunately, the M_α family can be easily extended to a more generalized form that considers unequal weighting structures.

Let w be a D-dimensional row vector with the d^{th} element being equal to w_d, which is the weight associated with the d^{th} dimension such that $|w| = D$. We define the $N \times D$ dimensional matrix $g^\alpha(w_d)$ with the nd^{th} element being equal to g^α_{nd} that takes two values as follows:

$$g^\alpha_{nd}\left(w_d\right) = \begin{cases} w_d \left(\left(z_d - x_{nd} \right) / z_d \right)^\alpha & \text{if } x_{nd} < z_d \\ 0 & \text{otherwise.} \end{cases}$$

The weighted column vector C of deprivation counts can be obtained with the n^{th} element being equal to $c_n = | g^0_{n\square} |$; c_n varies between 1 and D. In this situation, the dimensional cut-off for the identification step is real number k, such that $0 < k \leq D$, instead of k being a positive integer. When $k = \min\{w_d\}$, the criterion is nothing but the union approach, whereas, $k = D$ yields the intersection approach. Also note that if $w_d = 1$ for all d then the weighting structure turns out to be the equal weighting structure. After the multidimensionally poor are identified, the identification method is denoted by ρ_k such that $\rho_k(x_{n\bullet}, \mathbf{z}; w_d) = 1$ when $c_n \geq k$, and $\rho_k(x_{n\bullet}, \mathbf{z}; w_d) = 0$ when $c_n < k$. Finally, a censored matrix $g^0(k, w_d)$ is obtained from $g^0(w_d)$ by replacing the n^{th} row with a vector of zeros whenever $\rho_k(x_{n\bullet}, \mathbf{z}) = 0$. An analogous matrix $g^\alpha(k, w_d)$ is obtained for $\alpha > 0$, with the nd^{th} element $g^\alpha_{nd}(k, w_d) = g^\alpha_{nd}\left(w_d\right)$ if $\rho_k(x_{n\bullet}, \mathbf{z}; w_d) = 1$, while $g^\alpha_{nd}(k, w_d) = 0$ if $\rho_k(x_{n\bullet}, \mathbf{z}; w_d) = 0$. The class of dimension-adjusted FGT measures is defined by $M_\alpha(X; \mathbf{z}; w_d) = \mu(g^\alpha(k; w_d))$ for $\alpha \geq 0$.

Having introduced the new methodology, we now compare it to the methodology applied in the 2002 BPL process. Our empirical results draw on the National Family Health Survey dataset for the period of 2005–06, which is introduced in the next section.

5. Data

The National Family Health Survey (NFHS-3) for the year 2005/06 has been collabouratively conducted by the International Institute for Population Sciences (IIPS), Mumbai, India; ORC Macro, Calverton, Maryland, USA; and the East-West Center, Honolulu, Hawaii, USA. The survey interviews 124,385 women aged 15–49 and 74,369 men aged15–54 from 109,041 households and from all 29 states of India including Delhi. Unlike the previous two surveys, NFHS-3 interviews never-married women, never-married men, and ever-married men in addition to ever-married women. Besides collecting information on household characteristics, such as housing structures, access to sanitation, water sources, and assets, the survey collects data on individual characteristics, such as level of education and health status of the respondents. Numerous questions in the survey are analogous to the questions asked in the BPL questionnaire. This allows us to make a comparison between the BPL method and AF method of poverty measurement. We list all the related questions in Table 1.

In order to compare NFHS data with findings for the rural BPL population, we focus on rural areas. The reason for this is that the rural BPL survey is uniform and distinct from urban BPL methods. The NFHS includes data from men and women in 58,805 rural households. As the unit of analysis for the

BPL method is households instead of individuals, we keep households as our unit of analysis. In this paper, we weight the households by the nationally representative sample weight provided in the dataset (See Appendix 3).

6. The BPL 2002 Identification Method versus the AF Identification Method

In this section, we use the NFHS-3 dataset to compare the identification technique of the BPL 2002 method to that of the AF method. First, we select dimensions or variables to match the BPL questionnaire as closely as possible and report the descriptive statistics. We then replicate the 2002 BPL score structure using the chosen set of variables and identify the households that are poor using this pseudo-BPL method. Finally, we compare the pseudo-BPL results to the AF results for the same set of variables drawn from the same database.

6.1. Matching Dimensions, Indicators, and their Poverty Cut-offs

We select NFHS variables or questions that match, as closely as possible, those present in the 2002 BPL questionnaire (Appendix 1). The match is not perfect, and no proxy is available for three of the questions, thus our comparison is affected by the differences in dimensions. In the first three columns of Table 1, we summarize the questions asked in the BPL questionnaire and the analogous questions asked in the NFHS-3 questionnaire. It is evident from Table 1 that 10 out of 13 questions in the NFHS-3 are analogous to the BPL questions. Out of the ten questions, some are directly matched; the rest are obtained by manipulating several other questions.[14] The 2005/6 NFHS is not able to match BPL questions 3, 12, and 13.[15] The chosen variables restrict the sample size to 42,717 households, which contain 238,179 persons from 28 states of India. We exclude Delhi from our analysis because Delhi primarily consists of urban areas and our analysis focuses on rural areas. Note that all results are corrected for population weights. The fourth column of Table 1 reports the dimension-specific headcount poverty rates[16], which gives us an idea of the deprivation rates in each dimension. It is evident from Table 1 that a majority of the rural-Indian population is deprived in three dimensions: sanitation, land, and loan.

[14] For detailed description of the related NFHS variables and the corresponding poverty cut-offs please see Appendix 2.

[15] The earlier version of NFHS contained information on how many clothes households in the household owned, but the current version of the survey does not ask that question.

[16] Note that the poverty rates are calculated in terms of the proportion of individuals instead of the proportion of households. We first identify the households that are deprived in a particular dimension and assume that all members in those households are deprived in that dimension. Thus, the poverty rate is the proportion of sample population in the deprived households to total sample population.

Table 1: NFHS-3 Questions Analogous to BPL Questions and Dimensional Headcount Ratios

BPL Questions	**Relevant NFHS-3 Questions**	**Dimensions**	**Percentage Population Deprived (NFHS)**
1. Size group of operational holding of land	Acres of irrigated and un-irrigated and agricultural land holdings	Land	70
2. Type of house	Type of house	Housing	18
3. Average availability of normal wear clothing	N/A	–	–
4. Food security	Body mass index of the respondent	Food Security	44
5. Sanitation	Type of toilet facility	Sanitation	77
6. Ownership of consumer durables	Access to different assets	Asset	31
7. Literacy status of the highest literate adult	Highest education level attained by the family members	Education	26
8. Status of the household labour force	Number of hours the children worked for household and non-household members (5–14)	Labour	16[17]
9. Means of livelihood	Occupation of the respondent and her partner	Occupation	29
10. Status of children (5–14 years) [any child]	The reason why the children do not go to school (5–14)	Child Status	07[18]

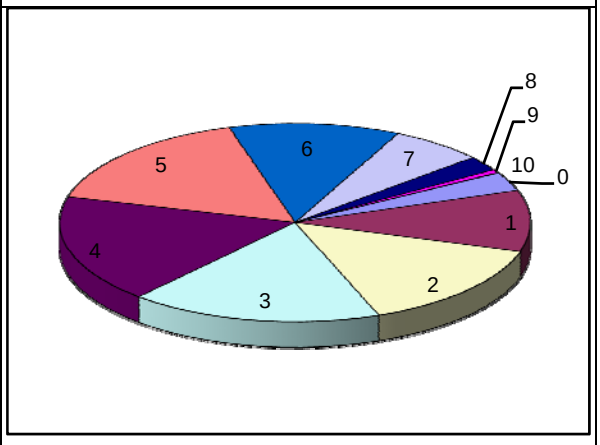
[17] There are 68.9% households consisting of at least one child in the age group of 5–14 and 19.9% of them contain at least one child labourer.

[18] Out of the 68.9% households containing at least one child within the age group of 5–14 years, 9.04% contain at least one child that does not attend school.

11. Type of indebtedness	Anyone in the household has a bank or post office account	Loan	64
12. Reason for migration from household	N/A	–	–
13. Preference of Assistance	N/A	–	–

As the analysis of poverty in this paper is multidimensional, one might be interested in the breadth of poverty. A household that is deprived in one dimension may not be deprived in any other dimension. In contrast, a household could be deprived in eight out of ten dimensions. Both households are deprived in at least one dimension. Does it mean that they are equally poor? The answer is indeed no. The breadth of deprivation for the latter household seems more intense. Thus, it would be interesting to explore the breadth of poverty among the rural-Indian population. In other words, it would be useful to see how many people are deprived in one dimension, in two dimensions, and so on. In the first column of Table 2, we report the exact number of dimensions in which any particular household is deprived. For example, 9.99 per cent of the sample are deprived in exactly one dimension (it does not matter which one) and not deprived in the other nine dimensions. The second column reports the percentage of people deprived in exactly that many dimensions. In the third column, we provide a pie chart to diagrammatically visualize the distribution of the breadth of multi-dimensional poverty.

Table 2: Indicators and Cut-offs of the Chosen Dimensions

Number of Dimensions	Percentage of Poor	Pie-Chart Distribution of Dimensional Poverty Rates
0	3.08%	
1	9.99%	
2	14.48%	
3	17.31%	
4	17.64%	
5	16.32%	
6	11.74%	
7	6.40%	
8	2.42%	
9	0.54%	
10	0.07%	

Total	**100.00%**	

As we can see from Table 2, only 3.08 per cent of the rural population is not deprived in any dimension. If identification of poor is based on the union approach, then 96.9 per cent of all rural people would live in poverty. Recall that a household is identified as poor by the union approach if the household is deprived in *at least* one dimension, whereas a household is identified as poor according to the intersection approach if the household is deprived in *every* dimension. Nearly 32 per cent of the rural population is deprived in either two or three dimensions. Roughly a third of the rural population is deprived in either four or five dimensions. Also observe that any poverty index based on the intersection approach would judge India as almost poverty free (0.07 per cent). The BPL process neither follows the union approach nor the intersection approach, but an intermediate approach in a peculiar way (see section 3.1).

6.2. Under-coverage Rate and Over-coverage Rate

In comparing our measure with the pseudo BPL measure, it would be useful to identify persons who are classified as poor according to one measure and non-poor by the other. These can be called over-coverage and under-coverage.

Let us denote the total household population by N. The number of poor based on the pseudo-BPL approach is denoted by N_{By} and the number of non-poor is denoted by $N_{Bn} = N - N_{By}$. We define $p_{By} = N_{By}/N$ and $p_{Bn} = N_{Bn}/N$, where p_{By} and p_{Bn} are the proportion of poor and non-poor identified by the pseudo-BPL method. Let the proportion of poor and non-poor identified by the AF method be denoted by p_{My} and p_{Mn}, respectively. These concepts are summarized in Table 3.

Table 3: Definition of Over-coverage and Under-coverage

Poor by AF Method / Poor by pseudo-BPL method	Yes	No	Total
Yes	p_{yy}	p_{Byn}	p_{By}
No	p_{Myn}	p_{nn}	p_{Bn}
Total	p_{My}	p_{Mn}	1

The row denotes the proportion of households identified as poor versus those identified as non-poor by the pseudo-BPL method. The column, on the other, denotes the proportion of households that are poor according to the AF method versus that are not poor according to the same method. The following four terms denote the interaction between these two distinct methodologies:

p_{yy} : The proportion of households that are identified as poor by both methodologies

p_{nn} : The proportion of households that are identified as non-poor by both methodologies

p_{Byn} : The proportion of households that are identified as poor by the pseudo-BPL method but are classified as non-poor by the AF method

p_{Myn} : The proportion of households that are identified as non-poor by the pseudo-BPL method but are classified as poor by the AF method

The *under-coverage rate* is defined by the percentage of sample population that are identified as non-poor by the pseudo-BPL method but are actually classified as poor by the AF method to the population that are classified as poor by the AF method. Similarly, *the over-coverage rate* is defined as the percentage of sample population that are identified as non-poor by the AF method but are classified as poor by the pseudo-BPL method to the population that are identified as poor according to the pseudo-BPL method. Thus, from Table 4, the under-coverage rate can be formulated as p_{Myn}/p_{My}; whereas, the over-coverage rate is formulated as p_{Byn}/p_{By}. Intuitively, if 100 persons are identified as poor by the AF method and five of them are misidentified as non-poor by the pseudo-BPL method, then the under-coverage rate is 5 per cent. Similarly, if 100 persons are identified as poor by the pseudo-BPL method and ten of them are actually non-poor according to the AF methodology, then the over-coverage rate is 10 per cent.

6.3. Coverage Rates for the Alternative Methodology

In this section, we compare the coverage rates of both methodologies and find that the AF methodology is able to identify the poor more efficiently than the BPL methodology. To illustrate the differences in coverage, we generate a pseudo-BPL score. The highest possible score for any household is 38. A household is classified as poor based on these ten dimensions if it fails to make a certain score, say z, out of 38 such that $0 \leq z \leq 38$. In Table 4, we summarize the pseudo-BPL poverty rates for various poverty cut-off scores. The first column of Table 4 reports various poverty cut-offs (z). If a household fails to meet a score that is greater than the cut-off, the household is classified as poor (analogous to what is done in BPL-2002 process). In the second column, we report the poverty rates based on the corresponding poverty cut-off reported in the first column.

Table 4: BPL Poverty Rates Calculated from the NFHS-3 Dataset

Poverty Line (z)	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
Pseudo-BPL Poverty Rate	12.7%	16.8%	21.6%	26.9%	32.9%	39.1%	44.9%	51.1%	56.8%	62.2%	67.2%	72.1%

For clarity, simplicity, and to match our analysis with the pseudo-BPL identification method, we primarily restrict the analysis to the multidimensional headcount ratio. According to the AF identification methodology, a household is identified as poor if the household is deprived in a certain number or weighted sum of dimensions only. For the purposes of comparison with the existing BPL measure, we further match the BPL assumption of weighting the dimensions equally. Hence, if the second cut-off (k) is, say, four out of ten dimensions, then a household is identified as poor if the

household is deprived in at least four dimensions. We present the multidimensional headcount ratio (MD Headcount) in Table 5.

Table 5: India: Multidimensional Poverty Measures

Poverty Cut-Off (*k*)	MD HeadCount (H)	Matched Pseudo-BPL Poverty Rate	Under-Coverage	Over-Coverage
3	0.724	0.721 (z = 24)	5.7%	5.3%
4	0.551	0.568 (z = 21)	7.7%	10.4%
5	0.375	0.391 (z = 18)	12.4%	16.1%
6	0.212	0.216 (z = 15)	20.6%	22.1%
7	0.094	0.092 (z = 12)	33.0%	31.1%

In the first column of the table, we report the second cut-off (k), which establishes the minimum number of dimensions a household must be deprived in to be considered poor. In the second column, we report the number of people from the households that are deprived in at least that many dimensions. For example, 55 per cent of the sample population are poor in at least four out of ten dimensions. If the poverty cut-off is five out of ten dimensions, then 38 per cent of the sample population are poor.

The next obvious question is how the AF identification method compares to the pseudo-BPL method. In the third column of Table 5, we report the pseudo-BPL poverty rates that match with the corresponding multidimensional poverty rates. For example, the multidimensional poverty rate for k = 3 (0.72) is close to the pseudo-BPL poverty rate corresponding to z = 24 (0.72) from Table 4. In the fourth and the fifth columns of Table 5, we report the under-coverage rate and the over-coverage rate of the multidimensional headcount method. This is analogous to what we defined in the last subsection and in Table 3.

The findings are striking. The k cut-off that comes closest to approximating the actual 2002 BPL headcount ratio is k = 5. At this headcount, over 12 per cent of the poor do not receive BPL cards, and 16 per cent of those with BPL cards are not poor. If we focus on the poorest households among the BPL population – those deprived in seven or more dimensions (k = 7) – we find that 33 per cent of the extreme poor do not receive BPL cards. While we might have expected the persons who were borderline on either measure to be mis-identified, in fact we find that mis-identification increases with the depth of poverty, which is a disturbing feature. More generally, in the fourth column, we report the percentage of population residing in households that are classified as non-poor by the pseudo-BPL method among the total population residing in households that are identified as poor by the AF method. Similarly, in the fifth column, we report the percentage of population residing in households that are classified as poor by the pseudo-BPL method but are identified as non-poor by the AF method.

The under-coverage rate and the over-coverage rate for M_0 increases because as the cut-off k becomes more stringent, the non-deprived dimensions partially compensate for the deprived dimensions.[19] Even in an environment with no data corruption, the BPL 2002 method would not allocate BPL cards to some of the extreme poor and instead would distribute them among the non-poor.

We can conclude from the analysis in this section that the AF approach is more powerful than the BPL 2002 approach in terms of the identification of poor households. The BPL method has also been criticized due to the data content. It has been argued in section 3 that the poor households cannot be identified properly even if the methodology is implemented without any corruption. In the next section, we propose to choose the dimensions based on the capability approach. We also propose the adjusted headcount ratio as a measurement of overall poverty instead of the simple multidimensional headcount ratio.

7. Towards an Improved Measure: Reflecting Multiple Deprivations

In the last section, we matched the dimensions and weights used in the BPL census to identify the poor households. However, as we observed, the BPL census data content and weighting was subject to serious and reasonable criticism. In August 2008[20], the Deputy Chairperson of the Planning Commission of India stated that an index of deprivation might be constructed to better represent the many faces of poverty. The dimensions might include education, health, infrastructure, clean environment, and benefits for women and children – thus some dimensions not used in the 2002 BPL method. Moreover, poverty should be measured by the deprivation of capabilities (Reddy, 2008). Therefore, in this last section we explore an illustrative improved multidimensional poverty measure that uses existing data but still might better reflect multiple deprivations across India. Naturally, the choice of dimensions, poverty cut-offs, and weights for such an improved measure are value judgements and should be influenced by public debate, as well as by the needs of policy and public sector institutions. If such a set of dimensions were widely agreed upon, then it might be a reasonable expectation that accurate and robust measures of all relevant dimensions would be implemented in national survey processes such as BPL, NSS, and/or NFHS. The process of public discussion and debate, and the enriched data set, would contribute to a measure of poverty that reflects people's multiple deprivations. Using existing data and illustrative dimensions, this final section demonstrates the characteristics of such a measure if it employs the adjusted headcount methodology (M_0) proposed by Alkire et al.

7.1. Dimensions, Indicators, and Cut-offs

First, we present the tentative dimensions, indicators, and cut-offs that will be used in the following analysis. We use NFHS-3 data to select the indicators for nine dimensions, drawing on the article mentioned above but selecting these indicators merely as an illustrative example. The set of dimensions and the set of indicators for the proposed poverty measure are summarized in Table 6; the detailed description of the indicators and the cut-offs can be found in Appendix 4. We chose nine dimensions that are based on eleven indicators.

---

[19] Note that the under-coverage rate and the over-coverage rate would have been identical if we were able to choose the pseudo-BPL poverty rate as exactly identical to the multidimensional headcount ratio.

[20] Hindustan Times, New Delhi, August 19, 2008.

Table 6: Dimensions, Indicators, and the Headcount Ratios

Dimensions	**Indicators**	**Percentage Population Deprived (NFHS)**
1.Living Standard	Housing type	0.18
	Access to electricity	0.44
2. Health	The minimum BMI of one woman in the household	0.44
3. Water & Sanitation	Access to improved sanitation	0.77
	Access to improved drinking water source	0.16
4. Air Quality	Sources of fuel for cooking	0.31
5. Assets	Asset holding	0.31
6. Education	Maximum year of education completed by any member[21]	0.26
7. Livelihood	Occupation of the respondent and her partner	0.29
8. Child Status	Child labour and/or child school attendance	0.20[22]
9. Empowerment	Empowerment of women in the household	0.59

In the last columns of Table 6, we report unidimensional headcount ratios. It is evident that most of the rural Indians (77 per cent) in the sample are deprived in sanitation. This is, as might be expected, slightly higher than the national average, which, according to the Human Development Report 2007 (pg. 253), was 67 per cent. On the Most (84 per cent) of the villagers, however, have access to safe drinking water.

[21] See Basu and Foster (1998).

[22] Among the 68.9% households having at least one child in the age group of 5–14, 24.6% households are deprived in terms of child status.

7.2. Weighting

We use equal weights again for illustrative purposes. Note that two dimensions have two indicators. Therefore, the following dimensions receive equal weights of 11/9 for living standard, sanitation/water, fuel, assets, education, livelihood, electricity, child status and empowerment. We provide nested weights of 11/18 each to the following indicators: housing, electricity, sanitation, and water. We presume that infrastructural facilities should be an important dimension while measuring deprivation. The dimension consists of two crucial indicators – housing and access to electricity – with equal importance. Similarly, sanitation and access to drinking water together create another important dimension for the same purpose.

7.3. Results

In Table 7, we present the number of poor in multiple dimensions, the cut-off based headcount ratios, the adjusted headcount ratios, and average deprivation among the poor using the nested weight. The union approach would identify 92.4 per cent of rural population as poor. On the other hand, the intersection approach leads to an almost poverty-free India. If the poverty cut-off is four out of eleven, 46 per cent of rural population belongs to poor households and it denotes the multidimensional headcount ratio for this particular cut-off. The main criticisms of the multidimensional headcount ratio are that it does not take into account the breadth of multidimensional poverty, does not satisfy dimensional monotonicity, and is not decomposable. Therefore, we propose the adjusted headcount ratio (M_0) as a measure of poverty instead of a multidimensional headcount. For theoretical properties of M_0, see section 4.

We use the cut-off of four out of eleven subsequently, because the multidimensional headcount ratio of 46 per cent is somewhat close to the $1.25 headcount ratio of 42 per cent estimated by the World Bank (Chen and Ravallion, 2005). The third column of Table 7 reports the adjusted headcount poverty rates for different cut-offs. If the poverty cut-off is four out of ten dimensions, then M_0 is 0.244. Recall that $M_0 = HA$. For the poverty cut-off of four out of ten dimensions, H is equal to 0.463 and A is equal to 0.244/0.463 = 0.527. A can be interpreted as the poor being deprived in 52.7 per cent of all dimensions on average. If the union approach is employed then the poor are deprived in 37.9 per cent of all dimensions on average. Thus, the fourth column reports the average depth of poverty among the population from the poor households.

Table 7: Multidimensional Poverty Measures

Poverty Cut-Off (k)	Headcount Ratio (H)	M_0	$A = M_0/H$
3	0.676	0.308	0.456
4	0.463	0.244	0.527
5	0.275	0.166	0.603
6	0.200	0.128	0.642

Until now, our discussion has been at the country level. We now move to state-level analysis. In our NFHS sub-sample, India has 28 states. Table 8 ranks states according to their adjusted headcount poverty ranks, where a household is identified as poor if it is deprived in four out of eleven dimensions. Kerala ranks first and Sikkim, a state in the eastern part of India, registers the second lowest poverty rate according to the M_0 measure. Jharkhand ranks last, where more than 80 per cent of the population are identified as members of poor households. The overall M_0 ranks for states do not vary significantly from headcount ranks. The Spearman's rank correlation coefficient between these two rankings is 0.99. Conversely, the M_0 rank and the NSS income poverty rank among states varies significantly. The Spearman's rank correlation coefficient between these two rankings is merely 0.58. Andhra Pradesh, which ranks fifth in terms of the NSS income poverty line, ranks eighteenth in terms of the adjusted headcount ratio. Similarly, Rajasthan ranks eighth in terms of the NSS income poverty but twenty-fourth in terms of M_0.

Table 8: State-wise Decomposition of Poverty for Unequal Weighting and 4/11 Cut-off

1	2	3	4	5	6	7	8
States	**Population Share of States**	**Headcount Ratio**	**HC Rank**	**M_0 Poverty Ratio**	**M_0 Rank**	**NSS Income Poverty[23]**	**NSS Rank**
Kerala	2.41%	0.056	1	0.026	1	0.132	6
Sikkim	0.06%	0.073	2	0.033	2	0.223	14.5
Mizoram	0.05%	0.088	3	0.040	3	0.223	14.5
Himachal Pradesh	0.73%	0.100	5	0.046	4	0.107	4
Manipur	0.18%	0.100	6	0.046	5	0.223	14.5
Goa	0.07%	0.098	4	0.049	6	0.054	2
Punjab	2.25%	0.149	7	0.071	7	0.091	3
Nagaland	0.13%	0.161	8	0.079	8	0.223	14.5
Tripura	0.41%	0.227	9	0.114	9	0.223	14.5
Jammu and Kashmir	0.88%	0.242	10	0.116	10	0.046	1
Uttaranchal	0.82%	0.244	11	0.118	11	0.408	25
Meghalaya	0.25%	0.258	12	0.129	12	0.223	14.5

23 We report the poverty rates based on Uniform Recall Period (URP) rather than the Mized Recall Period (MRP) since the URP method is the same as the traditional method used in 1993–94 and different from the method pursued in 1999–00. The MRP based method yielded an extremely low level of rural poverty (22%). (Government of India, 2007)

Tamil Nadu	3.72%	0.293	13	0.142	13	0.228	19
Haryana	2.10%	0.306	14	0.152	14	0.136	7
Gujarat	4.14%	0.325	15	0.159	15	0.191	9
Karnataka	4.80%	0.345	17	0.172	16	0.208	10
Maharashtra	6.82%	0.342	16	0.173	17	0.296	21
Andhra Pradesh	6.79%	0.382	18	0.192	18	0.112	5
Arunachal Pradesh	0.11%	0.388	19	0.203	19	0.223	14.5
Assam	2.94%	0.395	20	0.205	20	0.223	14.5
West Bengal	8.54%	0.466	21	0.246	21	0.286	20
Bihar	10.62%	0.503	22	0.254	22	0.421	26
Chhattisgarh	2.62%	0.541	25	0.281	23	0.408	24
Rajasthan	6.51%	0.535	23	0.286	24	0.187	8
Orissa	4.23%	0.537	24	0.288	25	0.468	28
Uttar Pradesh	17.86%	0.612	26	0.332	26	0.334	22
Madhya Pradesh	6.97%	0.629	27	0.344	27	0.369	23
Jharkhand	2.97%	0.823	28	0.489	28	0.463	27
India	**–**	**0.463**	**–**	**0.244**	**–**	**0.283**[24]	**–**

After we compare the ranks of states under different methodologies, it would be interesting to analyze the source and contribution of different dimensions in the overall poverty. In Table 9, we present the decomposition of poverty across different dimensions. It is evident from the table that Sikkim and Kerala have almost same M_0 poverty rates but the source differs radically. For example, the contribution of the education dimension towards the overall poverty in Kerala is merely 1.9 per cent while the contribution of education to Sikkim poverty is nearly 20 per cent. Kerala also performs better in terms of sanitation and fuel but performs much worse in nutrition, assets, and livelihood, compared to Sikkim. West Bengal and Bihar comparisons are now more similar, although the stark differences appear with respect to assets, where West Bengal is much worse, and clean air, where Bihar drags. Comparing Orissa and Jharkhand we find that women's disempowerment is starkly more prominent in Orissa, where poverty is also more strongly driven by poor housing and nutrition. Jharkhand has far

24 The overall rural poverty rate is based on only twenty-eight states of India excluding the rural areas of the capital and union territories. However, the total rural population of the capital and union territories is only 0.25% of the total Indian rural population. Thus, the overall poverty rate excluding those areas remains almost unchanged.

higher contributions from poor asset holdings and livelihoods. This type of decomposition enables the policy makers to make proper policy recommendations.

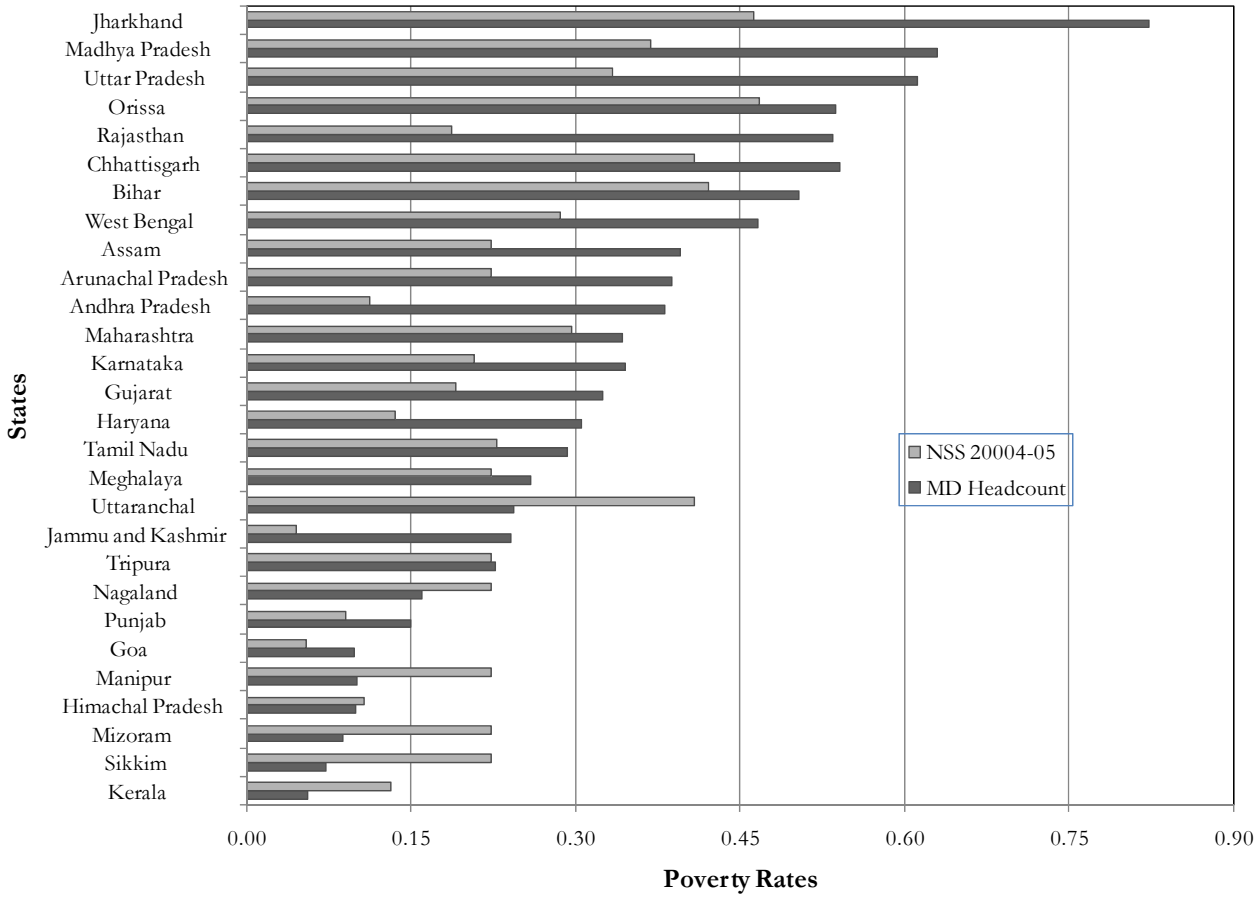
Table 9: Poverty Decomposition by Dimensions

M_0 Rank	State	House	Elect.	Health	Sanit.	Water	Fuel	Asset	Educ.	Liveli.	Child Status	Empow-erment	M_0
1	**Kerala**	0.012	0.034	0.036	0.021	0.031	0.022	0.043	0.004	0.028	0.012	0.038	**0.026**
-	*Break Down*	*2.65%*	*7.38%*	*15.41%*	*4.45%*	*6.74%*	*9.42%*	*18.43%*	*1.92%*	*12.09%*	*5.17%*	*16.34%*	***100.00%***
2	**Sikkim**	0.032	0.038	0.021	0.057	0.036	0.044	0.023	0.059	0.018	0.025	0.026	**0.033**
-	*Break Down*	*5.42%*	*6.35%*	*7.11%*	*9.56%*	*6.05%*	*14.98%*	*7.70%*	*19.72%*	*6.01%*	*8.46%*	*8.63%*	***100.00%***
21	**West Bengal**	0.161	0.400	0.326	0.374	0.056	0.110	0.363	0.285	0.208	0.120	0.305	**0.246**
-	*Break Down*	*3.63%*	*9.05%*	*14.72%*	*8.46%*	*1.27%*	*4.97%*	*16.40%*	*12.89%*	*9.42%*	*5.41%*	*13.80%*	***100.00%***
22	**Bihar**	0.273	0.465	0.358	0.488	0.032	0.249	0.038	0.297	0.173	0.174	0.371	**0.254**
-	*Break Down*	*5.97%*	*10.15%*	*15.63%*	*10.66%*	*0.69%*	*10.88%*	*1.65%*	*13.00%*	*7.54%*	*7.62%*	*16.21%*	***100.00%***
25	**Orissa**	0.270	0.418	0.344	0.528	0.147	0.286	0.197	0.282	0.213	0.140	0.446	**0.288**
-	*Break Down*	*5.21%*	*8.06%*	*13.30%*	*10.20%*	*2.83%*	*11.04%*	*7.61%*	*10.90%*	*8.23%*	*5.40%*	*17.21%*	***100.00%***
28	**Jharkhand**	0.064	0.697	0.488	0.813	0.472	0.544	0.696	0.375	0.492	0.259	0.520	**0.489**
-	*Break Down*	*0.72%*	*7.92%*	*11.10%*	*9.24%*	*5.36%*	*12.36%*	*15.83%*	*8.53%*	*11.19%*	*5.90%*	*11.84%*	***100.00%***
-	**India**	**0.145**	**0.311**	**0.289**	**0.439**	**0.096**	**0.240**	**0.263**	**0.220**	**0.218**	**0.152**	**0.319**	**0.244**
-	*Break Down*	*3.31%*	*7.08%*	*13.15%*	*10.00%*	*2.20%*	*10.95%*	*11.96%*	*10.01%*	*9.93%*	*6.90%*	*14.52%*	***100.00%***

For a graphical visualization of the difference in ranking between the Alkire and Foster methodology and the NSS income poverty ranking, please see Figure 1.[25]

25 It can be seen from Table 7 and Table 8 that the multidimensional headcount ratio for $k = 5$ (28%) is very close to the NSS 2004–05 poverty rate (28%). Therefore, a comparison of ranking for $k = 5$ would have made more sense. However, a subsequent analysis of rank correlation between rankings generated by various k values (Table 10) ensures that a choice of different k would not alter our analysis.

Figure 1: Adjusted Headcount Poverty Ranking Vs.



The final concern is about how robust is the poverty ranking for varying cut-offs. One might argue that the choice of cut-off is arbitrary and might wonder if the M_0 rankings change drastically due to a change in the cut-off. To address this legitimate query, we calculate the M_0 measures for all states for different cut-offs and then we calculate the Spearman's rank correlation coefficients between each pair of rankings for $k = 3,\ldots,8$. From Table 10, it can be seen that the minimum correlation is 0.98 between $k = 3$ and $k = 8$. Therefore, we can conclude that the rankings for varying poverty cut-offs are highly robust. We did not calculate the rankings beyond $k = 8$ because the value of M_0 is very low and with so few observations the rankings could be biased.

Table 10: Spearman's Rank Correlation Matrix for Different M_0 Rankings

Cut-off (*k*)	**3**	**4**	**5**	**6**	**7**
4	1.00	-	-	-	-
5	0.99	1.00	-	-	-
6	0.99	1.00	**1.00**	-	-
7	0.97	0.97	**0.98**	0.98	-
8	0.96	0.96	**0.96**	0.97	0.98

8. Conclusion

To address the problems of identification and aggregation, using the same NFHS matching dimensions, we applied dimension-specific cut-offs and computed a multidimensional headcount and adjusted headcount measure (M0), using the methodology proposed by Alkire and Foster (2007). We constructed the measure (by way of a second cut-off, specifying the minimum number of dimensions a household must be deprived in to be counted poor). The resulting measure – which matched BPL dimensions but with better data and a more defensible aggregation technique – was then compared with the poverty status identified by a pseudo-BPL approach at the national level. Significant differences appeared, with under-coverage and over-coverage rates of up to 33 per cent, which, despite the differences in dimensions, bears consideration. We also illustrated the policy value of having an aggregation method that generates decomposable multidimensional poverty measures, because they can reveal to any policy maker immediately the poverty priorities in her or his area. If census data were available, such a measure could be calculated at the local level or for different population groups to identify local priorities for public investment and hence inform multisectoral planning.

Finally, the paper addressed the issue of *data content* and also sought to affirm the possibility of a multidimensional index that transparently represents the multiple deprivations people suffer. Naturally, the final selection of dimensions, weights, and cut-offs for a national poverty measure requires significant public discussion as well as the generation of new data to match the dimensions of interest. However, for illustrative purposes we tentatively selected nine dimensions and eleven indicators that may improve upon the BPL dimensions. We included empowerment because of its intrinsic importance, although data for this dimension remains weak.

The nine dimensions were living standard (housing, electricity), health, water and sanitation, air quality the household members breathe in, assets, education, livelihood, child status, and empowerment. We computed the measure using these dimensions, compared it with 2004/5 NSS levels, and decomposed it by state (Table 9). The results are striking and informative. Multidimensional poverty in Jharkhand is driven by asset deprivation, low air quality, and poor quality of work, with nutritional deficits and disempowerment also contributing significantly. In Gujarat, nutrition ranks as the leading contributor to poverty, followed by deprivations in women's empowerment and air quality.

While clearly further analysis is required, the multidimensional poverty methodology implemented in this paper can be used not only to identify the poor (as NSS or BPL do), but also to see easily what dimensions drive multidimensional poverty among different groups of people.

Appendix 1: Below Poverty Line Survey Questions (2002)

Sl No	Characteristic/ Questions	Scores				
		0	**1**	**2**	**3**	**4**
1	**Size group of operational holding of land**	Nil	Less than 1 ha of un-irrigated land (or less than 0.5 ha of irrigated land)	1–2 ha of un-irrigated land (or 0.5–1 ha of irrigated land)	2–5 ha of un-irrigated land (or 1.0–2.5 ha of irrigated land)	More than 5 ha of un-irrigated land (or 2.5 ha of irrigated land)
2	**Type of house**	Houseless	Kachha	Semi-pucca	Pucca	Urban type
3	**Average availability of normal wear clothing (per household in pieces)**	Less than 2	2 or more, but less than 4	4 or more, but less than 6	6 or more, but less than 10	10 or more
4	**Food Security**	Less than one square meal per day for major part of the year	Normally, one square meal per day, but less than one square meal occasionally	One square meal per day throughout the year	Two square meals per day with occasional shortage	Enough food throughout the year
5	**Sanitation**	Open defection	Group latrine with irregular water supply	Group latrine with regular water supply	Clean group latrine with regular water supply and regular sweeper	Private latrine
6	**Ownership of Consumer durables: Do you own (tick) – TV, electric fan, radio, pressure cooker**	Nil	Any one	Two items only	Any three or all items	All items and/or any one of the following items: computer, telephone, refrigerator, colour TV, electric kitchen appliances, expensive furniture, LMV@/ LCV@, tractor, mechanized two-wheeler/ three-wheeler, power tiller, combined thresher/ harvester [@ 4-wheeled mechanized vehicle]
7	**Literacy status of the highest literate adult**	Illiterate	Up to Primary (Class V)	Completed Secondary (Passed Class X)	Graduate/ Professional Diploma	Post Graduate/ Professional Graduate
8	**Status of the Household**	Bonded labour	Female and children labour	Only adult females and	Adult males only	Others

	Labour Force			no child labour		
9	**Means of livelihood**	Casual Labour	Subsistence cultivation	Artisan	Salary	Others
10	**Status of children (5–14 years) [any child]**	Not going to school and working	Going to School and working			Going to school and not working
11	**Type of indebtedness**	For daily consumption purposes from informal sources	For production purpose from informal sources	For other purpose from informal sources	Borrowing only from Institutional agencies	No indebtedness and possess assets
12	**Reason for migration from household**	Casual work	Seasonal employment	Other forms of livelihood	Non-migrant	Other purposes
13	**Preference of Assistance**	Wage Employment/TPDS (Targeted Public Distribution System)	Self Employment	Training and Skill Upgradation	Housing	Loan/Subsidy more than Rs. One lakh or No assistance needed

*Source: Government of India, Ministry of Rural Development (2002) and Sundaram (2003).

Appendix 2: Dimensions, Indicators, and Poverty Cut-Offs Analogous to Year 2002 BPL Questions[26]

1. **Land: Acres of irrigated and un-irrigated agricultural land holdings**
   This dimension corresponds to *Question 1* in the BPL questionnaire and is asked directly in NFHS-3 survey.

   Question HV244: If owns land usable for agriculture

   Question SH60H: Hectares of agricultural land holding

   Question SH61H: Hectares of land irrigated

   Poverty Cut-off – Less than one hectare of un-irrigated land and 0.5 hectare of irrigated land.

2. **Housing: Type of House**
   This dimension corresponds to *Question 2* in the BPL questionnaire and is asked directly in NFHS-3 survey.

   Question SHNFHS2: House type (Kachha, Semi-pucca, Pucca)

   Poverty Cut-off – Live in a Kachha House.

3. **Food Security: Body mass index of the respondent**
   This dimension corresponds to *Question 2* in the BPL questionnaire that asks how many times the households eat during a day. NFHS-3 does not contain this question, but it does collect information on nutritional intake and body mass index (BMI) of the respondents in the household. We prefer BMI to the nutritional intake of the respondents not merely for convenience but also for the following reasons: First, it is difficult to match the BPL question with NFHS questions regarding specific food types consumed. Second, the body mass index directly represents the nutritional state of a household – which is arguably the desired outcome for which the BPL meal resources are a proxy. Note that BMI data are present for the female only, which is not optimal, but may be acceptable because of the importance of women's health in general. Also, malnutrition among women has not improved over the past decade despite a high rate of growth and reduction in income poverty (Jose and Navaneetham, 2008).

   Question V445: Body mass index for the female respondent

   Poverty Cut-off – The minimum BMI of the women in the household is less than 18.5 Kg/m^2.

4. **Sanitation: Type of toilet facility**
   This dimension corresponds to *Question 5* in the BPL questionnaire and is asked directly in NFHS-3 survey.

   Question HV205: Type of toilet facility (1. Flush – to piped sewer system, 2. Flush – to

[26] The following questions or indicators were gathered from the NFHS-3 questionnaire. Poverty cut-off denotes the situation under which a household is deprived in that dimension.

septic tank, 3. Flush – to pit latrine, 4. Flush – to somewhere else, 5. Flush – don't know where, 6. Pit latrine – ventilated, 7. Pit latrine – with slab, 8. Pit latrine – without slab, 9. No facility/uses bush/field, 10. Composting toilet, 11. Dry toilet, 96. Other)

Poverty Cut-off – Uses Pit latrine – w/o slab, No facility/uses bush/field, Composting toilet, Dry toilet, Other.

5. Asset: Access to different assets

This dimension corresponds to *Question 6* in the BPL questionnaire and NFHS-3 collects information on the ownership of most of these items.

Question SH47B: Has mattress	Question SH47V: Has thresher
Question SH47C: Has pressure cooker	Question SH47W: Has tractor
Question SH47F: Has table	Question HV207: Has radio
Question SH47G: Has electric fan	Question HV209: Has refrigerator
Question SH47I: Has black & white TV	Question HV211: Has motorcycle
Question SH47J: Has colour TV	Question HV212: Has car
Question SH47N: Has computer	Question HV221: Has phone

Poverty Cut-off – Owns any *one* of the following assets: a b/w television, an electric fan, a pressure cooker, or a radio. At the same time, does not own any of the following assets: a refrigerator, a motor cycle, a car, a phone, a mattress, a table, a colour TV, a computer, a thresher, or a tractor.

6. Education: Highest education level attained by the family members

This dimension corresponds to *Question 7* in the BPL questionnaire and NFHS-3 survey contains enough information to replicate the dimension.

Question HV108: Education completed in single years

Poverty Cut-off – Maximum year of education completed by any member is less than five years.

7. Labour: Number of hours the children worked for household and non-household members [age: 5–14]

This dimension corresponds to *Question 8* in the BPL questionnaire that asks about bonded labour and the labour status of women and children in the household, implying that a household is most deprived if any worker is bonded, or if women and the children work. NFHS does not have data on bonded labour. Further, many would dispute the view that women's work-force participation should be treated as a deprivation. However, there is widespread agreement in treating a child's labour force participation as a deficiency for the household. Therefore, we substitute the eighth BPL question by the dimension named

'existence of child labour in the household within the age group of 5–14'.

Question SH24: In past week, number of hours worked for non-HH member [age 5–14]

Question SH27: In past week, number of hours helped with HH chores [age 5–14]

Question SH29: In past week, number of hours did other family work [age 5–14]

Question HV105: Age of household members

Poverty Cut-off – There is at least one incidence of child labour within the age group of 5–14.

8. Occupation: Occupation of the respondent and her partner

This dimension corresponds to *Question 9* in the BPL questionnaire that asks respondents to categorize the means of livelihood for the family. The NFHS survey contains enough information to identify a household by the major occupation of its members.

Question V716: Respondent's occupation

Question V704: Partner's occupation

Poverty Cut-off – The respondent and her partner *both* fall into the following occupation categories: unemployed, agricultural labourer, plantation labourers, simply labourers, and new workers seeking jobs.

9. Child Status: The reason why the children do not go to school (5–14)

This dimension corresponds to *Question 10* in the BPL questionnaire that asks about the status of children in the household – whether they are in school and whether they are in working. We have already created a dimension on child labour. Therefore, we replicate the tenth question by creating a dimension based only on whether the children in the age group of 5–14 go to school.

Question SH22: Main reason not attending school [age 5–18] (1. School too far away, 2. Transport not available, 3. Further education not considered, 4. Required for household work, 5. Required for work on farm, 6. Required for outside work, 7. Costs too much, 8. No proper school facilities, 9. Not safe to send girls, 10. No female teacher, 11. Required for care of sibling, 12. Not interested in studies, 13. Repeated failures, 14. Got married, 15. Did not get admission, 96. Other)

Question HV105: Age of household members

Poverty Cut-off – A household is classified as deprived in the child-status dimension, if any of the children in the age group of 5–14 does not go to school for any reason.

10. Loan: Anyone in the household has a Bank or Post Office account

This dimension corresponds to *Question 11* in the BPL questionnaire that asks for what purposes the household has become indebted and whether the loan is from an informal sector or from institutional agencies. The NFHS does not contain analogous questions, but it has information on whether any member of the household has a bank or a postal account. A household that has access to such an account is more likely to obtain an institutional loan,

but a household without it is more inclined to obtain loan from an informal sector, if at all.

Question HV247: Owns a bank account or post office account

Poverty Cut-off – None of the household members hold a bank or post office account.

Appendix 3: Score Structure of the Ten Matched NFHS-3 Questions

Sl No	Characteristic/ Questions	Scores				
		0	**1**	**2**	**3**	**4**
1	**Size group of operational holding of land**	Nil	Less than 1 ha of un-irrigated land (or less than 0.5 ha of irrigated land)	1–2 ha of un-irrigated land (or 0.5–1 ha of irrigated land)	2–5 ha of un-irrigated land (or 1.0–2.5 ha of irrigated land)	More than 5 ha of un-irrigated land (or 2.5 ha of irrigated land)
2	**Type of house**		Kachha	Semi-pucca	Pucca	
3	**Minimum BMI of the respondent in the household**	Less than 16 Kg/m^2	Higher than 16 Kg/m^2 but less than 18.5 Kg/m^2		Higher than 18.5 Kg/m^2	
4	**Sanitation**	No facility/uses bush/field or others	Composting toilet or dry toilet or share the following type of facilities with others: Pit latrine – ventilated, Pit latrine - with slab, Pit latrine - without slab	Pit latrine - without slab or share the following facilities with others: Flush – to piped sewer system, Flush – to septic tank, Flush – to pit latrine, Flush – to somewhere else, Flush – don't know where	Pit latrine – ventilated, Pit latrine - with slab	Flush – to piped sewer system, Flush - to septic tank, Flush –to pit latrine, Flush – to somewhere else, Flush – don't know where
5	**Ownership of Consumer durables: Do you own (tick) – B/W TV, electric fan, radio, pressure cooker**	Nil	Any one	Two items only	Any three or all items	All items and/or any one of the following items – refrigerator, motorcycle, car, phone, mattress, table, colour TV, computer, thresher, and tractor
6	**Literacy status of the highest literate adult**	Illiterate	Up to Primary (Class V)	Completed Secondary (Passed Class X)	Graduate/ Professional Diploma	Post Graduate/ Professional Graduate

7	**Status of the Household Labour Force**	Only children work and no adult work or no one works	Female and child labour	Only adult females and no child or adult male works	Adult males only	Both adult male and adult female work but no child works
8	**Means of livelihood**	Labourer, others, and no occupation	Agricultural labourer and plantation labourers	Other unskilled and manual except labourer	Clerical and salary	Professional, technical, management, sales, other agricultural employee
9	**Status of children (5–14 years) [any child]**	Not going to school irrespective of working	Going to school and working			Going to school and not working
10	**Bank Account**	No one in the household has bank account				Has bank account

Appendix 4: Dimensions, Indicators, and Cut-Offs for the Deprivation Measure[27]

1. Living Standard

The first dimension represents the living standard of the households. The indicators used to measure this dimension are the type of house[28] and access to electricity.

Question SHNFHS2: House type (Kachha, Semi-pucca, Pucca)

Question HV206: Has electricity

Poverty Cut-off – A household is deprived in terms of housing if the household lives in a kachha house.

A household is deprived of electricity if it does not have access to electricity.

2. Health

This dimension is same as the food security dimension (3) in Appendix 2.

Question V445: Body mass index for the female respondent

Poverty Cut-off – The minimum BMI of the women in the household is less than 18.5 Kg/m^2.

3. Water and Sanitation

This dimension measures the quality of household's access to water and sanitation.

Question HV201: Source of drinking water

Question HV205: Type of toilet facility

Poverty Cut-off – A household is classified as deprived in terms of access to safe drinking water supply if the sources of water are an unprotected well and spring, river, dam, lake, ponds, stream, tanker truck, cart with small tank, bottled water, other.

A household is classified as deprived in the sanitation dimension if the household uses one of the following: pit latrine without slab, no facility/uses bush/field, composting toilet, dry toilet, other.

4. Air Quality

More than 90 per cent of the rural households use solid waste matter as their source of fuel while cooking. But the use of solid waste matter is harmful for the environment and indeed

---

[27] The following questions or indicators were gathered from the NFHS-3 questionnaire. Poverty cut-off denotes the situation under which a household is deprived in a dimension.

[28] The NFHS-3 dataset does not allow us to incorporate the size of the house, which might be an important factor. We do not rely on land holding because the quality of land differs from place to place and not all household owns land.

harmful for household members if they breathe it regularly.[29] Some rural households cook outside or in a separate building; others cook inside, but some, unfortunately, do not have a separate room for cooking. The households that cook inside their living room using solid waste matters face clear respiratory hazards.

Question HV242: Household has separate room used as kitchen.

Question HV226: Type of cooking fuel (1. Electricity, 2. LPG/Natural gas, 4. Biogas, 5. Kerosene, 6. Coal, lignite, 7. Charcoal, 8. Wood, 9. Straw/shrubs/grass, 10. Agricultural crop , 11. Animal dung, 96. Other)

Poverty Cut-off – The household does not have a separate room used as a kitchen and the sources of fuel are coal, lignite, charcoal, wood, straw/shrubs/grass, agricultural crop, animal dung, and other.

5. Assets

This dimension is same as the Asset dimension (5) in Appendix 2.

Question SH47B: Has mattress

Question SH47C: Has pressure cooker

Question SH47F: Has table

Question SH47G: Has electric fan

Question SH47I: Has black & white TV

Question SH47J: Has colour TV

Question SH47N: Has computer

Question SH47V: Has thresher

Question SH47W: Has tractor

Question HV207: Has radio

Question HV209: Has refrigerator

Question HV211: Has motorcycle

Question HV212: Has car

Question HV221: Has phone

Poverty Cut-off – Owns any *one* of the following assets: a b/w television, an electric fan, a pressure cooker, or a radio. At the same time, does not own any of the following assets: a refrigerator, a motorcycle, a car, a phone, a mattress, a table, a colour TV, a computer, a thresher, or a tractor.

6. Education

This dimension is same as the Asset dimension (6) in Appendix 2.

Question HV108: Education completed in single years

Poverty Cut-off – Maximum year of education completed by any member is less than five years.

7. Livelihood

---

[29] See Duflo, Greenstone, and Hanna (2008).

This dimension is same as the Occupation dimension (8) in Appendix 2.

Question V716: Respondent's occupation

Question V704: Partner's occupation

Poverty Cut-off – The respondent and her partner *both* fall into the following occupation categories: unemployed, agricultural labourer, plantation labourers, simply labourers, and new workers seeking jobs

8. Child Status

For any country, one of the biggest assets is the children. Therefore, we incorporate a dimension regarding the status of the child. This dimension consists of the labour status and school attendance status of the children.

Question SH24: In past week, number of hours worked for non-HH member [age 5–14]

Question SH27: In past week, number of hours helped with HH chores [age 5–14]

Question SH29: In past week, number of hours did other family work [age 5–14]

Question HV105: Age of household members

Question SH22: Main reason not attending school [age 5–18] (1. School too far away, 2. Transport not available, 3. Further education not considered, 4. Required for household work, 5. Required for work on farm, 6. Required for outside work, 7. Costs too much, 8. No proper school facilities, 9. Not safe to send girls, 10. No female teacher, 11. Required for care of sibling, 12. Not interested in studies, 13. Repeated failures, 14. Got married, 15. Did not get admission, 96. Other)

Poverty Cut-off – There is at least one incidence of child labour[30] and/or at least one child aged 5–14 does not attend school. [31]

9. Women's Empowerment

The final dimension is the empowerment of women. It has been very difficult to find a variable that adequately represents the empowerment of women. In the NFHS-3 sample survey, respondents were asked several questions related to empowerment and violence, such as: 1) if the woman faces severe, less severe, emotional, or sexual violence; 2) if the woman has the final say in household decision making; 3) when the woman respondent justifies beating; and 4) if the woman is allowed to freely go to certain places. The first two sets of question reduce the number of observations drastically. Given that on some occasions other households were present in the household during interview, the fourth question seems to be a better proxy for woman empowerment than the third as it is more objective. The fourth question asks if they are freely allowed to go to certain places such as the market, health facility, and out of the village. We use this dimension but acknowledge that stronger data are

[30] The NFHS-3 does not allow us to incorporate the labour status of the children in the age group of 15–18.

[31] The households that do not have any children are assumed not to be deprived in this dimension.

necessary to reflect the degree and kinds of empowerment among all household members.

Question S824A: Allowed to go to: market (1. Alone, 2. With someone else only, 3. Not at all)

Question S824B: Allowed to go to: health facility (1. Alone, 2. With someone else only, 3. Not at all)

Question S824C: Allowed to go to: places outside this village/community (1. Alone, 2. With someone else only, 3. Not at all)

Poverty Cut-off – If any woman in the household does not have right to go alone in the market, health facility, and somewhere outside of village.

Appendix 5: Weighted and Unweighted Population

State	Dataset Comparing BPL and M_0		Dataset for The Deprivation Measure	
	Number of Observation	Weighted by Population	Weighted by Population	Weighted by Population
Andhra Pradesh	8,415	16,235	8,455	16,357
Arunachal Pradesh	3,972	250	4,149	262
Assam	8,648	7,009	8,725	7,091
Bihar	9,449	25,449	9,470	25,577
Chhattisgarh	9,310	6,231	9,392	6,304
Goa	4,623	162	4,837	170
Gujarat	7,656	9,694	7,849	9,966
Haryana	8,214	4,997	8,272	5,046
Himachal Pradesh	7,388	1,732	7,476	1,757
Jammu and Kashmir	7,066	2,062	7,267	2,126
Jharkhand	7,404	7,126	7,409	7,151
Karnataka	12,830	11,381	12,990	11,555
Kerala	7,317	5,709	7,405	5,794
Madhya Pradesh	12,352	16,662	12,399	16,772
Maharashtra	9,443	16,218	9,537	16,425
Manipur	7,681	432	7,855	443

Meghalaya	4,123	594	4,190	605
Mizoram	2,857	130	2,877	131
Nagaland	6,584	309	6,607	311
Orissa	10,171	10,005	10,326	10,186
Punjab	8,401	5,326	8,520	5,416
Rajasthan	10,652	15,574	10,694	15,679
Sikkim	3,959	141	3,978	142
Tamil Nadu	8,292	8,907	8,324	8,967
Tripura	4,555	973	4,597	985
Uttar Pradesh	27,862	42,550	28,088	43,014
Uttaranchal	7,546	1,967	7,600	1,986
West Bengal	11,408	20,355	11,493	20,564
India	**238,178**	**238,178**	**240,781**	**240,781**

Appendix 6: Contribution of Each Dimension by State: M_0 for Multiple Deprivations, $k = 4$, Nested Weights

M_0 Rank	States	Population	House	Electricity	Health	Sanitation	Water	Fuel	Asset	Education	Livelihood	Child Status	Empowerment	M_0
1	**Kerala**	5,794	0.012	0.034	0.036	0.021	0.031	0.022	0.043	0.004	0.028	0.012	0.038	0.026
-	*Break Down*	-	*2.65%*	*7.38%*	*15.41%*	*4.45%*	*6.74%*	*9.42%*	*18.43%*	*1.92%*	*12.09%*	*5.17%*	*16.34%*	*100.00%*
2	**Sikkim**	142	0.032	0.038	0.021	0.057	0.036	0.044	0.023	0.059	0.018	0.025	0.026	0.033
-	*Break Down*	-	*5.42%*	*6.35%*	*7.11%*	*9.56%*	*6.05%*	*14.98%*	*7.70%*	*19.72%*	*6.01%*	*8.46%*	*8.63%*	*100.00%*
3	**Mizoram**	131	0.073	0.069	0.035	0.041	0.061	0.083	0.012	0.059	0.020	0.019	0.010	0.040
-	*Break Down*	-	*10.18%*	*9.55%*	*9.65%*	*5.74%*	*8.44%*	*22.96%*	*3.28%*	*16.50%*	*5.50%*	*5.40%*	*2.80%*	*100.00%*
4	**Himachal Pradesh**	1,757	0.015	0.016	0.059	0.098	0.033	0.035	0.062	0.026	0.058	0.018	0.075	0.046
-	*Break Down*	-	*1.81%*	*1.91%*	*14.19%*	*11.84%*	*3.97%*	*8.49%*	*15.07%*	*6.35%*	*13.93%*	*4.25%*	*18.18%*	*100.00%*
5	**Manipur**	443	0.058	0.045	0.040	0.075	0.081	0.058	0.027	0.047	0.012	0.039	0.061	0.046
-	*Break Down*	-	*6.97%*	*5.44%*	*9.55%*	*9.00%*	*9.78%*	*14.07%*	*6.51%*	*11.43%*	*3.01%*	*9.43%*	*14.81%*	*100.00%*
6	**Goa**	170	0.013	0.034	0.069	0.086	0.057	0.049	0.050	0.042	0.067	0.019	0.054	0.049
-	*Break Down*	-	*1.51%*	*3.79%*	*15.52%*	*9.69%*	*6.46%*	*11.11%*	*11.25%*	*9.34%*	*15.06%*	*4.23%*	*12.04%*	*100.00%*
7	**Punjab**	5,416	0.026	0.025	0.074	0.121	0.004	0.070	0.047	0.071	0.113	0.058	0.114	0.071

-	*Break Down*	-	*2.05%*	*1.95%*	*11.72%*	*9.49%*	*0.35%*	*10.98%*	*7.47%*	*11.24%*	*17.77%*	*9.10%*	*17.88%*	*100.00%*
8	**Nagaland**	311	0.129	0.119	0.066	0.125	0.080	0.059	0.063	0.114	0.020	0.055	0.112	0.079
-	*Break Down*	-	*9.02%*	*8.29%*	*9.27%*	*8.77%*	*5.57%*	*8.23%*	*8.74%*	*15.96%*	*2.75%*	*7.72%*	*15.68%*	*100.00%*
9	**Tripura**	985	0.090	0.171	0.149	0.087	0.130	0.074	0.122	0.132	0.101	0.071	0.139	0.114
-	*Break Down*	-	*4.37%*	*8.30%*	*14.53%*	*4.25%*	*6.34%*	*7.21%*	*11.82%*	*12.84%*	*9.86%*	*6.92%*	*13.56%*	*100.00%*
10	**Jammu and Kashmir**	2,126	0.089	0.056	0.128	0.238	0.123	0.085	0.062	0.089	0.171	0.097	0.162	0.116
-	*Break Down*	-	*4.23%*	*2.67%*	*12.19%*	*11.38%*	*5.90%*	*8.13%*	*5.96%*	*8.52%*	*16.29%*	*9.31%*	*15.44%*	*100.00%*
11	**Uttaranchal**	1,986	0.079	0.135	0.147	0.231	0.071	0.108	0.092	0.065	0.101	0.103	0.187	0.118
-	*Break Down*	-	*3.70%*	*6.38%*	*13.86%*	*10.88%*	*3.33%*	*10.19%*	*8.70%*	*6.15%*	*9.56%*	*9.65%*	*17.62%*	*100.00%*
12	**Meghalaya**	605	0.140	0.210	0.070	0.188	0.184	0.055	0.118	0.202	0.150	0.085	0.124	0.129
-	*Break Down*	-	*6.00%*	*8.99%*	*5.98%*	*8.05%*	*7.92%*	*4.73%*	*10.16%*	*17.31%*	*12.88%*	*7.33%*	*10.65%*	*100.00%*
13	**Tamil Nadu**	8,967	0.111	0.096	0.173	0.287	0.024	0.160	0.242	0.116	0.197	0.055	0.075	0.142
-	*Break Down*	-	*4.34%*	*3.78%*	*13.51%*	*11.22%*	*0.92%*	*12.53%*	*18.99%*	*9.07%*	*15.45%*	*4.31%*	*5.87%*	*100.00%*
14	**Haryana**	5,046	0.045	0.085	0.184	0.279	0.019	0.154	0.166	0.116	0.185	0.121	0.229	0.152
-	*Break Down*	-	*1.66%*	*3.12%*	*13.44%*	*10.21%*	*0.70%*	*11.23%*	*12.10%*	*8.47%*	*13.52%*	*8.81%*	*16.74%*	*100.00%*
15	**Gujarat**	9,966	0.019	0.102	0.236	0.320	0.094	0.160	0.072	0.159	0.138	0.191	0.206	0.159
-	*Break Down*	-	*0.65%*	*3.56%*	*16.54%*	*11.19%*	*3.28%*	*11.23%*	*5.04%*	*11.11%*	*9.63%*	*13.37%*	*14.39%*	*100.00%*

16	**Karnataka**	11,555	0.047	0.090	0.227	0.338	0.076	0.184	0.197	0.177	0.136	0.112	0.240	0.172
-	*Break Down*	-	*1.52%*	*2.92%*	*14.69%*	*10.92%*	*2.45%*	*11.87%*	*12.71%*	*11.42%*	*8.77%*	*7.22%*	*15.52%*	*100.00%*
17	**Maharashtra**	16,425	0.029	0.175	0.245	0.332	0.062	0.173	0.224	0.138	0.166	0.105	0.203	0.173
-	*Break Down*	-	*0.92%*	*5.63%*	*15.80%*	*10.70%*	*1.99%*	*11.16%*	*14.41%*	*8.90%*	*10.65%*	*6.79%*	*13.06%*	*100.00%*
18	**Andhra Pradesh**	16,357	0.107	0.089	0.251	0.370	0.038	0.167	0.238	0.232	0.200	0.101	0.240	0.192
-	*Break Down*	-	*3.09%*	*2.57%*	*14.50%*	*10.69%*	*1.11%*	*9.64%*	*13.78%*	*13.42%*	*11.54%*	*5.82%*	*13.85%*	*100.00%*
19	**Arunachal Pradesh**	262	0.321	0.206	0.114	0.301	0.126	0.321	0.227	0.210	0.059	0.206	0.212	0.203
-	*Break Down*	-	*8.81%*	*5.64%*	*6.24%*	*8.24%*	*3.44%*	*17.60%*	*12.45%*	*11.51%*	*3.21%*	*11.27%*	*11.60%*	*100.00%*
20	**Assam**	7,091	0.186	0.376	0.242	0.327	0.168	0.089	0.183	0.229	0.245	0.137	0.191	0.205
-	*Break Down*	-	*5.05%*	*10.20%*	*13.14%*	*8.86%*	*4.56%*	*4.83%*	*9.94%*	*12.40%*	*13.28%*	*7.43%*	*10.33%*	*100.00%*
21	**West Bengal**	20,564	0.161	0.400	0.326	0.374	0.056	0.110	0.363	0.285	0.208	0.120	0.305	0.246
-	*Break Down*	-	*3.63%*	*9.05%*	*14.72%*	*8.46%*	*1.27%*	*4.97%*	*16.40%*	*12.89%*	*9.42%*	*5.41%*	*13.80%*	*100.00%*
22	**Bihar**	25,577	0.273	0.465	0.358	0.488	0.032	0.249	0.038	0.297	0.173	0.174	0.371	0.254
-	*Break Down*	-	*5.97%*	*10.15%*	*15.63%*	*10.66%*	*0.69%*	*10.88%*	*1.65%*	*13.00%*	*7.54%*	*7.62%*	*16.21%*	*100.00%*
23	**Chhattisgarh**	6,304	0.031	0.244	0.355	0.535	0.170	0.288	0.453	0.252	0.194	0.120	0.374	0.281
-	*Break Down*	-	*0.61%*	*4.82%*	*14.06%*	*10.59%*	*3.37%*	*11.39%*	*17.92%*	*9.99%*	*7.67%*	*4.77%*	*14.81%*	*100.00%*
24	**Rajasthan**	15,679	0.260	0.359	0.303	0.528	0.173	0.253	0.340	0.270	0.134	0.237	0.380	0.286

-	*Break Down*	-	*5.05%*	*6.96%*	*11.75%*	*10.25%*	*3.36%*	*9.83%*	*13.18%*	*10.47%*	*5.19%*	*9.21%*	*14.75%*	*100.00%*
25	**Orissa**	10,186	0.270	0.418	0.344	0.528	0.147	0.286	0.197	0.282	0.213	0.140	0.446	0.288
-	*Break Down*	-	*5.21%*	*8.06%*	*13.30%*	*10.20%*	*2.83%*	*11.04%*	*7.61%*	*10.90%*	*8.23%*	*5.40%*	*17.21%*	*100.00%*
26	**Uttar Pradesh**	43,014	0.160	0.506	0.338	0.581	0.063	0.378	0.376	0.213	0.365	0.208	0.454	0.332
-	*Break Down*	-	*2.67%*	*8.47%*	*11.31%*	*9.71%*	*1.05%*	*12.67%*	*12.60%*	*7.14%*	*12.23%*	*6.97%*	*15.19%*	*100.00%*
27	**Madhya Pradesh**	16,772	0.235	0.299	0.375	0.627	0.233	0.419	0.439	0.284	0.239	0.189	0.454	0.344
-	*Break Down*	-	*3.80%*	*4.83%*	*12.12%*	*10.13%*	*3.76%*	*13.53%*	*14.18%*	*9.17%*	*7.72%*	*6.11%*	*14.65%*	*100.00%*
28	**Jharkhand**	7,151	0.064	0.697	0.488	0.813	0.472	0.544	0.696	0.375	0.492	0.259	0.520	0.489
-	*Break Down*	-	*0.72%*	*7.92%*	*11.10%*	*9.24%*	*5.36%*	*12.36%*	*15.83%*	*8.53%*	*11.19%*	*5.90%*	*11.84%*	*100.00%*
-	**India**	**240,780**	**0.145**	**0.311**	**0.289**	**0.439**	**0.096**	**0.240**	**0.263**	**0.220**	**0.218**	**0.152**	**0.319**	**0.244**
-	***Break Down***	**-**	***3.31%***	***7.08%***	***13.15%***	***10.00%***	***2.20%***	***10.95%***	***11.96%***	***10.01%***	***9.93%***	***6.90%***	***14.52%***	***100.00%***

References

Alkire, S. and Foster, J. 2007. 'Counting and Multidimensional Poverty Measures', OPHI Working Paper 7. Oxford University: Oxford Poverty & Human Development Initiative.

Atkinson, A. B. and Micklewright, J. 1983. 'On the Reliability of Income Data in the Family Expenditure Survey'. *Journal of the Royal Statistical Society*. Series A. No. 146. 33–61.

Atkinson, A.B. et al. 2002. *Social Indicators: The EU and Social Inclusion*. Oxford: Oxford University Press.

Basu, K. and Foster, J. 1998. 'On Measuring Literacy', *The Economic Journal,* 108 (451): 1733–49.

Bourguignon, F. and Chakravarty, S. R..2003. 'The measurement of multidimensional poverty', *Journal of Economic Inequality,* 1 (1): 25–49.

Drèze, J. et al. 2007. 'Neglect of Children under Six', *Economic and Political Weekly,* 42 (13): 1066, 224.

Drèze, J. and Sen, A. 2002. *India, development and participation* (2nd edn). New Delhi, New York: Oxford University Press.

Duflo E., Greenstone M. and Hanna R. 2008. 'Cooking Stoves, Indoor Air Pollution and Respiratory Health in Rural Orissa'. *Economic Political Weekly*, August 9: 71–78.

Foster, J. and Sen, A. 1997. 'After a Quarter Century', in A. Sen (ed), *On economic inequality*. Oxford: Clarendon Press.

Government of India. 2007. Poverty Estimates for 2004–05, *Press Information Bureau*. March. New Delhi.

Grosh, M. and Glewwe, P. (eds). 2000. *Designing Household Survey Questionnaires for Developing Countries: Lessons from 15 years of the Living Standards Measurement Study*. Washington D.C.: The World Bank.

Guruswamy, M. and Abraham, R. 2006. 'Redefining Poverty: A New Poverty Line for a New India', *Economic and Political Weekly*. June 24: 2534–2541.

Hirway, I. 2003., 'Identification of BPL Households for Poverty Alleviation Programmes', *Economic and Political Weekly,* 38 (45): 4803–38.

Jain, S. K. 2004. 'Identification of the Poor: Flaws in Government Surveys', *Economic and Political Weekly,* 39 (46): 4981–84.

Jalan, J. and Murgai, R. 2007. 'An Effective "Targeting Shortcut"? An Assessment of the 2002 Below-Poverty Line Census Method', *Mimeo*. New Delhi: World Bank.

Jose, S. and Navaneetham, K. 2008. 'A Factsheet on Women's Malnutrition in India', *Economic Political Weekly*, August 16: 61–67.

Khera, R. 2008. 'Access to the Targeted Public Distribution System in Rajathan', *Economic and Political Weekly,* forthcoming.

Ministry of Rural Development, Government of India. 2002. 'Report of the Expert Group on Identification of Households Below Poverty Line (BPL Census 2002)', New Delhi.

Mukherjee, N. 2005. 'Political Corruption in India's Below the Poverty Line (BPL) Exercise: Grassroots' Perspectives on BPL in Perpetuating Poverty and Social Exclusion', New Delhi: Development Tracks in Research, Training & Consultancy.

Planning Commission, Government of India. 1979. 'Report of the Task Force on Projections of Minimum Needs and Effective Consumption Demand', New Delhi: Perspective Planning Division, Planning Commission, Government of India.

Planning Commission, Government of India. 2006. 'Report of the XI Plan Working Group on Poverty Elimination Programmes', New Delhi.

Planning Commission, Government of India. 2007. *Eleventh Five Year Plan (2007–2012): Inclusive Growth*. New Delhi: Oxford University Press.

Radhakrishna, R. and Ray, S. (eds). 2005. *Handbook of Poverty in India, Perspective, Policies, and Programmes*. New Delhi: Oxford University Press.

Raja, J. C. and Sudarshan, R. 1999. *Income Poverty and Beyond: Human Development in India*. London: Anthem Press.

Ravallion, M. and Datt, G. 2002. Is India's Economic Growth Leaving the Poor Behind? World Bank Policy Research Working Paper No. 2846.

Reddy, S. G. 2008. 'Differently Distorted: The World Bank's 'Updated' Poverty Estimates', *Economic Political Weekly*, October 25: 44–47.

Right-to-Food-Campaign. 2006. *Focus on Children Under Six*. New Delhi.

Ruggeri-Laderchi, C., Saith, R., and Stewart, F. 2003. 'Does It Matter That We Do Not Agree on the Definition of Poverty? A Comparison of Four Approaches', *Oxford Development Studies,* 31 (3): 243–74.

Ruggieri-Laderchi, C. 2008. 'Do Concepts Matter? An Empirical Investigation of the Differences Between a Capability and a Monetary Assessment of Poverty', in F. Comim, M. Qizilbash, and S. Alkire (eds), *The Capability Approach: Concepts, Measures and Applications*. Cambridge: Cambridge University Press.

Sen, A. K. 1996. 'On the Foundations of Welfare Economics: Utility, Capability and Practical Reason'. In F. Farina, F. Hahn and S. Vannucci (eds), *Ethics, Rationality and Economic Behaviour*. Oxford: Clarendon Press: 50–65.

Sen, A. K. 2004. 'Capabilities, Lists and Public Reason: Continuing the Conversation', *Feminist Economics*, 10(3): 77–80.

Sundaram, K. 2003. 'On Identification of Households Below Poverty Line in BPL Census 2002: Some Comments on Proposed Methodology', *Economic and Political Weekly,* 38 (9): 4803–08.

United Nations Development Programme. *Human Development Report 2007/2008: Fighting Climate Change – Human Solidarity in a Divided World*. New York: UNDP.