WORKING PAPER 305/2026

Multidimensional Poverty Indices: A State Level Analysis for India

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Price : Rs. 35

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Abstract

In its operational form most indicators used to arrive at the multidimensional poverty index (MPI) values are at the household level. These indicators are 'public' in nature for the household and it is assumed that every member of the household benefits equally from having access to such resources. The analysis in this study sheds light on the channels of non-monetary deprivation faced by women. The proposed alternate MPI employs indicators some of which exclusively capture the deprivations that women disproportionately face, viz. use of dirty cooking fuel, lack of a ventilated kitchen etc. While other indicators like roofing and flooring material, toilet facility etc. are shared resources used by all members in a household. This study explores whether such distinction makes any difference to the deprivation index value and rankings of the states in India based on NFHS-5 data (2019-21).

The magnitude of MPI scores from alternate specification for India and its sub-regions are higher than those based on conventional specification. Across different MPI specifications, southern states including the union territories such as Lakshadweep and Puducherry consistently record lower MPI scores and consequently lower poverty rates, whereas states like Bihar have higher MPI scores and higher poverty rates. The individual specific MPI while retaining similar rankings across states, has a wider range compared to that based on shared-goods specific MPI. The wider range of scores in the individual specific MPI suggests that it is a useful exercise to delve into the gap left by the lack of focus on interpersonal inequality by conventional MPI and its implications for state-wise development patterns. Its flexibility as an index, though not without concerns, provides ample potential for exploration of disaggregated channels of deprivations.

Keywords: *Multidimensional poverty, private and shared household commodities, Women, States*

JEL codes: *J16, I32, D10*

Acknowledgements

This work was supported by research presented in the first author's Master's thesis titled "Female Specific Alternate MPIs: An Assessment for 2019-21", completed at Madras School of Economics in May, 2024. We would like to extend our heartfelt gratitude to Dr. Vidya Bharati Rajkumar for her comments as panel members of the dissertation. The research was also presented at the Kerala Economic Conference, 2025, held in Thiruvananthapuram in February, 2025 and would like to acknowledge the insightful comments provided by the chairperson of the session. Findings from this study were also presented at the MSE Seminar Series in March, 2025 at MSE titled "Welfare Implications from Household Scale Economies".

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CONTEXTUALISING THE POVERTY ESTIMATION DEBATE

The challenge of poverty has been at the centre of the discussions in the discipline of development economics. It sustains relevance in the realm of development in the policy making circles by means of evolving discussions on dimensions and definitions of poverty and new and refined techniques of poverty estimation (Alkire and Foster, 2011; Rangarajan et al., 2014; Vijaya et al., 2014; Mishra, 2024 and Balakrishnan and Raj, 2026).

The centrality of poverty in the developmental debate cannot be discounted and any policy aimed at targeting poverty must have a clear definition for the standard against which poverty shall be measured, such as a poverty line. Essentially, the poverty line quantifies the minimum standard required for a person to survive, conditional on their needs. The estimation of such a standard is dependent on underlying philosophies and priorities of the various committees tasked with estimating it.

Traditionally, poverty estimation in India follows the rationale of absolute poverty. An absolute normative level of consumption is fixed as the poverty line, which denotes an absolute minimum, such that anything less is incompatible with the maintenance of physical wellbeing (Rudra, 2005). All households that fall below the poverty line are classified below poverty line and this is used to arrive at a headcount ratio[1], thus giving a consumption based estimate for poverty. Poverty estimation in India has a traceable history. Table 1 summarises the different consumption poverty estimates proposed by the different working groups and committees constituted to this end.

[1] Head count ratio (H) is the ratio of number of people (n_q) below the poverty line to the total population (n) i.e. $H = n_q/n$

Table 1: Poverty Lines Estimated By Various Committees (Per Capita Per Month)

Year		Chairperson	Poverty line		National Headcount ratio (%)		
Constituted in	Report on		Rural	Urban	Rural	Urban	Total
1962		Working Group	Rs. 20	Rs. 25			
1973-74	1979	Dr. Y.K Alagh	Rs. 49	Rs. 56	56	49	54.9
1989	1993-94	Prof. Lakdawala	Rs. 205.8	Rs. 281.35	37.3	32	36
2005	2009	Dr. S. D. Tendulkar	Rs. 816	Rs. 1000	25.7	13.7	21.9
2012	2014	Dr. C. Rangarajan	Rs. 972	Rs. 1407	30.9	26.4	29.5

Source: www.sansad.nic.in/ Accessed on: 13-03-2024

Conventionally, poverty estimation in India is centred around (monthly per capita) expenditure and the access it provides to material goods (Rangarajan et al., 2014 and Panagariya and More, 2026). Essentially, poverty and deprivation have been studied through a largely instrumental lens, where income acts as the instrument that ushers in well-being by allowing access to certain choices, provided opportunities exist (Sen, 1988).

Conceptualising the Multidimensional Poverty Index (MPI)

The crux of the debate in poverty estimation surrounds the fact that poverty is easy to perceive but difficult to be precise about (Tripathi and Yenneti, 2019). It is fairly obvious that deprivations often have synergistic and multiplier effects and that all issues around poverty are interconnected and hence demand cross cutting solutions (Alkire and Santos, 2014).

As can be inferred from Amartya Sen's seminal work[2] (Sen, 1988; Sen, 1990), a pertinent shortfall of consumption-based poverty estimates is that often, there is a gap between knowing whether the minimum requirements as modelled by the poverty line basket are indeed consumed i.e. consumption-based estimates most often remain as normative standards. Particularly, some of the capabilities indicative of

[2] This section infers from the work by Amartya Sen (1988, 1990) for the given context of assessing measurement and conceptualisation of poverty and its myriad dimensions.

wellbeing may not be tightly linked to the privately purchased consumption basket in terms of which the poverty lines are currently drawn. Thus, a fair case can be made for the argument that poverty modelled through income or consumption is different from that modelled through deprivations of basic necessities. There was thus relevance for a measure like MPI, which quantifies acute poverty, understood as a person's inability to simultaneously meet minimum internationally comparable standards in indicators related to core functionings. It thus brought the focus of poverty estimation to the direct method, a disaggregated study of whether people are able to satisfy a set of specified basic needs or functionings.

Sen's capability approach forms the theoretical base for MPI (Alkire and Foster, 2011). The essence of his analysis can be captured thus: "Even though an expansion of GNP, given other things, should enhance the living conditions of people, there are many other variables that also influence the living conditions and the concept of development cannot ignore the role of these other variables" (pp.16: Sen,1988). This helps to view income as one dimension that adds to wellbeing but does not constitute wellbeing in itself. He thus argues that 'GNP at best, can be concluded as a means to development and not an end in itself' (Sen,1988).

In essence, GNP or Gross National Product, can be modelled as a functioning, where 'functioning' constitutes the ends of the growth process because they are causally related to commodity possession and use, and can be understood as indicators of welfare. Development then, has to be measured in terms of functionings achieved. A set of alternative functionings' n-tuples, any one of which a person can choose constitutes a capability. Wellbeing thus, is modelled as a function of achievement of a functioning and of the capability set from which the n-tuple of the functioning is chosen such that capability set represents the means to development and functionings represent the ends of the development process. This framework, known as the capabilities approach, proposes

that social arrangements should be primarily evaluated according to the extent of freedom people have to promote or achieve plural functionings they value (Alkire, 2008).

Evaluation of these chosen functionings represent the extent of development achieved. Such evaluation encompasses two aspects -value heterogeneity and value endogeneity (Sen, 1988). Value heterogeneity indicates the different valuations that individuals associate with different functionings available to them. This heterogeneity can be partially overcome by establishing a larger order of dominance of functionings that is mostly agreed upon, given all stakeholders have adequate information. Value endogeneity indicates the dependence of the valuation function on the value being assessed. It is endogenous and evolving because valuations might change with the developmental process. For instance, when we regard the example of food, a person living in extreme poverty will associate a much higher value to it than someone who lives in relatively well-off circumstances. To overcome this problem, Sen suggests using the intersection technique; a change is considered an improvement if it is prospectively better than the available alternatives and retrospectively better than the rejected alternatives.

Unlike the existing poverty measures which focused on consumption as the key pathway to development, multidimensional poverty index thus recognises income/consumption as a causal factor in attaining well-being and centres the focus of the development process on a host of other indicators like health, education and standards of living. Aspects like value heterogeneity and value endogeneity help pick and choose the various dimensions and indicators that may be relevant to poverty estimation through non-monetary measurements, like MPI.

Development of Multidimensional Poverty Index

The multidimensional poverty index is the average of weighted sum of deprivations. It can be understood as the headcount ratio, adjusted for intensity of deprivation, with a specific selection of deprivations, indicators and weights. Thus, MPI measures the combination of deprivations in a range of (predominantly non-monetary) indicators experienced by the population (Alkire and Foster, 2011). It uses microeconomic data to reflect the percentage of households that experience overlapping deprivations in several dimensions of well-being including health, education and standard of living. The index is created to reflect overlapping and simultaneous deprivations that a household experiences in different indicators of well-being and helps identify the most vulnerable segments of the population.

The computational methodology of MPI developed by Alkire and Santos (2014) is based on the Alkire-Foster method (Alkire and Foster, 2011) which identifies people as poor based on a dual-cutoff counting method. MPI is the adjusted head count ratio (M_0)[3], the appropriate measure to be used when dimensions under consideration are largely ordinal. According to global standards, an individual is classified multidimensionally poor if they are simultaneously deprived in at least 1/3rd of the dimensions of development considered. The Alkire-Foster method, due to its employment of the dual cutoff method, captures the middle ground between underestimation[4] and overestimation[5] of poverty. MPI also satisfies the properties of dimensional monotonicity, wherein

[3] Adjusted Headcount ratio corresponds to headcount ratio derived from Foster-Greer-Thorbecke index (FGT (0)), adjusted to reflect intensity of poverty. Computation of MPI has been detailed in Appendix 1

[4] Underestimation of poverty follows as a result of using the *intersection method*, which identifies a household as poor only if it is deprived in all indicators.

[5] Overestimation of poverty follows as a result of using the *union method*, which identifies a household as poor if it is deprived in at least one indicator

the index reflects the deprivation in another added dimension, thus increasing M_0; and of subgroup decomposability, where the index can de disaggregated to reflect the deprivation faced by particular sub-groups of population[6]. It further helps examine the contribution of each dimension to MPI.

MPI was envisioned as a more comprehensive and holistic measurement of poverty. This fulfils MPI's stated aim of aiding policy interventions and targeting of welfare policies. Policies aimed at reducing income poverty may not affect other deprivations. There was also the concern that headcount measures of poverty based on consumption surveys do not provide accurate information on the depth and intensity of poverty. In its more commonly used operational form, the indicators of MPI are so chosen to integrate SDG targets (UNDP and OPHI, 2020). In India, NITI Aayog adopted the MPI in its 2021 report, based on the NFHS 4 (2015-16) data banking on the rationale that income is only among one of the many dimensions of and not the only attribute of wellbeing (NITI Aayog, 2021 and 2023).

Motivation and Objective

In its operational form to arrive at the MPI values most of the indicators used are at the household level due to the nature of the indicator and data limitations. For instance, if access to water, sanitation, and housing are important components of welfare indicators as per some of the SDG goals then the indicator is measured as accessibility/availability (or not) from data source at the household level and not at the individual level. Many such commodities used as indicators are public goods for the household and it is assumed that every member of the household benefits equally from having access to this resource. Hence when the indicator is aggregated to indicate the poverty rate for the population under the assumption that all members of the household

[6] Nevertheless, such exercise might not reflect the full extent of deprivations that has exclusive channels, say like that of gender, because of the all-encompassing nature of the indicators and data set used in estimation.

benefit equally from having access to this resource which a public good shared commodity, the deprivation rate would miss out the intra-household differences in then benefits accruing to them. Consequently, the measured deprivation rate would be lower than what could be analysed if the indicators were available at the individual level.

Thus, the objective of this study is to demonstrate how the range of MPI values could differ across regions when individual specific indicators are used, when comparison to household specific indicators and combined set of indicators. Further, the study uses indicators that are specific to women in the age-group of 15 to 49 years and household specific indicators to which these women belong to for the comparative analysis. In this context, this study contributes to a thin literature that consider the intra-household aspects of the MPI but while considering indicators pertaining to women (Batana, 2013; Espinoza-Delgado and Klasen, 2018; Vijaya et al., 2024). More recently, Alkire and Ul Haq (2023) provides a methodological framework combining the unidimensional individual level deprivation rate lodged within a household that could be multidimensionally poor or non-poor. The supporting evidence based on South Asian countries highlights that the extent of overlap between the two not only varies on the chosen aspect of individual domain but also across countries. This reflects the need for an individual assessment of deprivation alongside the household assessment.

In contrast to the empirical analysis in Alkire and Ul Haq (2023) and related studies cited earlier, this study here is an assessment of the ranks of the states of India based on MPI using multiple individual level indicators versus the MPI based on household level indicators for the same individuals and the MPI values including both individual and household variables. The focus of the study is more on the comparison of MPI based on shared good versus private goods and illustrates this with indicators using women as the unit of analysis and is neither a

gendered comparison of MPI nor assesses as to how the individual deprivation is lodged within the household MPI.

The goods modelled in the household consumption basket, captures the intrinsic and instrumental value that it confers on the wellbeing of the household and the individual. An indicator like years of schooling attributes an intrinsic value to wellbeing of the individual, by adding largely to their individual capabilities and expanding their capabilities set through improved exposure to the job market. An indicator like nutrition also confers an intrinsic value to the wellbeing of an individual. A well-nourished individual is better posed to undertake productive labour and enjoy its fruits. These indicators also have sizeable externalities that justify its intrinsic valuation to the wellbeing of the household.

On the other hand, an indicator like pucca housing or clean cooking fuel imparts an instrumental value to the wellbeing of the household. They are measured at the household level rather than at the individual level and they enable the household achieve better developmental outcomes. The paper thus attempts to include a set of indicators that relate to an individual and another set of indicators that include individual and household goods for non-monetary measures of poverty for women. The differences in the magnitudes and rankings of different states of India in women's multidimensional poverty based on these alternate set of indicators could inform us as to how deprivations could be different between individual well-being versus household well-being.

DATA AND METHODOLOGY

The analysis follows the conventions set by global MPI estimation (Alkire and Santos, 2014). The composite index of MPI is arrived at by aggregating 3 domains that signal dimensions of non-monetary development viz. education, health and standards of living. Indicators signalling achievements and outcomes in each domain were chosen

according to established beliefs and notions. The choice of indicators used for arriving at women's MPI for India based on the National Family Health Survey Data IIPS, 201) in 2019-20 (NFHS-5) is discussed below. Along with that the weights used for aggregating the different dimensions are also mentioned[7].

Alternate MPI

The alternate indicators used in this study for MPI in comparison to the NITI Aayog MPI is referred as alternate MPI in this study. The first domain that receives importance in any discussion relating to non-monetary measures of poverty is *education*. When women become the focus of the analysis, it is a given to choose an indicator of education that can capture substantial impact it makes in her life. The indicator chosen for the analysis is *women in their early youth (16-21 years) who have not completed secondary education*, with an assigned weight of 0.2 as it is the only indicator in this domain. The importance of education in a gendered analysis cannot be understated. The gains from completing at least secondary education (approx. 10-12 years of education) makes a substantial impact in both the personal and societal life of a woman. The economic gains, by way of job opportunities and an independent income is but one of the influential interventions of an education. The consequent empowerment that reflects in freer interactions with the larger society has an effect spanning generations. A secondary education also plays an important role in making a woman conscious of her health and environment. It has had a role in reducing malnutrition and improving menstrual and sexual hygiene. Its role in empowering women to make informed autonomous choices pertaining to their bodies and sexual health is massive. Especially so, when the woman is in her pivotal early youth. Education and the consequent empowerment she receives during her early youth has a life-cycle impact on herself and on the larger society. Since it is the age where most women are led to marriage, it also

[7] Reference for the rationale and reasoning behind assigned weights is taken from Alkire and Santos, (2014)

typically shapes her interactions with the immediate family and larger society. All these established linkages and beliefs justify the choice of '*teenage women who have not completed secondary education*' as the primary indicator for the analysis[8].

The next domain used in the analysis is *health*, weighted at 0.2. This domain spans four indicators so its impacts maybe holistically captured. Each indicator is weighted at 0.05. The importance of health in an analysis of poverty is obvious. Its instrumentality in enabling everyday interactions is a given. When there are institutional factors that hamper achieving a standard health outcome it becomes necessary to study them in the context of deprivation and poverty. To this end, the analysis employs four indicators of deprivation viz *not having a health insurance, low frequency of consuming leafy vegetables, low frequency of consuming fruits and body mass index (BMI) below 18.5* at the time of the survey. In one way or another, these indicators capture the capability of the individual to stay healthy (via dietary diversity and BMI) and an aspect of the capability to access health care in case of contingency (health insurance).

The third domain relevant to the analysis is *standard of living*, weighted at 0.6. It employs 15 different indicators spanning amenities capturing deprivation (non-use) or inaccessibility to electricity, clean fuel, separate and ventilated kitchen, modern roofing, toilets and durables like motorised vehicle, washing machine, pressure cooker, and individual centric quality of life indicators like methods of menstrual protection. The larger number of indicators and their further relevance in the analysis justify the higher weight of the domain, where, each indicator is weighted at 0.04. These indicators mostly capture material deprivations faced by the individual.

[8] Women in their early youth (16-21 years) have been labelled as teenage women, for convenience in the analysis here.

Individual Specific Alternate MPI

This is an alternate index synthesised in the analysis. It retains the same indicators in the education and health domains, but employs a selection of 8 indicators from the standard of living domain that are largely relevant to or used intensively by women viz. cooking fuel, refrigerator, separate and ventilated kitchen, pressure cooker, washing machine, menstrual products and the location of the nearest accessible water source.

Standard of living indicators are weighted at 0.075 when they are used in this analysis. The weight accorded to the standard of living indicators change here because the number of total indicators fall to 13 from the initial 20 (and standard of living indicators alone cause this difference, where the indicators fall to 8 from the initial 15, as listed in Table 2). Insights from this index will help focus on the deprivations faced exclusively by women and address to some extent the criticism that MPI faces on its lack of emphasis on the distributional inequalities.

Table 2: Variable Definitions and Assigned Weights

Domain	Variable	Deprived if...	Intensive consumer	Weight		
				Alt. MPI	Indiv. Spec.	Shared Goods
Education						
1.1	Teenage education	Women aged 16 to 21 haven't completed secondary education.		**0.2**		
Health				**0.2**		
2.1	Health insurance	Individuals who are 15-49 and are not covered by any (public/private) insurance.		0.05		
2.2	Freq. of leaf vegetable	Consumption (by women aged 15-49) is rare (occasionally/never).		0.05		
2.3	Freq. of fruit	Consumption (by women aged 15-49) is rare (occasionally/never).		0.05		
2.4	BMI	Women aged 15-49 report a BMI < 18.5.		0.05		
Standard of Living				**0.6**		
3.1	Electricity	The household has no electricity.	All members	0.04		0.0857
3.2	Cooking fuel	The household uses dirty fuel.	Women	0.04	0.075	
3.3	Fridge	The household does not have a fridge.	Women	0.04	0.075	
3.4	Floor material	The household uses rudimentary flooring material.	All members	0.04		0.0857
3.5	Wall material	The household uses rudimentary wall material.	All members	0.04		0.0857
3.6	Roof material	The household uses rudimentary roofing material.	All members	0.04		0.0857
3.7	Separate kitchen	The household does not have a separate room used as a kitchen.	Women	0.04	0.075	
3.8	Bank Account	No members of the household have a bank account.	All members	0.04		0.0857
3.9	Pressure cooker	Household does not have a pressure cooker.	Women	0.04	0.075	
3.10	Washing machine	Household does not have a washing machine.	Women	0.04	0.075	
3.11	Ventilated kitchen	Household does not have a well-ventilated separate kitchen.	Women	0.04	0.075	
3.12	Menstrual protection	Individual uses a rudimentary method of menstrual protection like cloth pads, locally made napkins, other means or nothing.	Women	0.04	0.075	
3.13	Time to water source	The nearest water source is >30 mins away.	Women	0.04	0.075	
3.14	Toilet facility	The household has access only to a rudimentary toilet facility.	All members	0.04		0.0857
3.15	Means of transport	The household has only a cycle or nothing as a means of transport.	All members	0.04		0.0857

Note: Alt. is Alternate Indicators MPI combining both individual and household specific indicators.
Source: Author's own description.

Shared Household Goods Specific Alternate MPI

Another alternate MPI synthesised on the same grounds as the individual specific alternate MPI, this index retains the indicators in the education and health domain while employing a selection of indicators from the standard of living domain. These indicators are so chosen that they derive value from collective consumption rather than individual consumption. The indicators used here are electricity, flooring, roofing and wall material, bank account, toilet facility and possession of at least a cycle. Each indicator denotes non-access or deprivation except the last one which denotes non-access to any form of private motorised vehicle. Each indicator is weighted at 0.0857 for the analysis because the number of indicators in the standard of living dimension falls to 7 from 15 (essentially making the total indicators fall to 12 from in the initial 20, as listed in Table 2). Such an index is synthesised to capture the deprivations that are more relevant at the household level and also signal the distinction between goods that are individualistic and those that are consumed collectively within a household.

Methodology

The analysis adopts the conventional methodology followed in MPI estimation (NITI Aayog, 2021). Domains are retained as they are, with differences incorporated in the indicators. While the global MPI uses 10 indicators and NITI Aayog's MPI index extends the analysis by incorporating 2 more indicators, our analysis employs the 20 indicators detailed above. The idea of such expansionary inclusion was to study the impacts of dimensionality i.e., the effect of an increase in indicators on the MPI score, to shed light on the differential impact of poverty on women and to establish the differences in deprivation arising from individual and shared goods on poverty and inform policy from this perspective.

Deprivation in an indicator is highlighted by assigning a score of 1, indicating that an individual is deprived in that specified indicator, while

a deprivation score of 0 indicates that the individual is *not deprived* in that indicator. These scores are then aggregated to arrive at a deprivation score, which, if it falls above the designated cutoff, the individual is classified multidimensionally poor. The cutoff assigned for the analysis follows the global convention. According to the global MPI, if an individual is simultaneously deprived in at least 1/3rd of the indicators considered for the analysis, they are classified multidimensionally poor. Since the global and national MPIs employs 10 and 12 indicators respectively, the cutoff adopted for their analysis is 0.3, implying that if an individual is simultaneously deprived in at least 3 indicators, they are multidimensionally poor.

For the alternate MPI analysis, since we consider 20 indicators, the cutoff was fixed at 0.6, implying that an individual has to be simultaneously deprived in at least 6 indicators (i.e. 1/3rd of the indicators) to be considered multidimensionally poor. In the individual specific alternate MPI analysis, the cutoff falls to 0.43, since the total number of indicators are 13. Essentially, a woman in considered multidimensionally poor if she is simultaneously deprived in 4 or more indicators. Similarly, for the shared household goods specific MPI employing 12 indicators, an individual is considered multidimensionally poor if they are simultaneously deprived in 4 or more indicators, with a cutoff of 0.4.[9]

RESULTS AND INFERENCES

Preliminary Analysis

Table 3 details the proportion of women deprived in each indicator. Indicators like health insurance (68%), having a refrigerator (59%) and washing machine (78%) have more than 50% deprivation, while proportion of deprived are closer to 50% in indicators like frequency of consumption of fruits (49%), clean cooking fuel (43%), roofing materials

[9] The estimations for MPI are calculated using STATA software (Pacifico and Poege, 2017).

(43%), having a separate kitchen (42%) and no motorised means of transport (44%).

Around 10% of teenage women have not completed secondary education. While this is a small proportion compared to the deprivation in other indicators, it still makes a substantial differential impact in the lives of deprived. Other indicators like consumption of leafy vegetables, ownership of a bank account, proximity to a water source etc. have minimal deprivation. There have been comments questioning the relevance of inclusion of such indicators in the exercise in informing policy, but unless precise data will be made available, replacing these indicators with more appropriate ones is impractical. The state wise distribution of deprivations is detailed in Table A1 in the Appendix. The highest proportion of deprivation comes through the standard of living indicators, both through goods that are exclusively used by women and those that derive value from shared consumption. The distribution of deprivations across states follows expected patterns, where states from the south show much less deprivation and states like Bihar, Odisha and Assam show higher proportion of deprivation across most domains and indicators.

Table 3: Summary Statistics- All India

Serial number	Domain	Indicators	Mean	Proportion of women deprived (%)
1.1	Education	Teenage women without at least secondary education	0.104	10.4
2.1	Health	No Health Insurance cover	0.687	68.7
2.2		Low Frequency of consumption of leafy vegetables	0.09	9
2.3		Low Frequency of consumption of fruits	0.493	49.3
2.4		Low BMI	0.207	20.7
3.1	Standard of Living	Does not have electricity availability	0.208	20.8
3.2		Use of dirty cooking fuel	0.438	43.8
3.3		Does not own a refrigerator	0.594	59.4
3.4		Rudimentary floor material	0.315	31.5
3.5		Rudimentary wall material	0.257	25.7
3.6		Rudimentary roof material	0.438	43.8
3.7		Does not have a separate kitchen	0.425	42.5
3.8		Does not own a bank account	0.037	3.7
3.9		Does not own a pressure cooker	0.271	27.1
3.10		Does not own a washing machine	0.788	78.8
3.11		Does not have a well ventilated kitchen	0.321	32.1
3.12		Rudimentary methods of menstrual protection	0.193	19.3
3.13		Nearest water source is more than 30 mins. away	0.014	1.4
3.14		Rudimentary toilet facility	0.222	22.2
3.15		No motorised means of transport	0.448	44.8

Source: Author's calculation

Alternate MPI Indices

The analysis compares NITI Aayog MPI scores with the alternate MPI scores, individual specific alternate MPI scores and shared household goods specific alternate MPI. The difference between the indicators is channelled through the difference in the number of indicators. At the all-India level, the NITI Aayog MPI score is 0.117, the alternate MPI index (with 20 indicators) has a score of 0.046, the individual specific alternate MPI (with 13 indicators) registers a high score of 0.225 and the shared household specific MPI (with 12 indicators) has a score of 0.144.

The all-India alternate MPI score reveals that MPI is highly sensitive to the number of indicators in the analysis. The alternate MPI registers a very low score, probably because of its inclusion of a large variety of indicators. A host of these indicators (like possession of a bank account or the proximity to the nearest water source) also have considerably minimal deprivation and hence might not be as useful in informing policy.

The substantially large value of the individual specific alternate MPI (0.225) signals to the considerably high deprivation that women face, channelled through indicators that are intensively women centric and whose deprivations have a more than proportionate impact in their private lives and for the country as a whole. The absolute difference in the index scores highlight the possible gap and the need to shift the focus to a gendered MPI, thereby tackling the lack of accountability of MPI to distributional inequalities.

Shared household goods specific MPI has an index score of 0.144, similar to the NITI Aayog value of 0.117 but considerably smaller than 0.225 (individual centric) and substantially larger than 0.046 (alternate MPI). This index aggregates the deprivation across public goods used in a household, like roofing material, flooring material, toilet facility etc. The intensity of poverty in this respect is lesser than in the index with private goods used intensively by women, but greater than

when a combination of shared and individual centric indicators is employed (i.e. 0.046 < 0.144 < 0.225).

The number of dimensions apart, it is perhaps clear that when there are several shared goods within a household, the MPI values are lower, indicating that these are perhaps first acquired by the household as a single unit or the state provides them for free or at subsidized rates as its commitment to improving the welfare of several individuals at the same time. So, in this sense, there is a scale advantage in either the purchase of such goods or its public provision as their per person cost or expenditure is lower and a greater number of people will be out of poverty at a lower per unit price. The following maps in Figure1 (a), (b) and (c) for alternate, individual and household or shared good specific MPI values respectively provide a more holistic picture about the convergence of the different alternate MPI scores.

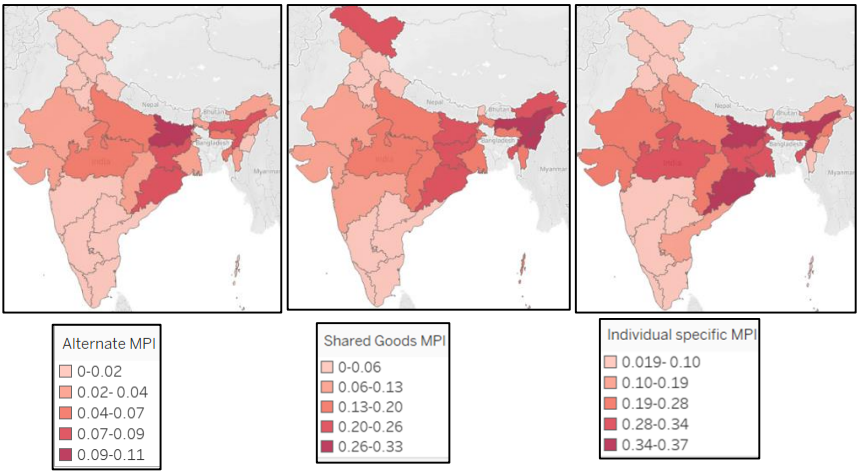
The figures below show the state wise alternate MPI scores for all three synthesized indices. We observe that state wise patterns are fairly consistent- the states in the southern region consistently score low MPI index values, indicative of lower poverty, both with respect to incidence (measured through headcount ratio) and intensity (measured through average proportion of deprivations)[10]. The scores diverge considerably when the female specific alternate MPI scores and shared household goods specific alternate MPI scores are considered. The patterns are still consistent for southern states, but states like Gujarat, Rajasthan, Madhya Pradesh, Uttar Pradesh, Bihar, Jharkhand etc. record higher deprivations via the gender angle than the shared household goods angle. This is possibly indicative of a need to address gender as a specific channel of deprivation and direct policy accordingly. All the above listed states have a considerable population and the household size also will be consequently larger, but the substitution effect away from public good to individual centric goods, that is generally observed for economies

[10] MPI score, M_0= H* A; H- headcount ratio of poverty, A- average proportion of deprivations

of scale has not followed through here, resulting in the prevalence of deprivations channelled through gender. A state wise analysis gives the following conclusions: the alternate MPI scores (employing 20 indicators) ranged from 0 from 0.117, with Kerala, Lakshadweep and Puducherry recording the least MPI scores and Bihar recording the highest MPI scores, indicative of the general state wise pattern of development.

Individual Specific Alternate MPI ranged from 0.019 to 0.374, which shows considerable difference form the range of alternate MPI employing 20 indicators (which ranges from 0 to 0.117). Kerala ranks the highest with the least MPI score of 0.019, whereas Bihar ranks the least with the highest MPI score of 0.374. We observe that even though the ranks differ considerably in range, the general state wise pattern is retained.

Shared household goods specific MPI ranges from 0 to 0.334, once again exhibiting considerable difference from the formative alternate MPI with 20 indicators (which ranges from 0 to 0.117). Lakshadweep ranks the highest whereas Assam ranks the least with the 0.334 score. Comparison of this index with the others indicate points of divergence, with the deprivation increasing in intensity around the central and eastern parts of the country.



(a) Alternate MPI **(b) Individual Specific MPI** **(c) Shared Goods Specific MPI**

Figure 1: State Level Variations in MPI Scores with Different Types of Indicators

Source: Authors' calculation

Note: (a) MPI with a combination of 20 indicators, both individual specific and shared; All India MPI score- 0.046; (b) MPI with 13 indicators, employing 8 individual-specific standard- of living indicators; All India MPI Score- 0.225; (c) MPI with 12 indicators, with 7 shared goods-specific standard- of- living indicators.; All India MPI Score- 0.144

Rank Correlation

Spearman's rank correlation has been used to arrive at the rank correlation between index scores across states. Correlation between indices is mostly high and positive, at the state level, indicating a high degree of similarity and uniformity between indices. There is a possibility of change when the analysis is extended to a more microscopic district level because of intrastate disparities, thus opening up more specific areas of study.

Table 4 details the different correlation coefficients and their significance. The alternate MPI employing 20 indicators is very similar to

NITI Aayog index, exhibiting a high positive correlation. Same patterns follow for the alternate MPI and the individual specific MPI, nevertheless a look at the absolute index scores inform about high range of differentiation between the indices, stressing the relevance of an alternate index that channels the various deprivations manifesting exclusively through gender.

Correlation between alternate MPI and shared household goods MPI is high for states, but very low and insignificant for union territories. There is probably a gap in observing individual deprivations in the consumption of shared household goods, especially in union territories. Factors causing this deviation may be attributed to social customs prevalent in such regions.

Individual specific MPI and shared goods specific MPI expectedly exhibit comparatively lower, but positive correlation, attributable to the differences in their composition. This divergence is probably indicative of how the economies of scale in household consumption does not especially benefit women, and in particular, might leave them more vulnerable to intra household inequalities.

Table 4: Correlation between ranks derived from each index score

Region	Rank Correlation			
	NITI Aayog MPI and Alternate MPI	Alternate MPI and Individual specific MPI	Alternate MPI and Shared Household goods specific MPI	Individual specific MPI and Shared Household goods specific MPI
States	0.83***	0.92***	0.81***	0.78***
Union territories	0.96***	0.82**	0.39	0.57

Source: Author's calculation;
Note: ***: significant at 1%; **: significant at 5%; NITI Aayog MPI's are from NITI Aayog, 2023)

CONCLUSION

MPI was envisioned as an able complement to income poverty estimates, and its relevance for poverty estimation in poor countries cannot be questioned. Income estimates and MPI diverge considerably among poor countries and hence, the chances of exclusion errors, where people that are not income poor but are multidimensionally deprived are excluded from targeted interventions, are large. As much as MPI retains its relevance as an important aspect of poverty estimation because having enough household income is no guarantee of being non-deprived in core aspects of individual wellbeing. This study has extended this argument further by indicating that household level indicators used for MPI could still undermine deprivation compared to individual level indicators.

The analysis in this study centred its focus primarily on gender specific indicators as a channel of exclusive deprivations and the results that followed through was indicative of a need to shed light on this aspect. As an index, MPI is fairly subjective. Changing indicators and weights themselves provide varied estimates of multidimensional poverty. Such a possibility can be explored in much detail to examine the exclusive channels of gendered deprivation faced by women.

The synthesis of a composite index meant to inform policy by directly measuring deprivation rather than through a channel like income definitely addressed the need for simplifying poverty measurement. In the creation of such a flexible but sound index, there is also the merit of being able to magnify the focus on the different specific channels of deprivation. Additionally, the errors through underreporting might be minimal, in a considerable departure from income-based poverty measures. While such subjectivity affords flexibility, it also raises concerns. Nevertheless, as we see from the analysis, such arbitrariness is also bounded. There can be no acute subjectivity hampering the relevance of the analysis, because the functionings have to necessarily be in domains like education, health and material prosperity, that are generally accepted as relevant for analysing non-monetary poverty.

This study has demonstrated that when data is available on indicators at an individual level within the same three broad dimensions of education, health and standard of living then the same MPI measures can be informative about individual deprivations. This can also be used to compare deprivations between men and women within the same household and hence intra-household gendered gaps in deprivations. Alternatively, individual level indicators could be used to arrive at MPI and then decomposed on the basis of gender or elderly versus the young. Though there is much to be refined and expanded upon, this exercise with an extensive scope sheds an indicative light on the various gaps that can be potentially be addressed by policy.

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APPENDICES

Computation of MPI: The Alkire- Foster Method

The computational methodology of MPI is based on the Alkire-Foster method which identifies people as poor based on a dual-cutoff counting method. MPI is the adjusted head count ratio (M_0)[11], the appropriate measure to be used when dimensions under consideration are largely ordinal. M_0 thus measures poverty in *d* dimensions across *n* individuals. Y_{n*d} [each element is y_{ij}] is the matrix of individual i's achievement of dimension j. The matrix of weights is defined as W [where each element is w_j], with *w* is the weight assigned to dimension *j*. The first cutoff is defined as Z_j, the deprivation cutoff in dimension j. This can be understood as a poverty line, hence measuring the incidence of poverty. If, for individual i,

$y_{ij} < Z_j$, i is deprived in j and $y_{ij} = 1$
$y_{ij} > Z_j$, i is not deprived in j and $y_{ij} = 0$

With such classification, a matrix of deprivations, g^0 is created, such that:
$g^0_{ij} = w_j$, if deprived
$g^0_{ij} = 0$, if non-deprived

Thus, each row of g^0 gives the combination of deprivations faced by individual i. A column vector, C of deprivation counts is created, where:
$c_i = \Sigma^d_{j=1} g^0_{ij}$

Essentially, each element constitutes the sum of deprivations faced by individual i. The second cutoff is now defined as k, the minimum sum of weighted deprivations, $k > 0$.
A person is defined as multidimensionally poor if their weighted deprivation count C_i is greater than k; if C_i is greater than k then that individual could be deprived in one dimension but need not be identified as multidimensionally poor.

[11] Adjusted Headcount ratio corresponds to headcount ratio derived from Foster-Greer-Thorbecke index (FGT (0)), adjusted to reflect intensity of poverty

For analysis purposes, the standard of k is adopted as 3. If the weighted deprivation count of a household exceeds 3, it is inferred that the household is deprived in at least 1/3rd of the weighted indicators and is classified multidimensionally poor.

Table A.1: State-wise Proportion (%) of Women in Each Indicator: Health and Education

	Education	Health			
States and Union Territories	**Women with below secondary education**	**No health Insurance cover**	**Low frequency of leafy vegetables consumption**	**Low frequency of fruits consumption**	**Low BMI**
Andhra Pradesh	7.8	25.8	15.5	44.1	17.7
Arunachal Pradesh	9.9	79.8	3.7	41.7	6.7
Assam	11.9	47	13.7	50.1	18.8
Bihar	20	89.2	9.1	65.7	27.3
Chhattisgarh	5.9	33.1	2.7	57.1	25
Goa	3.3	31.5	2.4	7.3	16.2
Gujarat	10.3	65.8	9.7	46.1	26.3
Haryana	6.3	83.4	6.9	39.4	19.5
Himachal Pradesh	1.5	69.2	10.1	30	15.1
Jharkhand	13.4	63.4	3.7	63.1	28.1
Karnataka	5.3	78.3	2.5	21.5	21
Kerala	0.12	50	37.6	24	12.6
Madhya Pradesh	10.1	73.2	7.5	57.2	28
Maharashtra	4.6	86	9.9	45.6	26.1
Manipur	5.3	91.6	2.4	46.6	7.8
Meghalaya	13.2	38.1	14.2	37.4	13.9
Mizoram	6.4	60.1	6.2	47	9.7
Nagaland	6.2	90.2	16.3	61.3	11.4
Odisha	12	66	1.7	75.3	22.4
Punjab	6	88.7	6.6	39	20.4
Rajasthan	14.5	16.3	9.8	54.2	21.2
Sikkim	5	79.8	2.8	28.1	12.1
Tamil Nadu	0.64	67.3	15.3	36.9	15.7
Telangana	9.77	36.8	19.9	49.5	24.5
Tripura	7.7	71.7	5.9	47.5	17.6
Uttar Pradesh	16.2	91.5	8.6	60.4	22.7
Uttarakhand	8.4	56.1	6.9	39.6	20
West Bengal	6.9	73.8	2.5	55.9	16.4
Andaman & Nicobar	1.5	99.1	6.1	39	10.1
Chandigarh	6.1	86.9	2.9	25	23.1
Delhi	5.7	97.7	9.9	30.4	7.6
Jammu & Kashmir	2.8	95.3	13.5	32.6	6
Ladakh	0	36.3	55.3	31.2	9.2
Lakshadweep	5	83.4	6.4	23.1	18.3
Puducherry	0.078	86.5	14.1	33.8	11.4
Total	10.4	68.7	9	49.3	20.7

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States and Union territories	No electricity	Dirty Fuel for Cooking	No Refrigerator	Rudimentary Floor Material	Rudimemtary Wall Material
Andhra Pradesh	0.52	14.9	49.8	2.9	6.9
Arunachal Pradesh	5.1	44.7	69.6	56.6	69.1
Assam	6.7	58.9	84.8	62.9	55.4
Bihar	3.4	62	89.1	61.6	26.7
Chhattisgarh	1.1	65.5	74.2	44	44.5
Goa	0	3.2	12.7	3.5	3.5
Gujarat	2	34	44.3	16.1	13.5
Haryana	0.27	43.1	22.9	10	3.8
Himachal Pradesh	0.36	51.5	28	13	19.8
Jharkhand	5.1	68.2	84.9	50.6	41.8
Karnataka	0.86	20.3	64.3	8.3	22.6
Kerala	0.43	27.7	20.8	1.5	14.5
Madhya Pradesh	1.4	58.9	73.4	41	35.8
Maharashtra	2	18.7	48.9	13.8	16.4
Manipur	1.5	26.7	66.3	60	76.8
Meghalaya	7	65	85.1	29.2	46.6
Mizoram	1.6	15.3	22.7	36.2	65.8
Nagaland	1.2	52.4	68.2	40.2	64.1
Odisha	2.7	65.1	74.1	33.8	30.9
Punjab	0.25	25.7	10	12.9	6.1
Rajasthan	1.6	59	51.3	16.3	13.2
Sikkim	0.67	21.3	61.2	12.1	20.5
Tamil Nadu	0.52	14.2	39	3.4	6.5
Telangana	0.32	7	54.7	7.6	13.5
Tripura	1.6	55.3	68.2	54.4	69.8
Uttar Pradesh	8.1	51.3	68.2	51.4	11.7
Uttarakhand	0.32	42.5	40.7	18.3	11.4
West Bengal	2.3	61.1	74.4	38.8	34.6
Andaman & Nicobar	2.2	18	27	16.5	35
Chandigarh	0.14	5.3	14.8	2.5	2
Delhi	0.7	31.9	43.2	15.8	19.3
Jammu & Kashmir	0.49	25	74.7	36.5	43.3
Ladakh	0.82	43.7	13.8	0.02	10.5
Lakshadweep	0.14	0.94	18.5	0.63	3.5
Puducherry	0.81	5.6	16	2.2	4.9
Total	2.8	43.8	59.4	31.5	25.7

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States and Union territories	Rudimentary Roof Material	No Separate Kitchen	No Bank Account	No Pressure Cooker	No Washing Machine
Andhra Pradesh	22	33.6	3.4	35.7	85.6
Arunachal Pradesh	94.7	46	7	15.8	86.7
Assam	96.1	60.2	3.5	37.6	96.1
Bihar	42.1	56.7	3.9	51.3	95.3
Chhattisgarh	41.6	29.3	4.4	39.6	89.9
Goa	21.5	7.3	3	3.1	33.2
Gujarat	36.9	43.9	4	17	88
Haryana	25.1	41.6	3.4	9	34.8
Himachal Pradesh	24.8	23.8	1.9	0.97	53.5
Jharkhand	52.4	52.8	3.9	53.2	92.1
Karnataka	48.4	17.7	4.9	16.4	83.3
Kerala	12.6	6.2	2.7	7.6	60.8
Madhya Pradesh	34.5	41.8	3.8	37.7	89
Maharashtra	49.8	24.1	4.7	9.9	83.1
Manipur	91.5	31.8	3.4	8.2	70
Meghalaya	83.8	43.5	8.7	44.2	95.4
Mizoram	68.9	52.6	3.5	4.6	37.3
Nagaland	86	49.6	6	14.5	83.2
Odisha	44.9	63.6	2.4	51.4	91.9
Punjab	14.8	39.2	3.9	10.6	31.6
Rajasthan	44.6	50	2.2	36.7	80.9
Sikkim	65.4	41.8	6.7	1.6	85.1
Tamil Nadu	22.2	27.9	2	18.4	73.3
Telangana	35.3	35.1	2.9	38.2	86.6
Tripura	94.4	71.5	3.2	54.5	98.6
Uttar Pradesh	22.7	53.1	2.8	23.4	79.6
Uttarakhand	17.6	39.2	2.7	3.8	60.3
West Bengal	52.1	62.7	4.2	43.6	95.4
Andaman & Nicobar	83.2	21.1	2.6	17.5	57.7
Chandigarh	6.2	34.9	1.8	2.9	32
Delhi	58.4	20.4	2.9	3.1	48.5
Jammu & Kashmir	95.3	13	3.8	3.1	54.1
Ladakh	8.2	16.7	3.3	4.9	53.1
Lakshadweep	19.3	25.9	5.6	1.3	30.8
Puducherry	20.1	18.6	2	16	54.2
Total	43.8	42.5	3.7	27.1	78.8

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States and Union Territories	No Ventilated Kitchen	Rudimentary Menstrual Protection Methods	Water Source More Than 30 Mins Far	Rudimentary Toilet Facility	No Motorised Means of Transport
Andhra Pradesh	20.7	12.1	2	16	46.4
Arunachal Pradesh	52.1	10.9	0.37	3.7	43.2
Assam	65.3	25.2	0.51	33.4	67.5
Bihar	32.8	31.4	0.26	40.1	69.1
Chhattisgarh	32.2	25.8	0.78	25.3	37.9
Goa	9.3	9.3	0.72	3.8	9.4
Gujarat	29.6	22.8	1.2	19.5	32
Haryana	35.1	10.9	2.3	3.6	30.9
Himachal Pradesh	21.5	9.7	0.53	6.6	53.7
Jharkhand	36	25.5	1.6	51.9	54.4
Karnataka	18.5	16.4	0.7	19.5	33.8
Kerala	4.4	11.1	0.15	0.24	32.5
Madhya Pradesh	32	24.7	5	26.7	41.6
Maharashtra	19.1	10.7	1.3	18.9	39.9
Manipur	30.8	19.2	3.7	4.7	51
Meghalaya	38.3	24	2.7	5.7	69.4
Mizoram	31	4.6	0.34	0.28	47.8
Nagaland	55.8	17.9	0.95	0.7	61.9
Odisha	60.2	16.3	0.16	33.7	52.6
Punjab	30.6	13.2	0.22	2.6	20.3
Rajasthan	42.8	18.6	3.3	21	28.2
Sikkim	38.8	7.6	0.32	0.6	69.7
Tamil Nadu	18.6	7.1	1.3	24.2	27.1
Telangana	17.1	7.6	3.9	13	37.3
Tripura	57.8	18.7	1.5	4.7	69
Uttar Pradesh	22.1	29.6	0.32	36.7	43.8
Uttarakhand	31.6	14.6	1.1	6.5	47.6
West Bengal	48.7	14.7	0.68	16.3	68.3
Andaman & Nicobar	24.2	2.2	0.58	3.1	45.3
Chandigarh	21.6	9.4	0.73	4.5	27.1
Delhi	17	22.2	2.1	17.3	56
Jammu & Kashmir	13.4	19.1	2.7	55.9	49
Ladakh	16.5	7.5	0	0	26
Lakshadweep	18.1	6.5	0.5	2.7	39.7
Puducherry	11.9	4.4	0.16	10.3	17.7
Total	32.1	19.3	1.4	22.2	44.8

Source: Author's calculation

Note: Dadra and Nagar Haveli was excluded from analysis due to data inconsistencies

Table A.2: Comparison of Different MPI Scores

States and Union Territories	NITI AAYOG (2023)	Alternate MPI	Alternate MPI Individual Specific	Alternate MPI Household (shared) Specific
Andhra Pradesh	0.025	0.013	0.108	0.041
Arunachal Pradesh	0.059	0.036	0.157	0.244
Assam	0.086	0.089	0.363	0.334
Bihar	0.16	0.117	0.374	0.256
Chhattisgarh	0.07	0.029	0.208	0.157
Goa	0.003	0.002	0.035	0.005
Gujarat	0.05	0.039	0.198	0.11
Haryana	0.031	0.009	0.107	0.033
Himachal Pradesh	0.02	0.005	0.052	0.03
Jharkhand	0.131	0.086	0.337	0.259
Karnataka	0.031	0.013	0.089	0.064
Kerala	0.002	0	0.019	0.001
Madhyapradesh	0.09	0.051	0.291	0.162
Maharashtra	0.033	0.02	0.093	0.095
Manipur	0.034	0.019	0.116	0.27
Meghalaya	0.133	0.048	0.245	0.148
Mizoram	0.024	0.026	0.057	0.181
Nagaland	0.066	0.034	0.258	0.278
Odisha	0.07	0.075	0.355	0.214
Punjab	0.02	0.007	0.074	0.034
Rajasthan	0.065	0.04	0.23	0.083
Sikkim	0.011	0.008	0.076	0.065
Tamil Nadu	0.009	0.002	0.069	0.031
Telangana	0.024	0.011	0.099	0.05
Tripura	0.056	0.05	0.324	0.26
Uttarakhand	0.103	0.012	0.118	0.06
Uttarpradesh	0.041	0.056	0.276	0.178
West bengal	0.05	0.037	0.293	0.2
Andaman and Nicobar islands	0.009	0.006	0.076	0.147
Chandigarh	0.017	0.016	0.058	0.011
Delhi (NCT)	0.014	0.005	0.031	0.025
Jammu and Kashmir	0.02	0.021	0.099	0.125
Ladakh	0.015	0.012	0.061	0.228
Lakshadweep	0.004	0	0.046	0
Puducherry	0.003	0	0.027	0.012

Source: Author's calculation

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