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Methodological Nuances in Estimating Proportion and Number of Poor for States and India, 2022 23

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June 2024

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Abstract

The purpose of this exercise is methodological while also providing us with poverty estimates of rural, urban, and combined areas for States and India in 2022-23. The methodological nuances behind this are five-fold. First, matching items from Consumer Price Index (CPI, 2012 base) with items from Poverty Level Baskets (PLBs) of Tendulkar and Rangarajan and assigning PLB weights to the matched items. Second, computing the PLB-specific inflation index of 2022-23 over 2011-12. Third, calculating the PLB-specific poverty lines for 2022-23. Fourth, ascribing from grouped data of household consumption expenditure of 2022-23 the percentile associated with the monthly per capita expenditure (MPCE) that is greater than but nearest to the PLB-specific poverty line. Fifth, estimating proportion and number of poor. At the all-India level, for 2022-23, the updated Tendulkar poverty lines indicate a poverty incidence of 6.4% for rural, 3.1% for urban and 5.3% for combined, while the updated Rangarajan poverty lines indicate a poverty incidence of 9.3% for rural, 9.5% for urban and 9.4% for combined. In addition to non-comparability of consumption expenditure 2022-23 with earlier rounds, one may point out that the CPI is perhaps not capturing the ground reality faced by the poor. In other words, our poverty lines that lie in the per capita per day range of Rs.43-109 are not adequate to provide for nutrition, basic education, and primary health care needs among others. These suggest that social welfare measures linked to the poverty line need a re-think calling for a broad-based approach.

Keywords: Consumer Price Index, Household Consumer Expenditure, India, Poverty

JEL Code: A29, C18, C43, C81, I32, Y1

Acknowledgements:

This paper has been written in honour of Late Professor R Radhakrishna, former Director (Vice Chancellor), IGIDR, who also was a member of the first three Task Force/Expert Groups on poverty estimates for India. The motivation for this paper comes from a discussion in a closed social media platform of Odisha Economic Association, particularly with Manoj Panda. The usual disclaimers apply.

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1. Introduction

The release of the recent report on household consumption expenditure (HCE) 2022-23 (NSSO 2024a, 2024b) has brought attention to its possible implication on poverty estimates in India. Changes in the design and the scope of the survey also brings to the fore concerns on possible comparability of HCE 2022-23 with earlier rounds, particularly the one in 2011-12. While the concerns are pertinent, in the current exercise we will attempt to update the poverty lines, compute poverty estimates from fractile-wise grouped data, and use population shares as weights to compute combined estimates for States and rural, urban and combined estimates for India. The purpose of this exercise is from a methodological perspective and in the process arrive at the proportion and the number of poor. This may lead to some discussion on their methodological nuances and implications for policy linking estimates of poverty to welfare measures.

Official attempts at poverty estimates in India have relied on HCE surveys (Government of India 1979, 1993, 2009, 2014). These poverty estimates or the methods behind them are also known by the name of the Chairpersons, namely, Alagh, Lakdawala, Tendulkar and Rangarajan, respectively. These reports have evolved from using grouped data for the first two to use of unit level data in the last two. The first two also paved the use of consumer price indices for updating of poverty lines and applying them to estimate poverty aligned with subsequent years/rounds of household consumption expenditure surveys. The third used 2004-05 as base and suggested updating of poverty lines by using prices computed from subsequent surveys, which was done for 2011-12 (Government of India 2013). The last one (Government of India 2014), unfortunately, was officially not adopted.

There have been concerns raised on the last two reports (Pathak and Mishra 2013, 2015; Ray and Sinha 2014; Mishra 2014; among others). Independent of that, poverty lines for both rural and urban for States and India in 2011-12 are available in these two reports. Both the reports also provide poverty line baskets (PLBs), the third one for 2004-05 urban as benchmark and the fourth one for 2011-12 rural and urban separately. We plan to update both the poverty lines by taking recourse to their PLB weights with Consumer Price Index (CPI, 2012 base) and then use the new poverty lines to estimate incidence of poverty.

2. Methodological Nuances

2.1 One-to-one Correspondence

Let $i, j; i \neq j$ be items (item or sub-item) in a commodity basket, $x = c, g$ denoting CPI 2012, or goods and services associated with a PLB like Tendulkar, T, or Rangarajan, R, such that, $g = T, R$. The first step is to have a one-to-one correspondence of the items used for computing CPI 2012 base, i_c, with the items in the PLBs of Tendulkar or Rangarajan, i_g,

(1a) $\quad i_c = i_g;\ i_x = 1, \dots, k\ \forall x\ \&\ x = c, g, T, R,$

such that the i^{th} item in CPI 2012 matches with each of the two PLBs. In arriving at a one-to-one correspondence (or, the equivalence) between the items of CPI 2012 and the items in the two PLBs, as also indicated in Appendix 1, there are three broad concerns.

First, there could be two items of CPI 2012, i_c and j_c, that have correspondence with one item in the PLB of Tendulkar or Rangarajan, i_g. These have been indicated in note 2 of Appendix 1.

Second, there could be one item of CPI 2012, i_c, that has correspondence with two or more items in the PLB of Tendulkar or Rangarajan, i_g and j_g. These have been indicated in note 3 of Appendix 1.

Third, some items of CPI 2012 may not have exact matches with PLBs of Tendulkar or Rangarajan, $i_c \approx i_g$. These, as indicated in note 4 of Appendix 1, could be because coverage of sub-items may be less in the PLBs, because the item of PLB may be defined in such a way that a part of the item is a part of some other item under CPI 2012 (for instance, in Rangarajan, salt is with sugar when it is part of spices under CPI, bedding is with clothing when it is part of household goods and services in 2012, other non-food may include other non-durable goods and services). The first two concerns can be addressed, which we will take up later, but the third concern suggests that some items are approximately matched such that,

(1b) $\quad i_c \approx i_g;\ i_x = 1, \dots, k\ \forall x\ \&\ x = c, g, T, R.$

Once, the items are approximately matched, the PLB weights, w_{i_g}, need to be assigned such that,

(2) $\sum_{i_g} w_{i_g} = 1;\ i = 1, \ldots, k,$

but for ease of presentation, the weights can be indicated as $w_{i_g} \times 100$ and as a result the total is 100. However, before assigning weights, we need to address the first two concerns of one-to-one correspondence.

For the situation that two items of CPI 2012 have correspondence with one item from PLB of Tendulkar or Rangarajan, the latter is pro rata adjusted, $w_{i_{ga}}$ and $w_{j_{ga}}$, such that,

(3a) $w_{i_{ga}} = w_{i_g}(w_{i_c}/(w_{i_c} + w_{j_c}))$, and

(3b) $w_{j_{ga}} = w_{i_g}(w_{j_c}/(w_{i_c} + w_{j_c}))$.

For the situation that one item of CPI 2012 has correspondence with two items from PLB of Tendulkar or Rangarajan, the latter should be a sum of their individual items, $w_{i_{gb}}$, such that,

(4) $w_{i_{gb}} = w_{i_g} + w_{j_g}$.

2.2 Inflation Indexing

In Appendix 1, CPI 2012 has six broad items and 23 independent items of which three are broad items (pan, tobacco and intoxicants; housing; and fuel and light) and 20 are sub-items of which 12 are sub-items of food, two are sub-items of clothing and footwear, and six are sub-items of miscellaneous. MOSPI (2024) provides information on month wise price indices for rural and urban across 37 States and Union Territories (UTs) of India (hereafter, States refer to both States and UTs). From this, information is available for all six items for all the 37 States, but information for 20 sub-items is available for 23 States, which means that there are 14 States where information is available for six items only. In 2012 base, all this is available for all months from July 2011 to June 2012 and from August 2022 to July 2023.

Let P_{i_csm} denote price index of item or sub-item (hereafter, item), i, in State for rural and urban, s, for month-year, m, with 2012 as base. This means that for any item of any State, there will be 12 monthly prices for 2011-12 (from July 2011 to June 2012) and another 12

monthly prices for 2022-23 (from August 2022 to July 2023). Further, for each of these two years, y, a year-specific, item-specific, state-specific (separately for rural and urban) price index, P_{i_csy}, will be weighted average over the months with the month-wise weights, w_m, being the number of days in that month, d_m, as a proportion of days in that year, $\sum_m d_m$, such that,

(5) $\quad P_{i_csy} = \sum_m w_m P_{i_csm}\,;\; w_m = d_m / \sum_m d_m\,,\; \sum_m w_m = 1.$

Now, a year-specific, state-specific price index linked to a PLB (separately for rural and urban) will be,

(6) $\quad P_{gsy} = \sum_i w_{i_g} P_{i_csy}\,; g = T, R.$

If the years 2011-12 and 2022-23 are y_1 and y_2, respectively, then state-specific, PLB-specific (separately for rural and urban) price inflation index of 2022-23 over 2011-12 will be,

(7) $\quad Q_{gsy_2} = (P_{gsy_2}/P_{gsy_1})100.$

In equation (7) two price indices with 2012 base gives us a new price index for the latter year (2022-23) with the former year (2011-12) as base (that is, $Q_{gsy_1} = 100$).

2.3 Updated Poverty Lines and Estimating Poverty

Let $Z_{gsy}; g = T, R \;\&\; y = y_1, y_2$ be poverty line associated with Tendulkar and Rangarajan PLB for States for the two years, 2011-12 and 2022-23 (separately for rural and urban). The state-specific poverty lines (separately for rural and urban) for 2011-12 for the two PLBs is already available in Government of India (2013, 2014). Using poverty lines for 2011-12 and price inflation of 2022-23 over 2011-12, the poverty lines for 2022-23 will be,

(8) $\quad Z_{gsy_2} = Z_{gsy_1}(Q_{gsy_2}/100); g = T, R.$

NSSO (2024) provides grouped data of monthly per capita expenditure (MPCE) for 2022-23 for 12 fractiles (0-5%, 5-10%, 10-20%, 20-30%, …, 80-90%, 90-95%, and 95-100%) for rural and urban in 36 States and for nine percentiles (10%, 20%, …, 90%) for 18 of these States. Given that the distribution is positively skewed, for almost all States (separately for rural and urban) the average MPCE lie in the eighth fractile (60-70%), we assume that the MPCE for

the 12 fractiles denotes the three-fifths position within the fractile, that is, they represent the percentiles of 3%, 8%, 16%, 26%, …, 86%, 93%, and 98%). Let E_{sl} be state-specific MPCE of the l^{th} percentile. This means, we have information of E_{sl} for 21 percentiles for 18 States and for 12 percentiles for another 18 States. Now, let us identify the MPCE that is the greater than but nearest to the updated poverty line, that is, the MPCE that is the minimum one from among those that are greater than the poverty line,

(9) $F_{sl} = \{\min(E_{sl})\} \geq Z_{gsy_2}$.

We now propose that the PLB-specific, state-specific incidence of poor (or head count ratio) in 2022-23 to be,

(10) $H_{gsy_2} = (Z_{gsy_2}/F_{sl})l;\ G = T, R$.

Now, as the head count ratio are state-specific, an average with state-specific population shares as weights, α_s, will provide the all-India level head count ratio for the two PLBs, separately for rural and urban, such that,

(11) $H_{gy_2} = \alpha_s H_{gsy_2};\ \sum_s \alpha_s = 1$.

Let population shares for rural and urban be, $\alpha_v;\ \sum_v \alpha_v = 1$, and $v = v_1, v_2$ denote rural and urban, respectively. The head count ratio for the combined areas, γ, for States and India, will be a weighted average over rural and urban, such that,

(12) $H_{\bullet\gamma} = \sum_v \alpha_v H_{\bullet v}\ ;\ H_\bullet = H_{gsy_2}, H_{gy_2}\ \&\ \sum_v \alpha_v = 1;\ v = v_1, v_2$.

Now, let $\theta = v, \gamma; v = v_1, v_2$ denote rural, urban and combined such that $H_{\bullet\theta}$ denotes various head count estimates given in equations (10)-(12) for rural, urban and combined and N_θ denotes the population estimates for the relevant rural, urban and combined. Thus, for each of these poverty estimates, the number of poor will be,

(13) $N_{Z\bullet\theta} = H_{\bullet\theta} N_\theta;\ \theta = v, \gamma\ \&\ v = v_1, v_2$.

In the absence of population estimates in NSSO (2024), the MOHFW (2020) population projections for 1st March 2023, which is the nearest to the mid-year of HCE 2022-23, may be considered.

3. Proportion and Number of Poor from Grouped Data

In Table 1, the weights, $w_{i_g} \times 100$, are those from the PLBs of Tendulkar or Rangarajan, indicated separately for rural and urban. The PLB of Tendulkar is benchmarked at the poverty line decile class for urban areas with HCE 2004-05 for mixed recall period (MRP). The PLB of Rangarajan is benchmarked at the poverty line class, separately for rural and urban, with HCE 2011-12 for modified mixed recall period (MMRP). The two PLBs are not comparable, but keeping that aside, one can make use of the two sets of weights to arrive at inflation index in 2022-23 over 2011-12.

The state-specific, PLB-specific inflation index, Q_{gsy_2}, separately for rural and urban, with 2011-12 as base, as indicated in equation (7) has been given in Table 2. The inflation increase was the least for rural in Dadra and Nagar Haveli and for urban in Delhi for both Tendulkar and Rangarajan PLB weights. The inflation increase was the highest for rural in Sikkim for Tendulkar PLB and in Lakshadweep for Rangarajan PLB and for urban in Puducherry for both Tendulkar and Rangarajan PLB. If one excludes Delhi and the 14 States with price information for six broad items only then the inflation increase was the least for rural areas in Himachal Pradesh for both Tendulkar and Rangarajan PLB weights and for urban areas in Haryana for Tendulkar PLB and in Punjab for Rangarajan PLB. The inflation increase was the highest for rural areas in Telangana for both Tendulkar and Rangarajan PLB weights and for urban areas in Uttarakhand for Tendulkar PLB and in Telangana for Rangarajan PLB.

Table 3 gives the updated poverty lines for 2022-23, as indicated in equation (8), and the poverty lines for 2011-12 as given in Government of India (2013, 2014). In fact, as per equation (8), the poverty lines of 2011-12 multiplied with price inflation, $Q_{gsy_2}/100$, gives us the updated poverty lines. So far so good. Can these, poverty lines be applied to the grouped monthly per capita expenditure (MPCE) data for different fractiles or percentiles to arrive at a head count ratio. Concerns of comparability remain, more so for the Tendulkar poverty line, as that was with mixed recall period. Even if Rangarajan poverty line is benchmarked to a modified mixed recall period the design of household consumption expenditure in 2022-23 may get higher expenditure estimates.

Table 1

Items under Consumer Price Index (CPI, 2012 base) Matched with Weights for Poverty Line Baskets (PLBs) under Tendulkar and Rangarajan for Rural and Urban areas of India

Consumer Price index, 2012 base		Tendulkar weights		Rangarajan weights	
Code	Items	Rural	Urban	Rural	Urban
1.1.01	Cereals and products	17.30	16.67	14.64	10.30
1.1.02	Meat and fish	3.30	3.18	4.33	3.54
1.1.03	Egg	0.43	0.42	0.49	0.46
1.1.04	Milk and products	7.82	7.53	6.32	6.40
1.1.05	Oils and fats	5.20	5.01	4.51	3.80
1.1.06	Fruits	1.86	1.80	1.70	2.10
1.1.07	Vegetables	6.54	6.30	8.42	6.00
1.1.08	Pulses and products	3.44	3.32	3.51	3.00
1.1.09	Sugar and confectionery	2.35	2.26	2.01	1.70
1.1.10	Spices	2.62	2.52	3.91	3.30
1.2.11	Non-alcoholic beverages	0.86	0.83	1.43	1.03
1.2.12	Prepared meals, snacks, sweets etc.	4.23	4.07	5.79	5.07
1	Food and beverages	55.95	53.90	57.06	46.70
2	Pan, tobacco and intoxicants	2.26	2.18	2.90	2.10
3.1.01	Clothing	6.87	6.61	7.81	8.28
3.1.02	Footwear	1.08	1.04	1.00	0.90
3	Clothing and footwear	7.94	7.65	8.81	9.18
4	Housing	0.00	3.66	0.00	5.29
5	Fuel and light	12.62	12.16	9.71	7.89
6.1.01	Household goods and services	7.35	7.08	1.90	1.50
6.1.02	Health	4.45	4.28	4.50	3.39
6.1.03	Transport and communication	1.70	1.64	3.60	7.29
6.1.04	Recreation and amusement	1.18	1.14	2.08	3.17
6.1.05	Education	3.32	3.20	3.00	8.08
6.1.06	Personal care and effects	3.23	3.11	6.43	5.41
6	Miscellaneous	21.23	20.45	21.52	28.85
	General index	100.00	100.00	100.00	100.00

Note: See Table 1 for equivalence of items under CPI 2012 with PLBs of Tendulkar and Rangarajan. The weights for Tendulkar are for urban based on 2004-05 household consumer expenditure for the poverty line decile class while the weights for Rangarajan are for rural and urban separately based on 2011-12 household consumption expenditure. The weights for rural indicated here are adjusted pro rata after excluding housing from urban under Tendulkar and from original rural under Rangarajan because CPI 2012 does not include housing for rural. Certain items that are indicated here separately were a single item in Tendulkar or Rangarajan poverty line baskets (see note 2 in Table 1) with the weight indicated here under Tendulkar and Rangarajan being pro rata based on their CPI 2012 weights. Similarly, certain other items that are indicated as a single item here were indicated separately in Tendulkar (see note 3 in Table 1) with the weights indicated here being a sum of their individual weights. In some other cases the item terms were different (see the terms considered equivalent in Table 1, particularly the concerns in note 4).

Source: Authors calculation based on Government of India (2009, 2014) and MOSPI (2024)

Table 2

Inflation Index for Rural and Urban areas in States and Union Territories of India for 2022-23 over 2011-12 with Weights from Poverty Line Baskets of Tendulkar and Rangarajan

States or Union Territories	Tendulkar		Rangarajan	
	Rural	Urban	Rural	Urban
Andaman and Nicobar Islands[1]	191.49	182.07	194.21	181.40
Andhra Pradesh	186.43	186.53	190.14	192.10
Arunachal Pradesh[1,2]	195.17	195.17	194.02	194.02
Assam	190.12	187.20	189.22	183.20
Bihar	181.40	188.00	182.28	186.78
Chandigarh[1]	179.32	179.59	180.17	178.85
Chhattisgarh	180.47	181.09	180.40	176.11
Dadra and Nagar Haveli[1]	164.88	180.51	165.38	180.08
Daman and Diu[1]	191.39	182.88	189.24	182.16
Delhi	177.84	173.80	172.99	172.65
Goa[1]	179.15	187.78	179.03	183.81
Gujarat	183.97	178.14	182.72	173.10
Haryana	185.90	176.23	185.63	176.38
Himachal Pradesh	171.03	187.77	174.12	181.82
Jammu & Kashmir	191.83	190.77	193.63	193.47
Jharkhand	184.97	191.89	183.97	186.43
Karnataka	183.99	190.42	187.61	191.74
Kerala	188.31	190.67	191.32	189.59
Ladakh[3]	191.83	190.77	193.63	193.47
Lakshadweep[1]	205.30	183.01	204.72	179.09
Madhya Pradesh	184.96	189.17	185.30	188.51
Maharashtra	191.45	181.65	189.40	179.20
Manipur[1]	199.68	177.25	199.39	178.20
Meghalaya[1]	173.59	191.17	172.43	185.08
Mizoram[1]	196.75	188.70	196.60	180.66
Nagaland[1]	196.90	189.37	194.96	185.65
Odisha	185.70	183.12	186.23	179.64
Puducherry[1]	195.56	199.79	195.64	194.81
Punjab	184.21	176.40	181.97	172.68
Rajasthan	184.99	180.61	185.35	180.76
Sikkim[1]	208.84	185.96	204.33	186.48
Tamil Nadu	193.91	192.87	194.28	194.00
Telangana	196.57	190.84	203.15	194.74
Tripura[1]	202.23	196.06	198.57	192.84
Uttar Pradesh	187.57	186.11	187.34	185.17
Uttarakhand	182.71	193.17	183.50	184.55
West Bengal	194.05	193.11	195.29	190.80
All India	187.09	185.21	187.90	186.74

Notes: 1. States and Union Territories for which price information was available for six broad items only. 2. In Arunachal Pradesh, price was available only for rural and the same has been used for urban. 3. In Ladakh, price of Jammu and Kashmir has been used.

Source: MOSPI (2024)

Table 3

Poverty Lines in 2022-23 for Tendulkar and Rangarajan Poverty Line Baskets (PLBs) Updated over 2011-12 with Information from Consumer Price Index 2012 Base

States or UTs	Tendulkar Method Poverty Lines				Rangarajan Method Poverty Lines			
	2011-12		2022-23		2011-12		2022-23	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
Andaman & Nicobar Is	880.0	937.0	1685.14	1706.02	1314.98	1797.69	2553.81	3260.99
Andhra Pradesh	860.0	1009.0	1603.31	1882.12	1031.74	1370.84	1961.71	2633.43
Arunachal Pradesh	930.0	1060.0	1815.09	2068.82	1151.01	1482.94	2233.15	2877.15
Assam	828.0	1008.0	1574.20	1887.00	1006.66	1420.12	1904.79	2601.72
Bihar	778.0	923.0	1411.30	1735.27	971.28	1229.30	1770.49	2296.14
Chandigarh	1155.0	1155.0	2071.10	2074.23	1303.17	1481.21	2347.94	2649.21
Chhattisgarh	738.0	849.0	1331.90	1537.48	911.80	1229.72	1644.88	2165.69
Dadra & Nagar Haveli	967.0	1126.0	1594.35	2032.56	1008.39	1540.81	1667.66	2774.61
Daman & Diu	1090.0	1134.0	2086.10	2073.89	1200.60	1434.93	2271.99	2613.88
Delhi	1145.0	1134.0	2036.30	1970.92	1492.46	1538.09	2581.85	2655.52
Goa	1090.0	1134.0	1952.72	2129.47	1200.60	1470.07	2149.43	2702.12
Gujarat	932.0	1152.0	1714.59	2052.13	1102.83	1507.06	2015.14	2608.71
Haryana	1015.0	1169.0	1886.87	2060.12	1127.82	1528.31	2093.54	2695.62
Himachal Pradesh	913.0	1064.0	1561.50	1997.91	1066.60	1411.59	1857.19	2566.52
Jammu & Kashmir	891.0	988.0	1709.22	1884.85	1044.48	1403.25	2022.45	2714.82
Jharkhand	748.0	974.0	1383.60	1868.96	904.02	1272.06	1663.12	2371.50
Karnataka	902.0	1089.0	1659.57	2073.65	975.43	1373.28	1830.04	2633.19
Kerala	1018.0	987.0	1917.01	1881.96	1054.03	1353.68	2016.55	2566.47
Ladakh	891.0	988.0	1709.22	1884.85	1044.48	1403.25	2022.45	2714.82
Lakshadweep	1018.0	987.0	2089.95	1806.30	1327.77	1458.69	2718.15	2612.42
Madhya Pradesh	771.0	897.0	1426.05	1696.82	941.70	1340.28	1744.99	2526.55
Maharashtra	967.0	1126.0	1851.34	2045.36	1078.34	1560.38	2042.36	2796.19
Manipur	1118.0	1170.0	2232.39	2073.85	1185.19	1561.77	2363.12	2783.00
Meghalaya	888.0	1154.0	1541.52	2206.06	1110.67	1524.37	1915.07	2821.24
Mizoram	1066.0	1155.0	2097.40	2179.48	1231.03	1703.93	2420.21	3078.34
Nagaland	1270.0	1302.0	2500.58	2465.65	1229.83	1615.78	2397.62	2999.74
Odisha	695.0	861.0	1290.65	1576.67	876.42	1205.37	1632.17	2165.39
Puducherry	1301.0	1309.0	2544.21	2615.31	1130.10	1382.31	2210.96	2692.94
Punjab	1054.0	1155.0	1941.54	2037.47	1127.48	1479.27	2051.69	2554.45
Rajasthan	905.0	1002.0	1674.16	1809.67	1035.97	1406.15	1920.21	2541.78
Sikkim	930.0	1226.0	1942.25	2279.83	1126.25	1542.67	2301.27	2876.82
Tamil Nadu	880.0	937.0	1706.42	1807.19	1081.94	1380.36	2102.04	2677.83
Telangana	860.0	1009.0	1690.54	1925.57	1031.74	1370.84	2095.97	2669.56
Tripura	798.0	920.0	1613.77	1803.77	935.52	1376.55	1857.67	2654.57
Uttar Pradesh	768.0	941.0	1440.52	1751.28	889.82	1329.55	1667.03	2461.88
Uttarakhand	880.0	1082.0	1607.83	2090.14	1014.95	1408.12	1862.39	2598.69
West Bengal	783.0	981.0	1519.44	1894.37	934.10	1372.68	1824.19	2619.09

Note: In 2011-12 poverty lines for some smaller states and union territories are with reference to another neighbouring state, but in 2022-23 updating is based on their respective price index.

Source: Compiled and computed from Government of India (2013, 2014) and MOSPI (2024)

Table 4

The Minimum Monthly Per Capita Expenditure Percentile of 2022-23 Greater Than the Updated Poverty Line of 2022-23 for Tendulkar and Rangarajan

States or UTs	Tendulkar Method				Rangarajan Method			
	Rural		Urban		Rural		Urban	
	%ile	MPCE	%ile	MPCE	%ile	MPCE	%ile	MPCE
Andaman & Nicobar Is	3	3066	3	4007	3	3066	3	4007
Andhra Pradesh	3	1952	3	2187	8	2442	8	3017
Arunachal Pradesh	8	2135	3	2993	16	2610	3	2993
Assam	8	1905	3	2149	8	1905	8	2729
Bihar	8	1777	3	1739	8	1777	10	2334
Chandigarh	3	3871	3	4348	3	3871	3	4348
Chhattisgarh	16	1352	8	1819	30	1713	16	2207
Dadra & Nagar Haveli	8	1709	3	3013	8	1709	3	3013
Daman & Diu	26	2499	3	3013	26	2499	3	3013
Delhi	3	2926	3	2540	3	2926	8	3311
Goa	3	3524	3	3855	3	3524	3	3855
Gujarat	8	2102	3	2339	8	2102	8	3036
Haryana	8	2392	3	2192	8	2392	8	3099
Himachal Pradesh	3	2203	3	2449	3	2203	8	3364
Jammu & Kashmir	3	1800	3	2301	8	2144	8	3055
Jharkhand	10	1422	8	2087	20	1704	16	2493
Karnataka	3	1958	3	2397	3	1958	8	3124
Kerala	3	2113	3	2283	3	2113	8	2866
Ladakh	16	1892	3	1948	26	2462	16	3169
Lakshadweep	3	2761	3	2831	3	2761	3	2831
Madhya Pradesh	8	1609	3	1860	16	1895	16	2655
Maharashtra	10	1938	3	2083	16	2143	10	2902
Manipur	8	2360	3	2083	16	2708	16	3014
Meghalaya	8	1837	8	2984	16	2156	8	2984
Mizoram	3	2123	3	3098	8	2663	3	3098
Nagaland	16	2607	3	3087	16	2607	3	3087
Odisha	8	1561	8	2027	10	1657	10	2168
Puducherry	3	2819	8	3486	3	2819	8	3486
Punjab	3	2377	3	2510	3	2377	8	3149
Rajasthan	8	1922	3	2077	8	1922	8	2612
Sikkim	3	3321	3	4523	3	3321	3	4523
Tamil Nadu	3	2041	3	2649	8	2676	8	3453
Telangana	3	2168	3	3094	3	2168	3	3094
Tripura	3	2365	3	3309	3	2365	3	3309
Uttar Pradesh	8	1695	3	1820	8	1695	16	2671
Uttarakhand	3	1894	3	2206	3	1894	8	2820
West Bengal	8	1755	8	2252	10	1859	16	2689

Note: MPCE is monthly per capita expenditure. In 2011-12 poverty lines for some smaller states and union territories are with reference to another neighbouring state. In 2022-23 updating is based on their respective price index. Further, in 2022-23, MPCE for Dadra & Nagar Haveli and Daman & Diu are a single entity, but they are indicated separately as their estimated poverty lines are different.
Source: Computed from Government of India (2013, 2014) and MOSPI (2024)

Table 5

Proportion and Number of Poor in 2022-23 for Tendulkar Poverty Lines

States or UTs	Proportion poor (%)			Number poor (in 000)		
	Rural	Urban	Combined	Rural	Urban	Combined
Andaman & Nicobar Is	1.65	1.28	1.48	3.71	2.27	5.98
Andhra Pradesh	2.46	2.58	2.51	832.10	500.53	1332.63
Arunachal Pradesh	6.80	2.07	5.59	79.03	8.29	87.33
Assam	6.61	2.63	5.99	1993.56	146.39	2139.94
Bihar	6.35	2.99	5.94	7064.65	465.95	7530.60
Chandigarh	1.61	1.43	1.43	0.02	17.60	17.62
Chhattisgarh	15.76	6.76	13.32	3466.87	553.46	4020.33
Dadra & Nagar Haveli	7.46	2.02	3.67	15.75	9.88	25.62
Daman & Diu	21.70	2.06	2.97	5.64	11.11	16.75
Delhi	2.09	2.33	2.33	1.94	495.04	496.98
Goa	1.66	1.66	1.66	6.33	19.79	26.12
Gujarat	6.53	2.63	4.63	2392.33	917.17	3309.50
Haryana	6.31	2.82	4.84	1103.85	358.56	1462.41
Himachal Pradesh	2.13	2.45	2.16	142.43	18.85	161.27
Jammu & Kashmir	2.85	2.46	2.73	269.17	102.08	371.26
Jharkhand	9.73	7.16	9.06	2834.83	740.13	3574.96
Karnataka	2.54	2.60	2.57	956.86	780.17	1737.04
Kerala	2.72	2.47	2.53	240.30	666.40	906.70
Ladakh	14.45	2.90	10.87	29.92	2.70	32.62
Lakshadweep	2.27	1.91	1.92	0.02	1.30	1.32
Madhya Pradesh	7.09	2.74	5.83	4358.95	686.99	5045.95
Maharashtra	9.55	2.95	6.35	6214.20	1806.77	8020.97
Manipur	7.57	2.99	6.08	164.82	31.21	196.03
Meghalaya	6.71	5.91	6.55	178.44	40.87	219.31
Mizoram	2.96	2.11	2.49	16.51	14.37	30.88
Nagaland	15.35	2.40	9.41	185.70	24.51	210.21
Odisha	6.61	6.22	6.54	2484.52	542.24	3026.76
Puducherry	2.71	6.00	5.02	13.29	69.32	82.62
Punjab	2.45	2.44	2.44	438.06	313.00	751.06
Rajasthan	6.97	2.61	5.81	4143.49	563.65	4707.14
Sikkim	1.75	1.51	1.64	6.16	5.11	11.27
Tamil Nadu	2.51	2.05	2.26	892.95	844.43	1737.37
Telangana	2.34	1.87	2.11	464.28	340.61	804.89
Tripura	2.05	1.64	1.89	51.63	26.57	78.20
Uttar Pradesh	6.80	2.89	5.86	12174.16	1634.67	13808.83
Uttarakhand	2.55	2.84	2.65	189.99	118.73	308.71
West Bengal	6.93	6.73	6.85	4338.23	2452.86	6791.09
All India	6.85	2.78	5.27	61771.93	13519.10	75291.02

Note: The estimates are an application of inflation index of 2022-23 over 2011-12 by using Consumer Price Index (CPI 2012 base) to obtain updated poverty lines, which are matched with grouped data of monthly per capita expenditure across fractiles/selected percentiles and not based on the approach followed by the Tendulkar method with unit level data. For state-specific combined estimates and for all estimates for India population shares used are given in Appendix 2.

Source: Computed from Government of India (2013, 2014), MOHFW (2020) and MOSPI (2024)

Table 6

Proportion and Number of Poor in 2022-23 for Rangarajan Poverty Lines

States or UTs	Proportion poor (%)			Number poor (in 000)		
	Rural	Urban	Combined	Rural	Urban	Combined
Andaman & Nicobar Is	2.50	2.44	2.47	5.62	4.35	9.97
Andhra Pradesh	6.43	6.98	6.63	2170.19	1353.78	3523.96
Arunachal Pradesh	13.69	2.88	10.92	159.08	11.54	170.61
Assam	8.00	7.63	7.94	2412.21	423.83	2836.03
Bihar	7.97	9.84	8.20	8862.71	1531.25	10393.97
Chandigarh	1.82	1.83	1.83	0.02	22.48	22.50
Chhattisgarh	28.81	15.70	25.25	6336.10	1285.09	7621.19
Dadra & Nagar Haveli	7.81	2.76	4.29	16.47	13.48	29.95
Daman & Diu	23.64	2.60	3.57	6.15	14.00	20.15
Delhi	2.65	6.42	6.40	2.46	1364.48	1366.94
Goa	1.83	2.10	2.04	6.97	25.11	32.08
Gujarat	7.67	6.87	7.28	2811.69	2395.34	5207.03
Haryana	7.00	6.96	6.98	1224.75	884.94	2109.69
Himachal Pradesh	2.53	6.10	2.90	169.40	47.00	216.39
Jammu & Kashmir	7.55	7.11	7.41	713.06	295.32	1008.38
Jharkhand	19.52	15.22	18.39	5687.20	1572.40	7259.60
Karnataka	2.80	6.74	4.55	1055.15	2027.05	3082.21
Kerala	2.86	7.16	6.10	252.78	1930.46	2183.24
Ladakh	21.36	13.71	18.99	44.21	12.75	56.96
Lakshadweep	2.95	2.77	2.77	0.03	1.88	1.91
Madhya Pradesh	14.73	15.23	14.88	9057.66	3822.01	12879.67
Maharashtra	15.25	9.64	12.52	9919.37	5909.77	15829.14
Manipur	13.96	14.77	14.23	304.10	154.39	458.48
Meghalaya	14.21	7.56	12.84	377.76	52.26	430.02
Mizoram	7.27	2.98	4.91	40.50	20.30	60.80
Nagaland	14.71	2.92	9.31	178.05	29.82	207.87
Odisha	9.85	9.99	9.88	3699.91	870.35	4570.26
Puducherry	2.35	6.18	5.04	11.55	71.38	82.93
Punjab	2.59	6.49	4.22	462.91	834.10	1297.02
Rajasthan	7.99	7.78	7.94	4752.46	1678.74	6431.20
Sikkim	2.08	1.91	2.00	7.30	6.45	13.75
Tamil Nadu	6.28	6.20	6.24	2237.22	2559.74	4796.95
Telangana	2.90	2.59	2.75	575.63	472.21	1047.84
Tripura	2.36	2.41	2.38	59.43	39.11	98.54
Uttar Pradesh	7.87	14.75	9.52	14088.43	8350.96	22439.39
Uttarakhand	2.95	7.37	4.54	220.06	307.94	528.00
West Bengal	9.81	15.58	11.94	6146.20	5680.22	11826.42
All India	9.55	9.34	9.38	86095.12	45474.61	131569.72

Note: The estimates are an application of inflation index of 2022-23 over 2011-12 by using Consumer Price Index (CPI 2012 base) to obtain updated poverty lines, which are matched with grouped data of monthly per capita expenditure across fractiles/selected percentiles and not based on the approach followed by the Rangarajan method with unit level data. For state-specific combined estimates and for all estimates for India population shares used are given in Appendix 2.

Source: Computed from Government of India (2013, 2014), MOHFW (2020) and MOSPI (2024)

While acknowledging the limitation of our poverty lines to the household consumption expenditure of 2022-23, we extend our methodological exploration to the grouped monthly consumption expenditure data for 12 fractiles for 36 States and for nine percentiles for 18 of these States. Besides, as the distribution is positively skewed, for the fractiles, we assume that the MPCE is associated with the three-fifths position within the fractile and identify all the available MPCE with a percentile. From these MPCE, we identify the MPCE that is the minimum from those greater than the poverty line, $F_{sl} = \{\min(E_{sl})\} \geq Z_{gsy_2}$, as in equation (9). The relevant percentile and the associated MPCE are given in Table 4.

Tables 5 and 6 give the proportion and number of poor for the updated Tendulkar and Rangarajan poverty lines, respectively, see equations (10)-(13) and Appendix 2. This, strictly speaking, is not comparable with the Tendulkar method estimates which were based on MRP (that is, 30 days recall for most items and 365 days recall five items that are not frequently purchased) while HCE 2022-23 is based on MMRP (that is, in addition to the 30 days and 365 days recall, seven days recall was used for some food and other items with lower durability that require frequent purchases). In addition, the design and structure of HCE 2022-23 is different (has more items covered, collects household consumption expenditure through multiple schedules/questionnaires with multiple visits to the household surveyed over a three-month period, and limits the sample selection to the first ten months). Given all these, our estimates with Tendulkar PLB are likely to be underestimates.

Nevertheless, the estimates in Table 5, in conjunction with Table 4, indicate that 18 States in rural and 31 States in urban have their estimated poverty line that is lower than the MPCE of the first fractile. Excluding some UTs, the proportion of poor is the highest in Chhattisgarh at 15.76% for rural, 6.76% for urban and 13.32% for combined. The proportion of poor at the all-India level being 6.85% for rural, 2.78% for urban and 5.27% for combined with the total number of poor being 7.53 crores of which 6.18 crores are in rural and the remaining 1.35 crores are in urban.

The Rangarajan poverty line of 2011-12, unlike that of Tendulkar poverty line, is based on MMRP and in that sense is similar to HCE 2022-23. However, the design and structure of the 2022-23 is different, and as indicated earlier, the HCE 2022-23 survey has more items and a greater number of schedules canvassed through multiple visits to the same household. Thus,

our poverty estimates using Rangarajan PLB are also likely to be underestimates. Keeping that aside, in conjunction with Table 4, the estimates indicate that 14 States in rural and 12 States in urban have their estimated poverty line that is lower than the MPCE of the first fractile. Chhattisgarh has the highest proportion of poor at 28.81% for rural, 15.7% for urban and 26.25% for combined. The proportion of poor at the all-India level being 9.55% for rural, 9.34% for urban and 9.38% for combined with the total number of poor being 13.16 crores of which 8.61 crores are in rural and the remaining 4.55 crore are in urban.

In recent years, the multidimensional poverty index (MPI) and the component of head count ratio therein has been an alternative method to measure and use it as a public policy discourse (Alkire and Foster 2011; UNDP and OPHI 2023). The recourse to head count ratio in MPI has led to a reliance on dimensional cut-off and information loss, which could underestimate poverty (Mishra 2024). Keeping that methodological concern aside, we look up a recent discussion paper by NITI Aaayog (2024), which shows that the head count ratio component of MPI in India has come down from 55.34% in 2005-06 to 24.85% in 2015-16 to 14.96% in 2019-21 and was projected to be at 11.28% in 2022-23.

The approach in MPI is different from estimates using HCE, but if one goes by the trends then incidence of poverty has been declining. Like the concerns for information loss in MPI, one is aware of non-comparability of HCE 2022-23 with earlier rounds. One may also point out that the inflation index of 2022-23 over 2011-12 by using CPI 2012 is perhaps not capturing the ground reality faced by the poor. It is possible that use of unit level data where prices could have been computed for the poverty line decile class would give different estimates. Keeping these aside, it is pertinent to note that our poverty lines that lie in the per capita per day range of ₹43-85 in rural and ₹51-88 in urban for Tendulkar and ₹54-91 for rural and ₹72-109 in urban for Rangarajan will not provide for adequate nourishment, basic education and primary health care needs. These suggest that social welfare measures linked to poverty line need a re-think calling for a broad-based approach.

4. Concluding remarks

The purpose of this exercise has been methodological and less about providing estimates on proportion and number of poor in rural, urban, and combined for States and India in 2022-23. The methodological nuances behind this are the following. First, we obtained one-to-one correspondence between items in CPI 2012 base with PLBs of Tendulkar and Rangarajan and assigned PLB weights to the matched items. Second, we used state-specific (separately for rural and urban) CPI 2012 base data and obtained item-wise annual average for 2011-12 and 2022-23 and superimposed the PLB weights to arrive at price indices for the two years and used these to compute PLB-specific inflation index of 2022-23 over 2011-12. Third, we calculated PLB-specific poverty lines for 2022-23 by multiplying PLB-specific inflation index of 2022-23 with relevant poverty lines of 2011-12. Fourth, we assigned a percentile to MPCE from grouped data for 2022-23 and matched the MPCE that is greater than but nearest to the PLB-specific poverty line of 2022-23. Fifth, we estimated the proportion of poor using the matched MPCE and the relevant percentile and used projected population data to arrive at the number of poor; we also used population shares between rural and urban to arrive at state-specific combined estimates and population shares across states to arrive at rural, urban and combined estimates for India.

At the all-India level, for 2022-23, the updated state-specific Tendulkar poverty lines indicate a poverty incidence of 6.4% for rural, 3.1% for urban and 5.3% for combined, while the updated state-specific Rangarajan poverty lines indicate a poverty incidence of 9.3% for rural, 9.5% for urban and 9.4% for combined. Some of the concerns are non-comparability of consumption expenditure 2022-23 with earlier rounds, CPI is perhaps not capturing the ground reality faced by the poor, and that our estimates do not use unit level data. It is pertinent to note that our poverty lines that lie in the per capita per day range of ₹43-109 are not adequate to provide for nourishment, basic education and primary health care needs. These suggest that social welfare measures linked to the poverty line need a re-think calling for a broad-based approach.

Appendix 1

Equivalence of Items under Consumer Price Index (CPI, 2012 base) with Poverty Line Baskets (PLBs) under Tendulkar and Rangarajan.

Code[1]	CPI items 2012 base	PLB items, Tendulkar	PLB items, Rangarajan
1.1.01	Cereals and products	Cereal[4a]	Cereals and substitute
1.1.02	Meat and fish[2a]	Egg, Fish and Meat[2a]	Egg, Fish and Meat[2a]
1.1.03	Egg[2a]		
1.1.04	Milk and products	Milk[4a]	Milk and milk products
1.1.05	Oils and fats	Edible oil[4a]	Edible oil
1.1.06	Fruits[3a]	Fresh fruits[3a]	Fruits
		Dry fruits[3a]	
1.1.07	Vegetables	Vegetables	Vegetables
1.1.08	Pulses and products	Pulses[4a]	Pulses and products
1.1.09	Sugar and confectionery	Sugar[4a]	Salt and sugar[4a,4b]
1.1.10	Spices	Salt & Spices	Spices[4b]
1.2.11	Non-alcoholic beverages[2b]	Other food[2b]	Other food[2b]
1.2.12	Prepared meals, snacks, sweets etc.[2b]		
1	Food and beverages		Food total
2	Pan, tobacco and intoxicants	Intoxicants	Pan, tobacco and intoxicant
3.1.01	Clothing	Clothing	Clothing and bedding[4c]
3.1.02	Footwear	Footwear	Footwear
3	Clothing and footwear		
5	Fuel and light	Fuel[4a]	Fuel and light
4	Housing[2c]	Rent and Conveyance[2c,4a]	Rent[4a]
6.1.03	Transport and communication[2c,4a]		Conveyance[4a]
6.1.01	Household goods and services[3b,4d]	Other goods[3b]	Durable goods[4d]
		Other services[3b]	
		Durable goods[3b]	
6.1.02	Health[3c]	Medical: Institutional[3c]	Medical (institutional and non-institutional)
		Medical: Non-institutional[3c]	
6.1.05	Education	Education	Education
6.1.04	Recreation and amusement[2d]	Entertainment	Other non-food[2d,4d]
6.1.06	Personal care and effects[2d]	Personal items	
6	Miscellaneous		
			Non-food total
	General index	Total poverty line basket	Total (food + non-food)

Note: 1. Code as per CPI 2012 base. 2. Certain items that are indicated separately under CPI 2012 are indicated as a single item under PLBs of Tendulkar or Rangarajan: (a) 'meat and fish' and 'egg' as 'egg, fish and meat', (b) 'non-alcoholic beverages' and 'prepared meals, snacks, sweets etc.' as 'other food', (c) 'housing' and 'transport and communication' as 'rent and conveyance', and (d) 'recreation and amusement' and 'personal care and effects' as 'other non-food'. 3. Certain items that are indicated as a single item under CPI 2012 are indicated separately under PLB of Tendulkar: (a) 'fruits' as 'fresh fruits' and 'dry fruits', (b) 'household goods and services' as 'other goods', 'other services' and 'durable goods', and (c) 'health' as 'medical: institutional' and 'medical: non-institutional'. 4. The equivalence may not be exact matches because for both Tendulkar and Rangarajan (a) coverage of sub-items may be less, and for Rangarajan (b) salt is included with sugar and not with spices, (c) bedding is included with clothing and is not part of household goods and services, and (d) other non-food may include other non-durable goods and services.

Source: Compiled by author from Government of India (2009, 2014) and MOSPI (2024)

Appendix 2

Population Shares across States for Rural, Urban and Combined Areas of India and within States between Rural and Urban for States or Union Territories and India

States or Union Territories	Shares across States			Shares within States	
	Rural	Urban	Combined	Rural	Urban
Andaman and Nicobar Islands	0.025	0.037	0.029	55.8	44.2
Andhra Pradesh	3.747	3.982	3.829	63.5	36.5
Arunachal Pradesh	0.129	0.082	0.113	74.4	25.6
Assam	3.346	1.141	2.573	84.4	15.6
Bihar	12.337	3.197	9.131	87.7	12.3
Chandigarh	0.000	0.253	0.089	0.1	99.9
Chhattisgarh	2.440	1.681	2.174	72.9	27.1
Dadra and Nagar Haveli	0.023	0.100	0.050	30.2	69.8
Daman and Diu	0.003	0.111	0.041	4.6	95.4
Delhi	0.010	4.368	1.539	0.4	99.6
Goa	0.042	0.245	0.113	24.2	75.8
Gujarat	4.068	7.157	5.151	51.3	48.7
Haryana	1.941	2.612	2.176	57.9	42.1
Himachal Pradesh	0.743	0.158	0.538	89.7	10.3
Jammu and Kashmir	1.048	0.853	0.980	69.5	30.5
Jharkhand	3.233	2.122	2.843	73.8	26.2
Karnataka	4.175	6.175	4.876	55.6	44.4
Kerala	0.980	5.535	2.577	24.7	75.3
Ladakh	0.023	0.019	0.022	69.0	31.0
Lakshadweep	0.000	0.014	0.005	1.4	98.6
Madhya Pradesh	6.821	5.156	6.237	71.0	29.0
Maharashtra	7.217	12.598	9.104	51.5	48.5
Manipur	0.242	0.215	0.232	67.6	32.4
Meghalaya	0.295	0.142	0.241	79.4	20.6
Mizoram	0.062	0.140	0.089	45.0	55.0
Nagaland	0.134	0.210	0.161	54.2	45.8
Odisha	4.167	1.790	3.334	81.2	18.8
Puducherry	0.054	0.237	0.119	29.8	70.2
Punjab	1.983	2.640	2.214	58.2	41.8
Rajasthan	6.597	4.429	5.837	73.4	26.6
Sikkim	0.039	0.069	0.050	50.9	49.1
Tamil Nadu	3.950	8.475	5.537	46.3	53.7
Telangana	2.202	3.747	2.744	52.1	47.9
Tripura	0.280	0.334	0.299	60.8	39.2
Uttar Pradesh	19.867	11.631	16.978	76.0	24.0
Uttarakhand	0.828	0.858	0.838	64.1	35.9
West Bengal	6.949	7.487	7.138	63.2	36.8
ALL India	100.000	100.000	100.000	64.9	35.1

Note: Shares are for population projection for 1 March 2023.

Source: Computed from MOHFW (2020)

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