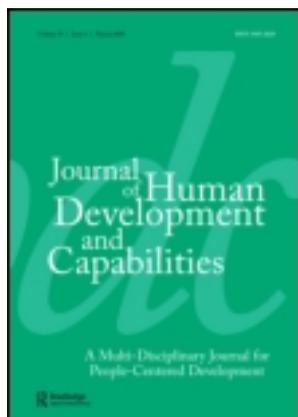


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Is Targeting the Poor a Penalty on the Food Insecure? Poverty and Food Insecurity in India

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Abstract This paper seeks to verify the hypothesis that the set of food insecure is larger than the set of poor in India. Any attempt to reform safety nets like a food distribution programme by targeting it only to the latter would penalize those who are non-poor but food insecure. Towards this end, the paper attempts to: exemplify the issue with reference to measures and criteria for identifying the poor and food insecure; to estimate the incidence of poverty and food insecurity at the national and state levels; and to examine how far their magnitudes tally across states. This limited exercise shows that aggregate estimates of poverty and food insecurity broadly tally at the national level and for several states. The targeted public distribution system covers the majority of the food insecure who are poor, but excludes those sections/regions whose consumption patterns have changed by choice. This calls not for any income transfer but, if at all, for nutrition education programmes to influence consumer choice.

Key words: Food insecurity, Poverty, Safety nets, Consumption patterns, Measures, India

Introduction

India has achieved considerable success in reducing economic deprivation, as judged by estimates of consumption-based poverty measures. The official estimate of poverty for 1999/2000 was 26%.¹ India has attained self-sufficiency in food grain production, has surplus stocks of food grains and has even started exporting food grains in recent years (Government of India [GoI], 2004, p. S-21). Such trends in macro-indicators are sometimes

interpreted as evidence that India has achieved food security. However, the High Level Committee on Long-Term Grain Policy appointed by the GoI challenges this view. It attributes the surplus stocks of food grains to the decline in per-capita cereal consumption, rather than to increases in food production in recent decades (GoI, 2002b). As per its findings, more than 70% of the population had a per-capita energy intake less than 2100 kcal/day for some years since 1993/94. The Committee finds that the bottom 80% of the rural and the bottom 40% of the urban households, respectively, spend more than 60% of their total expenditures on food. This means that the magnitude of food insecurity by this food share criterion is more than the incidence of poverty in India.

The Committee draws the implications of this finding for safety net programmes such as the public distribution system (PDS) as follows. The PDS is a welfare scheme under which the GoI sells food grains at subsidized prices to maintain price stability and to promote food security of the population. Until the mid-1990s, the PDS laid emphasis on universal coverage of the population. However, as part of its economic reform agenda, the GoI in 1997 introduced targeting in the PDS (GoI, 1997). Under this system, the poor and non-poor groups are subject to differential pricing of food grains to restrict subsidies only to the former. The population is bifurcated into these two groups in both rural and urban areas with reference to the poverty lines estimated by the Planning Commission for the year 1993/94. The estimates of poverty corresponding to these norms were 37% for rural and 32% for urban All-India. Under the revised scheme, PDS off-take declined from 19.6 million tonnes in 1996/97 to an annual average of 17.5 million tonnes during 1997–2000. Price instability, as measured by the ratio of the wholesale price index for cereals to that of all commodities, increased by 17.4% between 1997/98 and 1999/2000, and declined sharply by 13.3% between 1999/2000 and 2001/02 (GoI, 2002b).

In other words, the attempt to target the public distribution system only to the poor has rendered it non-viable because of a reduction in sales and profit margin for the retail outlets, and ineffective in terms of price stabilization. Thus, the Committee concludes that the targeted PDS has penalized states with low incidence of poverty but relatively high incidence of calorie deficiency, and it felt that, *inter alia*, it was “essential to go back to the universal PDS” (GoI, 2002b, p. 3).

This type of assessment needs some scrutiny since, if valid, it has definite implications for economic policy and the development agenda in India.² The reason is that estimates of food insecurity have a bearing on targets for food grain production, and hence for agricultural policy (agricultural prices, terms of trade between agriculture and industry, input subsidies), imports, buffer-stocks on the supply side and consumer subsidies, form, magnitude and distribution, on the demand side. This raises the following questions:

- How valid are the findings and interpretation of the High Level Committee?
- How serious is the question of food insecurity in India? What is its regional profile? How strong is its association with the incidence of poverty?
- Does it imply that the targeted PDS has penalized the states with low incidence of poverty but high incidence of food insecurity?
- What are the policy imperatives?

This paper, based on a study by the authors, attempts to address the questions listed above. The following section provides a background by highlighting the major issues relating to food security in India, which have so far received attention in the pertinent literature. Next, we examine the validity of the findings of the High Level Committee and interpretation from a methodological perspective, followed by sections on the concept and methodology, and database, respectively. The subsequent section presents estimates of the dual dimensions (economic access and physical access) of food insecurity at the national and state levels in India for the year 1999/2000, followed by the conclusion of our findings.

Review of literature

The question of food insecurity at the national and state levels in India has received considerable attention ever since the GoI embarked upon the economic reform programme in 1991. Some of the important issues addressed include:

- Concept, definition and trends, where the focus has largely been at the macro level.³
- Fiscal dimensions of food subsidy, its magnitude and composition such as consumer subsidy, costs due to operational inefficiency of the state agencies, and so on.
- Macro economic implications of food subsidy and alternative options to promote growth with equity.⁴
- Reform options ranging from revamping the existing food distribution system to its replacement by food stamps, and their macro-economic implications.⁵
- Efficiency and effectiveness. Scope for efficient functioning of the food distribution programme and ensuring its effectiveness by minimizing Type I and Type II errors.⁶
- Extent of food and nutrition security across states, and their determinants and policy imperatives.
- Changing consumption patterns and their implications for policy reform. Most of these studies are based on the National Sample Survey (NSS) data on consumer expenditure distribution in India.⁷

Some of the important empirical details deemed relevant by the authors of the present study include the following:

- Based on macro-measures such as poverty and food self-sufficiency, India appears to have achieved some progress with respect to the population's food security.
- This can be further verified using disaggregate indicators like per-capita consumer expenditure, cereal consumption, calorie intake and associated measures of deprivation. Nawani (1994), Swaminathan Research Foundation (2001), Suryanarayana (1996, 1997, 2001a, 2003, 2004) and the High Level Committee (GoI, 2002b) are among the studies that have attempted to examine food security in terms of these indicators at the state level.
- With improvement in economic status, consumption patterns have changed for the majority of the rural and urban populations. Cereal consumption, which is the major source of calorie intake for the Indian household, has remained stable or marginally increased for the bottom two decile groups and declined for the top seven decile groups in rural All-India (Suryanarayana, 2000). Urban All-India does not exhibit such clear-cut patterns; but broadly speaking, cereal consumption increased somewhat for the bottom decile groups and decreased for the top decile groups (Table 1; for time-series details, see Suryanarayana, 1997).
- Per-capita calorie intake increased for the bottom four decile groups and decreased for the top six decile groups in rural All-India. As regards urban All-India, it increased for the bottom six decile groups and declined for the top four decile groups (Table 2).
- The GoI has pursued policies and programmes to promote both economic and physical access of the population, the poor and vulnerable in particular, to food grains (cereals).
- The health status of the population, as measured by different indicators, has improved (GoI, 2001a; Suryanarayana, 2001b).

Table 1. Estimates of per capita cereal consumption: rural and urban All-India (kg per 30 days)

Decile group	Rural All-India				Urban All-India			
	1972/73	1983	1993/94	1999/2000	1972/73	1983	1993/94	1999/2000
0-10	9.08	10.35	10.53	10.49	8.75	9.19	9.53	9.57
10-20	12.03	12.45	12.09	11.65	10.52	10.46	10.64	10.30
20-30	13.32	13.38	12.65	12.30	11.23	10.98	10.80	10.80
30-40	14.35	13.94	13.22	12.59	11.46	11.34	10.93	10.67
40-50	15.15	14.78	13.40	12.92	11.84	11.49	11.03	10.87
50-60	15.60	15.29	13.77	13.09	11.90	11.88	10.96	10.78
60-70	17.07	15.66	14.12	13.43	12.15	12.12	11.02	10.74
70-80	17.75	16.34	14.46	13.54	12.09	12.12	10.80	10.60
80-90	18.96	17.41	14.65	13.81	11.84	12.08	10.77	10.62
90-100	21.26	19.40	15.52	14.18	11.43	12.16	10.31	10.06
All	15.46	14.90	13.44	12.80	11.32	11.38	10.68	10.50

Source: Suryanarayana (1995, 2004).

Poverty and Food Insecurity in India

Table 2. Estimates of energy intake: rural and urban All-India (kcal per capita per diem)

Decile group	Rural All-India				Urban All-India			
	1972/73	1983	1993/94	1999/2000	1972/73	1983	1993/94	1999/2000
0–10	1192.09	1356.31	1460.12	1491.48	1298.70	1331.76	1443.50	1520.88
10–20	1591.90	1681.80	1731.32	1730.52	1575.94	1588.29	1702.40	1731.16
20–30	1783.40	1847.86	1850.00	1865.30	1745.94	1724.00	1803.48	1912.56
30–40	1944.00	1952.00	1971.66	1955.22	1802.18	1861.19	1896.79	1970.46
40–50	2115.04	2111.53	2056.48	2049.15	1980.00	1912.41	1992.81	2092.92
50–60	2210.00	2229.56	2156.34	2170.62	2035.48	2046.00	2074.64	2189.89
60–70	2451.41	2322.00	2275.17	2287.78	2266.00	2221.13	2186.00	2297.00
70–80	2581.40	2506.92	2410.00	2403.00	2382.13	2294.20	2296.74	2467.69
80–90	2929.00	2779.53	2584.72	2582.54	2658.75	2500.71	2470.50	2536.00
90–100	3861.77	3422.49	3034.19	2954.39	3324.88	3410.30	2843.14	2841.53
All	2266.00	2221.00	2153.00	2149.00	2107.00	2089.00	2071.00	2156.00

Source: Suryanarayana (2003, 2004).

Validity of High Level Committee findings and interpretation

The issue raised by the High Level Committee provides an empirical illustration of a well-known methodological problem; namely that — although the concepts of both poverty and food insecurity are anchored in terms of a subsistence food-consumption/calorie-intake norm, and although their estimates are based on the same consumer expenditure dataset and hence, tally for any reference year — the two estimates would, however, differ for subsequent years because of differences in methodology. It points to the following concrete empirical explanation:

- The official definition of poverty in India is anchored in terms of a physical measure of food insecurity; that is, a normative calorie intake criterion.⁸ It measures the proportion of the population living below the poverty line, defined as the amount of consumer expenditure required to secure a minimum calorie (food insecurity) norm in the reference year 1973/74. For this base year, estimates of poverty and food insecurity by the calorie intake measure are the same. However, the estimates of poverty and food insecurity would not tally for the subsequent years, since:
 - Estimates of poverty are made on the basis of data on consumer expenditure distribution (at current prices) with reference to poverty lines suitably adjusted only for changes in cost of living.
 - Food insecurity estimates are based on data on physical measures, such as cereal consumption and calorie intake (which are responsive to changes in not only cost of living, including relative prices, but also tastes and preferences, as well as a host of other institutional factors), with reference to a constant base year norm.

Hence, the set of poor identified and estimated in terms of an economic access (monetary) measure need not necessarily tally with the set of

food insecure in terms of a physical measure for a subsequent year. This is precisely the problem underlying the issue raised by the High Level Committee. In addition, there are several other methodological details that the Committee has not taken care of, which are as follows.

- Hunger, of course, persists in the country,⁹ and average cereal consumption and average calorie intake of the rural population have been declining. Today nearly 80% of the Indian population is energy deficient with reference to the subsistence calorie norms underlying the official definition of the poverty line. This is because the calorie intake of the richer decile groups has declined by choice; and because that of the poorer sections, although increased, still falls short of the subsistence norm (Suryanarayana, 2003). The decline in the calorie intake of the richer sections could be explained in terms of changing consumption patterns in favour of non-calorie food and non-food items at the expense of calorie intake. Moreover, the poor seem to have opted for some diversification in consumption providing a more nutritious diet, although not necessarily adequate energy (Suryanarayana, 1995).¹⁰ But such shortfalls in food grain consumption and calorie intake are not reflected in final outcome indicators, such as anthropometric measures and other indicators of health status, which show some improvement (Suryanarayana, 1997).¹¹ Infant and child mortality rates have declined over time (Suryanarayana, 2001b). In other words, policy efforts by the GoI in terms of targeted programmes to promote both economic and physical access to food grains, better physical infrastructure and medical facilities seem to have paid dividends in terms of improved living conditions and health status, and hence reduced calorie requirement. Therefore, the observed decline in cereal consumption and calorie intake need not necessarily indicate worsening food insecurity situation as interpreted by the Committee. Instead this would call for downward revisions in calorie norms by triangulating input, output and final impact measures for assessing food security.
- As per the NSS estimates, 96.2% of the rural and 98.6% of the urban households in India reported to have obtained adequate food (two square meals a day) throughout the year in 1999/2000 (GoI, 2001b). This would raise the question as to whether cereal/calorie shortfall is a question of voluntary choice or involuntary. As the preceding findings show, cereal consumption and calorie intakes of the richer decile groups have declined by choice. If the corresponding limits were to be the norm (see sections below), then only about 30% of the rural and 40% of the urban population were food insecure, and these macro estimates of food insecurity were near the poverty estimates. Hence, there would be little basis for the observation that PDS targeting has imperilled the food insecure.
- The public distribution system is implemented by the State Governments, which decide on the identification and magnitude of the poor. Generally the State Governments have targeted the PDS to a

larger proportion of the population than the estimate of poverty by the GoI. For instance, as against the GoI's estimate of poverty at 25% for Kerala, its State Government has decided to target the programme to 42% of the population as recommended by the village administrative bodies, which have been entrusted with the task of identifying the poor (Suryanarayana, 2001a).

Concept and methodology

The most widely used definition of food security runs in terms of economic (ability to buy) and physical (availability) access to food grains required for an active and healthy life (World Bank, 1986). The Food and Agricultural Organisation has made it more specific by laying emphasis on sufficiency of energy, protein, fat and micro nutrients; and on quantity, quality, safety and cultural acceptance of food (Food and Agricultural Organisation/World Health Organization, 1992). The High Level Committee has not defined food security/insecurity; but it has carried out the discussion in terms of estimates of poverty, and measures such as cereal consumption and calorie intake, without any explicit reference to specific norms for the different measures.

In this paper, we recognize the dual dimensions of food insecurity, in terms of inadequate economic/physical access or both. We measure economic access to food (purchasing power) in terms of levels of per-capita consumer expenditure and its deprivation by estimates of consumption poverty. Estimates of poverty are made with reference to the GoI official definition and measures of rural and urban poverty lines; namely, Rs.49.09 and Rs.56.64 per capita per month at 1973/74 prices, respectively (GoI, 1979). The revised estimates of these poverty lines for the rural and urban areas of All-India and major states for the year under review, 1999/2000, are obtained by adjusting for changes in cost of living indices (GoI, 2001d).¹²

As regards physical access to food grains, we examine it from two complementary perspectives; namely, food grain (cereal) consumption and calorie intake. We measure these two dimensions in terms of their average levels and extent of deprivation, and estimate the extent of deprivation with explicit reference to two alternative norms as follows:

- To begin with, the food security norms underlying the estimate of the poverty line may be considered relevant. They are cereal consumption levels of 15.50 kg and 12.25 kg per capita per month, and calorie intake levels of 2400 kcal and 2100 kcal per capita per diem for the rural and urban areas, respectively. Any individual having cereal consumption or calorie intake less than these norms could be considered food insecure.
- The calorie norms, cited above, worked out as they were in the 1950s/1960s, might be outdated and irrelevant with improvements in modes of production and standard of living. This would explain the observed

voluntary reductions in cereal consumption and calorie intake. Hence, it would be unreasonable to verify the question on food security with reference to outdated exogenous norms, presupposing that the expert knows the needs of the people better than the people themselves.¹³ Given the convergent patterns of changes in cereal consumption and calorie intake across decile groups of population in rural and urban India, we may consider the corresponding cereal consumption,¹⁴ and calorie intake levels, as alternative/revised thresholds for defining food and nutrition insecurity in India. Such estimates of convergence for the year 1993/94 work out to 13 kg per capita per month in rural India and 11 kg per capita per month in urban India,¹⁵ and a daily per-capita calorie intake of 2100 kcal in rural India and 2030 kcal in urban India.¹⁶

Hence, estimates of physical dimension of food insecurity may be worked out with reference to two norms – namely, the norms explicit/implicit in the estimation of the official poverty lines for rural and urban All-India, and the convergence levels observed in 1993/94 as their alternative/revised norms. The cross-sectional findings across regions and states are similar for the two different norms considered. Hence, for reasons of brevity and limited space, we report the results with reference to the revised norms for the rural and urban sectors for All-India and states only.

The discussion so far is based on *per-capita* measures of expenditure, cereal consumption and calorie intake, which are of course average All-India per-capita norms. But this implies an implicit assumption that the age, sex and activity composition is invariant across states, which is not true. India is a large and heterogeneous country, and it is therefore important to normalize all the variables discussed so far with reference to sex–age–activity status of the population. However, the relevant adult equivalent scales are available only with reference to calorie requirements (GoI, 2001b); hence, our study provides estimates of food insecurity based on such normalizations only for calorie intake estimates. Since 1972/73, the standard NSS norm has been 2700 kcal per consumer unit per diem for both rural and urban sectors (GoI, 2001c, p. 14).¹⁷ However, considering the changes in consumption preferences already discussed, we estimate deprivation in calorie intake per adult equivalent unit per diem with reference to the same set of energy intake norms considered above. Specifically:

- We measure levels of food security in terms of averages (per head of population) and different dimensions of its deprivation in terms of P_α class ($\alpha=0, 1$ and 2) of poverty measures (Foster *et. al.*, 1984) for per-capita consumer expenditure, cereal consumption and calorie intake.
- To account for age–sex–activity status, we have worked out levels and incidence of deprivation in terms of calorie intake per adult equivalent unit.

Database

This study is based on the NSS unit record data on household consumer expenditure for the year 1999/2000, available at the International Poverty Centre, Brasilia.¹⁸ The NSS household survey on consumer expenditure collects information not only on household demographic particulars, but also on almost every item of private household non-productive consumption expenditure. The merit of this database lies in the design of the sample.

The NSS 55th-round survey on household consumer expenditure provides estimates of per-capita consumption, calorie intake and other related parameters, such as household size, education, ownership of assets such as land, area of residence, social group, participation in a few select safety nets like the Integrated Rural Development Programme and different types of public works programme. Estimates of per-capita consumer expenditure, cereal consumption and calorie intake are, in an *ex post* sense, realized measures of physical and economic access to food.

India is a Union of States and Union Territories. The country is diverse and heterogeneous. This study seeks to obtain estimates of food insecurity at the All-India (national) level and 17 major states separately.¹⁹ Some emerging salient features analysed here include the following.

Food insecurity

Levels in terms of per-capita measures

Economic access. Measures of economic access as given by the estimates of average per-capita consumer expenditure exceeded the corresponding poverty lines in both rural and urban All-India, and across major states. As is well known, there exist wide regional disparities in levels of economic access, and this is well reflected in the levels of per-capita expenditures relative to poverty lines. The ratio was minimal for states like Orissa, Bihar, Madhya Pradesh and Uttar Pradesh, for which the estimates of incidence of poverty are some of the highest (Table 3; see also Tables 5 and 6 later).

Physical access

- Both rural and urban All-India average cereal consumption levels fell short of their respective (revised) norms (13 and 11 kg. per capita per month); however, their corresponding per capita calorie intakes exceeded the norms (2100 and 2030 kcal respectively) (see previous Table 3).
- Average rural cereal consumption exceeded the revised norm in the poorer states like Orissa, Rajasthan, Bihar and West Bengal. Rural calorie intake exceeded the norm in states like Haryana, Himachal Pradesh., Punjab, Rajasthan and Uttar Pradesh.
- Urban average per capita cereal consumption exceeded the norm for Orissa, Bihar, Assam, Rajasthan, West Bengal and Madhya Pradesh but

Table 3. Indicators of food security levels: All-India and major states (sector): 1999/2000

State	Per-capita consumer expenditure (Rs. for 30 days)		Per-capita cereal consumption (kg for 30 days)		Per-capita calorie intake (kcal per diem)		Calorie intake per adult equivalent unit (kcal per diem)	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
Andhra Pradesh	453.23	770.68	12.66	10.94	2021	2049	2517	2513
Assam	425.58	815.44	12.63	12.26	1914	2175	2347	2649
Bihar	384.40	601.29	13.76	12.70	2120	2171	2653	2650
Delhi	916.65	1379.19	7.85	8.61	1825	2151	2147	2634
Gujarat	550.87	891.12	10.18	8.50	1985	2058	2469	2528
Haryana	712.90	911.15	11.37	9.37	2452	2172	3037	2680
Himachal Pradesh	684.70	1242.83	12.85	10.33	2453	2655	3076	3225
Karnataka	499.45	910.68	11.53	10.21	2029	2046	2528	2510
Kerala	767.84	931.92	10.86	9.70	1985	1995	2519	2516
Madhya Pradesh	401.50	693.74	12.96	11.09	2063	2131	2572	2603
Maharashtra	496.42	972.49	11.45	9.42	2012	2038	2518	2496
Orissa	373.06	619.62	15.10	14.51	2119	2299	2645	2817
Punjab	743.63	897.56	10.60	9.20	2389	2194	2983	2676
Rajasthan	548.44	796.00	14.19	11.56	2425	2335	3041	2869
Tamil Nadu	513.54	972.06	10.72	9.66	1828	2031	2286	2531
Uttar Pradesh	466.62	689.40	13.63	10.79	2328	2130	2934	2620
West Bengal	454.19	865.83	13.58	11.16	2094	2133	2581	2613
All-India	485.85	854.30	12.77	10.44	2149	2155	2685	2648
Lower quartile	453.23	770.68	10.86	9.42	1985	2049	2517	2528
Median	499.45	891.12	12.63	10.33	2063	2133	2572	2620
Upper quartile	684.70	931.92	13.58	11.16	2328	2175	2934	2676

Note: Calculations by the authors.

calorie intake was more than the norm in all the states except Kerala.²⁰

In urban Uttar Pradesh, though cereal consumption fell short of the norm, calorie intake did not.

In sum, poorer states like Bihar and Orissa fell in the poorest quartile group if ranked in terms of average per-capita consumer expenditure but in the upper quartile groups in terms of average per-capita cereal consumption. The correlation matrix reveals that there existed an inverse association between average per-capita consumer expenditure and average per-capita cereal consumption indicating the shifts in consumer preferences away from cereals as deprivation decreased (see Table 4). Consistent with this result, the statistical association between per-capita cereal consumption and per-capita calorie intake, although positive, is not significant.

Poverty and food insecurity

This subsection proposes to examine inadequate economic and physical access to food as reflected in different indices like incidence (P_0), depth (P_1) and severity (P_2) of poverty and food deprivation across states in India. Estimates of food deprivation in terms of different measures — per-capita

Poverty and Food Insecurity in India

Table 4. (Product moment) correlation matrix (major state-wise)

	Per-capita consumer expenditure		Per-capita cereal consumption		Per-capita calorie intake		Calorie intake per adult equivalent unit	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
Per-capita consumer expenditure								
Rural	1.0000							
Urban	0.7918*	1.0000						
Per-capita cereal consumption								
Rural	-0.7470*	-0.7273*	1.0000					
Urban	-0.6982*	-0.6761*	0.8591*	1.0000				
Per-capita calorie intake								
Rural	0.1192	-0.1319	0.4144	0.0878	1.0000			
Urban	0.1134	0.2158	0.3804	0.3009	0.6316*	1.0000		
Calorie intake per adult equivalent unit								
Rural	0.0621	-0.1928	0.4581	0.1106	0.9924*	0.6000**	1.0000	
Urban	0.1511	0.229	0.3719	0.2866	0.6374*	0.9943*	0.6108*	1.0000

Note: * $p < 0.01$, ** $p < 0.05$.

cereal consumption and per-capita calorie intake — with reference to the revised norms are presented in Tables 5 and 6.²¹

Per-capita measures

Economic access: deprivation

- About 27% of the rural and 25% of the urban All-India population had per-capita consumer expenditure less than the subsistence monetary norm (i.e. they were poor in 1999/2000).
- Incidence of rural poverty was low (less than 10%) in the states of Delhi, Haryana, Himachal Pradesh, Punjab and Kerala. It was high (more than 30%) in the states of Uttar Pradesh, West Bengal, Madhya Pradesh, Assam, Bihar, Orissa state.
- Urban poverty was less than 10% in Assam, Delhi, Haryana, Himachal Pradesh and Punjab, and more than 30% in Bihar, Madhya Pradesh, Orissa and Uttar Pradesh. In other words, consistent with the estimates of average per-capita consumer expenditure, the incidence of poverty was high in the states of Bihar, Madhya Pradesh, Orissa and Uttar Pradesh.

Physical access: deprivation

- Incidence of (per-capita) cereal insecurity with reference to the alternative norm was about 57% in rural India and 60% in urban India. This might be interpreted that the set of food insecure was larger than the set of poor in both rural and urban India, which, as shown below, is not correct.

Table 5. Estimates of rural food insecurity (%): states and All-India: 1999/2000

State	Per-capita consumer expenditure			Per-capita cereal consumption (Norm II)			Per-capita calorie intake (Norm II)		
	P ₀ (%)	P ₁ (%)	P ₂ (%)	P ₀ (%)	P ₁ (%)	P ₂ (%)	P ₀ (%)	P ₁ (%)	P ₂ (%)
Andhra Pradesh	10.54	1.81	0.54	56.51	11.91	4.08	62.33	12.59	3.87
Assam	40.24	8.48	2.70	57.79	10.78	3.11	70.84	14.61	4.32
Bihar	44.01	8.75	2.54	45.85	9.00	2.74	55.55	10.62	2.98
Gujarat	12.39	2.22	0.60	81.55	25.20	10.08	64.62	13.47	3.98
Haryana	7.36	1.25	0.36	72.61	18.79	6.35	38.33	6.25	1.55
Himachal Pradesh	7.80	1.05	0.24	53.00	9.67	2.85	33.99	4.23	0.85
Karnataka	16.89	2.74	0.69	71.63	18.98	7.31	62.56	14.46	4.74
Kerala	9.34	1.45	0.37	76.87	21.34	7.89	63.12	14.31	4.55
Madhya Pradesh	37.20	7.68	2.33	55.89	11.98	3.96	61.42	12.81	3.84
Maharashtra	23.26	4.37	1.29	72.96	17.54	6.13	63.22	12.90	3.83
Orissa	48.14	11.75	4.01	28.95	4.75	1.46	54.34	9.68	2.63
Punjab	6.02	0.80	0.18	83.00	22.16	7.60	41.41	6.64	1.63
Rajasthan	13.58	2.06	0.51	41.45	7.41	2.14	36.24	5.27	1.24
Tamil Nadu	19.99	3.80	1.12	78.75	22.38	8.51	74.10	19.28	6.72
Uttar Pradesh	31.04	5.80	1.61	47.96	9.98	3.21	44.61	7.78	2.14
West Bengal	31.70	6.51	1.96	48.01	9.77	3.07	56.76	11.00	3.11
Delhi	0.72	0.03	0.00	95.32	40.39	20.16	74.50	20.47	6.86
All-India	26.70	5.26	1.55	56.73	13.07	4.51	55.66	11.08	3.27

Note: Estimates of consumer expenditure deprivation are with reference to the respective state-specific and All-India poverty lines for 1999/2000.

- Estimates of cereal deprivation as measured by different indices were the lowest for the state of Orissa (rural as well as urban), and one of the highest for the state of Gujarat. Orissa stands out as a state with the highest incidence of poverty, but lowest incidence of cereal deprivation.
- The association between incidence of poverty and alternative measures of per-capita cereal deprivation (both norms) is negative and significant for the rural sector, but generally weak for the urban sector across states (see Table 7).
- The association between incidence of poverty and different measures of per-capita calorie deprivation, although positive, is weak for both rural and urban sectors across states (see Table 7).

In other words, besides the macro findings for All-India, cross-sectional state-wise estimates also confirm that consumption preferences change with reduction in economic deprivation. Therefore, calorie inadequacy *per se* could not be taken to indicate food insecurity.

Physical access: calorie intake adjusted for age-sex-activity

Having already noted the limitations of a discussion based on per-capita estimates of alternative measures of food insecurity, this subsection presents estimates of the levels of, and extent of deprivation in, calorie intake per adult equivalent unit per diem. Among the important findings:

Poverty and Food Insecurity in India

Table 6. Estimates of urban food insecurity (%): states and All-India: 1999/2000

State	Per-capita consumer expenditure			Per-capita cereal consumption (Norm II)			Per-capita calorie intake (Norm II)		
	P_0 (%)	P_1 (%)	P_2 (%)	P_0 (%)	P_1 (%)	P_2 (%)	P_0 (%)	P_1 (%)	P_2 (%)
Andhra Pradesh	27.63	5.62	1.72	51.49	11.53	4.60	56.91	10.99	3.22
Assam	7.46	1.47	0.40	34.52	7.24	2.99	51.11	9.30	2.49
Bihar	33.54	6.75	2.09	30.85	6.34	2.43	46.25	8.53	2.49
Gujarat	14.89	2.42	0.65	83.27	25.12	10.25	56.31	10.09	2.72
Haryana	9.96	2.03	0.75	73.74	20.34	7.14	51.80	9.44	2.66
Himachal Pradesh	4.57	0.59	0.12	50.47	16.85	10.74	22.52	3.35	0.89
Karnataka	24.60	5.59	1.84	64.68	16.88	6.69	55.44	11.17	3.35
Kerala	19.81	3.90	1.14	67.16	18.32	7.55	59.25	12.91	4.21
Madhya Pradesh	34.64	8.32	2.80	52.76	11.96	4.25	54.07	10.18	2.94
Maharashtra	26.79	6.74	2.41	74.24	20.16	7.97	57.34	11.04	3.12
Orissa	43.21	11.02	3.90	18.16	3.92	2.01	37.66	5.43	1.41
Punjab	5.44	0.63	0.13	78.66	21.04	7.88	46.53	8.15	2.09
Rajasthan	19.32	3.42	0.91	46.92	10.04	3.42	39.19	6.09	1.51
Tamil Nadu	22.42	4.76	1.53	72.18	19.29	7.86	61.72	13.33	4.34
Uttar Pradesh	30.87	6.58	2.00	56.18	13.14	4.86	50.98	10.28	3.13
West Bengal	14.67	2.54	0.70	49.36	11.38	4.40	52.91	9.53	2.70
Delhi	9.31	1.55	0.36	83.43	25.36	10.20	52.71	9.86	2.59
All-India	23.46	5.16	1.65	60.51	15.49	6.05	53.12	10.18	2.97

Note: Estimates of consumer expenditure deprivation are with reference to the respective state-specific and All-India poverty lines for 1999/2000.

- Average calorie intake per adult equivalent exceeded the revised norms in rural and urban India, and the majority of the states (see Table 3).
- The incidence of calorie deprivation (per adult equivalent unit) (with reference to the revised norm) was much less; that is, about 25% in rural and urban All-India. In 1999/2000, the majority of the poor were food insecure; only a minority of the non-poor were food insecure by choice (see Table 8).
- Most importantly, it is to be noted that the PDS is targeted with reference to estimates of poverty for the year 1993/94 and not for 1999/

Table 7. Rank correlation matrix

	Correlation between incidence of poverty (P_0) and cereal or calorie deprivation			Correlation between incidence of poverty (P_0) and cereal or calorie deprivation		
	Incidence (P_0)	Depth (P_1)	Severity (P_2)	Incidence (P_0)	Depth (P_1)	Severity (P_2)
	Cereal deprivation (Norm I)			Cereal deprivation (Norm II)		
State rural	-0.6716*	-0.6863*	-0.6324*	-0.6471*	-0.5907**	-0.6103*
State urban	-0.3505	-0.4485	-0.5245**	-0.3333	-0.4485	-0.5368**
	Calorie deprivation (Norm I)			Calorie deprivation (Norm II)		
State rural	0.0858	0.0441	0.0588	0.0637	0.0735	0.0098
State urban	0.2010	0.2843	0.3333	0.1667	0.3235	0.3676

Note: * $p < 0.01$, ** $p < 0.05$.

Table 8. Incidence of food insecurity (%) by population type: All-India (1999/2000)

Population type	Norm II	
	Rural	Urban
Non-poor	14.75	15.56
Poor	52.87	52.28
Total	25.04	24.18

Note: Based on estimates of calorie intake per adult equivalent unit.

2000. A comparison between estimates of incidence of poverty for 1993/94 and the incidence of (per adult equivalent) calorie deficiency for 1999/2000 reveals that in both rural and urban India the size of the targeted population exceeded that of the calorie deficient (per adult equivalent unit) (see Table 9). This result held good for the majority of the states, except Andhra Pradesh, Gujarat, Karnataka, Kerala, Punjab and Delhi.

- But even the preceding finding may not imply exclusion of the non-poor but food insecure since: (i) states like Kerala have targeted the PDS to a larger proportion (42%) of the population than that estimated by the Central Government (25%), and hence to a proportion of the population larger than that of the calorie insecure; and (ii) these states are relatively better off and the estimate of calorie insecurity may be apparent (by choice) rather than real.
- The limitations of the discussion become clear when we examine the association between energy intake and health status. For instance, Kerala and Tamil Nadu fall in the first quartile group in terms of calorie intake (see Table 3). Still they do very well in terms of nutritional status of children, thanks to effective public welfare programmes in Kerala and mid-day meal schemes in Tamil Nadu (Radhakrishna *et al.*, 2004).

In sum, it is not possible to unambiguously make statements about the status of food insecurity in India on the basis of measures such as cereal consumption and calorie intake, due to changes in consumption preferences associated with a decline in deprivation. Between the two indicators, calorie intake is a relatively more comprehensive measure. However, a limited exercise based on this measure does not provide any evidence to the effect that targeted PDS has penalized the non-poor but food insecure. The policy imperatives of the observed phenomena, if at all, have to do with influencing consumption choice, rather than enlarging the PDS net to the whole population.

Conclusion

The study has attempted to verify the finding of a High Level Committee that the recent reform programme of the GoI to streamline welfare

Poverty and Food Insecurity in India

Table 9. Incidence of poverty and food insecurity: states and All-India

State	Rural		Urban	
	Targeted poor (%)	Food insecure (%)	Targeted poor (%)	Food insecure (%)
Andhra Pradesh	15.92	29.35	38.33	27.01
Assam	45.01	35.97	7.73	24.73
Bihar	58.21	23.62	34.50	19.00
Gujarat	22.18	32.63	27.89	23.66
Haryana	28.02	12.45	16.38	22.15
Himachal Pradesh	30.34	6.76	9.18	6.24
Karnataka	29.88	33.07	40.14	27.84
Kerala	25.76	32.77	24.55	27.63
Madhya Pradesh	40.64	29.88	48.38	24.22
Maharashtra	37.93	29.72	35.15	27.20
Orissa	49.72	21.03	41.64	10.20
Punjab	11.95	14.44	11.35	20.97
Rajasthan	26.46	9.40	30.49	12.63
Tamil Nadu	32.48	47.54	39.77	31.18
Uttar Pradesh	42.28	15.52	35.39	24.22
West Bengal	40.80	24.55	22.44	23.32
Delhi	1.90	56.27	16.03	23.68
All-India	37.27	25.04	32.36	24.18

Note: Targeted estimates of population refer to the percentage of (consumer expenditure) poor population in 1993/94; estimates of food insecure population by calorie intake per adult equivalent unit correspond to the year 1999/2000.

schemes, like the food distribution programme, by targeting it only to the (income/consumer expenditure) poor, has ended up excluding the non-poor but food insecure. The verification is carried out in terms of estimates of the dual dimensions of food insecurity; namely, deprivation in economic access (incidence of poverty), and inadequate physical access to food grains (incidence, depth and severity of deprivation in cereal consumption/calorie intake), corresponding to conventional as well as revised norms.

The paper points out that, although the official definition and measurement of income/consumption poverty in India is anchored in a physical norm for food insecurity, and, hence, the estimates of poverty and food insecurity should tally for a given reference year, they could diverge for any subsequent other year for the following reasons:

- (i) Estimates of poverty are made on the basis of measures such as consumer expenditure distributions (at current prices) with reference to a base year monetary norm, which is adjusted only for price changes; and
- (ii) estimates for deprivation in physical access to food are made in terms of physical measures (which respond to changes not only in prices, but also tastes and preferences as well as a host of other variables such as levels of living and infrastructural facilities) with reference to a constant base-year physical norm.

Hence, from a methodological perspective, the estimates of poverty and food insecurity would not tally for non-reference years giving scope for both Type I and Type II errors in food distribution programmes targeted with reference to monetary-measure based poverty estimates.

These findings are all more the case in the context of economic development, which involves better infrastructure, medical and sanitation facilities, institutional and structural changes in the economy, thus calling for downward revisions in norms for energy requirements. This is precisely what is observed in India. Consumption preferences of the richer decile groups have shifted against cereals, a major source of energy, and in favour of non-cereal and non-food items. Accordingly, cereal consumption and calorie intake for the upper decile groups have declined. With a decline in economic deprivation along with development, cereal consumption and energy intake of the poorer sections increased, although not up to the required norm. In other words, levels of cereal consumption and calorie intake for different decile groups have been converging to a limit. Hence, we calculated such limits for the alternative measures of physical access to food as the respective thresholds or revised norms to define food insecurity for both rural and urban India; and calculated estimates of food insecurity after appropriate allowances for adult equivalent scales. The findings show that the estimates of monetary measures of poverty by sectors at the national level exceed or tally with those for food insecurity, obtained with necessary adjustments for calorie intake to account for age–sex composition. This result holds good for the majority of the states, except Andhra Pradesh, Gujarat, Karnataka, Kerala, Punjab and Delhi. The latter are relatively better-off states; hence, any shortfall in cereal consumption/calorie intake could be by choice and does not call for policy measures for income transfers by subsidized food distribution.

The behavioural patterns underlying the findings cited above essentially reflect the hypothesis that consumer choices in response to income increases are concerned more with variety than with nutrition *per se* (Behrman and Deolalikar, 1987, 1989; Behrman *et al.*, 1988). Therefore, under-nutrition, if at all real, cannot be removed by simple direct or indirect income transfers alone. It would also call for nutrition education programmes to influence consumer choice.

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Notes

- 1 The estimates of poverty for India as a whole declined from 51.3% in 1977/78 to 36% in 1993/94 and 26.1% in 1999/2000 (GoI, 2004, p. 204). Preliminary results from the survey during 2004/05 reported in newspapers indicate this number to be 22% [<http://www.thehindubusinessline.com/2006/06/15/stories/2006061504670100.htm>].
- 2 Many countries (Bangladesh, Egypt, Jamaica, Pakistan, Sri Lanka, Tunisia, and Zambia) have used subsidized food distribution as an important strategy for poverty alleviation. Countries like Sri Lanka have tried to reform the system.
- 3 See Suryanarayana (1997) and the studies cited therein.
- 4 See Parikh and Suryanarayana (1992).
- 5 See, for instance, Krishnaji and Krishnan [Eds] (2000).
- 6 Type I and Type II errors refer to errors in targeting: the former occurs when it does not reach the target population, and the latter when it benefits the non-target population (Cornia and Stewart, 1993).
- 7 See, for instance, Dev *et al.* [Eds] (2003), Krishnaji and Krishnan [Eds] (2000) and Prabhu and Sudarshan [Eds] (2003).
- 8 The Government of India defines the poor as “those whose per capita consumption expenditure lies below the midpoint of the monthly per capita expenditure class having a daily calorie intake of 2,400 in rural areas and 2,100 in urban areas” (GoI, 1981, p. 81). The poverty lines corresponding to these norms were worked out with reference to the NSS data for the year 1973/74. The poverty lines turned out to be Rs.49.09 per capita per month at 1973/74 prices for rural All-India and Rs.56.64 for urban All-India. Poverty lines for subsequent years are updated using appropriate cost of living indices (GoI, 1993).
- 9 See GoI (2001b). As per the available estimates, about 5% of the Indian population is hungry [http://fcamin.nic.in/civil_ind.htm].
- 10 A major reason for diversification could be monetization of the rural labour market necessitating purchases of food grains and complementary food items and kitchen overheads (Suryanarayana, 2000).
- 11 Life expectancy at birth has increased by more than 100% during the past 50 years. For other details, see GoI (2001a).
- 12 The High Level Committee also makes use of these estimates.
- 13 The GoI points out that physical activity level and energy requirement has declined over the decades, and the Indian Council of Medical Research has reconstituted its Expert Committee to review the Recommended Dietary Allowance for Indians (GoI, 2002a, pp. 324–325).
- 14 The range between per-capita total cereal consumption of the poorest and the richest decile groups in rural India declined from 16.75 kg in 1952 to 4.99 kg in 1993/94 (Suryanarayana, 2000).
- 15 These estimates of convergence for cereal consumption are obtained as averages of monthly per-capita cereal consumption of the third and fourth poorest decile groups in rural India and the fourth and fifth decile groups in urban India.
- 16 The estimates of convergence for per-capita daily calorie intake are worked out as averages of the observed levels for the fifth and sixth decile groups for 1993/94 in both rural and urban India. We have not considered the same decile groups for working out both cereal and calorie norms because diversity is also an indicator of food security, and with diversification people tend to get an increasing proportion of calories from non-cereal items. Hence, lower decile groups are considered for cereal norms and higher decile groups for calorie norms. The average calorie norm recommended for the country by the Indian Council of Medical Research expert group is 2200 kcal per capita per diem (Nawani, 1994; http://www.fao.org/DOCREP/x0172e/x0172e02.htm#P136_28504).
- 17 This works out to a per-capita norm of 2178 calories for the rural sector and 2208 calories for the urban.

- 18 For methodological details such as concepts, definitions, sample design and estimation procedure, see GoI (2001e).
- 19 The analysis is confined to 17 major states only for reasons such as adequate sample size and reliability.
- 20 That Kerala stands out among the Indian states is a much cited observation. One reason for low calorie intake in Kerala could be high levels of sanitation, medical facilities, literacy and awareness in comparison with those prevailing in the rest of India and hence the relatively low calorie requirement.
- 21 These All-India norms are applied uniformly across all states and regions without any reference to differences in tastes and preferences, and requirements. This is a limitation of this exercise.

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