

The Hunger Crisis

Measuring Hunger across Indian States

AMRITA PAL, ATANU GHOSH, SHOUMMO SEN GUPTA, SAMIRAN BISAI

India faces significant challenges in addressing hunger, particularly when measured against the global hunger index. The India state hunger index for 2017 is presented to evaluate hunger across states, filling the void post-2008. Most states and union territories fall in the serious category with only a few in the moderate, none in the low, and some in the alarming categories.

A consumption threshold of 1,600 kcal is proposed to identify populations at risk of undernourishment. This allows ISHI 2017 to align with the GHI scores for India for 2017. To meet the Sustainable Development Goal-2 of “No Hunger” by 2030, strategies must target reducing undernourishment, under-five mortality, stunting, and wasting at the subnational level, necessitating regular review and monitoring of interventions.

There are 820 million chronically hungry people in the world, a significant proportion of whom live in South Asia, including India (WHO 2019). Hunger is of two types: overt hunger and hidden hunger. Overt hunger necessitates filling of the stomach at regular intervals, while hidden hunger alludes to micronutrient deficiency that is fundamental in limited quantities for the human body, as well as inadequate protein and calorie intake (Gopaldas 2006). There has been a drastic decline in self-reported hunger in India from 16.1% to 1.9% between 1983 and 2004–05, which implies a decline in food insecurity (Kumaran 2008). Adequate calorie consumption is closely linked to the socio-economic status (SES) and health status of a nation. To measure a nation’s progress, a standardised method, the global hunger index (GHI) has been developed. The GHI takes into account four SES and health indicators, namely prevalence of undernourishment, child stunting, child wasting, and child mortality.

Globally, each day about 25,000 people, including more than 10,000 kids, die from hunger and related causes (Holmes 2021). The Sustainable Development Goal (SDG)-2 aims to eradicate hunger by 2030. India has made a slight improvement in the last two decades in terms of reduction of hunger. However, the country remains in the “serious” category as per the GHI severity scale. Despite having the world’s most extensive nutrition and childcare programme (Integrated Child Development Services [ICDS]) launched way back in 1975, the country failed to achieve its nutritional goals. Subsequently, different initiatives such as the mid-day meal scheme, the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), 2005, the National Food Security Act (NFSA), 2013, and the National Nutrition Mission (NNM), 2018 were taken to reduce deprivation and food insecurity.

India is one of the largest food-producing countries in the world. Notwithstanding these potentialities, the country ranked 102 in the GHI out of 117 qualifying countries, scoring 30.3 in 2019, worse than its neighbouring countries, Bangladesh, Nepal, and Pakistan. Marginal improvement was observed in 2020, where the country ranked 94 globally with a score of 27.2. In 2021, the country’s rank fell to 101 with a score of 27.3. This was not because of India’s poor performance between 2020 and 2021, but because other countries with ranks close to that of India performed better. These statistics indicate that India’s food insecurity scenario was already poor even before the COVID-19 pandemic. The pandemic has significantly affected the employment scenario in

Amrita Pal (amrita.pal@icrisat.org) is with the International Crops Research Institute for the Semi-Arid Tropics, Patancheru, Telangana. Atanu Ghosh (iipsatanu@gmail.com) is with the Department of Economics, Bankura Christian College, Bankura, West Bengal. Shoummo Sen Gupta (shoummosengupta@gmail.com) is a doctoral student at the Koita Centre for Digital Health, Indian Institute of Technology Bombay, Mumbai. Samiran Bisai (sbisai@hotmail.com) is with the Department of Anthropology and Tribal Studies, Sidho-Kanho-Birsha University, Purulia, West Bengal.

India, further exacerbating the already compromised food insecurity situation.

Malnutrition affects a person throughout their life cycle. A malnourished child becomes a malnourished adolescent and then an adult, hampering her physical, cognitive, and productive capacities. Still, 24% of Indian adolescents are thin (BMI-for-age < -2 SD) and around 80% suffer from multiple micronutrient deficiencies, a condition often referred to as hidden hunger (MOHFW et al 2019). Adolescents are not only the future workforce but also the bearers of the next generation. If they are not properly fed then the country will not only be unable to reap the gain of demographic dividend but also suffer from the vicious cycle of malnourishment (Joe et al 2018). A malnourished mother is also more likely to give birth to a low birth weight baby and the vicious cycle will continue.

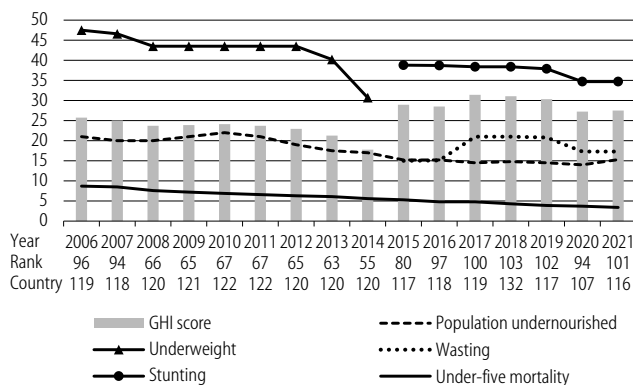
Being a culturally diversified country, the nation might require state-specific interventions to overcome hunger in addition to national-level programmes. Assessment of the India state hunger index (ISHI) will help formulate and monitor state-specific programmes for eradicating extreme poverty and hunger. For ISHI 2008, it was observed that none of the states was in the low or moderate categories in terms of index scores; rather, they fell in the serious, alarming, or extremely alarming categories (Menon et al 2009). The current estimation will be useful to track statewise progress on the hunger index from ISHI 2008.

Methods and Materials

The current construction of the ISHI was calculated using the revised GHI methodology (Wiesmann et al 2015). Accordingly, we used standardised component indicators to estimate the ISHI. These indicators are the undernourished population, that is, the proportion of the population that did not receive the minimum threshold level of calories (1,600 kcal), the proportion of under-five children stunted and wasted, and under-five mortality. Two different national survey data sets were used to estimate the ISHI in 2017. Both these surveys collected state as well as national-level representative data. The proportion of the undernourished population was calculated from the 68th round (2011–12) of the National Sample Survey (NSS) data and the prevalence of child wasting, stunting, and under-five mortality rates were obtained from the National Family Health Survey (NFHS)-4 (2015–16).

Calculating ISHI from these two sources, the value of 31.5 was obtained, which is almost equivalent to the hunger score for India (31.4) calculated by GHI for 2017 (Grebmer et al 2017). Taking a cut-off of 1,820 kcal per capita per day, the Food and Agriculture Organization (FAO 2017) estimated the prevalence of calorie malnourishment among the Indian population as 14.5% in 2017. They used the national food balance sheet data. For our calculation, the household consumption data from the NSS 68th round are used. We used the calorie cut-off as less than 1,600 kcal per person per day and obtained almost the same estimate as FAO. According to the NSS 68th round, the mean calorie intake among Indians was $2,130 \pm 530$ kcal. Therefore, 1 standard deviation below this is

Figure 1: Global Hunger Index Score, Its Components, and India's Rank, 2006–21



Source: Global Hunger Index Reports (2006–21); UNICEF/WHO/World Bank (2021).

1,600 kcal, which we took as a cut-off. However, while calculating ISHI for 2008 from the NSS 61st round (2004–05) and NFHS-3 data (2005–06), Menon et al (2009) took the cut-off as 1,632 kcal per person per day, to equate their estimate with FAO's estimates.

The rate of population undernourishment was estimated by the unit-level food consumption data from the NSS 68th round, collected from 59,683 rural households and 41,968 urban households from June 2011 to June 2012. The NSS collected household consumption data on around 150 individual food items from nice food groups. These were converted to calories using food-to-calorie conversion factors. Calories obtained from outdoor meals were calculated following procedures as suggested by the National Sample Survey Office (GOI 2015). The nutritive value of Indian foods was calculated based on the method outlined in Gopalan et al (1989).

From the unit-level data of NFHS-4, child wasting and stunting were calculated based on the anthropometric z-score of the World Health Organization's (WHO) child growth standard considering age, sex, height, and weight. The z-score was calculated using the WHO Anthro 3.2 software package. Children with weight-for-height (WHZ) z-scores below -5 standard deviation or above +5 standard deviation and height-for-age (HAZ) z-scores below -6 standard deviation or above +6 standard deviation were flagged and were not incorporated in the present analysis. Similarly, calorie intake below 500 kcal and above 5,000 kcal per capita per day was excluded from the analysis. The under-five mortality was estimated for 0–4 years preceding the survey using synthetic cohort probabilities in STATA. In ISHI, hunger is defined on a scale of 100 points, with zero being the best score (no hunger), and 100 being the worst (maximum hunger). For all the states and union territories, the ISHI score was classified by its severity from low to extremely alarming.

Results

The mean per capita calorie consumption for Indians was found to be $2,130 \pm 530$ kcal, with $2,119 \pm 548$ kcal for urban and $2,134 \pm 521$ kcal for rural areas, respectively. According to our calculation of the hunger index, the score for India as 31.5, which is almost similar to the hunger score calculated by the

GHI for 2017, 31.4. We refer to this calculated state-level hunger index as ISHI 2017.

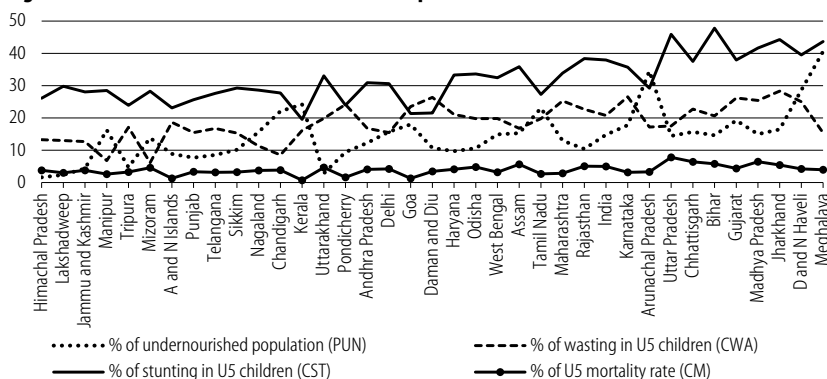
From 2006 to 2014, GHI was measured based on three equally weighted indicators, namely undernourishment, children underweight/stunting/wasting, and under-five mortality (Figure 1, p 113). However, in 2015, the calculation was revised and since then, it has been measured based on four indicators. The indicator for underweight was replaced with stunting and wasting. Figure 1 reveals a decreasing trend in the GHI score from 2006 to 2014. Alternatively, it can be said that during this period, India made progress in global ranking in the hunger index. During this period, a decline in underweight children and under-five mortality was also observed.

However, since 2015, the situation in India started to worsen. India's global rank was 55 in 2014, it increased to 80 in 2015, and the global position continued to get worse till 2018. At that time, India's position was worse than that of its neighbouring countries, Bangladesh, Pakistan, Nepal, Bhutan, and Sri Lanka. Given this dire situation, the Government of India started the NNM or the Prime Minister's Overarching Scheme for Holistic Nourishment (POSHAN) Abhiyaan to improve the nutritional outcomes for children, pregnant women, and lactating mothers. After the launch of this programme, the country did well in 2019 and 2020, but again in 2021, India's position deteriorated globally. From 2015 to 2021, there was a decrease in stunting and under-five mortality, while wasting showed fluctuation.

The percentages of different nutrition-related indicators used for developing ISHI and the under-five mortality rates of the states and union territories are presented in Figure 2. Vast differences are observed. Among the three indicators of nutritional status, the percentage of stunting was generally higher in states, followed by wasting and undernourishment. The proportion of stunting was the highest in Bihar (47.8%), and the lowest in Kerala (19.6%), with a national average of 37.9%. Jharkhand had a higher proportion of wasting (28.3%), and Mizoram had the lowest (6.1%). The highest proportion of food undernourishment was found in Meghalaya (40.6%); Himachal Pradesh had the lowest proportion (1.6%). Under-five mortality was the highest in Uttar Pradesh (UP) (7.8%) and the lowest in Kerala (0.7%).

In our analysis of ISHI 2017, a wide variation among Indian states is observed in terms of composite hunger index scores

Figure 2: Statewise Distribution of Different Components of ISHI Indicators



Source: Authors' calculation from unit-level data of NSS 68th round and NFHS-4.

Table 1: India State Hunger Index 2017 and Its Component Indicators

State	PUN ¹	CWA ²	CST ³	CM ⁴	India State Hunger Index Scores and Rank	Rural India State Hunger Index Scores and Rank	Urban India State Hunger Index Scores and Rank
Himachal Pradesh	1.6	13.3	26.1	3.8	17.8 (1)	17.8 (1)	17.5 (2)
Lakshadweep	2.4	13.0	29.8	3.0	18.2 (2)	20.3 (4)	19.4 (4)
Jammu and Kashmir	4.3	12.7	28.0	3.8	19.1 (3)	18.4 (2)	21.4 (7)
Manipur	16.3	6.8	28.5	2.6	19.8 (4)	20.1 (3)	19.8 (5)
Tripura	4.7	17.1	23.9	3.3	20.3 (5)	21.8 (7)	15.6 (1)
Mizoram	13.8	6.1	28.3	4.6	20.3 (5)	24.9 (12)	15.6 (1)
Andaman and Nicobar Islands	8.9	18.6	23.1	1.3	20.8 (6)	22.5 (8)	–
Punjab	7.7	15.5	25.6	3.3	21.1 (7)	20.8 (5)	21.5 (8)
Telangana	8.6	16.8	27.6	3.2	22.5 (8)	25.5 (13)	19.0 (3)
Sikkim	10.2	15.3	29.3	3.2	22.8 (9)	23.6 (10)	21.6 (9)
Nagaland	15.7	11.3	28.6	3.7	23.2 (10)	23.2 (9)	20.3 (6)
Chandigarh	22.1	8.5	27.7	3.8	24.2 (11)	–	24.4 (12)
Kerala	24.2	16.1	19.6	0.7	24.4 (12)	24.6 (11)	23.3 (10)
Uttarakhand	2.8	19.9	33.0	4.7	24.5 (13)	24.6 (11)	24.7 (13)
Pondichery	9.4	24.2	24.0	1.6	24.6 (14)	23.6 (10)	24.9 (15)
Andhra Pradesh	12.3	16.8	30.9	4.1	25.7 (15)	25.9 (14)	24.8 (14)
Delhi	15.7	15.5	30.6	4.2	26.4 (16)	–	27.0 (17)
Goa	18.0	23.5	21.4	1.3	26.9 (17)	20.9 (6)	29.6 (21)
Daman and Diu	10.7	26.4	21.5	3.4	27.5 (18)	26.6 (15)	30.4 (23)
Haryana	9.7	21.1	33.3	4.1	27.6 (19)	27.4 (16)	28.2 (19)
Odisha	10.6	19.8	33.6	4.8	28.0 (20)	28.8 (17)	23.3 (10)
West Bengal	14.9	19.8	32.4	3.2	28.0 (20)	29.3 (18)	24.4 (12)
Assam	15.3	16.8	35.8	5.6	29.6 (21)	30.2 (19)	23.5 (11)
Tamil Nadu	23.1	19.8	27.3	2.7	29.6 (21)	31 (22)	27.9 (18)
Maharashtra	13.0	25.3	33.9	2.9	30.3 (22)	30.6 (20)	29.7 (22)
Rajasthan	10.4	22.7	38.4	5.1	30.9 (23)	30.8 (21)	30.8 (26)
Karnataka	17.8	26.6	35.7	3.1	33.7 (24)	35.4 (26)	31.0 (27)
Arunachal Pradesh	34.5	17.2	29.2	3.3	34.0 (25)	36.3 (27)	25.1 (16)
Uttar Pradesh	14.4	17.5	45.9	7.8	34.1 (26)	34.3 (23)	33.0 (30)
Chhattisgarh	15.7	22.8	37.5	6.4	34.2 (27)	35.1 (25)	30.7 (25)
Bihar	14.6	20.6	47.8	5.8	34.5 (28)	34.9 (24)	30.6 (24)
Gujarat	19.2	26.2	37.9	4.3	35.7 (29)	40.1 (30)	29.6 (21)
Madhya Pradesh	15.0	25.4	41.7	6.5	36.4 (30)	37.7 (28)	32.7 (28)
Jharkhand	16.5	28.3	44.3	5.4	38.3 (31)	39.5 (29)	32.8 (29)
Dadra and Nagar Haveli	28.6	25.0	39.5	4.2	39.3 (32)	47.7 (32)	28.6 (20)
Meghalaya	40.6	15.4	43.7	4.0	39.6 (33)	40.8 (31)	33.6 (31)
India	14.8	20.8	37.9	5.0	31.5	32.6	28.5

¹ PUN = Proportion of undernourished in the population (%);

² CWA = Prevalence of wasting in children under-five years (%);

³ CST = Prevalence of stunting in children under-five years (%);

⁴ CM = Under-five mortality rate (CM) (%).

Ranks: 1–4: Moderate; 5–28 Serious; 29–33 Alarming.

Source: Authors' calculation from unit-level data of NSS 68th round and NFHS-4.

(Table 1). It ranges from 17.8 in Himachal Pradesh to 39.6 in Meghalaya. As per the categories provided by the GHI, in ISHI 2017 none of the Indian states and union territories were under the “extremely alarming” category in terms of hunger.

However, in ISHI 2008, Madhya Pradesh (MP) was in the extremely alarming category.

Our calculations show that five states/union territories—Gujarat, MP, Jharkhand, Dadra and Nagar Haveli, and Meghalaya—were in the “alarming” category. Only four states/union territories—Himachal Pradesh, Lakshadweep, Jammu and Kashmir (J&K), and Manipur—were in the “moderate” category. The rest of the states and union territories were in the “serious” category of hunger. None of the states were in the “low” category. Apart from a few states such as J&K, Punjab, Puducherry, Goa, Daman and Diu, and Haryana, in all other states and union territories, the composite scores for hunger index were higher in rural areas compared to urban areas. The scores were the same for rural and urban areas in Rajasthan, while this gap was the highest in Gujarat. Among the larger states, apart from West Bengal (28.0) and Tamil Nadu (29.6), all other states such as Maharashtra (30.3), Rajasthan (30.9), Karnataka (33.7), UP (34.1), Bihar (34.5), Gujarat (35.7), and MP (36.4), scored more than 30 in the hunger index, which might have increased India’s overall score and brought down its rank globally.

Discussion

The analysis presented in this paper provides a comprehensive estimate of different components for calculating the hunger index and the composite hunger index for different Indian states and union territories. It shows how the hunger index of India changed from 2006 to 2021, and also how the different components changed over the years.

Notwithstanding India’s economic growth, there was a declining trend in the mean per capita calorie intake from 1983 to 2004–05. In India, the mean per capita calorie consumption for urban areas was 2,240 kcal in 1983 which reduced to 2,047 kcal in 2004–05. For rural areas, it was 2,070 kcal in 1983, which also reduced to 2,021 kcal in 2004–05 (Deaton and Drèze 2009). We found the mean per capita calorie consumption for Indians was 2,130 kcal; with 2,119 kcal and 2,134 kcal for urban and rural areas, respectively. The findings are similar to the average calorie norm of 2,110 kcal per capita per day for South Asian countries as recommended by the FAO (Bajpai et al 2005).

The proportion of calorie undernourishment (total =14.8%, rural =14.0%, and urban =16.4%) by our estimates is comparatively lower than that reported by Ahmed et al (2007) using the calorie intake of less than 1,600 kcal per day as the cut-off for ultra-hunger based on the NSS 55th round data collected during 1999–2000. They found the prevalence of population ultra-hunger in India was 17.4% (17.1% and 18% for rural and urban areas, respectively). Ahmed et al (2017) also reported medial hunger (per capita calorie intake 1,600–1,800 kcal) and subjacent hunger (per capita calorie intake 1,800–2,200 kcal) at 12.1% and 28.6%, respectively. In this study, a higher rate of medial (14.1%) and subjacent hunger (31.2%) is found. Various researchers calculated the average calorie consumption of the states of India, using the NSS 68th round. We tried to compare our calculations with theirs (Rawal et al 2019; Srivastava and Chand 2017; Borkotoky et al 2018; GoI 2015). Each study differs from the other in terms of mean calorie

intake and our calculations more this with Rawal et al (2019) study. The average caloric intake for all the states and union territories of India was not provided by these studies.

According to the Indian Council of Medical Research (ICMR 2020), the estimated average energy requirements for sedentary Indian men and women with body weights of 65 kg and 55 kg were 2,110 kcal and 1,660 kcal, respectively. Earlier studies have shown that energy intake levels considered sub-human ranged from 1,440 kcal to 1,700 kcal in 1999–2000, which corresponded with the official poverty lines in many states such as Andhra Pradesh, Gujarat, Kerala, and Tamil Nadu. In 2005, the calorie intake range for these states decreased to between 1,300 kcal and 1,600 kcal (Patnaik 2007). We set the calorie consumption cut-off at 1,600 calories, which is one standard deviation below the mean calorie intake as derived from unit-level data of the NSS 68th round for the Indian population. Adopting this threshold aligns our findings with the scores of the GHI for the same year. If we had used the ICMR’s recommendations for optimal energy requirements (ICMR 2020), the estimates of hunger at the national or state level would likely appear even more severe and would not maintain parity with the GHI 2017 scores.

Our results reveal that out of the 36 states and union territories, 27 fall into the serious category, and five in the alarming category in terms of the index score (Table 1). Only four states are in the moderate category. None of the states or union territories were in the low category. Although four states were doing well according to ISHI 2017, their positions at the global level were not good. For example, with a score of 17.8, Himachal Pradesh ranks first in the ISHI 2017, however, globally it lies below 66 countries, after Ghana and Bolivia. The worse-performed state Meghalaya (39.6) would rank third from the bottom globally, before Chad and the Central African Republic. Some of the financially advanced states such as Gujarat and Maharashtra are lagging far behind in terms of GHI scores. This indicates that there exists little association between state-level economic growth and its position in ISHI 2017.

In our study, it is found that except for J&K, Punjab, Puducherry, Goa, Daman and Diu, and Haryana, the hunger score is higher in rural areas compared to urban areas. Food insecurity during the COVID-19 pandemic might have not only increased the hunger level at the national level but it also widened the inter-state, rural-urban, and gender disparities in terms of hunger.

Poor nutritional status of women, poor dietary diversity (Aguayo and Menon 2016), and delayed complementary feeding are associated with malnourishment among children

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(Aguayo et al 2016; Kin et al 2017; Richter et al 2018). By bringing all programmes related to nutrition together, India, in 1993 formulated its first nutrition policy to address the problem of malnutrition (GoI 1993). Other programmes such as the National Health Policy 2002 and 2017 and the National Policy for Children 2013 have laid the groundwork for tackling malnutrition (MoHFW 2002, 2017; Ministry of Defence 2013). In previous policies, children under the age of three were given less importance, so the problem did not improve much. Realising this, the NNM 2018 has increased the importance of nutrition for the first 1,000 days of a child through the convergence of various government programmes (MoWCD 2018). These 1,000 days include 280 days of pregnancy, and the remaining 720 days relate to infant and child feeding practices.

Policy Implications

Hunger and poverty have always been a serious issue worldwide towards achieving food security. The country successfully implemented the green revolution in the mid-1960s. In terms of the production of food crops, the country ranks in second position, but still, there are problems in the distribution of resources within the country and it is increasing day by day. Despite having the world's largest public distribution system

(PDS) of food crops and being one of the largest producers of food crops, it is heartening that the country could not ensure food security for all of its inhabitants. Every state in India has a nutrition intervention programme aimed at reducing under-nourishment and some states have had better progress than others; their learning may be applied to other states. The experience of some low- and middle-income countries with similar socio-economic conditions like India may also be used. For example, Peru has halved the stunting rate in five years through political commitment (Huicho et al 2017; Marini et al 2017).

The food security policy of the union or state governments may be restructured apart from the distribution of foodgrains through PDS. Policymakers and implementers should also think about the following: (i) extensive research work is needed to identify the diversification of food production and consumption across different regions; they should map regional food consumption patterns; (ii) nutritional quality of locally available foods needs to be measured so that local consumption patterns do not compromise the minimum nutritional intake. Finally, to achieve SDG-2 (no hunger) in India, existing programmes must be thoroughly implemented and strictly and monitored, and strengths and weaknesses reviewed at the grassroots level.

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