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## Food Security and Undernourishment in India: Assessment of Alternative Norms and the Income Effect

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During the last four decades, total food production in India has increased at a much faster pace than the growth in human population. Food production<sup>1</sup> including livestock products and fish increased from 188 million tonnes (MT) during 1970-71 to 342 MT during 1990-91 showing an 82 per cent increase over these two decades. In the next two decades, food production increased to close to 600 MT – marking a 75 per cent increase. In these two periods, the population of the country increased by 53 and 47 per cent, respectively. This has resulted in an increase in per capita production of total food from less than 350 kg per person during the early 1970s to more than 500 kg in recent years. However, the effect of an increase in per capita production of food recorded in the country is not visible in terms of the improvement in food and nutrition security. According to some studies based on the per person per day energy norms of 2400 Kcal for rural and 2100 Kcal for urban areas, there is deterioration in the prevalence of undernourishment during 1987-88 to 2004-05 based on energy intake (Deaton and Dreze, 2009). About 40 per cent children under the age of 5 years are underweight and child mortality is also high. Based on such facts, serious questions are now being raised about the country's achievements in food security. This situation has been persisting even when large surplus of grains have been lying in public buffer stock and a part of it is shown to be rotting here and there for want of proper storage and maintenance. Correspondingly, India's export of food products have been growing and the country exports a sizable quantity of cereals and livestock products.

Another disturbing factor related to nutritional deprivation in India is that income poverty and prevalence of undernutrition are not moving in the same direction despite the fact that the poverty lines were initially associated with a calorie norm. It is somewhat puzzling as to why despite a substantial increase in per capita food production and significant decline in poverty, India continues to face high levels of undernutrition and malnutrition. India's progress in improving nutrition has been excessively slow regardless of its rapid growth in income over the past two decades. It, therefore, becomes important to distinguish between those who are undernourished because of poverty and those who are not poor but are still undernourished. This has strong implications for addressing the problem of hunger and malnutrition.

A related aspect is the significant difference in undernutrition based on alternative norms derived from National Sample Survey Office's (NSSO) Consumer Expenditure Survey (CES) data and those estimated from supply-side data as reported by the Food and Agriculture Organization (FAO) of the United Nations. The studies using NSSO's household-level CES data have shown that three-fourths of India's population suffers from undernutrition (Deaton and Dreze, 2009) – as their intake of dietary energy is lower than the recommended norms of 2400 Kcal for rural areas and 2100 Kcal for urban areas in 2004-05. On the contrary, as per the FAO only one-fifth of population of India was undernourished during 2004-06, which further declined to 17.5 per cent during the period 2010-12. Surprisingly, the NSSO's CES-based studies and FAO estimate not

only show wide difference but they also moved in opposite direction with regard to the temporal direction of calorie poverty.

Given the significance of identifying absolute numbers and identity of the food-insecure, this brief addresses the following key questions:

- (i) What is the current and real status of undernutrition and malnutrition in India,
- (ii) What is the incidence of hunger among poor and non-poor households based on different norms,
- (iii) Why FAO's estimate of prevalence of hunger is far lower than the other estimates and if it has some limitations.

### **Nutritional Intakes and Prevalence of Undernutrition and Malnutrition**

There is no consensus about the nutritional terminology among various organizations and researchers alike. The existence of and often interchangeable use of terms such as hunger, undernutrition, malnutrition, food deprivation, nutritional insecurity and food insecurity has added to the confusion. Thus, it is important to mention at the outset that the terms hunger and undernutrition (calorie deficiency) have been used synonymously to estimate calorie or energy deficiency in dietary intake while malnutrition refers to deficiency of proteins in this brief. The estimates of undernutrition and malnutrition were prepared for various income groups using the unit-level NSSO data for the latest round (66<sup>th</sup> Round) on Consumer Expenditure for the year 2009-10. The entire sample was divided into two subsets: the poor households and non-poor households on the basis of the state-specific poverty lines<sup>2</sup> for 2009-10 as provided by the Planning Commission. The non-poor or above poverty line (APL) population was further sub-classified into two categories: middle income and high income on the basis of decile classes of monthly per capita expenditure (MPCE). The prevalence of undernutrition was estimated on the basis of Indian Council of Medical Research-National Institute of Nutrition (ICMR-NIN) norm as well as FAO norm, whereas the prevalence of malnutrition was estimated based on ICMR-NIN norm only.

FAO uses a uniform norm of 1800 Kcal for both rural and urban areas for reporting undernutrition at global level and across countries. It is imperative to note here that

this norm represents the 'minimum' amount necessary for maintaining good health as is reflected in the FAO's minimum dietary energy requirement (MDER) for sedentary activity. It also takes into account the minimum energy needs of age and sex differentiated demographic groups that are based on body weights and activity levels, which are then aggregated to arrive at a typical person's energy requirement through a population-weighted average of the age-sex groups' requirements. This, however, does not reflect the complete story as every individual's body has differential adaptation mechanisms. Thus, in an attempt to capture the demographic differentials across individuals, we use an alternative approach as proposed by Vishwanathan and Meenakshi in their paper (Vishwanathan and Meenakshi, 2006). Under this approach, the demographic information as provided in the NSSO's CES was employed and household-specific norms were calculated for each of the household after adjusting for age, sex and activity status. This computation uses the recommended dietary intake levels for moderate activity in rural areas and assumes sedentary lifestyles in urban areas. The age, sex and activity status adjusted norms used in the analysis were taken from the Nutrient Requirements and Recommended Dietary Allowances for Indians (ICMR, 2010).

### **Nutritional Norms and Actual Intake**

The nutritional status in India during the year 2009-10 was examined using two indicators. One by comparing the per capita dietary intake of energy and protein with their respective recommended dietary allowances (RDAs) and two, by estimating the ratio of population that consumed lower than their RDAs. The first indicator may also be called as adequacy and the second as deficiency. Their respective estimates are in Tables 1 and 2.

The average per capita per day RDAs based on ICMR-NIN norm turns out to be 2226 Kcal for rural and 2022 Kcal for urban households. The RDA was lower for poor category than non-poor due to the higher concentration of children and infants in BPL households despite the higher occurrence of labourious work among poor households as compared to non-poor households. On an average, a rural Indian faced an energy deficiency of 175 Kcal while the deficiency in urban population was only 65 Kcal. In both rural as well as urban areas, the

energy deficiency was highest in poor households. Households in the poor income category suffered from a calorie deficiency of 300 Kcal in urban areas and 385 Kcal in rural areas. The level of deficiency in middle income group was 20 Kcal in urban areas and 79 Kcal per person per day in rural areas. On an average, the high income households consumed more energy than their required levels. The extent of difference was 9 per cent in rural areas and 14 per cent in urban areas.

**Table 1: Demographically and activity-wise adjusted energy and protein norms as per ICMR-NIN and actual intakes**

Locale and Expenditure Class	Calorie/person/day: Kcal		Protein/person/day: gram	
	ICMR - NIN norm	Actual intake	ICMR - NIN norm	Actual intake
<b>Rural</b>				
Poor	2140	1755	45.84	46.41
Middle income	2268	2189	49.75	58.78
High income	2357	2572	52.61	70.08
All rural	2226	2051	48.47	54.76
<b>Urban</b>				
Poor	1965	1665	47.04	44.77
Middle income	2034	2014	50.54	54.33
High income	2101	2394	53.52	64.49
All urban	2022	1957	49.92	52.78
<b>Rural+Urban</b>	2171	2026	48.86	54.23

Source: Authors' own estimation

Note: ICMR - NIN norms are adjusted for age, sex and activity.

As against the ICMR-NIN norm, which is more specific and varies according to physical activity and population composition, the FAO uses a uniform norm of 1800 Kcal as MDER for uniform sedentary activity level. The average energy intakes by the population residing in middle and high income households were found to be higher than the minimum norm prescribed by FAO. However, the average calorie intake for the BPL households was even lower than the FAO norm. Further, there are inter-household variations around the average. Thus, the exact prevalence of undernutrition can be captured by computing the number of persons living in households with consumption levels lower than their respective prescribed norms after adjusting for both demographic and activity attributes.

Protein intake in India presents a different picture than calorie intake in terms of the average intake levels.

According to the ICMR-NIN approach, a minimum intake of 48.47 gm in rural and 49.92 gm in urban areas is recommended. Against this, the actual intake was found to be 54.76 gm per person per day in rural areas and 52.78 gm in urban areas. Except the urban poor, all the other households showed an average intake of protein which was more than the required minimum intake norm. However, like calorie intakes there are wide variations in protein intakes across different households. Therefore, despite the average actual intakes being higher than their average norms there are households that do not consume the minimum recommended level of protein.

### Prevalence of Undernutrition and Malnutrition

Status of nutrition is consequently better revealed by the proportion of people living in households that are not consuming their threshold household level intakes of energy and protein respectively. These estimates are presented in Table 2. Though, on an average, the energy deficiency looks small, but the household level data reveals that about one-third of the rural population and close to 40 per cent of the urban population was undernourished based on the FAO norm. More than half of rural poor and two-thirds of urban poor consumed less than 1800 Kcal. One-fifth of the middle income population in rural households and one-third in urban areas consumed food that did not provide them even 1800 Kcal of energy. Amongst the high income group, prevalence of hunger was 7.0 per cent in rural and 10.1 per cent in urban households based on the FAO norm.

Prevalence of undernutrition was much higher based on the ICMR-NIN norm. Based on this norm, more than two-thirds of the population in rural households and 58.7 per cent in urban households was undernourished during 2009-10. As expected, the prevalence of hunger declined with a rise in income. Calorie intake by 82.6 per cent rural poor and 78.5 per cent urban poor was below the minimum level of recommended dietary intakes. Majority of the middle income households were also suffering from energy deficiency in their diets. It needs to be emphasised that undernourishment was significant even among rich households. Food intakes by 39.0 per cent rural rich and 29.7 per cent urban rich did not meet the minimum energy requirement as per the ICMR-NIN recommendations. High level of under-



nutrition among the non-poor households indicates that the undernutrition problem cannot be solved by addressing poverty alone. In the total population (rural+urban), prevalence of undernourishment was 34.2 per cent based on FAO norm and 65 per cent based on ICMR-NIN norm.

**Table 2: Prevalence of undernutrition and malnutrition based on FAO norm and ICMR - NIN norm in various income groups**

Locale and Expenditure class	Undernourishment (%)		Malnourishment (%)
	FAO norm	ICMR - NIN norm	ICMR - NIN norm
<b>Rural</b>			
Poor	56.9	82.6	50.0
Middle income	21.3	61.3	31.7
High income	7.0	39.0	14.0
All rural	32.3	67.0	36.7
<b>Urban</b>			
Poor	66.7	78.5	59.9
Middle income	33.7	55.2	40.8
High income	10.1	29.7	22.8
All urban	39.5	58.7	43.8
<b>Rural+Urban</b>	34.2	64.8	38.7

Source: Same as in Table 1.

Note: ICMR - NIN norms are adjusted for age, sex and activity.

Malnourishment was less severe than undernourishment (Table 2). Further, protein deficiency was higher among urban households as compared to rural households in all the income categories. Half of the rural poor and about 60 per cent urban poor consumed less than their minimum required level of proteins. Similarly, 31.7 per cent of rural and 40.8 per cent of urban households in middle income group were afflicted with malnourishment. Among rich households, 14.0 per cent of the rural population was found to suffer from protein deficiency.

### Critique of FAO Norm

The FAO indicator follows a parametric approach and is expressed as the share of people in a national population that are not meeting their minimum food energy requirements. It is based on three critical parameters: the mean quantity of calories available in a country for human consumption, inequality in access to those calorie intakes and mean minimum age-sex specific calorie requirements of that population. The FAO estimates the first parameter

based on FAO country Food Balance Sheets (FBS) which are compiled as the balancing item after taking production, trade, stock changes, non-food uses and extra household waste into consideration. Based on this, the food quantity is converted into calories using the food conversion tables and divided by the total population to arrive at the per capita dietary energy supply (DES). Next, the inequality in access to these calories is computed using the DES and coefficient of variation (CV). The distribution of calories in the population is estimated by calculating the CV of energy expenditure and assuming a log normal distribution of energy consumption. The aggregated MDER is computed as the amount of food energy needed to maintain an acceptable minimum body weight, body composition and a minimum physical (sedentary) activity level. The FAO has been publishing this indicator annually as a 3-year average in its *State of Food Insecurity in the World* (SOFI) publications to apprise the global community about the levels and trends of undernourishment and assist in the global and regional food security governance.

The FAO also in an attempt to update and overhaul its methodology has incorporated some changes in SOFI 2012 (FAO, 2012) with respect to revisions in the world population data, revised MDER using data from country-level demographic and health surveys and anthropometrics surveys, revised estimates of DES, introduced country-specific estimates of food losses at the retail distribution level. They also included improvements in the estimation methods such as the use of a skew-normal distribution, changes in the way the parameters involved are estimated etc. Further, they have also introduced a set of additional food security indicators like the relative dietary supply index, food price level index, share of food expenditure by the poor etc. Despite these changes in the FAO approach, it still suffers from some serious shortcomings in accurately assessing the food and nutritional security. The FAO approach only focuses on dietary energy availability and its distribution ignoring all the other nutrients. It is based on the minimum activity levels which are too simplistic an assumption in developing countries where majority of the workforce is involved in moderate or heavy manual labour. This approach is also incapable of capturing the impact of short-term price and economic shocks, on consumption, whose frequencies have

increased in the recent past. It is not capable to assess the nutritional status of households/individuals and identify them. Such a restriction deters the monitoring and targeting of interventions in any country.

Concerns have also been raised on the use of FBS data as it measures food availability rather than food consumed. Food availability turns out to be a poor predictor of other vital measures such as mortality and economic productivity. It is averaged over a period of 3 years and does not capture the seasonal variations. Our major concern about FAO estimate of undernutrition is the use of FBS as food intake. Actual undernutrition estimated by the FAO methodology will be higher or lower depending upon whether food intake is higher or lower than availability estimated from FBS. To substantiate this point, we take the case of India. FBS of FAO treats 89.6 per cent of cereals supply in the country as food intake. Thus, 10.4 per cent of total production of cereals is considered to be used for non-food purposes like feed, seed, wastage and industrial use. This coefficient of 10.4 per cent is fixed for the last more than 50 years. According to literature, the proportion of cereals going for non-food purposes has been rising and is much higher than 10.4 per cent assumed by the official estimate on net availability adopted by FAO. This is quite evident from the wide difference between our per capita estimate of hunger based on FAO norm of 1800 Kcal derived from NSSO data on consumption and incidence of hunger as reported by FAO. According to FAO, 18.8 per cent of India's population was undernourished during 2008-10 (FAO, 2012), whereas our estimate based on FAO norm (Table 2) reveals the undernourishment level to be at 34.2 per cent. We conclude that the FAO methodology underestimates hunger for all those countries wherein the use of food commodities for non-food purposes is underestimated, as is the case for India.

### **Concluding Remarks**

Calorie deficiency was higher for rural areas than urban areas. The average intake levels of poor households were at levels even lower than the uniform norm of 1800 Kcal of FAO. Among the demographically and activity-wise adjusted calorie norms, the prevalence of undernourishment is higher in rural areas across all the income categories. More than half of the income poor population is calorie deficient in both rural and urban

areas across all the choices of norms. Such a population can be termed to be suffering from 'involuntary hunger' as they do not have the necessary income resources to take care of the quantity aspect of their intakes. However, undernourishment is also widespread among the non-poor household categories even when evaluated using the low norm approach of FAO. These individuals can be termed as suffering from 'voluntary hunger' as they have the necessary income resources but still they are not consuming adequate calories – may be out of choice or due to other non-income factors. This requires further probing.

The protein adequacy of the study population paints a different picture than caloric adequacy. In this case, the average actual intakes were found to be higher than the required minimum intake levels both for rural and urban areas barring the urban poor. However, due to the uneven distribution of consumption across households, approximately 40 per cent population was found to be suffering from malnourishment. It was also observed that the percentage of population with inadequate protein intakes was higher in urban households as compared to their rural counterparts.

A number of indicators are coexisting that are being used both by the policymakers and public at large to infer about the state of food security and undernutrition at global, national, household and individual levels. Unfortunately, these different indicators do not reconcile with each other and are acting as a source of confusion. In terms of the brief appraisal of the FAO methodology, it was concluded that such an approach is bound to lead to erroneous conclusions as it deals with food availability rather than food intakes. It was expected, and was found to be the case for India, that the level of hunger will be underestimated when the use of food commodities for non-food purposes is not fully accounted for.

To conclude, improving only incomes is not a panacea for the undernourishment and malnourishment problem in India. There is a strong need to create awareness about adequate intake levels and bring in attitudinal changes to raise energy and protein intakes and adopt lifestyles that aid in digesting higher levels of energy and protein. Income growth and elimination of poverty is found to be a "necessary" but not a "sufficient" condition for reducing undernourishment and malnourishment in India.

## Notes

1. Food includes cereals, pulses, edible oil, sugar, fruits and vegetable, milk, meat, eggs and fish.
2. State - specific poverty lines show large variation. It was ₹ 632 for Madhya Pradesh and ₹ 1016 for Nagaland for rural areas for 2009-10.

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