Nutritional Deficiencies in Maharashtra, 2004-05 and 2011-12

Lakshmikanth Hari, Srijit Mishra

Nabakrushna Choudhury Centre for Development Studies, Bhubaneswar
(an ICSSR institute in collaboration with Government of Odisha)

December 2019

Nutritional Deficiencies in Maharashtra, 2004-05 and 2011-12

Lakshmikanth Hari, Srijit Mishra[1][*]

Abstract

This paper on nutritional deficiencies in Maharashtra computes the incidences of deprivation in calorie, protein, and fat for rural and urban areas across regions, social group (caste), religion, and household type (occupation). The calculations are made for 2004-05 and 2011-12 based on unit level National Sample Survey data by superimposing the recently recommended dietary allowance. In doing so, a methodological contribution is the extension of Pα class of deprivation measure to one where the deprivation line is household-specific and nutrient-specific.

Key words: Nutritional deficiency, Household specific deprivation line, and Sub-group differences.

JEL Code(s): D30, I32, O15

---

[*] LH is Assistant Professor & Chairperson, Centre for Sustainable Development, K J Somaiya Institute of Management Studies & Research (SIMSR), Mumbai, hari@somaiya.edu. SM is Director, Nabakrushna Choudhury Centre for Development Studies (NCDS), Bhubaneswar, srijit.ncds@gov.in.

Contents

1 Introduction

We began this exercise to update our earlier work, Mishra and Hari (2009), to include the latest round of National Sample Survey (NSS 68th round of 2010-11). However, as we went along we brought in two important additions that go beyond a mere estimation of calorie deprivation with the new data set. The first addition is methodological. We propose a household-specific nutrient-specific deprivation, which in principle is like each household having its own independent deprivation line (poverty line if one would use this approach to compute poverty) that is separate for each nutrient. This was made possible by superimposing the latest National Institute of Nutrition (NIN) norms of recommended dietary allowance that is age, gender and occupation specific. The second addition is to go beyond calorie deprivation and compute protein and fat deprivations. This approach can be extended in future for other nutritional deprivations (Calcium, Iron, Vitamin A, Vitamin B12, and Zinc among others). While we started this exercise for Maharashtra, we are now extending this to an all-India analysis in a companion paper.

The organization of the paper is as follows. Our new methodology is elaborated in section 2. Section 3 comprises of broad trends of calorie, protein and fat consumption over the years in India and Maharashtra. Section 4 discusses nutritional deficiencies across sub groups over two time periods for Maharashtra. The paper ends with concluding remarks in section 5.

2 Methodology

Recently NIN (2010) came up with recommended dietary allowance for Indians in 2010. This is age, gender and occupation specific and is given for calorie, protein, fat and other nutritional requirements. The requirements for calorie, protein and fat are given in Table 1. In this, if we consider the requirements for an adult (18 years and above) male who is involved in sedentary activities/occupation as the base category then the changes in requirement by age, gender and occupation will be pegged to this base category giving us an adult equivalent scale. This adult equivalence will be separate for calorie, protein and fat.

Using unit level NSS data one could know age-wise and gender-wise composition of households. However, for occupation-wise composition we make certain assumptions, as indicated in Table 2. We use household type information along with relationship of adult members with head of the household and categorize them (separately for rural and urban India) in a hierarchy from greater physical effort to lesser physical effort. We also took into the consideration of additional requirements of lactating mothers by assuming that households having a child less than one year old also had a lactating mother. We however could not make separate allowances for children below/above six months.

We must also mention that there are two other aspects of recommended dietary allowance that we are unable to incorporate into the calculation of adult equivalent scale. One is body weight of the individuals and the other is pregnant mothers as this information is not available in NSS data.

Table 1: Recommended Dietary Allowances

Group	Particulars	Body wt. (kg)	Net Energy (Kcal/day)	Protein (g/day)	Visible Fat (g/day)
Male	Sedentary	60	2320	60	25
	Moderate		2730		30
	Heavy		3490		40
Female	Sedentary	55	1900	55	20
	Moderate		2230		25
	Heavy		2850		30
	Pregnant		+350	82.2	30
	Lactation 0-6 m		+600	77.9	30
	Lactation 6-12 m		+520	70.2	30
Infants	0-6 months	5.4	497	6.3	–
	6-12 months	8.4	672	14.2	19
Children	1-3 years	12.9	1060	16.7	27
	4-6 years	18	1350	20.1	25
	7-9 years	25.1	1690	29.5	30
Boys	10-12 years	34.3	2190	39.9	35
Girls	10-12 years	35	2010	40.4	35
Boys	13-15 years	47.6	2750	54.3	45
Girls	13-15 years	46.6	2330	51.9	40
Boys	16-17 years	55.4	3020	61.5	50
Girls	16-17 years	52.1	2440	55.5	35

Source: NIN (2010)

Table 2: Assumptions for Sedentary, Moderate and Heavy

Sector	Household type	Head	Spouse	Rest
Rural	Agriculture labour	H	H	M
	Other labour	H	M	M
	Self-employed in agriculture	H	M	S
	Self-employed in non-agriculture	M	M	S
	Others	S	S	S
Urban	Casual labour	H	H	M
	Self employed	M	S	S
	Regular wage/salary	S	S	S
	Others	S	S	S

Note: H= Heavy; M=Moderate; S= Sedentary;

From the NSS unit level data, we use the quantity consumed and convert them to appropriate nutritional values based on food composition tables of Gopalan et al (1989). This gives us household-specific monthly consumption amount from which we compute nutritional intake for calorie, protein and fat.

In our earlier work, Mishra and Hari (2009), we use adjusted consumption as proposed by Minhas (1991). In the current exercise we bring in some additional assumptions as explained below, in equation 1.

(1) $C_a = CA$; $A = (M_h + M_f)/(M_h + M_g)$;

$A = 1$ if $M_h = 0$ and $M_f = 0$, and

$A = M_f$ if $M_h = 0$ and $M_g = 0$.

Here, C_a is adjusted consumption, C is consumption prior to adjustment, A is the adjustment factor, M_h is the number of meals consumed by household members in the household, M_f is the number of meals that household members had eaten outside the household without making any payment, and M_g is the number of meals given to guests and employees without taking any payment. Note that if M_f>M_g then the household is a net recipient and A>1 whereas if M_f<M_g then A<1 and the household is a net server. It is true that this is an approximation and should not have large differences at an aggregate level, but may correct for inequities that is largely because of the data limitation and not because of differences in nutrition intake. The additional assumptions (to avoid some computational difficulties) is to consider A as 1 if the numerator is zero (M_h=0 and M_f=0) and to consider A=M_f if the denominator is zero (M_h=0 and M_g=0).

Once we have the adult equivalence scale for a household based on adjusted consumption (separately for calorie, protein and fat) we use it to arrive at deprivation lines. If the household falls below these lines, we calculate deprivation in per capita terms (how many individuals are deprived and not how many adult equivalents are deprived).

We extend Foster et al. (1984) class of measure by considering the deprivation line to be household-specific in equation 2.

(2) $P_\alpha = (1/n)\sum_i((z_i - y_i)/z_i)^\alpha$

For our purpose, P_α is the alpha class of deprivation measure, n is total population, z_i is the deprivation line that is household-specific, y_i is the adjusted consumption for the ith household. Thus, P_0, P_1 and P_2 will give us incidence (head count ratio), depth (shortfall gap) and severity (shortfall gap squared), respectively. All these are computed separately for each nutrient - calories, protein and fat.

3 Calorie, Protein and Fat Consumption: Some Broad Trends

In Table 3 we observe the following patterns. At all India level, for both rural and urban areas the calorie consumption decreased from 1972-73 to 2004-05 and then increased in 2011-12, the protein consumption has been more or less stable, and the fat consumption has increased for the entire period. Again at the all India level, for all the years for which we have data, calorie and protein consumptions have been higher in rural areas when compared to urban areas, whereas fat consumption has been relatively higher in urban areas.

In Maharashtra, calorie and protein consumption is lower than the all India level for both rural and urban areas for all the years except for some exceptions in 1983 and 2011-12, whereas fat consumption is higher than the all India level for all the years. Calorie and protein consumptions for Maharashtra do not show a pattern over the years for both rural and urban areas, but their consumptions in 2011-12 is higher than their consumptions in all the years except for protein in 1983 for rural areas. As with the all India level, fat consumption for Maharashtra for all the years has been relatively higher in urban areas when compared to rural areas.

At all India level as well as in Maharashtra for both rural and urban areas, the average calorie, protein and fat consumptions obtained from our estimates using unit level data when

compared to published reports are lower (Table 4). It may also be mentioned that average adjusted consumptions, equation (1), are higher than average consumption estimates implying that households are net recipients as they eat more number of meals outside their house than they serve to outside members at home. For our subsequent analysis, as indicated earlier, we will be using adjusted consumption for our analysis.

Table 3: Trends in Per Capita Per Day Calorie, Protein and Fat Consumption

	Region	Item	1972-73	1983	1993-94	2004-05	2011-12
India	Rural	Calorie	2266	2211	2153	2047	2233
		Protein	62	62	60.2	57	60.7
		Fat	24	27	31.4	35.5	46.1
	Urban	Calorie	2107	2089	2071	2020	2206
		Protein	56	57	57.2	57	60.3
		Fat	36	37	42	47.5	58
Maharashtra	Rural	Calorie	1895	2144	1939	1933	2260
		Protein	54	62	54.8	55.7	60.7
		Fat	24	30	33.5	41.5	60.1
	Urban	Calorie	1971	2028	1989	1847	2227
		Protein	55	56	55.5	52.1	61.2
		Fat	41	45	47.9	50.1	66.8

Source: NSSO (1996, 2001, 2007, 2014)

Table 4: Comparing Published Data with Current Estimates: Per Capita Per Day Calorie Consumption in Maharashtra

Region	Item	Published		Current Estimates			
				Without adjusted consumption		With adjusted consumption	
		2004-05	2011-12	2004-05	2011-12	2004-05	2011-12
Rural	**Calorie**	1933	2260	1897.9	2103.0	2074.3	3283.9
	Protein	55.7	60.7	52.7	56.0	56.9	81.1
	Fat	41.5	60.1	41.1	52.1	44.7	72.7
Urban	**Calorie**	1847	2227	1841.4	2039.2	2251.6	2529.3
	Protein	52.1	61.2	50.5	55.2	59.4	65.5
	Fat	50.1	66.8	49.3	58.7	57.1	67.2

Source: NSSO (2012) and authors' calculation based on unit level data

Table 5: Average, Incidence, Depth & Severity of Calorie, Protein and Fat Deprivation in India & Maharashtra

State	Year	Sector	Calorie				Protein				Fat			
			Avg	Inc	Dep	Sev	Avg	Inc	Dep	Sev	Avg	Inc	Dep	Sev
India	2004-05	Rural	2043.9	67.4	13.6	3.9	55.8	35.5	6.4	1.8	35.4	48.6	15.6	6.9
		Urban	2019.4	62.4	12.0	3.4	55.4	41.3	7.0	1.9	47.3	21.1	5.3	2.0
	2011-12	Rural	2099.1	62.2	11.9	3.2	56.5	33.9	5.6	1.4	41.6	28.8	7.3	2.8
		Urban	2057.9	58.9	11.0	3.0	55.7	40.1	6.5	1.6	52.5	10.2	2.1	0.7
Maha-rashtra	2004-05	Rural	1897.9	78.9	17.6	5.3	52.7	43.2	7.5	2.0	41.1	30.0	7.6	3.0
		Urban	1841.4	74.3	15.6	4.5	50.5	54.2	9.1	2.3	49.3	11.1	2.1	0.6
	2011-12	Rural	2110.5	60.0	12.0	3.4	61.8	19.6	3.2	0.8	41.6	22.8	4.9	1.6
		Urban	2028.7	60.3	11.8	3.3	58.0	31.9	4.7	1.1	50.2	8.8	1.6	0.5

Source: Authors' calculation based on unit level data

In Table 5, we observe the following at the all India level as well as for Maharashtra. Compared to 2004-05, average consumptions of calorie, protein and fat are higher in 2011-12. Between 2004-05 and 2011-12, deprivations declined in calorie, protein and fat for both rural and urban areas. The decline in deprivations are higher in rural areas when compared to urban areas (except for depth and severity in protein for Maharashtra). Compared to urban areas, average consumptions of calorie and protein are higher and that of fat is lower in rural areas for 2004-05 and 2011-12. For both the years, calorie and fat deprivations are more in

rural areas whereas protein deprivation is more in urban areas (except for incidence in calorie deprivation in Maharashtra in 2011-12). Despite calorie consumption being higher in rural areas, the deprivations are relatively higher because their calorie requirements are likely to be higher.

4 Calorie, Protein and Fat Deficiency: Sub-Groups of Maharashtra

In this section, we look into deprivations in calorie, protein and fat for different sub-groups of population in Maharashtra (Table 6). The different sub-groups are NSS regions, social groups, religion, land possessed, and household type. We base our comparison and report some exceptions from four broad expected patterns: that average consumptions have increased over time, that deprivations have decreased over time, that average calorie and protein consumptions are higher in rural while average fat consumption is higher in urban, and that deprivations in calorie and fat are higher in rural while deprivation for protein is higher in urban.

4.1 NSS Region

Across NSS regions, the least average consumption and the highest deprivation is in Coastal (Konkan).

Between 2004-05 and 2011-12, deprivations in incidence and depth for protein increased in rural areas for Inland Eastern region.

Average calorie consumption is more in urban, compared to rural, in the following regions: Coastal and Inland Northern regions in both 2004-05 and 2011-12, Eastern in 2004-05, and Inland Eastern in 2011-12.

Average protein consumption is more in urban, compared to rural, in the following regions: Coastal, Eastern and Inland Northern in both the years.

Average fat consumption is more in rual, compared to urban, for Inland Western region in 2004-05. Note that the dairy sector co-operative development has happened in this region.

Across NSS regions, calorie deprivations is more in urban, compared to rural, in the following: incidence, depth and severity of calorie in Inland Central region for 2011-12; depth and severity of calorie in Inland Central region for 2004-05; and severity of calorie consumption in Inland Western region in 2011-12.

Across NSS regions, fat deprivation is more in urban, compared to rural, in the following: depth and severity of fat consumption in Inland Western region for 2004-05; and severity of fat consumption in Inland Eastern region for 2011-12.

Across NSS regions, protein deprivation, is more in rural, compared to urban, in the following: incidence, depth and severity in Coastal and Eastern regions for 2004-05 and 2011-12; depth and severity in Inland Eastern region for 2011-12; and incidence in Inland Northern region for 2011-12.

4.2 Social Group

Across social groups, the least average consumption and the highest deprivation is largely among scheduled tribes.

Average calorie and protein consumptions are more in urban, compared to rural, for schedule tribes in 2004-05 and 2011-12.

Across social groups, calorie deprivation is more for urban, compared to rural, in the following: incidence, depth and severity among scheduled castes for 2011-12; and severity among other castes for 2004-05.

Across social groups, fat deprivation is more for urban, compared to rural, in the following: severity among scheduled castes and other castes for 2011-12.

Protein deprivation is more for rural, compared to urban, among scheduled tribes in incidence, depth and severity for 2011-12; and in depth and severity for 2004-05.

4.3 Land Size

Across land size, for rural areas, greater deprivation is among marginal land holdings.

Between 2004-05 and 2011-12, for urban areas, protein deprivation increased in incidence, depth and severity for medium land possessed households, and in depth and severity for large land possessed households.

Rural urban comparison for size class of land possessed is not appropriate as the land requirement is different for them. Hence, it has not been attempted.

4.4 Religion

Between 2004-05 and 2011-12, average consumption decreased in the following: calorie, protein and fat for Sikhs in rural areas and Zoroastrians in urban areas; calorie and protein for other religion in rural areas; and fat for other religion in urban areas.

Between 2004-05 and 2011-12, deprivations increased in the following: incidence, depth and severity of calorie and protein consumption among Sikhs and others in rural areas, and Zoroastrians in urban areas; depth and severity of calorie consumption among Sikhs and others in urban areas; depth and severity of protein consumption among Muslims in rural areas; incidence of calorie and protein consumption among Christians in urban areas; and incidence of protein consumption among Sikhs and Jains in urban areas.

Average calorie consumption is more in urban, compared to rural, among Christians and Zoroastrians in 2004-05 and 2011-12 and among Sikhs and others in 2011-12.

Average protein consumption is more in urban, compared to rural, among Muslims in 2011-12.

Average fat consumption is more in rural, compared to urban, among Sikhs in 2004-05 and others in 2011-12.

Table 6: Incidence, Depth & Severity of Calorie, Protein and Fat Deprivation in Maharashtra across Sub-Groups

Type	Year	Sub-Group	Rural Calorie Avg	Inc	Dep	Sev	Rural Protein Avg	Inc	Dep	Sev	Rural Fat Avg	Inc	Dep	Sev	Urban Calorie Avg	Inc	Dep	Sev	Urban Protein Avg	Inc	Dep	Sev	Urban Fat Avg	Inc	Dep	Sev
NSS Region	2004-05	CO	1715.0	88.4	23.1	7.8	41.0	79.1	19.6	6.6	31.7	45.3	17.6	9.2	1781.3	78.0	16.8	4.9	48.4	63.5	11.5	3.1	51.1	5.9	1.0	0.3
		IW	2023.8	73.3	14.5	3.9	57.9	37.8	5.2	1.1	51.2	10.4	1.4	0.3	1909.5	68.1	13.3	3.7	52.6	47.0	7.2	1.6	50.9	8.8	1.7	0.6
		IN	1752.5	83.0	21.1	6.9	48.1	48.8	8.5	2.2	43.1	22.7	5.5	2.2	1793.0	76.8	15.7	4.5	49.1	58.4	9.4	2.3	51.4	11.9	2.6	0.9
		IC	1906.5	79.7	17.2	4.9	55.0	31.5	4.5	1.0	39.7	32.6	6.1	1.8	1851.5	73.7	17.3	5.5	53.2	42.6	6.7	1.6	42.9	25.2	4.4	1.1
		IE	1949.0	76.3	15.9	4.5	55.3	31.2	4.5	1.0	36.4	40.7	8.5	2.4	1919.0	73.6	15.1	4.3	52.4	43.1	6.5	1.6	45.3	19.7	3.9	1.1
		EA	1821.9	80.5	19.4	6.0	46.5	60.8	11.2	3.1	29.1	60.8	20.6	9.0	2009.7	62.4	12.4	3.6	54.4	42.2	6.7	1.7	45.2	18.9	4.4	1.5
	2011-12	CO	1852.0	69.2	17.9	6.3	45.3	59.9	14.2	4.5	39.7	24.2	7.7	3.5	1975.2	65.5	12.2	3.1	53.8	50.4	8.1	1.9	57.8	1.6	0.4	0.1
		IW	2160.3	63.3	9.5	2.1	58.5	19.4	2.2	0.4	58.0	1.0	0.1	0.0	2138.7	54.0	8.6	2.1	57.9	33.7	4.4	1.0	61.0	0.5	0.1	0.0
		IN	2027.3	65.6	14.0	3.9	53.8	38.5	7.1	1.9	51.9	8.3	2.2	0.9	2041.9	55.5	9.6	2.5	54.4	38.6	5.4	1.4	60.6	1.7	0.2	0.0
		IC	2233.6	52.3	9.4	2.3	61.0	21.5	2.8	0.6	55.9	2.3	0.2	0.0	2056.2	57.5	10.8	2.9	56.3	32.9	5.0	1.1	59.0	2.3	0.2	0.0
		IE	2071.6	67.0	13.4	3.7	56.5	34.2	4.7	0.9	49.7	11.7	1.1	0.2	2097.1	55.4	9.8	2.6	56.2	33.5	4.8	1.1	57.3	4.6	0.9	0.3
		EA	2138.3	58.7	11.0	2.9	52.2	41.5	7.3	1.9	45.0	14.0	2.7	0.9	2108.1	54.5	6.4	1.2	54.6	36.4	4.9	0.8	54.1	0.6	0.1	0.0
Social Group	2004-05	ST	1701.8	88.4	24.6	8.7	46.2	54.7	13.2	4.7	29.5	60.1	21.3	10.5	1834.9	82.5	19.2	6.2	49.2	58.3	10.8	3.4	45.5	25.2	6.3	2.3
		SC	1813.7	86.1	20.4	6.2	51.4	42.6	6.6	1.6	35.9	45.7	9.9	3.2	1748.4	78.9	18.9	5.9	48.7	60.8	11.1	2.9	42.5	16.8	3.5	1.1
		OBC	1947.5	76.1	16.2	4.6	54.8	41.8	7.0	1.8	41.8	26.0	6.0	2.1	1844.5	75.5	14.7	4.0	49.9	52.9	8.5	2.0	47.6	11.2	1.9	0.5
		OC	1957.7	75.1	15.3	4.3	53.7	40.5	6.2	1.5	47.0	16.1	2.9	0.9	1869.2	72.0	14.8	4.3	51.4	52.4	8.7	2.2	52.4	8.6	1.6	0.5
	2011-12	ST	1875.9	71.0	18.2	6.1	48.1	47.5	10.7	3.3	39.0	25.8	8.1	3.7	1989.8	57.3	12.5	3.4	53.3	38.3	6.0	1.4	53.2	3.4	0.4	0.1
		SC	2142.4	61.9	11.5	2.9	58.5	30.0	4.2	0.9	51.3	6.7	0.8	0.1	1958.6	69.6	14.0	3.9	53.1	48.1	7.9	2.0	52.9	3.6	0.7	0.2
		OBC	2089.7	63.8	11.3	2.9	55.1	30.9	4.6	1.0	52.1	6.4	0.9	0.3	2020.4	60.2	10.6	2.6	54.3	43.3	6.3	1.4	58.1	1.4	0.2	0.1
		OC	2190.5	57.9	10.2	2.6	59.1	26.5	4.1	1.0	57.7	3.0	0.3	0.1	2081.3	57.0	9.5	2.3	56.6	39.4	5.9	1.4	61.4	1.3	0.3	0.1
Land Size	2004-05	LL	1782.6	81.4	19.8	6.2	49.2	44.8	8.0	2.2	37.0	39.1	9.1	3.2	1826.2	75.5	16.2	4.8	50.1	56.4	9.4	2.4	49.0	11.3	2.2	0.7
		MA	1842.3	81.9	19.5	6.1	49.4	51.9	10.0	2.9	37.7	35.8	10.0	4.3	1933.2	67.6	12.4	3.4	52.8	41.4	8.0	2.1	51.1	11.8	2.1	0.7
		SM	1950.1	81.7	17.1	4.9	57.3	43.1	6.6	1.6	42.5	23.7	6.3	2.5	2005.6	60.2	9.6	2.4	54.1	35.1	5.2	1.2	51.6	5.0	1.1	0.3
		SE	2039.5	73.3	13.9	3.6	57.3	33.0	4.8	1.1	48.1	17.0	3.7	1.3	1847.4	73.1	12.9	3.3	50.9	40.8	6.8	1.5	48.8	11.1	2.2	0.5
		ME	2202.1	63.7	11.1	2.6	61.2	26.7	3.8	0.8	54.2	10.4	2.5	0.9	2041.2	61.0	8.0	1.7	56.1	26.8	3.5	1.1	55.7	10.0	0.3	0.0
		LA	2135.0	64.8	8.0	3.6	59.8	24.4	4.1	2.9	53.7	4.7	2.9	2.8	1989.9	63.5	9.5	2.1	56.0	42.8	5.3	1.1	57.2	0.7	0.1	0.0
	2011-12	LL	2087.8	61.0	11.8	3.2	55.2	31.7	5.4	1.4	50.2	9.0	1.5	0.5	2023.0	61.8	11.2	2.8	54.8	43.5	6.6	1.5	58.2	1.9	0.3	0.1
		MA	2029.3	64.6	13.7	4.1	53.4	34.8	6.8	1.9	49.3	11.7	3.5	1.5	2196.2	44.5	6.7	1.7	59.5	26.9	3.9	0.9	64.3	1.9	0.6	0.3
		SM	2156.9	67.6	11.4	2.8	58.0	30.9	4.4	0.9	55.7	4.3	0.5	0.1	2185.3	47.9	8.0	2.1	59.5	32.3	4.7	1.0	59.0	0.4	0.1	0.0
		SE	2106.3	62.1	11.5	2.9	57.4	30.5	3.9	0.8	54.5	4.5	0.6	0.2	2074.6	47.8	6.3	1.1	55.6	31.3	5.8	1.3	61.3	0.0	0.0	0.0
		ME	2319.8	56.3	8.2	1.6	63.0	21.8	2.7	0.4	61.1	0.7	0.1	0.0	2235.1	42.8	6.5	1.5	58.8	32.9	5.8	1.5	67.4	0.0	0.0	0.0
		LA	2602.6	23.8	2.6	0.4	71.4	12.2	1.1	0.2	67.0	0.0	0.0	0.0	2144.8	50.8	7.0	1.6	58.0	27.3	5.9	1.3	61.0	0.0	0.0	0.0

Continued

Table 6: Incidence, Depth & Severity of Calorie, Protein and Fat Deprivation in Maharashtra across Sub-Groups

Type	Year	Sub-Group	Rural Calorie Avg	Inc	Dep	Sev	Rural Protein Avg	Inc	Dep	Sev	Rural Fat Avg	Inc	Dep	Sev	Urban Calorie Avg	Inc	Dep	Sev	Urban Protein Avg	Inc	Dep	Sev	Urban Fat Avg	Inc	Dep	Sev
Religion	2004-05	HI	1912.7	78.5	17.5	5.3	52.9	43.5	7.7	2.1	41.9	28.3	7.4	3.0	1870.8	72.6	14.2	3.9	50.6	54.8	8.9	2.2	51.0	8.4	1.6	0.5
		MU	1754.1	73.2	16.7	4.8	50.4	36.5	5.8	1.4	37.8	26.6	4.8	1.3	1706.8	83.5	21.3	7.1	49.4	52.2	9.7	2.7	42.0	22.1	4.2	1.2
		CH	1829.4	88.6	21.6	7.0	45.8	79.0	17.5	5.3	41.1	12.4	3.1	0.8	2006.0	59.3	13.8	4.5	56.6	46.7	8.2	2.1	58.1	4.0	1.6	0.7
		SI	3029.5	40.6	10.2	2.6	82.8	40.6	2.7	0.2	95.0	0.0	0.0	0.0	2162.9	55.6	8.5	2.0	58.6	24.7	5.9	2.0	68.2	0.0	0.0	0.0
		JA	2228.8	72.0	14.6	5.3	61.2	25.0	5.7	2.1	56.5	16.1	3.0	0.6	1958.5	75.1	12.1	2.9	52.8	48.8	8.8	2.2	66.4	0.9	0.2	0.1
		BU	1772.0	89.6	20.6	6.1	50.6	44.2	6.2	1.5	30.6	60.0	12.7	4.1	1749.8	76.4	19.3	6.3	48.5	58.3	11.0	3.0	40.5	19.8	3.9	1.1
		ZO	-	-	-	-	-	-	-	-	-	-	-	-	2431.4	12.0	1.0	0.2	70.2	18.9	1.1	0.1	77.9	0.0	0.0	0.0
		OR	2155.3	55.3	1.6	0.4	62.4	0.0	0.0	0.0	54.7	0.0	0.0	0.0	1859.1	86.1	10.2	1.7	49.3	100.0	13.7	2.4	61.8	0.0	0.0	0.0
	2011-12	HI	2106.4	63.1	11.8	3.2	55.9	31.3	5.1	1.3	52.4	8.0	1.7	0.7	2058.2	58.5	10.2	2.5	55.1	42.7	6.5	1.5	59.6	1.3	0.2	0.1
		MU	1990.5	61.0	14.4	4.1	55.8	31.7	7.7	2.6	51.6	3.5	0.2	0.0	1961.1	64.1	12.2	3.2	56.0	35.3	5.1	1.2	54.1	3.3	0.7	0.2
		CH	2074.3	34.4	9.1	2.7	54.9	34.4	7.5	2.0	45.6	10.6	0.3	0.0	2076.3	69.2	12.7	3.0	58.8	47.8	6.2	1.1	63.4	0.0	0.0	0.0
		SI	2107.3	94.5	17.9	3.4	54.2	94.5	8.2	0.7	49.7	0.0	0.0	0.0	2534.5	40.9	9.6	2.4	65.1	30.2	3.3	0.4	81.0	0.0	0.0	0.0
		JA	2502.2	22.6	1.8	0.4	63.2	2.8	0.3	0.0	65.0	0.0	0.0	0.0	2133.8	60.3	8.4	1.8	56.5	54.3	7.0	1.5	75.6	0.0	0.0	0.0
		BU	2137.1	56.2	11.1	2.8	58.4	35.7	4.8	0.9	46.7	10.7	1.5	0.3	1947.6	67.3	13.9	4.4	52.1	46.3	8.1	2.3	52.0	5.7	1.2	0.3
		ZO	-	-	-	-	-	-	-	-	-	-	-	-	2030.4	57.1	17.2	5.2	57.1	57.1	21.6	8.2	76.3	0.0	0.0	0.0
		OR	1888.9	81.7	19.1	4.5	51.1	81.7	0.9	0.0	59.2	0.0	0.0	0.0	2004.5	61.2	15.0	4.6	52.4	50.1	8.9	2.1	55.1	0.0	0.0	0.0
Household Type	2004-05	H1	1850.0	71.0	14.8	4.1	50.1	48.4	7.8	1.9	43.5	18.4	4.4	1.6	1811.5	78.8	16.2	4.5	50.3	55.1	8.9	2.2	49.3	9.2	1.7	0.5
		H2	1787.6	88.0	21.9	6.9	49.7	44.4	8.2	2.3	33.0	48.8	11.7	4.2	1859.0	68.3	12.7	3.3	50.5	53.7	9.2	2.3	50.9	5.2	0.8	0.2
		H3	1773.5	87.9	22.4	7.0	47.5	49.9	9.8	2.8	36.2	36.8	11.1	4.9	1716.5	96.7	30.5	11.2	48.4	58.5	10.6	2.9	36.0	45.9	9.7	3.0
		H4	2039.4	76.6	15.0	4.1	57.9	38.1	6.1	1.5	48.0	17.2	4.5	1.9	-	-	-	-	-	-	-	-	-	-	-	-
		H9	2005.9	48.9	8.5	2.8	54.3	44.0	7.2	2.5	51.2	8.9	2.8	1.6	2190.9	49.5	7.5	1.8	57.9	42.4	6.7	1.6	64.7	4.8	0.8	0.3
	2011-12	H1	2100.6	52.0	8.3	1.9	56.0	28.4	5.0	1.4	53.8	1.8	0.2	0.1	2014.7	64.9	10.7	2.5	55.1	40.2	6.0	1.3	59.7	1.5	0.2	0.0
		H2	2022.7	75.0	16.2	4.6	54.4	33.1	5.8	1.5	46.9	14.0	2.6	0.9	2047.2	53.4	8.9	2.1	55.4	44.6	6.8	1.6	59.4	0.3	0.1	0.0
		H3	1923.5	75.8	18.6	6.3	49.4	44.7	10.0	3.3	43.3	20.8	6.7	3.5	1928.1	86.6	22.0	7.1	52.5	38.4	6.3	1.6	48.4	10.3	2.1	0.6
		H4	2159.6	64.2	11.4	2.9	58.1	29.4	4.3	1.0	55.2	5.6	1.1	0.4	-	-	-	-	-	-	-	-	-	-	-	-
		H9	2183.6	36.5	5.2	1.3	56.2	31.7	4.8	1.1	56.2	2.1	0.7	0.2	2372.7	35.8	4.6	0.9	60.1	36.2	4.7	0.9	66.1	1.0	0.1	0.0
All	2004-05	MH	1897.9	78.9	17.6	5.3	52.7	43.2	7.5	2.0	41.1	30.0	7.6	3.0	1841.4	74.3	15.6	4.5	50.5	54.2	9.1	2.3	49.3	11.1	2.1	0.6
	2011-12	MH	2110.5	60.0	12.0	3.4	61.8	19.6	3.2	0.8	41.6	22.8	4.9	1.6	2028.7	60.3	11.8	3.3	58.0	31.9	4.7	1.1	50.2	8.8	1.6	0.5

Note: Avg is average (in per capita terms), Inc is incidence (head count ratio), Dep is Depth (deprivation gap), Sev is severity (deprivation gap squared). NSS Regions codes are as follows: CO is coastal, IW is Inland Western, IN is Inland Northern, IC is Inland Central, IE is Inland Eastern, EA is Eastern. Social Group codes are as follows: ST is Scheduled Tribe, SC is Scheduled Caste, OB is Other Backward Classes, OC is Other Castes. Land size codes are as follows: LL is landless (0-0.1 hectares, ha), MA is marginal (0.1-1 ha), SM is small (1-2 ha), SE is Semi-Medium (2-4ha), ME is medium (4-10 ha), LA is large (10+ ha). Religion codes are as follows: HI is Hindu, MU is Muslim, CH is Christian, SI is Sikh, JA is Jain, BU is Buddhist, ZO is Zoroastrian, OR is Other religions. Household type codes are as follows: for rural, H1 is self-employed in non-agriculture, H2 is agriculture labour, H3 is other labour, H4 is self-employed in agriculture and H9 is others, respectively; for urban, H1 is self-employed, H2 is regular wage and salaried, H3 is casual labour, and H9 is others. MH is Maharashtra. In 2004-05, as in Hari and Mishra (2009), for rural, one household (coastal region, scheduled tribe, landless, Hindu, household type others) has entry for toddy as 60000 litres - we have corrected this to 60 litres; similarly, for urban, one household (coastal region, caste others, Zoroastrian, household type wage/salaried) has entry for butter as 200 kilograms - we have corrected this to 200 grams.
Source: Authors' calculation based on unit level data

Across religions, calorie deprivations is more in urban, compared to rural, in the following: incidence, depth and severity among Muslims, Zoroastrians and others in 2004-05, and Buddhists, Christians, Jains and Zoroastrians in 2011-12; incidence among Sikhs and Jains in 2004-05 and among Muslims in 2011-12; severity among Buddhists in 2004-05 and others in 2011-12.

Across religions, fat deprivations is more in urban, compared to rural, in depth and severity among Muslims in 2011-12.

Across religions, protein deprivations is more in urban, compared to rural, in the following: incidence, depth and severity among Christians in 2004-05 and among Sikhs in 2011-12; depth and severity among Christians and Muslims in 2011-12; incidence among Sikhs in 2004-05 and among others in 2011-12.

4.5 Household Type

Across household type, deprivation is the highest among agriculture labour in rural areas and among casual labour in urban areas.

Between 2004-05 and 2011-12, for rural areas, protein deprivation increased in depth and severity for other labourers.

Rural urban comparison for household type is not appropriate as they are different categories. Hence, it has not been attempted.

5 Concluding Remarks

To our knowledge, this is a first attempt to compute incidence of nutritional deficiencies where the deprivation line is household-specific and nutrition-specific. In calculating nutrition-specific deprivation, we compute incidence, depth and severity for calorie, protein and fat using NSS data for Maharashtra and India for 2004-05 and 2011-12. Our analysis for Maharashtra goes into various sub-groups: NSS regions, social groups (caste/tribe), land possessed, religion and household type (occupation).

The broad trends over time are as follows. Average consumptions have increased and deprivations have decreased in terms of calorie, protein and fat. Further, in rural-urban comparisons, one can state the following. On an average (or in per capita terms), calorie and protein consumptions are higher in rural while fat consumption is higher in urban. Deprivations in incidence, depth and severity have been higher in rural for calorie and fat and higher in urban for protein (an exception being incidence of calorie deprivation for Maharashtra in 2011-12).

Both consumption and deprivation being higher for calorie in rural areas is because of the their greater requirement, as people end up doing heavy and moderate work, while in urban areas the demands on work could be moderate to sedentary.

At the sub-group level, in Maharashtra, the deprivations have been higher in Coastal across NSS regions, scheduled tribe across social groups, marginal holdings across land size for

rural, agriculture labour in rural and casual labour in urban across household type. Further, at the sub-group level, there have also been some exceptions to the broad pattern such as increase in protein deprivation for Inland Eastern region, relatively greater deprivation of protein for scheduled tribes in rural areas, and relatively greater deprivation of calorie and fat for scheduled castes in urban areas.

References

Foster, J., Greer, J. and Thorbecke, E., 1984. "A Class of Decomposable Poverty Measures." *Econometrica*, 52 (3): 761-766.

Gopalan C., Rama Sastri B. V., Balasubramanian S. C., Narasinga Rao B. S., Deostale Y. G. and Pant K. C., 1989. *Nutritive Value of Indian Foods*, Revised edition. National Institute of Nutrition, Hyderabad.

Mishra, S. and Hari, L., 2009. "Calorie Deprivation in Maharashtra: An Analysis of NSS Data." In, Sardeshpande, N, Shukla, A, and Sctott, K. (eds.), *Nutritional Crisis in Maharashtra*, SATHI, Pune, pp.83-98.

Minhas, B.S., 1991. "On Estimating the Inadequacy of Energy Intakes: Revealed Food Consumption Behaviour versus Nutritional Norms (Nutritional Status of Indian People in 1983)." *Journal of Development Studies*, 28 (1): 1-38.

NIN (National Institute of Nutrition), 2010. *Dietary Guidelines for Indians – A Manual*. National Institute of Nutrition, Hyderabad.

NSSO (National Sample Survey Organization), 1996. *Nutritional Intake in India, NSS 50th round, July 1993-June 1994, Fifth Quinquennial Survey on Consumer Expenditure*. Government of India Report No. 405.

NSSO, 2001. *Nutritional Intake in India, 1999-2000, NSS 55th round, July 1999-June 2000*. Government of India Report No. 471 (55/1.0/9).

NSSO, 2007. *Nutritional Intake in India, 2004-05, NSS 61st round, July 2004-June 2005*. Government of India Report No. 513 (61/1.0/6).

NSSO, 2014. *Nutritional Intake in India, 2011-12, NSS 68st round, July 2011-June 2012*. Government of India Report No. 560 (68/1.0/3).