*International Research Journal of Social Sciences*_____ ISSN 2319–3565
Vol. **4(7),** 1-11, July **(2015)** *Int. Res. J. Social Sci.*

Regional Patterns of Food intake and Nutrients in Rural India: Evidence from NSS 66th round

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Available online at: www.isca.in
Received 6th April 2015, revised 27th May 2015, accepted 20th June 2015

Abstract

In the post reform period, India has witnessed a drastic change in food consumption pattern. There has been a fall in cereal intake particularly in coarse cereals whereas consumption of other food items (vegetables, fruits, oil and milk products) has not increased significantly especially in the diet of rural population. This change in food consumption has led to a drop in average per capita calorie and protein intakes which are one of the widely used indicators of nutrition. Besides, India's performance on child anthropometric measures such as height for age, weight for height and weight for age is even worse than the sub Saharan countries of Africa. Thus, poor nutrition level in India remains an issue of wide public concern and debate. Most of the studies deal with nutrition at macro level and there are dearth of them which examine regional pattern of food and nutrient intake. This study which is based on National Sample Survey (NSS) 66th Consumer Expenditure Schedule (2009-10) attempts to exhibit food consumption and nutrition (in terms of energy, protein, carbohydrates, minerals, fat, vitamin C, iron and calcium) distribution across 85 NSS regions. Findings of the study show that Indian diet is monotonous based on cereals and milk products which are major source of all nutrients. Regions with higher intake of cereals and milk appear to consume most of the nutrients. It is also evidenced that there are large regional gaps found between northern, southern and north-eastern NSS regions on nutrition parameters in rural India. However, findings of the study need to be correlated with other similar studies as consumption of nutrients not only determines nutrition security.

Keywords: Food consumption, nutrition distribution, NSS regions, rural India.

Introduction

Food security issue has an important place in health policy across the globe. Although, world has enough to feed everyone yet around 854 million people around the world are undernourished[1]. In India, a number of issues have evolved in the concept of Food Security in last two decades such as economic liberalization, its effect on agriculture and food security in 1990s, establishment of World Trade Organization (WTO) and its Agreement on Agriculture (AOA), climate change, rising food prices, financial crises, public distribution system, rotting of huge food stock in the storage despite acute hunger and poverty, ICDS/Midday meal/MNEREGA/food for work schemes, Right to Food and recent National Food Security Bill. These developmental issues provided opportunities and challenges in achieving food and nutrition security in the country[2].

India as a fast developing country has shown major improvements on some development front. Hunger and poverty level have declined much since 1994. This decline is much higher in rural areas as compared to urban areas. After economic reforms in early 1990s, India's food consumption pattern has also changed, diversifying mainly from coarse cereals to rice/wheat and other food items. This is believed to have been resulted by improvement in income, change in taste and preferences, better health facility, hygiene etc[3-6]. This change is mainly seen in rural areas where improvement in rural infrastructure make other food and non-food items available to the rural households and further reduction in manual work due to farm mechanization may have resulted in less need of cereals[6]. On economic front, Indian economy is one of the fastest-growing economies in the world. Real GDP per head grew at 3.95 percent a year from 1980 to 2005, and at 5.4 percent a year from 2000 to 2005[3].

Despite recent developments on income and consumption fronts, India fails to perform better on nutrition parameters. Majority of its population has monotonous diet constituting of cereals only and less attention is paid to other food items such as fruits, vegetables and meat rich with micro-nutrients (vitamins, minerals) which has resulted into high prevalence of hidden hunger in the country. Indian literature on food and nutrition is based on energy intake at macro level neglecting the importance of other micro-nutrients. This paper aims to bridge this research gap and attempts to i. examine regional pattern of consumption of major food groups, ii. analyze share of macro (energy, protein, fat) and micro nutrients (vitamin, minerals, carbohydrate, iron and calcium) from food groups, iii. identify regions with higher/lower intake of nutrients in rural India.

Data and Methodology

This paper has used unit level data from National Sample Survey (NSS), 66th Consumer Expenditure Schedule (Type 1) conducted during 2009-10. NSS Consumer Expenditure Surveys (CES) are primary source of data on various indicators of level of living of population both at state and national levels. These are carried out by Government of India under Ministry of Statistics and Programme Implementation. These surveys have been conducted quinquennially from 27th round (Oct. 1972-Sept. 1973) onwards. The NSS 66th round (July 2009-June 2010) was the eighth and latest in the series. This latest round (66th) has a special feature of collecting data on three reference periods. In this paper, 30 days reference period is taken. This Consumer Expenditure round (66th) covers 7428 villages, 5263 urban blocks spread over entire country. It is canvassed in 100855 households, out of them 59119 sample is rural and 41736 are urban households. This schedule provides information on quantity and value of more than 140 food items which can be converted into nutrition values. The standard nutrition units have been taken from Nutritive Value of Indian Foods[7]. All food items have been grouped into 9 categories which are i. cereals and cereal substitutes, ii. roots and tubers, iii. sugar and honey, iv. pulses and nuts and oilseeds, v. vegetables and fruits, vi. meat, eggs and fish, vii. milk and milk products, viii. oils and fats, ix. miscellaneous food, food product and beverages. The intakes of them have been converted into calories, protein, fat, minerals, carbohydrate, calcium, iron and vitamin C. Per capita per day nutrients have been estimated by dividing household food consumption by household size and number 30. In the study, National Sample Survey (NSS) regions are taken into account in order to show regional pattern. Regions are hierarchical domains below level of state/ UTs in NSS. Groups of districts having similar geographical features are considered as regions in NSS. There are 87 regions identified and demarcated in NSS by clubbing districts. Present study considers 85 regions excluding Andaman and Nicobar and Lakshadweep regions (figure-1).

For showing regional pattern of nutrient intake across NSS regions in rural India, bi-variate analysis and Geographical Information System (GIS) (Arc GIS version 9.3) have been used. Composite index covering eight nutrients has been constructed using the following formula:

$$\frac{\text{Observed value - Minimum value}}{\text{Maximum value - Minimum value}}$$

Results and Discussion

Table 1 represents the National Sample Survey Regions with their code according to NSS 66th round.

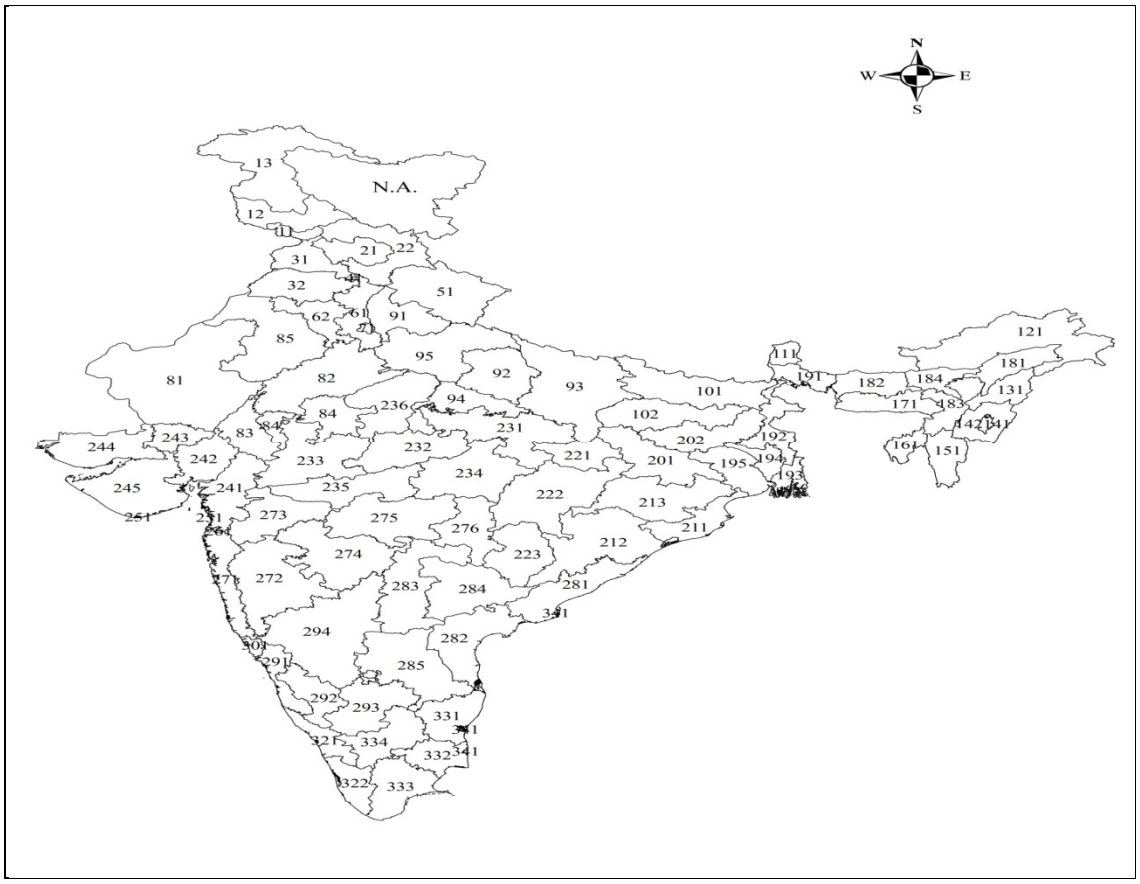

Figure-1
Regions Code according to National Sample Survey, 2009-10, (see table 1)

Table-1
National Sample Survey Regions with their Codes

States	Code	NSS regions
Jammu and Kashmir	11	Mountainous
	12	Outer Hills
	13	Jhelum Valley
Himachal Pradesh	21	Central
	22	Trans Himalayan and Southern
Punjab	31	Northern
	32	Southern
Chandigarh	41	Chandigarh
Uttarakhand	51	Uttarakhand
Haryana	61	Eastern
	62	Western
Delhi	71	Delhi
Rajasthan	81	Western
	82	North Eastern
	83	Southern
	84	South Eastern
	85	Northern
Uttar Pradesh	91	Northern Upper Ganga Plain
	92	Central
	93	Eastern
	94	Southern
	95	Southern Upper Ganga Plain
Bihar	101	Northern
	102	Central
Sikkim	111	Sikkim
Arunachal Pradesh	121	Arunachal Pradesh
Nagaland	131	Nagaland
Manipur	141	Plains
	142	Hills
Mizoram	151	Mizoram
Tripura	161	Tripura
Meghalaya	171	Meghalaya
Assam	181	Plain Eastern
	182	Plain Western
	183	Cachar Plain
	184	Central Brahmputra Plains
West Bengal	191	Himalayan
	192	Eastern Plains
	193	Southern Plains
	194	Central Plains
	195	Western Plains
Jharkhand	201	Ranchi Plateau
	202	Hazaribagh Plateau
Orissa	211	Coastal
	212	Southern
	213	Northern
Chhattisgarh	221	Northern Chhattisgarh
	222	Mahanadi Basin
	223	Southern Chhattisgarh
Madhya Pradesh	231	Vindhya
	232	Central
	233	Malwa
	234	South
	235	South Western
	236	Northern
Gujarat	241	South Eastern
	242	Plain Northern
	243	Dry Areas
	244	Kachchh
	245	Saurashtra
Daman and Diu	251	Daman and Diu
Dadra and Nagar Haveli	261	Dadra and Nagar Haveli
Maharashtra	271	Coastal
	272	Inland Western
	273	Inland Northern
	274	Inland Central
	275	Inland Eastern
	276	Eastern
Andhra Pradesh	281	Coastal Northern
	282	Coastal Southern
	283	Inland North-Western
	284	Inland North Eastern
	285	Inland Southern
Karnataka	291	Coastal and Ghats
	292	Inland Eastern
	293	Inland Southern
	294	Inland Northern
Goa	301	Goa
Kerala	321	Northern
	322	Southern
Tamil Nadu	331	Coastal Northern
	332	Coastal
	333	Southern
	334	Inland
Pondicherry	341	Pondicherry

Major Source of Nutrients and Food Consumption across regions: This section tries to find out percentage share of average per capita per day (PCPD) intake of nutrients from food groups and average PCPD consumption of major food groups across NSS regions. Table 2 clearly shows that all nutrients except fat, calcium and vitamin C have their major share from cereals particularly wheat and rice products. Cereals provide 68 percent calorie, 70 percent protein, 65 percent minerals, 82 percent carbohydrate and 77 percent iron. These results clearly show that rural population is generally dependent on cereals for their most of the nutrients. Besides, major source of fat is edible oil (54 percent) and milk products (27 percent). Milk

consumption also ensures proper calcium (59 percent) in the body whereas vegetables and fruits are rich with vitamin C (72 percent).

Consumption of cereals and milk ultimately fulfills major requirements of nutrients in the body as far as Indian rural diet is concerned. However, a diversified diet is required to fight against modern diseases and to lead a healthy and active life. It is studied that Indian diets are mainly based on cereals avoiding the importance of other food items especially fruits and vegetables. Since cereals are the major source of most of the nutrients in Indian diet, regions leading in cereal intake also show a higher proportion of most of the nutrients. Hence, analyzing food consumption pattern across regions becomes essential to determine intake of different nutrients. Table 3 describes consumption of food group items across major regions of India. This table clearly shows that among all major food groups, cereals constitute a major share followed by milk and vegetables in the diet of rural population. On an average, PCPD cereal intake in rural India is 380 grams followed by 172 grams of milk and 154 grams of vegetables. Lowest consumption is shown by meat products (18 grams) and fruits (16 grams). This pattern is common across all regions with little variations. However northern region covering states like Delhi, Haryana, Punjab, Rajasthan, and Himachal Pradesh consume higher intake of milk leaving far behind other regions. This has resulted into higher intake of all nutrients in this region.

Table-2
Percent Share of PCPD intake of different Nutrients from major food groups, 2009-10 in rural India

Food Items	Calories (Kcal)	Protein (gm)	Fat (gm)	Minerals (gm)	Carbohydrate (gm)	Calcium (mg)	Iron (mg)	Vitamin C (mg)
Rice and Rice Products	54.56	42.97	23.93	23.25	56.99	19.46	19.09	0
Wheat and Wheat Products	38.04	48.89	56.4	66.96	35.83	63.5	67.47	0
Coarse Cereals	7.4	8.14	19.67	9.78	7.19	17.04	13.44	0
Cereal Total	68.01	69.49	12.16	65.64	82.34	22.08	77.35	0
Root and Tubers	2.94	2.07	0.21	4.65	3.66	3.38	2.75	24.02
Sugar and Honey	4.89	0.05	0	0.27	6.85	0.58	0.27	0
Pulse, Nuts and Oilseeds	4.4	10.29	3	7.7	3.89	4.09	8.41	0.15
Vegetables and Fruits	1.58	2.55	0.74	7.18	1.22	6.33	6.72	72.44
Meat Products	0.61	3.83	0.58	1.85	0.02	4.44	2.45	0.05
Milk Products	7.21	10.75	27.1	12.7	2.02	59.12	2.05	3.34
Edible Oil	9.04	0	54.1	0	0	0	0	0
Miscellaneous Products	1.33	0.97	2.1	0	0	0	0	0
Total	100	100	100	100	100	100	100	100

Source: Authors' calculation based on NSS 66th Consumer Expenditure unit level data.

Table-3
Regional Distribution of average PCPD food consumption (in kg) in rural India, 2009-10

Food Products	North	Central	West	East	North East	South	Total
Rice and Rice Products	0.068	0.154	0.182	0.270	0.408	0.292	0.215
Wheat and Wheat Product	0.274	0.246	0.128	0.134	0.025	0.030	0.164
Coarse Cereals	0.156	0.086	0.120	0.051	0.038	0.086	0.106
Total Cereal	0.368	0.394	0.368	0.396	0.424	0.350	0.380
Pulses	0.021	0.025	0.025	0.017	0.017	0.024	0.022
Milk (litre)	0.350	0.167	0.143	0.108	0.087	0.128	0.172
Sugar and Products	0.040	0.024	0.029	0.013	0.016	0.022	0.024
Edible oil	0.020	0.018	0.025	0.016	0.014	0.019	0.019
Meat Products	0.011	0.012	0.012	0.017	0.024	0.025	0.018
Vegetables	0.133	0.159	0.139	0.199	0.177	0.123	0.154
Fruits	0.018	0.016	0.017	0.018	0.017	0.013	0.016

Source: Authors' calculation based on NSS 66th Consumer Expenditure unit level data.

Regional distribution of major Nutrients: Estimating nutrients at regional level is important as it can assess sufficiency of food supplies and accessibility of different food items rich with micro-nutrients to meet population' nutrition needs. Present section attempts to analyze regional distribution of average PCPD intake of nutrients across NSS regions which would help to identify regions with higher probability of nutrition deficiency.

Calories: Distribution of average PCPD calorie intake across NSS regions shows (figure 2A) that there is a higher concentration of calorie intake in northern and north western regions which include Central, Trans Himalayan and Southern in Himachal Pradesh; Northern and Southern Punjab; Eastern and Western Haryana. Out of 5 regions of Rajasthan, 4 are ranked in high calorie regions, out of 5 regions of Uttar Pradesh 3 are calorie sufficient. Madhya Pradesh which is one of the biggest states in terms of size shows very poor energy level. It has just one region namely Malwa which has high caloric value out of 6 regions. Similarly Maharashtra, fast developing state shows just one region (Inland Central) with high calorie intake out of 6 regions. Andhra Pradesh shows poor energy level as its 4 out of 5 regions are having low calorie values. Our results show that south India is suffering from lower average PCPD calorie intake. Although it may be due to distinct food consumption pattern or diet diversification yet calories are the major nutrients which also help in consumption of other nutrients. A lower consumption of calories either due to lower intake of calorie rich foods or distinct food culture would lead to severe nutritional problems.

In north east India, only Tripura and a region of Assam (Plain Eastern) consume higher intake of average PCPD calories compared to other north eastern regions which ranks this region very low in nutrition. Lower level of calorie intake (less than 1800 kcal) is seen in central, eastern and southern regions. This calorie level is even less than 1810 kcal which is recommended by Food and Agricultural Organization (FAO) for India[8]. Most of the regions of Madhya Pradesh, Gujarat, Tamil Nadu, West Bengal, Meghalaya, Manipur and Karnataka show very low level of calorie intake.

Protein: In rural India, average PCPD calorie intake is closely related to average PCPD protein intake. Regions showing lower calorie value also exhibit lower intake of protein. This has been caused by lower consumption of cereals as these food items are rich source of both calorie and protein in Indian diet. However, regions consuming higher intake of pulses and milk products show higher intake of protein despite their low calorie intake value (figure 2B). For example, south eastern Rajasthan has moderate consumption of calories but is ranked in high protein intake mainly because of higher pulse and milk consumption. Similarly, outer hills of Jammu and Kashmir show lower calorie but higher protein intake. On the other hand, there are the regions with higher calorie intake but are showing less protein consumption such as Inland north eastern part of Andhra Pradesh, Tripura, Coastal and northern part of Orissa. This situation is caused by higher cereal but lower pulse and milk intake.

Figure-2B clearly shows that average per capita per day intake of protein is much higher in northern and north western regions whereas southern and eastern regions suffer from very low protein intake. Among the southern regions are Inland North-Western, Inland Southern (Andhra Pradesh, total 5 regions); Coastal Northern, Southern, Inland (Tamil Nadu, total 4 regions); Inland Northern, Inland Eastern (Karnataka, total 4 regions) regions. In eastern regions, Chhattisgarh, southern Orissa, central, southern and eastern parts of West Bengal, Meghalaya show very low level of average PCPD protein intake. All these regions also have lower calorie intake. Thus lower cereal, pulse and milk consumption is dominant in these regions which could be resulted by diet diversification, distinct food culture and inadequate supply of food items or lower accessibility. To examine exact cause of poor calorie and protein intake in the regions is beyond the scope of this paper and needs further research.

Fat: If we analyze average PCPD fat intake across NSS regions, Figure 3A shows concentration of high fat intake in western and north western regions namely Gujarat, Punjab, Himachal Pradesh, Haryana, western and central Rajasthan and Inland northern and central parts of Maharashtra. Eastern and north eastern belt of rural India consumes lower level of oil as a result fat intake is very low in these regions. The southern region shows a mix picture of oil consumption as parts of Tamil Nadu and Kerala have low fat intake whereas other parts of south India prefer to consume oil resulting moderate intake of fat.

Minerals: As we have already discussed in earlier paragraphs that average PCPD calorie intake which is mainly derived from cereals and pulses is found low in southern and eastern parts of India, average per capita per day mineral intake is also low in these regions. Figure 3B exhibits that there is a belt of low mineral intake in southern and eastern regions whereas northern, western and parts of central regions utilize higher intake of minerals. Bihar, parts of Maharashtra and Madhya Pradesh have moderate mineral intake. It is interesting to note that regions with high average PCPD calorie and protein intakes also show higher average PCPD mineral consumption which ultimately establishes a strong link between calorie/protein rich food items with source of minerals in rural India.

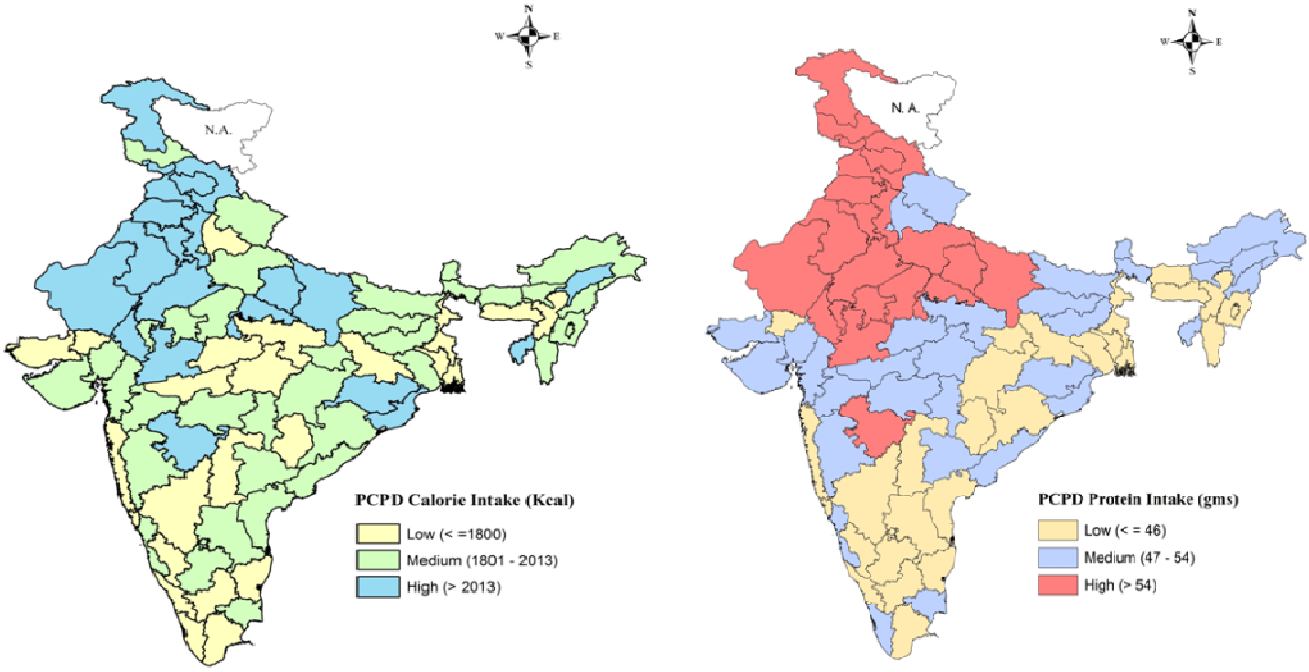

Figure-2
A. Average Per capita per day calorie intake across NSS region in rural India, 2009-10.
B. Average Per capita per day protein intake across NSS region in rural India, 2009-10

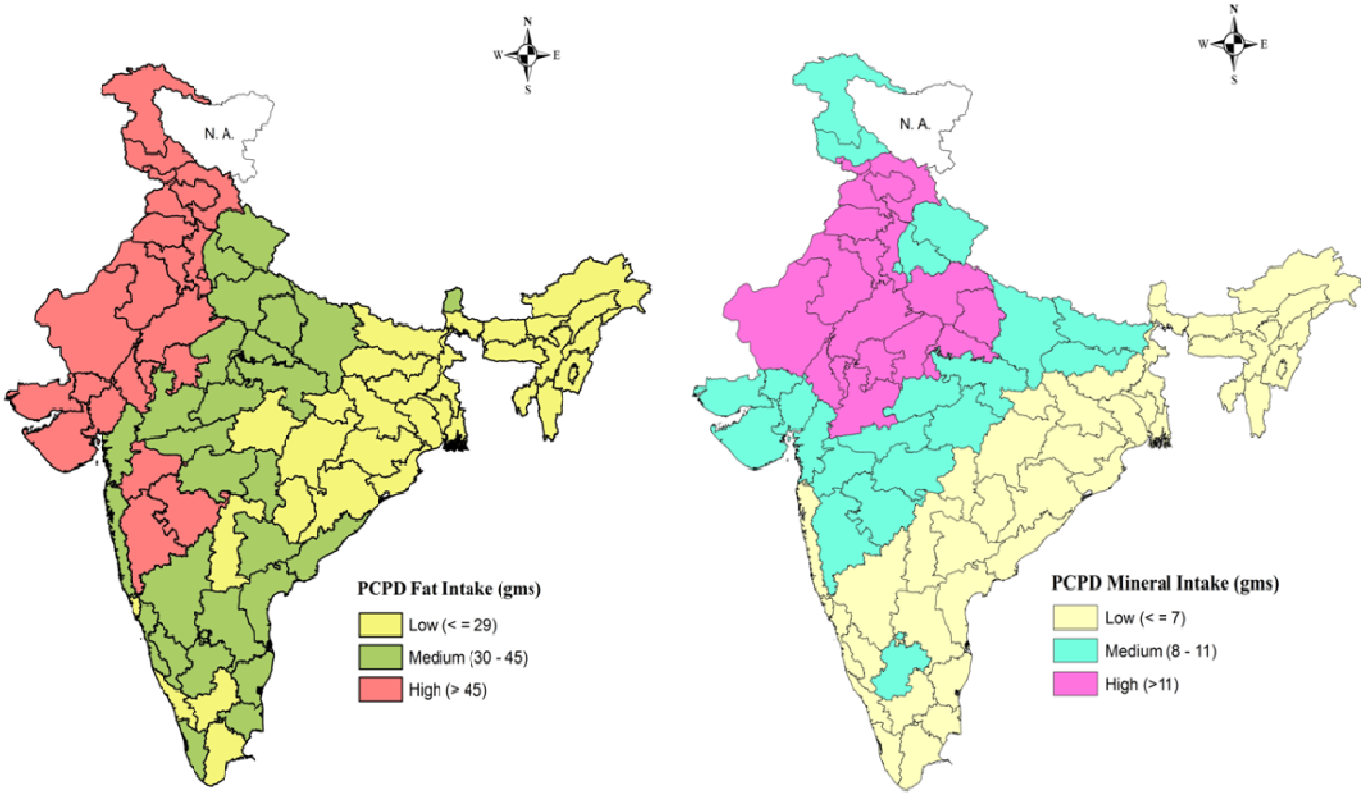

Figure-3
A. Average Per capita per day fat intake across NSS region in rural India, 2009-10.
B. Average Per capita per day minerals intake across NSS region in rural India, 2009-10.

Carbohydrates: A NSS region level distribution of average PCPD carbohydrate intake shows (figure 4A) that there is a moderate intake of carbohydrates in the Indian rural diets. However, difference in intake of carbohydrates is low as intake ranges between average 261 to 436 grams PCPD. North eastern region leads in carbohydrate consumption caused by higher cereal and sugar intake. Orissa and parts of Andhra Pradesh also show higher carbohydrate intake. Parts of southern, western and central regions show lower level of carbohydrate intake. In Gujarat and Maharashtra, sugar and cereal intake is low resulting into lower consumption of carbohydrates. The northern and western belt where calorie intake is high, show moderate consumption of carbohydrates resulted by lower intake of sugar products.

Iron: Out of cereals, millet, bajra and ragi are very rich source of iron. Indian rural diet derives iron mainly from cereals (77 percent), pulses (8 percent) and vegetables-fruits (7 percent). In India, there is widespread iron deficiency especially among pregnant women, which may adversely affect child health. However fortification of salt with iron has successfully been used to lower down iron deficiency. Due to higher iron deficiency, it is important to have a look on spatial distribution of iron so that deficient areas can be given special emphasis in policy making and policy monitoring.

Figure 4B illustrates distribution of average PCPD iron intake across NSS regions. Our findings show that northern and north western regions having higher intake of cereals and pulses also lead in iron intake. Eastern, southern and north eastern belt can sharply be demarcated as regions of low iron intake.

Vitamin C: Our results show that Indian rural diet derives most of the vitamin C from vegetables and fruits (72 percent) and root and tubers (24 percent). A NSS region level analysis in distribution of average PCPD vitamin C intake shows a very interesting result that most of the NSS regions rank low in intake of vitamin C which is resulted by lower intake of vegetables and fruits. Thus, Indian rural diet is based on only cereals and pulses. Intake of vegetables and fruits is quite low which make most of the regions to be prone to vitamin deficiency. Only two regions, one in Gujarat (Plain Northern) and other in West Bengal (western Plains) show a higher intake of vitamin C. Haryana, Punjab, parts of Uttar Pradesh, eastern coastal belt show moderate intake of vitamin C (figure 5A). Results clearly show that there is a need to increase the vegetable and fruits intakes in the diet of majority of rural population.

Calcium: Indians derive calcium from milk (59 percent), cereals (22 percent) and vegetables (6 percent). A spatial distribution of average PCPD calcium intake across different NSS region level show that north western region enjoy higher calcium intake which is resulted by higher milk and cereal consumption. Most of the eastern, central and north eastern parts of the country have very low intake of calcium causing severe health problems (figure 5B).

Thus, spatial distribution of different macro and micro nutrients clearly show that there is higher consumption of almost all food items in north- western and northern regions compared to east and north east regions. A better and more focused food and nutrition planning is needed to bring nutritionally backward regions with the nutritionally developed region. This can be achieved by increasing the production of other food items, making easy accessibility, spreading nutrition awareness programmes etc. This may help in bridging the nutrition gap among regions.

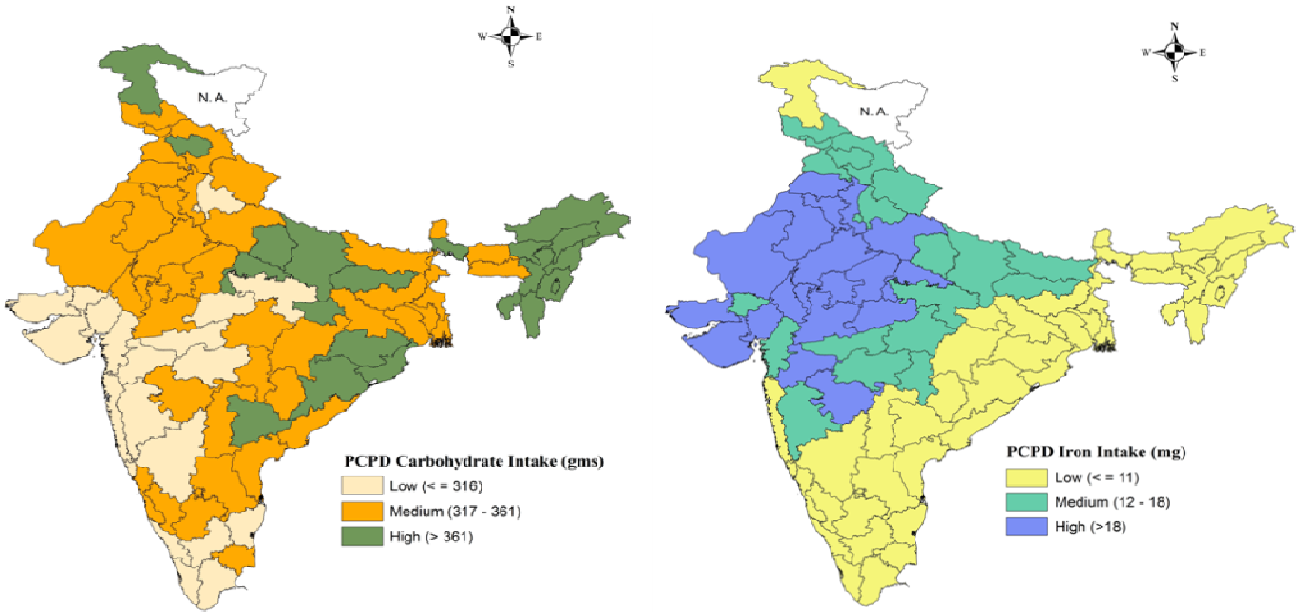

Figure-4
A. Average Per capita per day carbohydrate intake across NSS region in rural India, 2009-10.
B. Average Per capita per day iron intake across NSS region in rural India, 2009-10

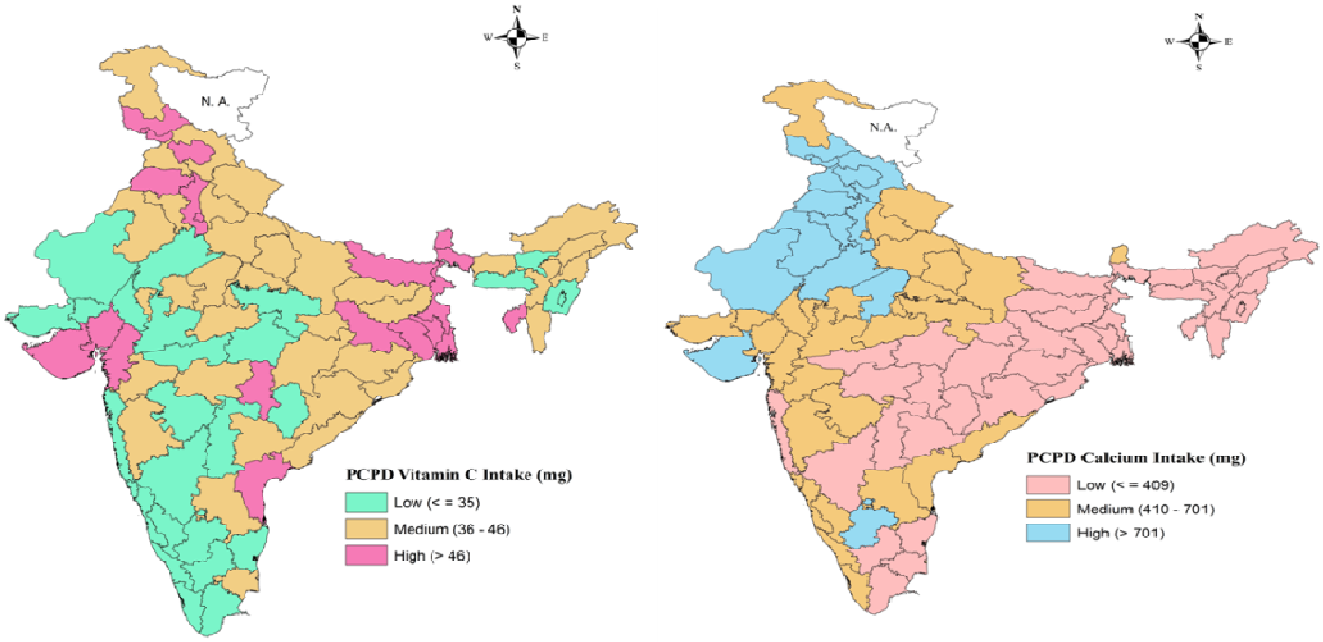

Figure-5
A. Average Per capita per day vitamin C intake across NSS region in rural India, 2009-10
B. Average Per capita per day calcium intake across NSS region in rural India, 2009-10

Regional Pattern of Nutrition Index: Earlier sections have demonstrated distribution of all major nutrients across NSS regions. This section tries to group all nutrients through composite index and examines regional differences. For calculating nutritional index, eight nutritional indicators namely calorie, protein, fat, mineral, carbohydrate, vitamin C, iron, calcium have been used (figure 6). Lower the value of index, lower is the nutrition intake and vice versa. Very high intake of nutrition is found in Rajasthan region, Southern Punjab, Haryana regions, central part of Himachal Pradesh, mountainous region of Jammu and Kashmir and also some part of Uttar Pradesh. This high intake has resulted by higher consumption of cereals and milk products.

There are some regions which show moderate nutrition level. These include major parts of Southern India. Lower intake of nutrition is found in North-Eastern India covering states of Sikkim, Arunachal Pradesh, Nagaland, Manipur, Assam regions. Eastern (West Bengal) and Central (Chhattisgarh region, parts of Madhya Pradesh) specially Vindhya and Southern Madhya Pradesh regions also show much lower level of nutrition. Meghalaya and northern Kerala exhibit lowest level of nutrition.

The above analysis is based on Indian diet pattern which constitutes mainly cereals and milk products. Our findings show that North Indian diet rich with cereal and milk products show much higher intake of all nutrients. However, these food groups are not the only measure to estimate nutrition. Southern regions which perform well on several social factors lack behind in nutrition level particularly due to distinct dietary pattern and system of production. This paper intends to show regional pattern of nutrients based on Indian diet pattern and does not examine other factors affecting nutrition level. Indian dietary pattern has a major flaw of cereal based diet and does not constitute other food items such as fruits, meat products and vegetables resulting in calorie and fat based diet. Most of Indian population consumes very lower level of all nutrients as recommended by ICMR (Indian Council of Medical Research). However, comparing nutrients with recommended level is beyond the scope of this paper.

Discussion: Indian economy has become as one of fastest growing economies in the world. Although household data shows that per capita consumption is slower than national accounts estimates, even this slower growth indicates substantial decrease of poverty since 1980s[9-10]. Apart from them, today more than three quarters of the population live below per capita per day 2100 kcal in urban areas and 2400 kcal in rural areas. These numbers are often cited as "minimum requirement" in India. Additional concern is that anthropometric indicators showing nutrition in India, for both adult and children, are among worst in the world[3]. Besides, the burden of under-nutrition is found to be disproportionately high across regions and among various socio-economic groups.

One of the significant achievements of India since Independence is increase in production of all food crops. Besides, it has also become successful in accomplishing food self-sufficiency and reducing acute hunger level. India has now become a net exporter of major food crops such as rice and wheat. Out of this whole successful story, India has lagged behind in food and nutrition security. News of rotting of food stuff in government go-downs is

quite common despite the fact that most of its population are suffering from hidden hunger. Since independence, main attention was given to production of rice and wheat crops through high yielding varieties, densely subsidized fertilizers that led to over-sufficient production of both crops excluding importance of other crops[11]. Our analysis clearly shows that consumption basket of Indians constitutes of high proportion of cereals particularly rice and wheat followed by milk products. Proportion of all other food groups in total diet is lower compared to cereals. It is evidenced from our analysis that there is overdependence on cereal consumption omitting the importance of other food stuff. On international platform, India does not stand with its counterpart countries in terms of food diversity. India is far behind with China, America, and Japan which consumes many times higher intake of cereals, pulses, vegetables, fruits and milk products. Thus, Indian food is considered monotonous and is merely for subsistence[12-13].

Indian diet is also unable to provide sufficient amount of calorie and protein as per body requirements and in fact, average consumption is declining. A study based on NSS data shows that average per capita per day calorie intake has declined from 2148 to 2044 kcal (-104 kcal) and protein from 59.9 to 55.1 gm (- 4.9 gm) during 1994-2005 period[14]. This intake is quite low as per the standards set out by ICMR and its decline has added fuel in the already burning story.

However, studies show that decline in calorie intake is not a matter of concern as calorie based nutrition measure is wrong. Mere consumption of calories does not ensure intake of other nutrients such as protein, minerals and other micro-nutrients. More balanced basket possibly with lesser amount of calories is nutritionally healthier than calorie rich diet. Thus, minimum norms for other nutrients are to be set for overall health[15]. Many of the Indian studies analyzing nutrition have shown that income is positively associated with calorie intake[8,16]. Large proportion of poor household in India does not have access to adequate food due to the lack of purchasing power[17]. Another study argued that persistence of low consumption level is both cause and consequence of increasing the differences in rural economy[18]. This study shows considerable differences in terms of nutritional status across NSS regions in rural India especially between southern (Karnataka, Kerala, Tamil Nadu and Andhra Pradesh) and North-western regions (Haryana, Delhi, Himachal Pradesh Jammu and Kashmir and parts of Uttar Pradesh). Studies show that there are some factors responsible for unequal distribution of food consumption and nutrition disparity in India. Weak transportation network, widespread *vanaspati* industries located in certain regions and economic disparities between regions and within population itself are some of the important factors[19].

Human development Index shows inter–state and inter-region disparities in India resulted by different social development levels. Kerala is better due to high literacy rate, Maharashtra have rapid growing industries. Tamil Nadu, Maharashtra, West Bengal are showing declining birth and death rates. Poverty level in these states varies depending on the source of livelihood. Food is not sole factor determining nutrition level. In case of child under-nutrition, low status of women and lack of nutrition knowledge are important factors[20]. Another study showing inter-regional disparities concluded that composition of food basket determines prices of food that ultimately lead to differences in consumption across regions[21].

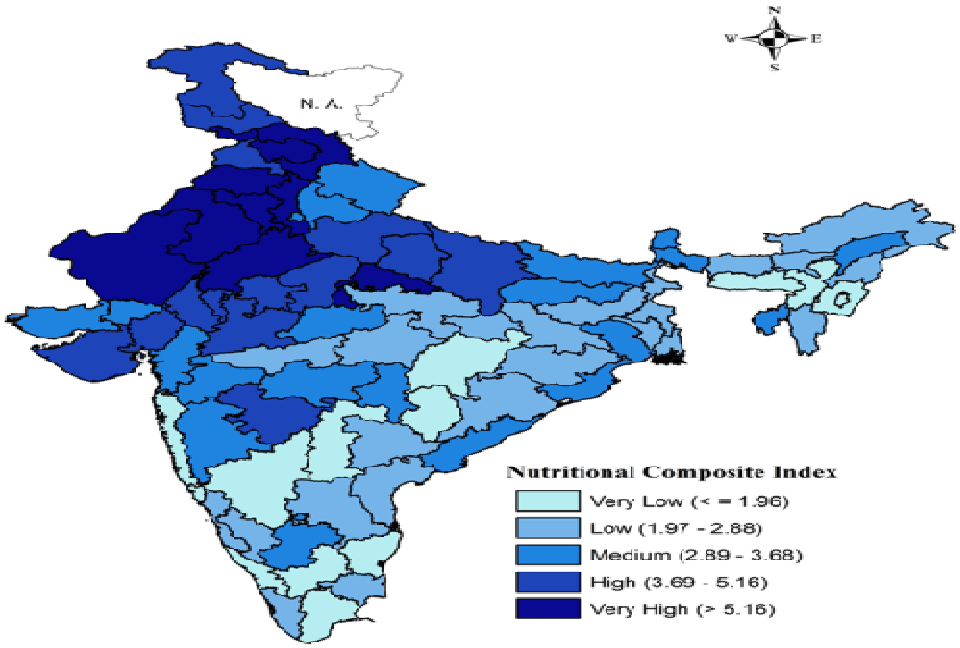

Figure-6
Composite index of nutrients across NSS region in rural India, 2009-10

Conclusion

This study also finds an interesting result exhibiting higher nutrition level in north-western states and worse in southern states which are considered to be much developed on social parameters. One of the principal reasons probably is the differences in food production, food composition basket, prices, distinct food culture, taste and preferences. Kerala, Tamil Nadu and Maharashtra which are high income states perform best on human development indicators. Kerala's HDI is close to developed countries. These states have also achieved higher literacy rates compared with several north Indian states[22]. Lower calories in southern states especially in Kerala which is considered as educationally 'developed' is resulted by the fact that more people work in offices require fewer calories[23].

Kerala may be at the bottom of all states in terms of per capita food consumption but, it has achieved lower death rates, better life expectancy, education level, land reforms, provision of full fair price shops, availability of hospitals and dispensaries[24]. On the other hand, northern states especially Uttar Pradesh, Bihar, Madhya Pradesh and Rajasthan show unfavorable conditions in terms of socio-economic and demographic characteristics. Despite high nutrition level (which is based on cereals only), hidden hunger is rampant among all social and economic groups. Child under-nutrition level is quite high in these states. They also show high fertility and inequality by caste and class[25].

In short, nutrients both macro and micro are important in proper functioning of the body, protection from several diseases and for healthy and productive life. The main source of all nutrients is number of food items which may vary across regions either due to distinct food culture, taste, diet diversification, or lower availability, accessibility and absorption. Indian rural diet is composed of cereals followed by milk products and consumption of other food items particularly vegetables and fruits are low. However, consumption of all food items varies from region to region that causes a different level of nutrition. This paper clearly shows that north-western region is the dominant region in consumption of all nutrients which are due to higher intake of cereals, pulses and milk products. Southern, parts of central India, eastern and north-eastern region suffer from lower nutrition diversity. It is also seen that there are lesser differences in nutrient consumption across NSS regions which shows a hope in improving the nutrition scenario in the country.

Analyzing nutrition across regions and states from the prism of energy (which is based on only cereal) is highly misleading. Other factors such as social development, food basket, prices, production, taste and preferences need to be included in the nutrition literature. Besides, Planners and Government policy makers must encourage consumption of other highly nutritious food items (pulses, meat, fruit and vegetables) through increasing their production, controlling the costs, making diverse food accessible and spreading awareness among the general populations.

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