



Economic Growth, Poverty and Malnutrition in India

Shyma JOSE¹

04 Eylül 2014'de alındı; 21 Ocak 2015'de kabul edildi.
21 Aralık 2015'den beri erişime açıktır.

Received 04 September 2014; accepted 21 January 2015.
Available online since 21 December 2015.

Araştırma Makalesi/Original Article

Abstract

The present study evaluated the inter-linkages between economic growth, poverty and malnutrition to explain if the economic growth lead reduction in poverty has been able to combat malnutrition level over the period of study from 1993-94 to 2004-05 using National Sample Survey, National Family Health Survey and National Nutrition Monitoring Bureau. The study found improvements in level of poverty from 1993-94 to 2004-05 however the nutritional status showed no improvements especially from 1998-99 to 2005-06. The reduction in poverty did not improve the level of nutrients intake which has been declining during the period of study. At all India level the study found there exist a connection between economic growth and poverty as well as poverty and malnutrition however states wise analysis showed otherwise for some of the states. The study also found prevalence of malnutrition level in children below three years of age among the richer wealth groups. The results reinforced that poverty or income is not the only factor causing the malnutrition level in the children; there exist factors other than poverty and calorie intake affecting the nutritional status of the children estimated using logistic regression at unit level such as household, social and demographic characteristics.

Keywords: Calorie Intake, Poverty, Economic Growth, Malnutrition.

JEL Classifications: I12, I19, I32, O40, O53.

© 2016 Published by EYD

² Corresponding author. Research Scholar, Centre for the Study of Regional Development, Jawaharlal Nehru University, New Delhi, India. E-mail: iamshyma@yahoo.co.in

Özet**Hindistan'da Ekonomik Büyüme, Yoksulluk ve Yetersiz Beslenme**

Bu çalışma ekonomik büyüme, yoksulluk ve yetersiz beslenme arasındaki etkileşimleri incelemektedir. Bu değişkenler arasındaki etkileşim, yoksulluk azalmasına sebep olan büyümenin 1993-94'den 2004-05 yıllarına kadar olan dönemde yetersiz beslenmeyle mücadele etmekte başarılı olup olmadığını açıklamak için incelenmiştir. Çalışmada 1993-94'den 2005-06'ya kadar olan dönemde yoksulluk düzeyinde iyileşme tespit edilmiş ancak 1998-99'dan 2005-06'ya kadar olan dönemde beslenme durumunda herhangi bir iyileşme gözlenmemiştir. Çalışmanın kapsadığı dönemde yoksulluktaki azalma besin tüketimini iyileştirmemiştir. Makale tüm Hindistan düzeyinde, ekonomik büyüme ile yoksulluk ve yoksulluk ile yetersiz beslenme arasında bir bağlantı tespit etmiştir ancak eyaletler-arası inceleme bazı eyaletler için tersine bir durumu işaret etmektedir. Ayrıca çalışmada daha yüksek gelir guruplarında, üç yaş altındaki çocuklarda yetersiz beslenme yaygınlığı tespit edilmiştir. Sonuçlar yoksulluk veya gelirin çocuklardaki yetersiz beslenmeyi açıklayan tek etken olmadığı düşüncesini desteklemektedir: çocukların yetersiz beslenmesine sebep olan yoksulluk ve kalori alımı dışında başka etkenler (hanehalkı, sosyal ve nüfus özellikleri gibi faktörler) lojistik regresyon analizi kullanılarak tahmin edilmiştir.

Anahtar Kelimeler: Kalori alımı, yoksulluk, ekonomik büyüme, yetersiz beslenme.

JEL Sınıflaması: I12, I19, I32, O40, O53.

© 2016 EYD tarafından yayımlanmıştır



Bu makalenin adını ve doi numarasını içeren aşağıdaki metni kolayca kopyalamak için soldaki QR kodunu taratınız. Scan the QR code to the left to quickly copy the following text containing the title and doi number of this article.

Economic Growth, Poverty and Malnutrition in India
<http://dx.doi.org/10.5455/ey.35901>

1. Introduction

Poverty is one such reality that stunts the capability of the human being to be free from material deprivation. Poverty reduces household's ability to provide children food with adequate and balanced diet and reduces the ability to claim maternal and child healthcare services. The Indian economy has been growing at an unprecedented rate over the last few years with a declining level of poverty as professed by the planning commission reports. This reduction in poverty should lead to a concomitant improvement in the nutritional status among the poor. Malnutrition is a manifestation of poverty which amounts to deprivation of the most elementary aspect of the well being. The lack of the ability to access bare minimum nourishment for sustenance measured in terms of daily calories intake terms has serious implication on the human development. However with growing economy and reduction in

poverty, malnutrition has not shown similar trends as argued by many economists. Under-nutrition undermines economic development which indeed, perpetuates vicious circle of poverty. Despite the improvements in reduction of poverty, progress toward reducing the number of undernourished in India has been sluggish. The reduction in the number of undernourished is not only an economic problem but also social welfare, social protection and human rights concern. The stagnation in the overall number of malnourished people reflects the growth of a country (Pathak & Singh, 2011).

This paper will focus on these interrelated issues to understand connect or disconnect between growth, poverty and malnutrition. The paper also tries to find answers to important questions on relationship between economic growth and poverty; the trend, severity and determinants of malnutrition; how poverty and malnutrition are related; consequently how far economic growth led poverty reduction does try to eliminate the prevalence of malnutrition. The paper is divided into 3 sections and section 1 gives a brief introduction and sets out the analytical framework to carry out the econometric analysis and also specifies the data source and methodology. The analysis is predominantly data driven using empirical and statistical tools and is constrained to the availability of the data. The section 2 is again sub-divided into 5 sub-sections where sub-section 1 discusses the linkages between economic growth, poverty and malnutrition. The sub-section 1 discusses about the poverty and calorie debate in detail. The next sub-section 2 talks about the depth & severity of malnutrition level in India. The sub-section 3 discusses the relationship between poverty and economic growth whereas sub-section 4 explores the relationship between poverty and malnutrition in India. The sub-section 5 discusses the determinants of malnutrition. Lastly the paper is concluded in the last section 3.

1.2 Data and methodology

The paper makes use of different quinquennial rounds of Consumption Expenditure Survey of the National Sample Survey from year 1993-94 and 2004-05 and the corresponding National Family Health Survey (NFHS) rounds for the year 1992-93, 1999-00 and 2005-06. NFHS data source is similar to other Demographic Health Survey (DHS) and collects reliable information on fertility, mortality,

contraceptive uses, nutrition, health and health care utilized at country, state level for both urban and rural sector (IIPS,2007). The paper also uses National Nutrition Monitoring Bureau (NNMB) reports published by National Institution of Nutrition and the Planning Commission reports². The malnutrition measures of children utilize norms of National Centre for Health Statistics (NCHS) based on standard deviation as well as WHO standards but this paper will make use of only NCHS standards to make comparisons between all the three rounds as the new WHO reference population published by WHO Multicenter Growth Reference Study Group (2006) in NFHS-I and NFHS-II data sources are unavailable (Pathak & Singh, 2009).

Anthropometric measures given in Z-Scores³ (standard deviation scores) for malnutrition include underweight (weight-for-age) which is an indicator of chronic deficiency and is also a composite measures of both chronic and acute malnutrition, stunting (height-for-age) is a measure of chronic under-nutrition; it measures deficiency in the food and energy intake over a long interval, and wasting (weight – for-height) measures acute under-nutrition. The children whose anthropometric measures are less than median -3S.D (standard deviation) are severely malnourished and with median -2 S.D are moderately malnourished. Adult malnutrition can be measured by chronic energy deficiency (CED)⁴, Anaemia and Body Mass Index (BMI). In NFHS-I the height and weight were measured for children below four years of age and in NFHS-II below three years of age. The height was not measured during fieldwork in the some of the states covered by NFHS-I⁵ due to the shortage of proper tools of measurement (Radhakrishnan & Ravi, 2004; Deaton & Dreze, 2009). The paper makes use of anthropometric indicators for children below three years of age consistently in all the econometric analyses, if otherwise stated, to measure the nutritional status of children for all three rounds of NFHS.

² “NNMB was established in 1972 by the Indian Council of Medical Research has been carrying out annual diet and nutrition surveys to assess the food and nutrient intake and nutritional status of the rural and urban population Research in the States of Kerala, Tamil Nadu, Karnataka, Andhra Pradesh, Maharashtra, Gujarat, Madhya Pradesh, Orissa, West Bengal and Uttar Pradesh. The recall period is of 24 hours” (Deaton & Dreze, 2009).

³ Z-score is measure of standardization and is calculated as “Z-score = (observed individual value – median value of the reference population)/ (standard deviation of value in the reference population)” (Pathak & Singh, 2009).

⁴ A person suffers from CED if his BMI (weight in kg/ height in mt²) is less than 18.5.

⁵ “NFHS provides information about weight-for-age, weight-for-height (not available in a few states in NFHS-1) and height-for-age (not available in a few states in NFHS-1) for all three survey rounds. The height of children could not be measured in the states of Andhra Pradesh, West Bengal, Himachal Pradesh, Madhya Pradesh, and Tamil Nadu due to unavailability of measuring instruments during the first phase of NFHS-1” (Pathak & Singh, 2009).

The NFHS data source provides information on wealth Index which is been used in the paper to calculate the poor –rich ratio to see the relationship between poverty and underweight which is calculated using ratio of proportion of underweight children belonging to poorest quintile to the children belonging to the riches quintile. The poor-rich ratio closer to one shows perfect equality and greater than one shows inequality in malnutrition level between the poorest and richest. The paper also uses growth elasticity of poverty (GEP) measured by percentage reduction in poverty rates associated with a percentage change in per capita gross domestic product (GDP) which is given by following equation where ΔPR is a rate of change in poverty measure (given by head count ratio) and Δy is rate of change in per capita GDP. In general, increases in per capita GDP tend to decrease the poverty rate therefore the elasticity is positive.

$$GEP = - \frac{\% \Delta PR}{\% \Delta Y}$$

The paper also tries to study the determinants of malnutrition using logistic regression analysis. The determinants of malnutrition are estimated for the two time period NHFS-II (1998-99) and NHFS-III (2005-06) for studying the factors other than calorie intake that affect the malnutrition. The dependent variable in logistic regression assumes 0 if there is no malnutrition and 1 if there is presence of malnutrition where malnutrition is measured by weight for age less than median -2 S.D. The logistic regression is used to measure the net effect of different factors on malnutrition. To estimate relationship between poverty and malnutrition, a semi-log model is used to see if malnutrition exists even if poverty is zero. The variables of determinants of malnutrition that are used for the logistic regression analysis have been used in many studies (Radhakrishnan & Ravi, 2004; Radhakrishnan et al, 2004; & Rajaram et al, 2003) are given in the Table 1.

Table 1 Variables used in logistic analysis

Factors	Category
Place of residence	Urban, Rural
Sex of child	Male, female
Source of lighting	Proxy variable for source of income. It has two categories: Not electrified, Electrified
Mother's education	Illiterate, Literate, < middle, Middle school, High school and above
Father's education	Illiterate, Literate, < middle, Middle school, High school and above
Birth interval	Preceding birth Interval (Continuous Variable)
Birth order	Birth order is divides into 1, 2, 3, ,4, 5, 6+
Age at delivery	Age of the mother at 1 st delivery (Continuous Variable)
Age of child	Age of the child in months (Continuous Variable)
Mother's work status	Working, Not working
Place of delivery	Child delivered at Home or Institution
Sex of Household head	Male, female
Caste	Describes the social group: Schedule Tribe, Schedule Caste, OBC, General
Religion	Categorized into : Hindu, Muslims, Christians & Others
Source of drinking water	Proxy for environment and hygiene :Others/ no facility, Open source, Piped.
Type of toilet facility	Measure for sanitation and hygiene : Pit Toilets, Flush toilets, Others
Mother's BMI Index	It measures the BMI in Kg/m ² (Continuous Variable)
Wealth index	It measure the Asset poverty and taken as factor score using Principal component Analysis (Continuous Variable)
Geographical region	Categorized into North, Central, South, East, West and North East

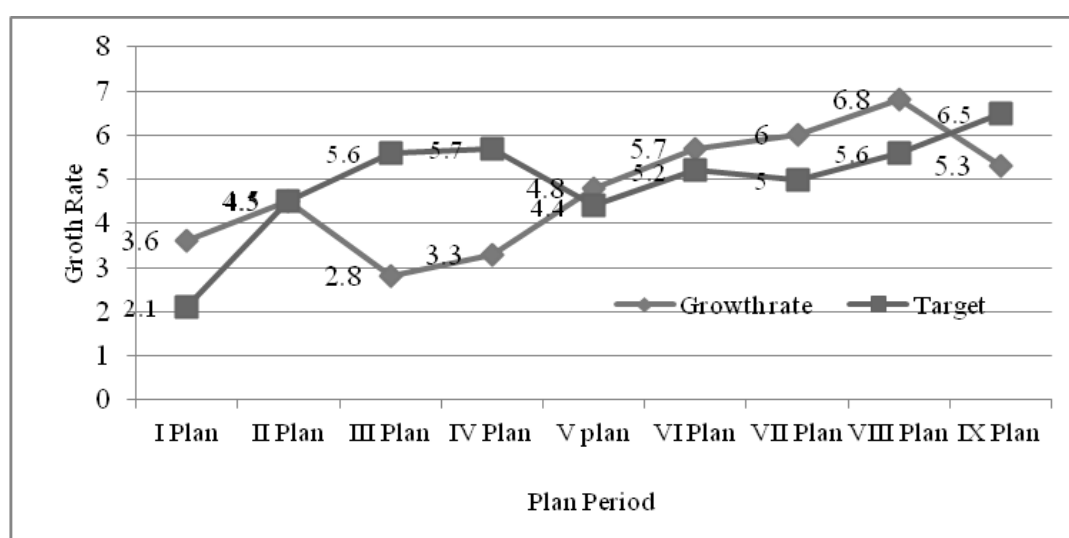
2. GROWTH, POVERTY AND MALNUTRITION

Poverty line demarcates poor from non-poor in order to ascertain poverty measures, this identification of poor is important for the policy perspective. The choices of the poverty line attracts great consideration as the head count ratio which demarcates poor from non-poor tend to sensitive to small changes which affects the lives of millions of people living near the poverty line. The discussions on poverty and its measures attracted great deal of debate and attention especially during the 1990's which marks the advent of the reform period.

The effect of reforms on economic front made the economy accelerate at high pace but its impact on poverty and subsequently on malnutrition remains obscure. The profiling of the poor on regional basis becomes important to underscore the complexities and nuances of the relationship between poverty, economic growth and malnutrition. The premise of accelerated growth of the Indian economy in the 1990s with the advent of neo-liberal reforms with no effect on poverty proved wrong the

trickle down hypothesis. The growth of Indian economy can be seen in Figure 1 as compared to the targeted growth rate for different plan period. The Indian Gross Domestic Product (GDP) grew at an unprecedented rate in the reform period however the pace of decline in poverty rate has been only modest. The poverty rate declined from 54 per cent in the 1970's to 36 per cent in the 1990's and to 26 per cent in 1999-00. To understand the effect of economic growth on poverty and consequently on nutritional level, it is important to study the regional patterns of economic growth and poverty rates in the Indian economy.

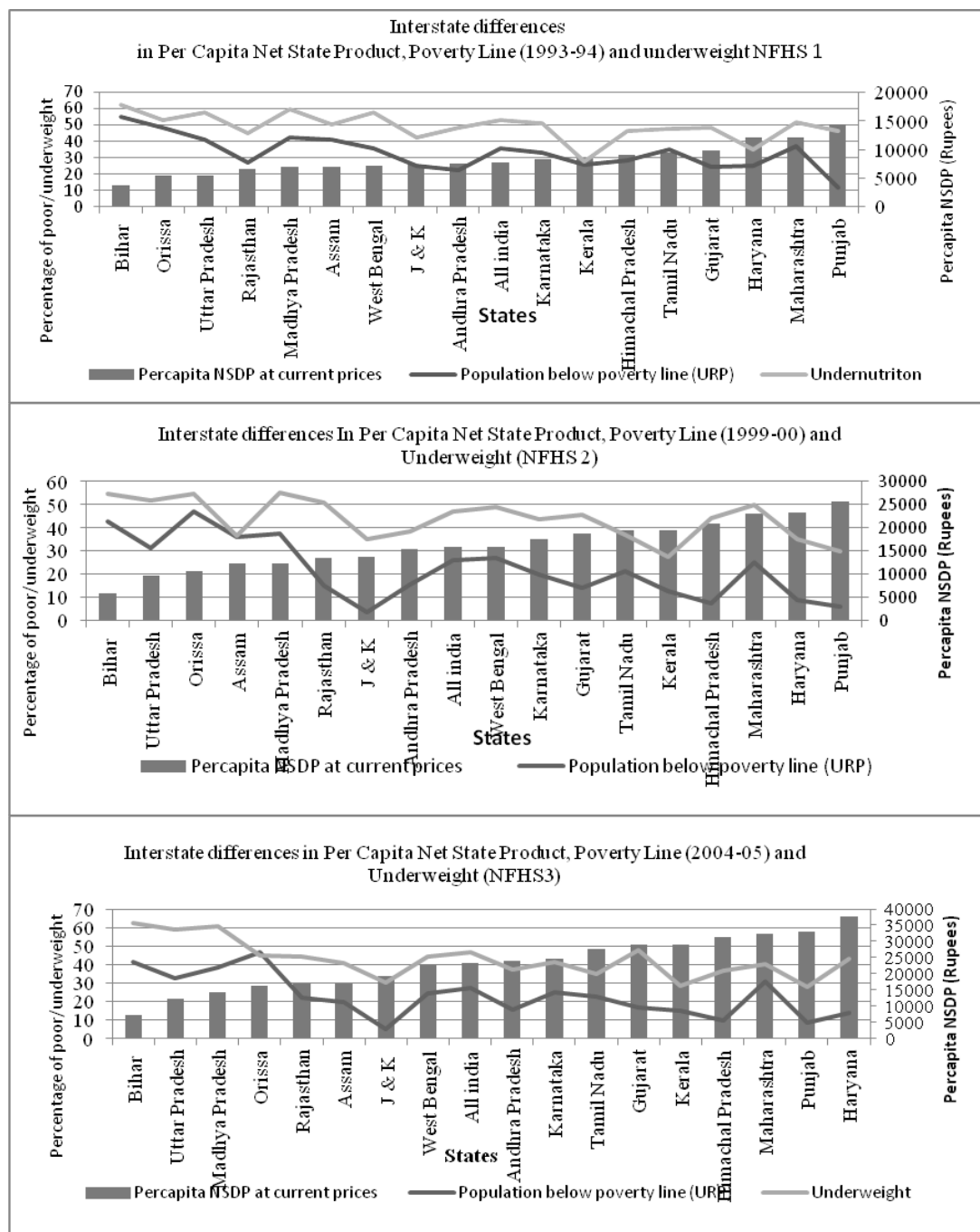
Figure 1 Growth rate of Indian economy during five year plans (GDP, % per annum)



Source: National account Statistics, 2000, CSO

The Figure 2 shows the inter-state disparity with respect to per capita NSDP; malnutrition (measured by weight for age z-score less than 2 S.D for NFHS I, NFHS II and NFHS-III); and poverty rates as given by the Planning commission for the period 1993-94, 1999-00 and 2004-05. There are wide inter-state disparities in terms of per capita state domestic product, malnutrition and poverty rates over the three period of time. Though the per capita Net State Domestic Product (NSDP) shows an increase but this increase has not been able to commensurate steady decline in poverty rate and malnutrition level in India. In states with high per capita NSDP shows low level of poverty and malnutrition.

Figure 2 Relative performance of states in per capita NSDP and poverty ratio from 1993-94 to 2004-05; and malnutrition, NFHS1-NFHS3



Source: Economic Survey 2005-06, Source: Planning Commission (1997), Press Information Bureau (2001), Press Information Bureau, (2007) & International Institute of Population Science (2000, 2007), National Family Health Survey-I,II,III.

Over the three period of time Bihar has consistently had a low per capita NSDP and high poverty ratio as well as high malnutrition level whereas Punjab showed a high per capita NSDP and low poverty ratio but comparatively higher malnutrition level than middle income states. The Per capita NSDP had shown an increase over the three periods and consequent decline in the poverty ratio and malnutrition level. Over the three rounds, Orissa, Assam and Andhra Pradesh have performed well in terms of economic growth. But poverty ratio and malnutrition in Orissa is still high. Maharashtra on the other hand shows relatively high poverty rate and malnutrition although being a high income state. In 1993-94 Bihar, Orissa, Uttar Pradesh, Tripura had poverty rates more than 40 per cent. Some states showed an increase in poverty ratio from 1999-00 to 2004-05 were Goa, Gujarat, Haryana, Himachal Pradesh, Jammu & Kashmir, Uttar Pradesh, Rajasthan, Delhi and Maharashtra where as the states that showed an increase in malnutrition front were Haryana, Madhya Pradesh, Gujarat showed an increase over the years. In some of the states, the agricultural sector still dominates the occupational structure of the economy which has not been able to emanate much growth. This leads to an inequitable growth and distribution of income between different regions and states. The differences in the rate of decline of poverty have in effect lead to widening the gap between the states. This gap is needed to be considered while assessing the nutritional status as majority of low income group population comprises of the unskilled workers and manual labourers as undernutrition adversely affects working capacity and hence affects their earning and purchasing power resulting in low food intake of the entire family which further aggravates the malnutrition level.

2.1 Tracing poverty and calorie debate

Table 2 shows the declining trend of urban and rural poverty over the three rounds. The table also shows with increasing urban rural disparity along with the increasing inequality in consumption measured by Gini Index of per capita consumption over the three rounds from 28.5 to 30.6 in 1993-94 to 2004-05 for rural areas and 34.4 to 37.6 in urban areas respectively even though the poverty line has declined over the three rounds. This increasing inequality has repercussion on calorie intake and also on the nutritional level of the people.

Table 2 Poverty and inequality across rural and urban areas

Year	Poverty Ratio (%)		Gini Index of Per Capita Consumption Expenditure (in percent)		Urban-Rural Disparity in Average MPCE (current prices)
	Rural	Urban	Rural	Urban	
1993-94	37.3	32.4	28.5	34.4	1.63
1999-00	27.1	23.6	26.1	34.3	1.75
2004-05	28.3	25.7	30.5	37.6	1.88

Source: Planning Commission (1997), Press Information Bureau (2001), Press Information Bureau, (2007).

The official poverty line in India is based on the calorie norm of 2400 kcal in rural and 2100 kcal in urban area which is calculated in terms of per capita total consumer expenditure at 1973-74 market prices and adjusted over time and across states to keep the changes in prices of the original poverty line basket of goods and services (Planning Commission, 1993). But the poverty line does not reflect the growing prices of the commodities and the rising standards of living. It cannot capture the changing consumption pattern of the poor as evidence show there has been a downward shift in the calorie Engel curve over time (see figure 3(a) and 3(b)). However some economist argue that the declining calorie requirements is due to better health, changes in food habits and squeezing out the food budget for non-food requirements and lower activity levels due to farm mechanization and rising food inflation. The revised minimum calorie norm requirement for India as recommended by FAO has come down to 1999 calories per capita in 2004-05 to 1,820 in 2006 and subsequently to 1,770 calories per caput per day in 2008 (Planning Commission report, 2009; Radhakrishnan & Ravi, 2004; Rao et al, 2004; Deaton & Dreze, 2009). The question here to examine here is if this trend in declining calorie intake is voluntary or stated otherwise.

Table 3 Mean per capita consumption of calories, protein, and fat (per day)

Year	Calories (kcal)		Protein (gm)		Fat (gm)	
	Rural	Urban	Rural	Urban	Rural	Urban
1993-94	2153	2071	60.2	57.2	31.4	42.0
1999-00	2149	2156	59.1	58.5	36.1	49.6
2004-05	2047	2020	57.0	57.0	35.5	47.6
2009-10	2147	2123	55.0	53.5	38.3	47.9

Source: NSS Report No.540, Nutritional Intake in India

Table 3 shows the time trend of the mean per capita consumption of calorie, protein and fat over the four quinquennial rounds from 1993-94 to 2009-10. The table

is in compliance with declining calorie consumption debates. The level of calorie and protein per capita for rural area has been declining and is well below the required calorie norm of poverty line. The trend in urban areas is not clear over the years but it has come down than the RDA except for 2009-10. But consumption of fat in both rural and urban areas has been increasing over the same period of time. There has been a shift in the consumption pattern from cereal consumption to non-cereal consumption. The cereals are considered to be cheap source of energy and protein which poor household can purchase either through PDS or otherwise. The increasing prices and shift toward non cereal food item in the total expenditure has resulted in declining calorie and cereal consumption. There has been declining trend in the break-up of calorie and protein from cereals per day for both rural and urban areas from 1993-94 to 2009-10 as shown in Table 4. The difference in calorie in rural areas from 1993-94 to 2009-10 is about 233 units and protein is about 5 units where as in urban areas the difference is about 142 units and 3 units for calorie and protein respectively.

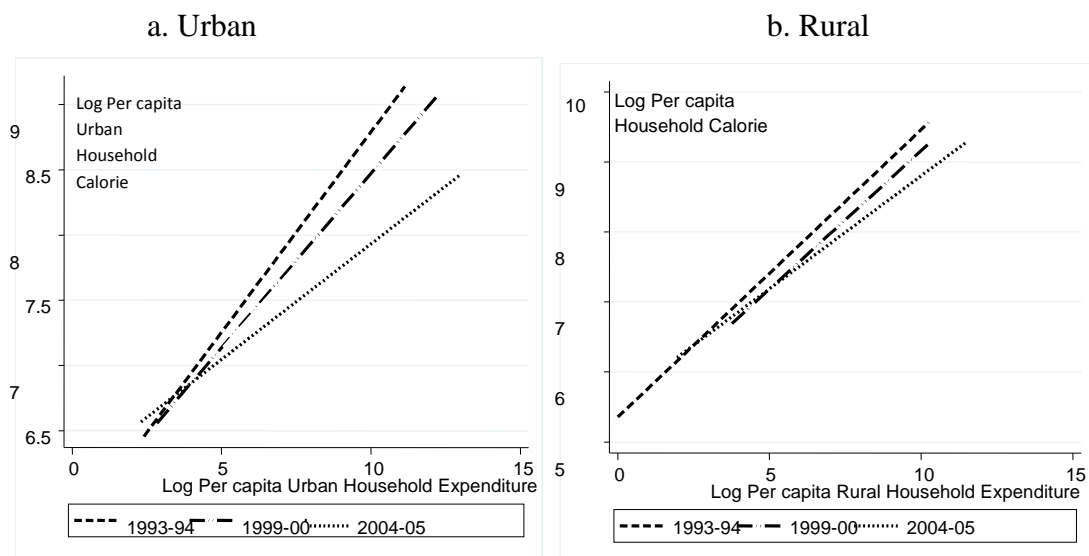
Table 4 Percentage break-up of calorie and protein intake by food group: 1993-94 to 2009-10

Year	Calories (kcal)				Protein (gm)			
	Rural		Urban		Rural		Urban	
	Cereal	Non cereal	Cereal	Non cereal	Cereal	Non cereal	Cereal	Non cereal
1993-94	71.03	28.97	58.53	41.47	69.42	30.58	59.41	40.59
1999-00	67.55	32.45	55.05	44.96	67.43	32.57	57.03	42.97
2004-05	67.54	32.46	56.08	43.92	66.37	33.63	56.16	43.84
2009-10	64.16	35.85	55.01	44.97	64.87	35.13	56.39	43.61

Source: NSS Report No.540, Nutritional Intake in India

The share of non cereal food has also increased in the calorie and protein intake from 1993-94 to 2000-10 in the last decade. The trend is more prominent in rural areas as compared to urban areas. Looking at Engel curves measuring the relationship between the calorie intake and total expenditure over the four rounds 50th, 55th and 61st from 1993-94 to 2009-10, we see that both calorie intake Engel curves have been declining. The trend is clear in the rural areas as well as in urban areas show declining trend till 2004-05 for both rural and urban calorie intake Engel curves (Figure 3.a & 3.b).

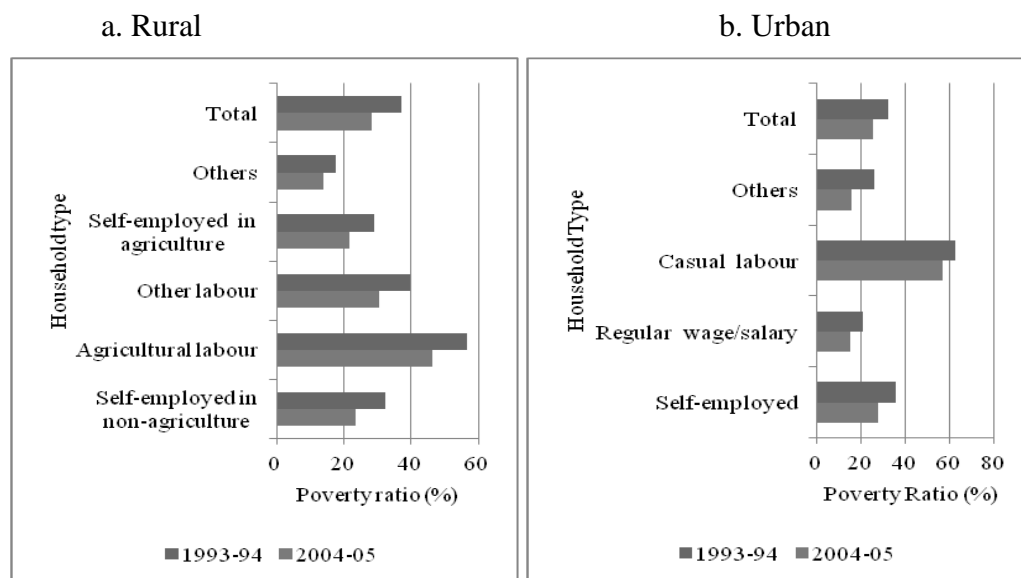
Figure 3 Engel curve of per capita calorie intake according to place of residence 1993-94 to 2004-05



Source: NSS 50, 55, 61st round unit level record

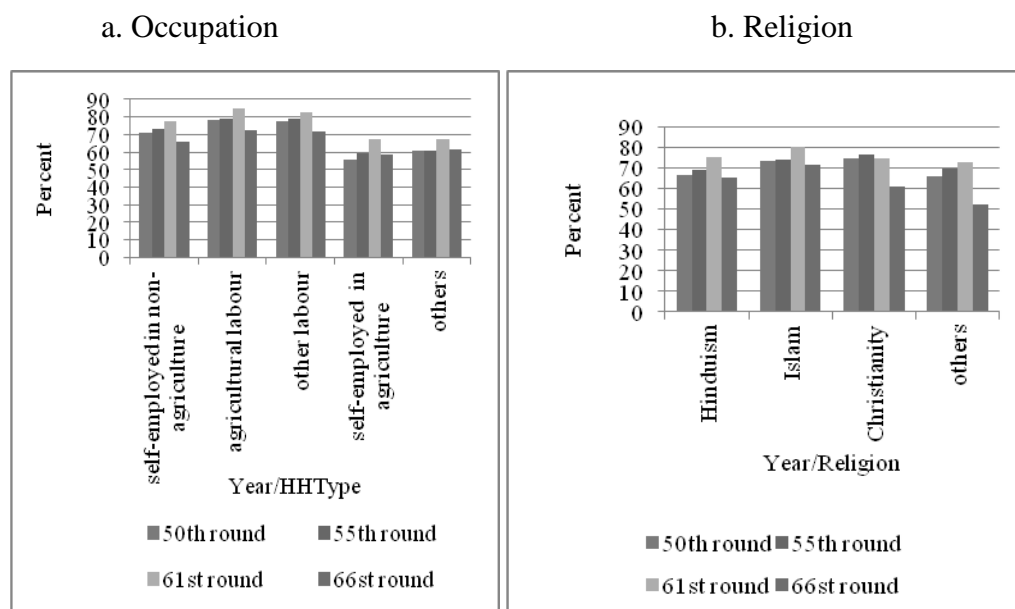
Figure 4 shows the prevalence of poverty by household type in both rural and urban areas from 1993-94 to 2004-05. The poverty rate declined over the two rounds from 1993-94 to 2004-05 for all the household type. The agricultural labourers and other rural household type are at the disadvantaged position as compared to the self employed households in rural areas. In urban areas poverty is higher among the casual labourers and self employed as compared to the regular salaried and other household types even though urban poverty has reduced from 1993-94 to 2004-05.

Figure 4 Poverty by occupation in rural areas over a decade by uniform recall period for 1993-94 to 2004-05

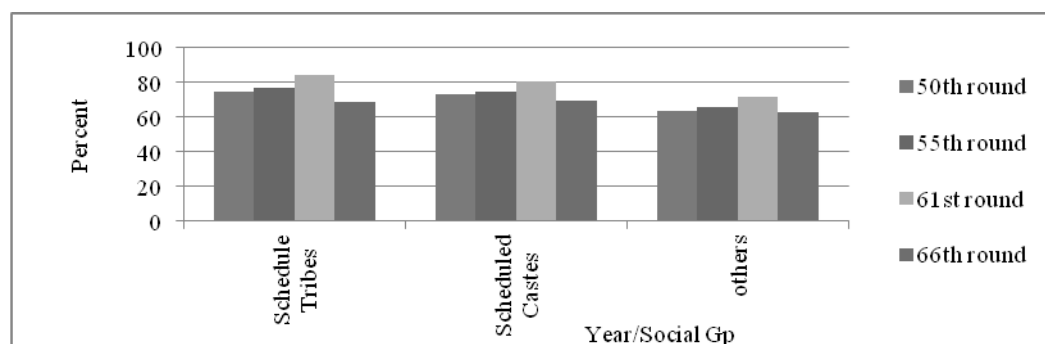


Source: NSS 50th, 55th, 61st round unit level data. Note: UPR- Uniform recall period

Figure 5 Fractions of the rural population living in households below the recommended calorie intake by occupation, by religion, by social group



c. Social Group

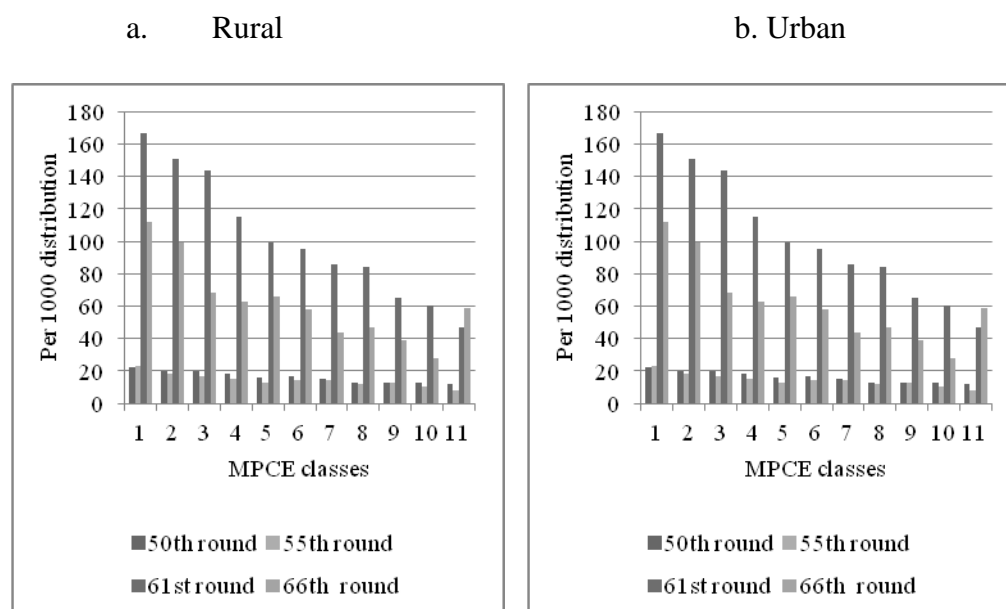


Source: 50, 55 and 61st Unit level data and NSS reports.

The Figure 5 shows the fraction of rural population living in rural household below the recommended calorie intake level from 1993-94 to 2009-10 by occupation, religion and social groups. The figure shows households below the calorie intake level has increased over the years from 1993-94 to 2004-05 but in 2009-10, household below required calorie norm subsequently declined over the occupation group, religion and social groups from previous round. The agricultural households, people following Islam and schedule tribe are at disadvantaged position in the society among the household type, religion and social groups from 1993-94 to 2009-10.

The figure 6 shows per 1000 distribution of people at different expenditure level for both rural and urban areas reporting zero meals consumed during a period of 30 days. The figure shows the level of people in the lowest MPCE class report more people with zero meal and the number comes down with higher MPCE classes. However the people reporting zero meal has increased drastically over the three rounds. However there were some improvements in 66th round (2009-10). The increasing in the monthly per capita expenditure level has not transcended into the calorie intake or nutrient intake. The Table 5 show percentage of total expenditure on food for the different MPCE classes from 1993-94 to 2004-05 for both urban and rural areas. There is a clear decline in the food expenditure as MPCE increases for all the three rounds. Over the time period, there is a clear trend of declining food expenditure though the trend is not clear in urban areas from 1999-00 to 2004-05.

Figure 6 Per 1000 distribution of persons at specified expenditure levels⁶ reporting zero meal, all-India: rural and urban, 1993-94 to 2009-10



Source: NSS Report No. 405, 471, 513: Nutritional Intake in India, 1993-94, 1999-2000, 2004-05

Table 5 Percentage of total expenditure spent on food by place of residence, 1993-94, 1999-00, 2004-05⁵

MPCE Classes	50 th round		55 th round		61 st round	
	Rural	Urban	Rural	Urban	Rural	Urban
1	71.6	73.6	68.5	64.9	67.0	64.0
2	71.1	74.1	67.2	63.1	67.0	64.0
3	70.3	73.7	66.3	60.0	66.0	62.0
4	68.8	73.3	64.8	57.3	65.0	60.0
5	67.0	72.5	64.0	55.3	65.0	58.0
6	65.2	71.4	62.9	52.4	64.0	56.0
7	63.0	70.4	61.6	49.7	63.0	54.0
8	60.4	68.5	60.1	46.6	62.0	52.0
9	56.6	66.7	58.0	44.4	60.0	49.0
10	53.1	62.9	53.9	40.2	58.0	45.0
11	48.8	58.2	49.8	35.6	55.0	41.0
12	34.9	43.6	33.7	23.7	46.0	32.0

Source: NSS 50th, 55th, 61st, 66th round unit level data.

⁶ The monthly per capita expenditure level is divided into 12 MPCE classes for each round (see Table A.1).

Looking at state wise pattern of calorie intake of Below Poverty Line (BPL) class and above poverty Line (APL) class as shown in the Table A.2, a stark difference emerges in the amount of calorie consumed as a percentage of the required calorie norm is not met for both APL and BPL classes of most of the states. Haryana, Himachal Pradesh, Jammu & Kashmir, Punjab and Rajasthan are some of the states who fulfil the RDA of calorie intake of 2400 Kcal if the rural areas. The table also shows the prevalence of north –south divide in calorie intake in the state wise pattern where the southern states show lower calorie intake for both APL and BPL classes in all the four rounds from 50th to 66th round. The table is also in compliance with the declining calorie intake debate over the three quinquennial rounds from 50th round to 61st round but shows an increase in the 66th round for both APL and BPL classes.

The Table 6 shows the time trend of average consumption of various nutrients intake from NNMB pooled states from 1975-79 to 2005-06 along with the RDA requirements. The figure shows the declining trend of the average calorie intake over the three decades especially energy, calcium, and vitamin A which are well below the RDA required. The gap between the RDA and Average consumption is increasing over the three decades. The deficiency of micronutrients leads to undernutrition and retard the growth of human being. The table shows increase in the consumption of vitamin C, but the riboflavin and the iron intake has fallen significantly over the decades such that the intake is half of the RDA. Deficiency of iron leads to serious health consequences in women and children.

Table 6 Time trend of average consumption of nutrients (Cu/Day)

Nutrients	1975-79	1988-90	1994-95	1996-97	2001-02	2005-06	RDA
Energy (Kcal)	2349	2283	2172	2108	1954.3	1834	2425
Calcium (mg)	606	565	528	521	426.3	439	400
Vitamin A (µg)	246	282	288	300	215.6	257	600
Protein (g)	61.5	58.4	55.8	53.7	50.7	49.4	60
Vit. C (mg)	39	37	34.5	40	42.3	44	40
Iron (mg)	30.2	27.2	26.1	24.9	15.2	14.8	28
Niacin	14.7	14.2	13.5	12.7	15.2	14.7	16
Thiamin (mg)	1.46	1.33	1.1	1.2	1.3	1.2	1.2

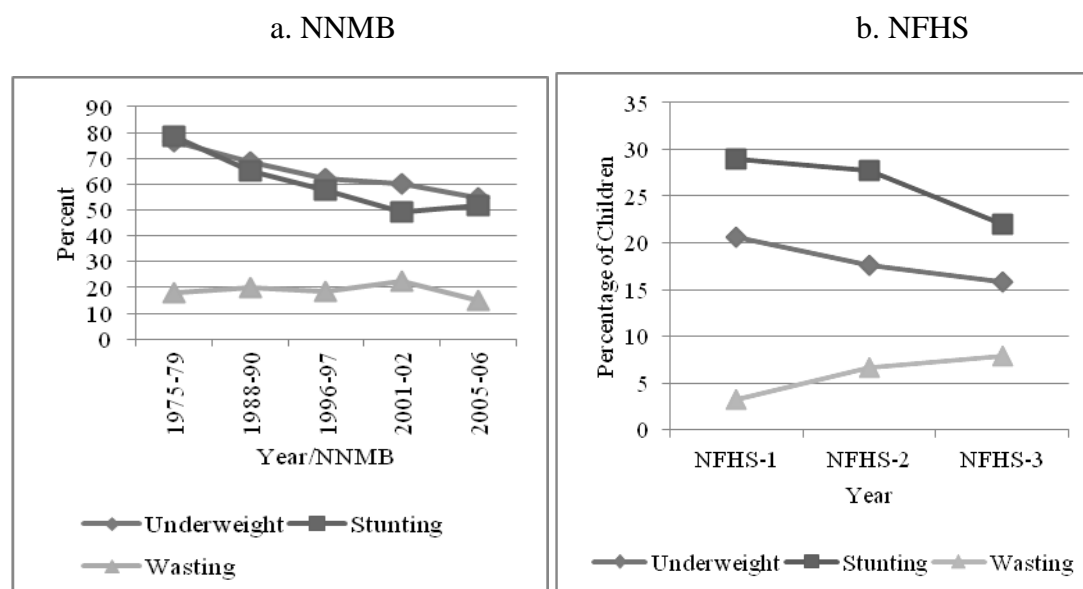
Source: National Nutrition Monitoring Bureau (1995, 1996, 2002, 2006)

2.2 Malnutrition: trends, depth and severity

The preposterous situation of malnutrition gets much aggravated along with high poverty level. Poverty level in India has been declining over the years but the number of under nourished have not been declining. The malnutrition level in India is very high with almost 185 million children being undernourished in 1991-92, highest in the world (Svedberg, 1999). The Figure 7 shows prevalence of malnutrition using standard deviation classification with weight-for-age measuring underweight, height-for-age measuring stunting and weight-for-height measuring wasting from NNMB pooled states for pre-school children below five years of age. The figure shows that the trend of under-weight, stunting, and wasting has come down over the thirty year period. The children with normal height for age, weight for age, and weight for height has actually increased over the period of three decade. Looking at NFHS data source for undernutrition among children below three years shows decline in underweight and stunting for children age 0-3 years whereas an increase in wasting from NFHS –II to NFHS –III. The decline in underweight for children in NFHS-II and NFHS-III has not been significant enough though stunting shows higher decline from NFHS –II to NFHS-III. On comparing NFHS data to NNMB data source we see how different sources show different level of malnutrition. The NNMB data source show higher level of underweight and stunting among the pre-school children but comparatively lower level of wasting as compared to NFHS data source.

Other contradictory observation between the two data sources is the increase in the level of stunting between 2001-02 to 2005-06 in NNMB while a decline in stunting between NFHS-II to NFHS-III. These discrepancies in the data sources could be due to difference in the coverage of collection of data and also difference in the age of the children. The severity of malnutrition from NFHS and NNMB data source is shown in the Figure 8.a and 8.b. The NNMB data source shows a declining trend in malnutrition measured by stunting and underweight. However the wasting has more or less remained the same over the three decades. NFHS data show declining trend of both underweight and stunting over the three rounds from 1992-93 to 2005-06 however an increase in wasting from 1998-99 to 2005-06 (see Figure 8. b).

Figure 7 Trends in nutritional status of children under three years of age, NFHS and pre-school children under five years of age, NNMB.



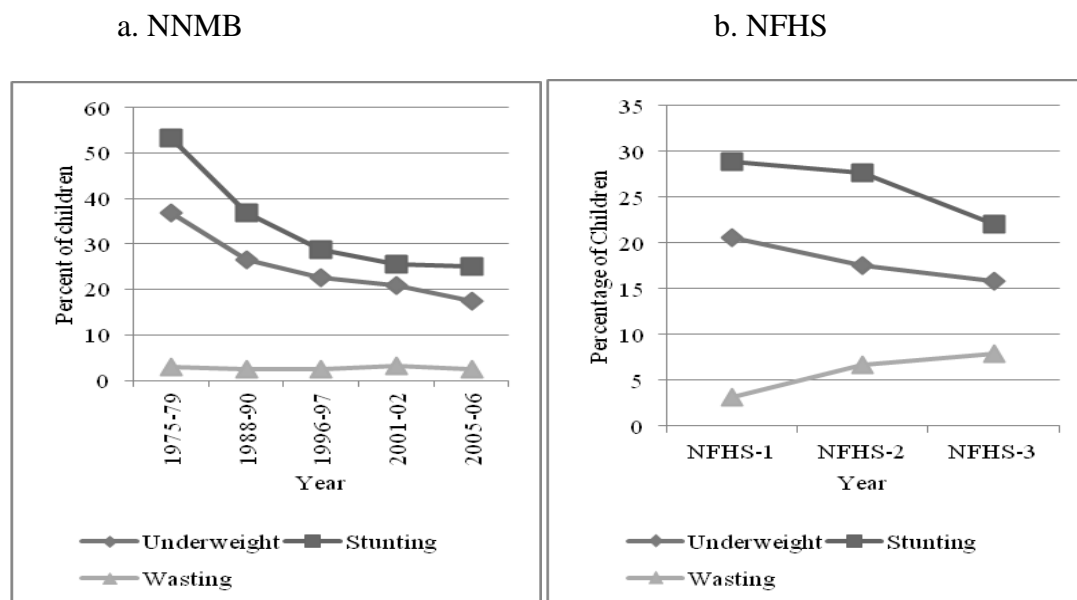
Note: NFHS-II figures on malnutrition are based on the last two children under the age of three of the sample ever married women in age group of 15-49 years. For the purpose of comparability the study presents data from NFHS -I, III on same group using NCHS standards.

Source: National Nutrition Monitoring Bureau (1995, 1996, 2002, 2006) and NFHS-I, II, III unit level data⁷.

Nutritional deficiencies in India are evident from the time of the birth in children where as stunting and underweight rise rapidly in the first two years of birth of the child (IIPS, 2007). Figure 9 shows prevalence of stunting, underweight and wasting in children below three years of age for NFHS-III. The proportion of children stunted and underweight rises sharply from 0 to 20 months where as the proportion of children wasted remains more or less the same till the 0-20 months and declines thereafter. The level of stunting and underweight is higher in 20-27 months for children since the child is prone to infection and illness beyond the breast feeding period. This period of formative years is critical for children's growth and development however the figure shows the prevalence of nutritional deficiency among the during early childhood years when the weaning starts.

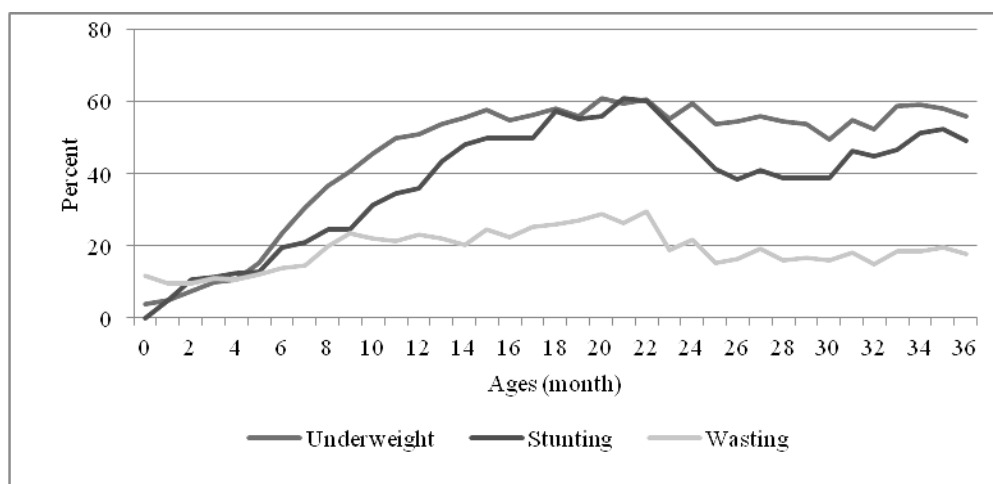
⁷ National Family Health survey -I, II uses National Centre for Health Statistics (NCHS) standards, recommended until 2006 by WHO and also are used in NNMB survey. The New WHO Child growth Standard are used in NFHS-III reports which also presents figure on NCHS standards for the purpose of comparability

Figure 8 Trends in prevalence (in %) of severe malnutrition in pre-school children (nmb) and children under 3 years of age, NFHS.



Source: National Nutrition Monitoring Bureau (1995,1996, 2002, 2006) & International Institute of Population Science (2000, 2007), National Family Health Survey-I, II, III.

Figure 9 Nutritional status of children among children age 0-35 months for NFHS-III



Source: International Institute of Population Science, National Family Health Survey-I, II, III Unit Level data

The Table 7 gives account of children in different geographical regions who are undernourished according to the wealth quintiles. The prevalence of underweight has increased among the poorest and poorer wealth quintiles in the northern region where as it has come down for the children belonging to the north-eastern and southern region of the same quintiles. Central and Eastern region emerges to have high prevalence of underweight children in India among all the three rounds. Underweight among the middle income and richer groups have come down for all the regions from NFHS-I to NFSH-III. At all India level 60.9 percent of people belonging to poorest quintile were underweight in 1992-93, the rate declined to 60.5 percent in 2005-06 whereas around 34.5 percent people were underweight belonging to the richest quintiles in 1992-93 came down to 25 percent in 2005-06. The level of underweight has not come down among the poor showing that the level of malnutrition has been unfavourable to poor.

Table 7 Percent of children below three years of age who were underweight by economic status of their households in different geographic regions of India, 1992-2006

NFHS-I (1992-93)						
Regions	Prevalence of underweight by wealth quintile (in %)					Average Underweight
	Poorest	Poorer	Middle	Richer	Richest	
North	43.9	46.8	50.7	44.1	34.2	42.8
Central	61.7	61.1	59.9	55.6	44.8	58.2
East	63.4	63.5	63.2	51.6	33.2	59.3
West	63.5	61.4	60.6	48.3	34.6	50.6
South	59.2	57.9	51.7	41.6	27.3	46.0
North-East	59.2	52.7	46.3	30.3	21.1	47.2
All India	60.9	60.3	57.0	47.2	34.5	52.8
NFHS-II (1998-99)						
North	59.3	55.6	48.5	41.5	26.6	42.3
Central	62.7	59.0	55.2	42.2	32.3	53.2
East	62.7	53.9	50.4	38.2	23.8	52.9
West	66.0	61.3	53.3	46.0	31.2	48.6
South	53.7	46.8	43.5	31.5	18.6	37.8
North-East	43.4	36.7	35.8	25.6	14.6	34.4
All India	61.1	54.3	49.5	39.1	26.3	47.1
NFHS-III (2005-06)						
North	54.9	50.6	41.9	36.7	24.1	39.5
Central	60.7	53.5	49.8	42.4	29.8	51.4
East	63.6	56.1	43.5	39.4	25.6	52.8
West	61.4	54.5	51.3	40.3	27.2	43.4
South	53.2	48.6	40.0	32.6	21.3	36.8
North-East	47.7	45.4	37.3	27.1	11.1	38.8
All India	60.6	53.3	44.9	37.9	25.2	46.5

Source: International Institute of Population Science, National Family Health Survey-I, II, III Unit Level data.

The surprising finding is prevalence of malnutrition among the richest quintile. It again raises the question if poverty is the only factor that affects malnutrition and makes us look into various other factors affecting malnutrition level in India.

On measuring the poor-rich ratio with respect to the malnutrition measured by children with weight for age below – 2 S.D gives an account of the perils on the poor due to their socio-economic status (see Table 8).

Table 8 Poor-rich ratio with respect to child malnutrition (weight-for-age < -2 S.D.) across geographic regions and states, India, 1992-2006.

States/ Region	1992-93	1998-99	2005-06
North	1.3	2.2	2.3
Jammu and Kashmir	1.2	3.1	3.7
Himachal Pradesh	2.0	3.0	1.3
Punjab	1.7	3.1	2.9
Uttaranchal	-	-	3.0
Haryana	2.4	2.0	1.7
Delhi	1.6	1.6	1.8
Rajasthan	0.9	1.7	1.9
Central	1.4	1.8	2.0
Chhattisgarh	-	-	2.9
Madhya Pradesh	1.4	2.2	1.5
Uttar Pradesh	1.3	1.8	2.2
East	1.9	2.5	2.5
Bihar	1.7	1.8	1.8
Jharkhand	-	-	2.8
Orissa	1.9	3.1	3.2
West Bengal	2.3	3.9	4.2
West	1.8	2.0	2.3
Goa	2.8	2.0	3.3
Gujarat	1.2	2.3	1.8
Maharashtra	1.7	2.0	2.6
South	2.2	2.8	2.5
Andhra Pradesh	1.8	2.4	2.2
Karnataka	2.3	3.1	2.6
Kerala	3.1	3.1	1.9
Tamil Nadu	1.8	3.6	3.0
North east	2.8	3.0	4.3
All India	1.8	2.3	2.4

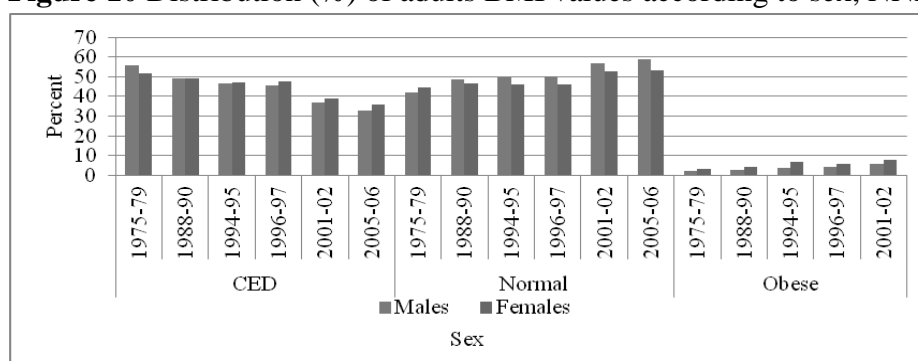
Source: International Institute of Population Science, National Family Health Survey-I, II, III Unit Level data.

The poor rich ratio has increased in all the three rounds from NFHS-I to NFHS-III for all the regions and the states except Haryana and Kerala. Though some states show

decline from NFHS-II to NFHS-III such as Himachal, Punjab, Madhya Pradesh, Gujarat, Andhra Pradesh and Tamil Nadu. The poor-rich ratio closer to one shows perfect equality in malnutrition level between the poorest and richest. All India data show an increase in poor and rich ratio in underweight from 1.8 to 2.3 to 2.4 from NFHS-I to NFHS-II and NFHS-III.

The other measures of malnutrition are Body Mass Index (BMI) which measures the level of malnutrition in adult to check if they are suffering from Chronic Energy Deficiency or obesity. Figure 10 shows the BMI value of adults from 1975-79 to 2005-06 in the NNMB pooled states according to sex. The figure shows overall decline in Chronic Energy Deficiency (CED) in both males and females over the three decade but experienced an increase in the obesity over the same period among both sexes. The CED in males was higher than females from 1975-79 to 1992-93 but it has increased in female than males in recent years.

Figure 10 Distribution (%) of adults BMI values according to sex, NNMB.



Source: National Nutrition Monitoring Bureau (1995, 1996, 2002, 2006)

The level of obesity has increased over the years, and the increase has been more in females than males from 1975-79 to 2005-06. The level of malnutrition in male child is greater than female in stunting, underweight, and wasting in all the three rounds NFHS-I, NFHS-II and NFHS-III. Another measure of nutritional deficiency is anaemia among the children, women and male due to iron deficiency. The Table 9 shows level of anaemia in children women and male between NFHS-II and NFHS-III. The level of anaemia has increased from NFHS-II to NFHS-III for both women and children showing an increase in iron deficiency.

Table 9 Anaemia in NFHS-II and NFHS-III

Category	NFHS –II (%)	NHFS-III (in %)
Ever married women	51.8	55.4
Ever married men	-	24.8
Children below three years of age	74.3	78.8

Note: "Table includes only the last two children age 6-35 months of ever-married women who were interviewed. Prevalence of anaemia, based on haemoglobin levels, is adjusted for altitude using formulae in CDC (1998). Haemoglobin in g/dl = grams per decilitre. NFHS-3 estimates of anaemia exclude Nagaland" (IPS, 2007).

Source: International Institute of Population Science, National Family Health Survey- III Unit Level data and NFHS 2 reports.

Table 10 Percentage of rural households reporting lack of food (India and Major States)

States	1993-94	1999-00	2004-05	2009-10
Jammu & Kashmir	0	0.6	0	1.0
Himachal Pradesh	0.3	0.2	0	1.5
Punjab	0.1	1.0	0.6	0.9
Uttaranchal	-	-	1.9	1.5
Haryana	0.6	1.7	0	2.0
Rajasthan	1.5	0.3	0	1.5
Uttar Pradesh	3.3	2.4	1.9	1.8
Bihar	6.8	6.3	3.2	1.1
Nagaland	0.4	1.7	1.3	0.4
Manipur	11.3	2.1	1	0.5
Mizoram	0.4	3	0.1	0.5
Meghalaya	0.5	0.1	0.3	0.9
Assam	9.9	7.2	5.5	0.5
West Bengal	14.3	11.3	11.7	0.8
Jharkhand	-	-	0.6	2.1
Orissa	14.2	7.8	5.9	1.4
Chhattisgarh	-	-	2.5	0.7
Madhya Pradesh	2.6	3.4	2.1	1.3
Gujarat	2.2	0.5	0.3	1.6
Maharashtra	4.4	2.1	1.1	1.1
Andhra Pradesh	3.2	1	0.7	1.4
Karnataka	3.9	1.1	0.3	1.1
Goa	2.5	0.8	0.6	4.4
Kerala	9.4	3.3	2.5	1.6
Tamil Nadu	2.8	1.3	0.1	0.7
All India	5.3	3.7	2.5	2.4

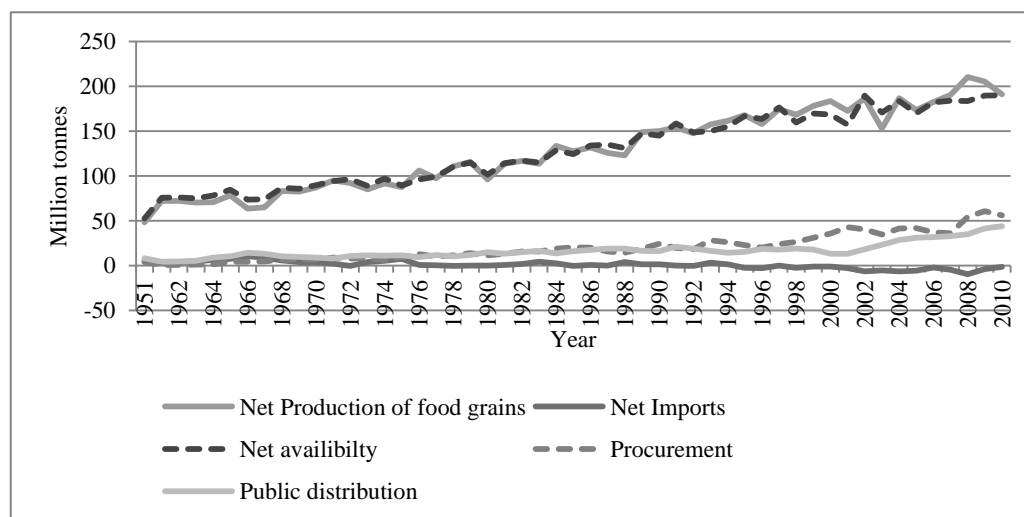
Note: - data unavailable

Source: NSS 50th, 55, 61, 66th round unit level data⁸

⁸ Calculated from question asked in 50th round "Do all members get two square meals a day" and 55th and 61st round, the question was "enough food every day". In 66th round the question changed to : "number of meals taken in a day".

The NSS rounds measure the number of square meals taken by the people. This question can be used to measure the household reporting lack of food to measure hunger among the people. The level of hunger is measured by insufficiency of food where as malnutrition refers to an inadequacy of both macro and micro-nutrients due to insufficient food intake and unproductive usage due to physiological or environmental factors (India Country Report, 2010). The Table 10 shows decreasing percentage of rural households reporting lack of food among Indian states from 1993-94 to 2009-10. Some states such as Bihar, Orissa, West Bengal and Manipur reported lack of food of more than 10 percent. The states reporting lack of food with at most 10 percent level shows high level of hunger and inadequacy of food. At All India the lack of food has decreased from 5.3 percent in 1993-94, 3.7 percent in 1999-00, 2.5 percent in 2004-05 to 2.4 percent in 2009-10 in the rural households though the calorie intake has been decline for the same period of time except 2009-10. The relationship between food and nutrition security has thus become important from the point of view of problem of malnutrition in India due to inequitable distribution.

Figure 11 Net availability, procurement and public distribution of food grains (1950-2008)



Note: Net availability = Net production + Net imports - changes in Government stocks.

Source: Economic Survey 2010-11.

The food production has kept pace with the population growth which has kept under check the per caput food availability. But declining per caput availability of pulses and legumes with the escalating prices have put the poor at the threshold as they cannot access cheap source of protein which could be reflected in the diet regime of the poor households even though the economy has been growing at an unprecedented rate.

The Figure 11 shows the net production of food grains were lower than net availability of foodgrains but in recent years the net production of foodgrains is greater than the net availability making the economy less dependent on the net imports. The figure also shows that the procurement of food grain in India is more than the public distribution thus adding to buffer stock of the food grains. The change of government stock and net imports affect the availability of foodgrains and cereals. The calorie intake and cereal consumption has been declining since three decade (as pointed in previous analysis) even with significant increase in per capita cereal production. Thus the relationship between the food energy intake, production and nutritional status is obscure which makes the food energy intake inadequate measure of nutritional status.

2.3 Linkages between economic growth and poverty

The linkages between economic growth and poverty have been extensively been dealt in various studies. The existence of poverty and its dire consequences on the individual, regions and states such as prevalence malnourishment vulnerabilities and inaccessibility to basic needs are important concerns of the economy. These challenges must be must be countered through development that is usually driven by positive economic growth measured by growth elasticity of poverty reduction (Wieser, 2011).

Table 11 Annual growth rate of NSDP, annual decline in poverty rate along with Growth Elasticity of Poverty, India, State, 1993-94 to 2004-05 & 1999-00 to 2004-05.

STATE / UNION TERRITORY	Annual Growth rate (%) of Per capita NSDP		Annual decline in poverty rate (%)		Growth elasticity of poverty	
	1993-94 to 2004-05	1999-00 to 2004-05	1993-04 to 2004-05	1999-00 to 2004-05	1993-94 to 2004-05 ⁹	1999-00 to 2004-05 ¹⁰
Andhra Pradesh	0.87	0.53	-1.05	-2.69	1.21	6.10
Assam	0.25	0.27	-1.97	-5.46	8.04	24.42
Bihar	0.45	0.36	-0.66	-1.49	1.47	4.95
Gujarat	0.89	0.43	-1.10	-0.91	1.24	2.55
Haryana	0.77	0.55	-1.79	1.12	2.34	-2.46
Himachal Pradesh	0.97	0.46	-3.35	-1.31	3.45	3.41
Jammu & Kashmir	0.40	0.23	-5.73	2.85	14.18	-14.96
Karnataka	0.79	0.26	-0.76	-0.96	0.96	4.51
Kerala	0.89	0.51	-1.61	-0.88	1.81	2.06
Madhya Pradesh	0.35	-0.06	-0.26	-0.81	0.73	-15.86
Maharashtra	0.62	0.29	-0.47	0.04	0.76	-0.19
Orissa	0.69	0.48	-0.11	-0.88	0.15	2.20
Punjab	0.39	0.17	-1.33	-1.94	3.38	13.93
Rajasthan	0.74	0.19	-0.61	0.98	0.82	-6.19
Tamil Nadu	0.81	0.34	-1.20	-1.15	1.48	4.09
Uttar Pradesh	0.33	0.14	-0.55	-1.19	1.68	9.89
West Bengal	0.91	0.41	-0.98	-1.70	1.08	5.03
All India	0.81	0.40	-0.71	-1.13	0.87	3.36

Source: Own calculation from Press Information Bureau, Planning Commission (2007) and Economic Survey (2001-12)

The Table 11 shows state-wise annual growth rate of Net State Domestic Product (NSDP) at factor cost at constant prices for 1999-00 base period from 1993-94 to 1999-00 and 1999-00 to 2004-05. At all India level the growth rate from 1993-94 to 2004-05 has been around 0.8 percent annually where as the growth rate from 1999-00 to 2004-05 has been 0.4 percent annually. The table shows decline in

⁹ Note: The rate of change in Poverty from NSS 50th round (1993-94) to NSS 61st (2004-05) round using URP estimates to and rate of change in per capita NSDP for the same year.

¹⁰ The rate of change in Poverty from NSS 55th round (1990-00) to NSS 61st (2004-05) round using MRP estimates to and rate of change in per capita NSDP for the same year.

poverty rate at all India Level the decline in poverty has been around 0.7 percent annually from 1993-94 to 2004-05 and 1.1 percent from 1999-00 to 2004-05. The question that should be raised is that should this decline in poverty be attributed to change in methodology from uniform recall period to mixed recall period or trickle down of growth to reduce the poverty rate. Now looking at GEP from 1993-94 to 2004-05 and 1999-00 to 2004-05, we see, that 1 percent growth leads to 0.8 percent reduction in poverty in 1993-94 to 2004-05 whereas 1 percent growth leads to a decline of 3 percent in poverty rate in 1999-00 to 2004-05 at all India level. The same can be seen at the state level analysis for growth rate of NSDP, poverty reduction and growth elasticity of poverty. There exists inter-state heterogeneity in the relationship between change in poverty and change in growth. And can be interpreted in similar manner as all India level. The paper tries to study how much does malnutrition level decline with this decline in number of poor.

2.4 Relationship between poverty and malnutrition

This section will discuss the linkages between poverty and malnutrition levels in India using econometric analysis. In the exercise to see the relationship between poverty and malnutrition we use semi-log type of specification to permit the existence of malnutrition at zero poverty level using both NSS and NFHS data source for the corresponding year from 1993-94 to 2004-05 and NFHS-I, II, III. The dependent variable is log of percentage of children with underweight (< median -2 S.D) and independent variable is percentage of people below poverty line.

$$\ln M_1 = 3.50 + 0.011 P_1$$

$$\text{P-value (0.00) (0.00)}$$

$$R^2 = 0.37 \quad R'^2 = 0.33 \quad \text{df} = 16$$

$$\ln M_2 = 3.50 + 0.012 P_2$$

$$\text{P-value (0.00) (0.00)}$$

$$R^2 = 0.43 \quad R'^2 = 0.39 \quad \text{df} = 16$$

$$\ln M_3 = 3.39 + 0.013 P_3$$

$$\text{P-value (0.00) (0.00)}$$

$$R^2 = 0.55 \quad R'^2 = 0.52 \quad \text{df} = 16$$

where $i=1, 2, 3$ for the three time period NFHS-I, NFHS-II and NFHS-III.

The coefficients are statistically significant indicating prevalence of malnutrition even when poverty is completely eradicated as the coefficients of poverty are positive and significant. The regressions analysis show a 10 percent reduction in poverty reduced undernutrition by around 1 percent in all the three rounds though the R-square is not very high. Thus it makes it necessary to look for the other factors affecting malnutrition level other than poverty. But before we move on to the linkages between the two distinct and related issues, we will discuss the determinants of poverty and malnutrition to see what are the factors affecting the two and how the two are interrelated.

The linkages between poverty and undernutrition among the Indian States are necessary to be seen to check if connect or disconnect exists between the two issues and also to curb the high prevalence of malnutrition along with other factors that may affect malnutrition level. The table 12 shows annual decline in poverty rate from 1973-74 to 2004-05 and annual decline in malnutrition level from 1992-93 to 2005-06. The all India annual decline in poverty from 1973-74 to 2004-05 is 0.6 percent, from 1993-94 to 2004-05 the annual decline in poverty is around 0.7 and 1.1 from 1999-00 to -2004-05. The annual decline in malnutrition level has been around 0.6 percent from 1992-93 to 2005-06 and 1.5 from 1992-93 to 1998-99 and 0.1 percent from 1998-99 to 2005-06. The overall decline in malnutrition due to decline in poverty has been around 0.7 percent over the decade from 1992-93 to 2005-06 and 0.1 from 1998-99 to 2005-06. The table also discusses the same estimates for all the major states. The ratio of the percentage rate of change in malnutrition level to percentage rate of change in poverty level shows a positive relationship between the two indicating decline in poverty would lead to a subsequent decline in malnutrition rate at all India level however state wise pattern show some with a connect between poverty reduction and malnutrition and some show disconnect. The state that show disconnect are Haryana, Kerala, and Madhya Pradesh in period 1 and Assam, Bihar, Gujarat, Jammu and Kashmir, Kerala, Madhya Pradesh, Maharashtra, and Rajasthan in period 2.¹¹ To understand this relationship between poverty reduction and decline

¹¹ Period 1 refers to the rate of change in Malnutrition from NFSH-I to NFHS-III and rate of change in poverty from NSS 50th round to NSS 61st round using URP estimates. Period 2 refers to the rate of change in Malnutrition from NFSH-II to NFHS-III and rate of change in poverty from NSS 55th round to NSS 61st round using MRP estimates

in the number of under nourished it is essential to know what all factors that affects malnutrition level which will be dealt in subsequent section.

Table 12 Annual decline in poverty and Malnutrition and rate of decline in malnutrition due to poverty, NSS and NFHS (various years)

States	Annual decline in poverty (%)			Annual decline in malnutrition (%)			Ratio of Rate of Δ In Malnutrition By Rate of Δ In Poverty in Period 1 ¹²	Ratio of Rate of Δ In Malnutrition By Rate of Δ In Poverty in Period 2 ¹³
	1973-74 to 2004-05	1993-94 to 2004-05	1999-00 to 2004-05	1992-93 to 2005-06	1992-93 to 1998-99	1998-99 to 2005-06		
Andhra Pradesh	-1.1	-1.0	-2.7	-0.1	-3.0	1.5	1.6	0.1
Assam	-0.9	-2.0	-5.5	-0.1	-0.8	0.3	0.5	-0.2
Bihar	-0.3	-0.7	-1.5	-0.5	-1.5	0.0	0.3	-0.4
Gujarat	-1.0	-1.1	-0.9	0.5	-0.1	0.8	0.1	-1.5
Haryana	-1.0	-1.8	1.1	-0.6	-0.3	-0.7	-0.7	6.9
Himachal Pradesh	-1.1	-3.3	-1.3	-0.8	-1.3	-0.6	0.5	8.1
Jammu & Kashmir	-2.5	-5.7	2.8	-0.5	-1.0	-0.2	0.6	-6.3
Karnataka	-0.7	-0.8	-1.0	0.1	-0.2	0.3	1.2	0.9
Kerala	-1.3	-1.6	-0.9	0.0	-0.5	0.3	-0.1	-1.3
Madhya Pradesh	-0.4	-0.3	-0.8	-0.6	-0.2	-0.8	-0.1	-1.0
Maharashtra	-0.5	-0.5	0.0	-0.2	0.2	-0.5	1.9	-
Orissa	-0.3	-0.1	-0.9	-1.3	-3.1	-0.2	3.7	1.4
Punjab	-1.4	-1.3	-1.9	-0.1	0.8	-0.5	5.4	1.3
Rajasthan	-0.7	-0.6	1.0	-0.8	-1.7	-0.3	0.2	-3.1
Tamil Nadu	-0.8	-1.2	-1.1	-0.4	-0.4	-0.4	1.0	0.7
Uttar Pradesh	-0.5	-0.6	-1.2	-0.6	-1.0	-0.4	1.2	0.6
West Bengal	-0.8	-1.0	-1.7	-0.3	-0.7	0.0	1.2	0.7
All India	-0.6	-0.7	-1.1	-0.6	-1.5	-0.1	0.7	0.1

Note: Δ denotes rate of change. '-' shows data inconsistency.

Source: Own calculation from Press Information Bureau, Planning Commission (2007) and NFHS-I, II, III.

2.5 Determinants of malnutrition

The NFHS data source collects information on population, health and nutrition to provide indicators of important issues of family welfare, maternal health, child health, and nutrition. This data source has been used to estimate the various determinants of malnutrition which will help us in finding the interrelated issues of poverty and malnutrition. The Table 1 shows the various indicators of malnutrition estimated using logistic regression for NFHS –II and NFHS –III. For sake of parsimony only NFHS-III will be discussed. The model is estimated for underweight

¹² Period 1 refers to the rate of change in Malnutrition from NFHS-I to NFHS-III and rate of change in poverty from NSS 50th round to NSS 61st round using URP estimates.

¹³ Period 2 refers to the rate of change in Malnutrition from NFHS-II to NFHS-III and rate of change in poverty from NSS 55th round to NSS 61st round using MRP estimates.

children aged below three years of age measured by weight for age z-score less than -2 S.D taken as zero if true otherwise 1 for weight for age z-score more than -2 S.D.

Table 13 Parameter estimates of logistic regression of underweight for children in NFHS-II and NFHS-III

Factors	NFHS-III				NFHS-II			
	B	S.E	Sig.	Exp(B)	B	S.E	Sig.	Exp(B)
Place of residence (Ref Rural)								
Urban	.09	.06	.14	1.10	.16	.09	.07	1.18
Sex of child (Ref Female)								
Male	-.10	.05	.04	.91	-.19	.07	.01	.83
Source of lighting (Ref Not electrified)								
Electrified	-.11	.08	.15	.89	-.24	.22	.28	.79
Mother's education (Ref Illiterate)								
Literate, < middle	-.12	.07	.11	.89	-.07	.11	.57	.94
Middle school	-.24	.07	.00	.79	-.32	.11	.00	.73
High school and above	-.32	.15	.03	.73	-.14	.15	.34	.87
Father's education (Ref Illiterate)								
Literate, < middle	-.11	.08	.15	.89	.09	.16	.56	1.10
Middle school	-.15	.07	.03	.86	.03	.14	.81	1.03
High school and above	-.35	.11	.00	.71	-.30	.15	.05	.74
Birth interval	-.09	.00	.01	.90	-.19	.05	.00	.82
Birth order (Ref 1)								
2-3	-.04	.06	.51	.96	.11	.11	.28	1.12
4-5	.20	.09	.03	1.23	.18	.19	.34	1.19
Age at delivery	-.09	.01	.72	.98	-.03	.08	.70	.97
Age of child	.06	.00	.00	1.07	.34	.02	.00	1.41
Mother's work status (Ref Not working)								
Working	.03	.05	.61	1.03	-.02	.10	.87	.98
Place of delivery (Ref Home)								
Institution	-.07	.06	.24	.93	.09	.08	.28	1.09
Sex of Household head (Ref Female)								
Male	.13	.08	.12	1.14	.03	.14	.82	1.03
Caste (Ref General)								
Schedule Caste	.14	.07	.05	1.15	.27	.11	.02	1.31
Schedule Tribe	.04	.09	.63	1.05	.55	.18	.00	1.74
OBC	.15	.06	.02	1.16	-.02	.08	.85	.98
Religion (Ref Hindu)								
Muslims	.08	.07	.29	1.08	.05	.10	.60	1.05
Christians	-.34	.11	.00	.71	-.76	.22	.00	.47
Others	-.01	.13	.92	.99	-.49	.17	.01	.62
Source of drinking water (Ref Piped)								
Open source	.01	.06	.80	1.01	.09	.08	.26	1.10
Others	.07	.21	.75	1.07	-.13	.46	.78	.88
Type of toilet facility (Ref Flush toilets)								
Pit Toilets	-.30	.10	.00	.74	.08	.10	.44	1.08
Others/ no facility	.00	.07	.98	1.00	.13	.10	.20	1.13
Mother's BMI	-.09	.01	.00	.91	-.09	.01	.00	.92

Month of first Ante natal check up (Ref: No visit)								
1 month	-.16	.91	.86	.86	-.14	.93	.88	.87
2-3 months	-.11	.91	.90	.89	.08	.92	.93	1.08
3-5 months	-.12	.91	.90	.89	.09	.92	.92	1.10
Above 5 months	-.19	.91	.84	.83	.12	.92	.90	1.13
Number of Ante natal visit (Ref: 1-2 months)								
3-4 months	-.10	.06	.13	.91	.10	.10	.30	1.11
5-10 months	-.14	.07	.05	.87	-.22	.10	.03	.80
Gave green leafy to the child (Ref: no)								
Yes	-.05	.06	.38	.95	-.05	.08	.55	.95
Wealth Index	-.16	.03	.01	.85	-.21	.03	.00	.81
Constant	1.3	.27	.00	3.8	.62	1.01	.54	1.86
Num of Obs	8731			10102				
-2 Log likelihood	10379			11638				
Cox & Snell R ²	.15			0.17				
Nagelkerke R ²	.20			.22				

Source: Own calculation from NFHS-II and NFHS-III.

Table 13 shows negative relationship between malnutrition and mother's education level, father's education level, birth interval (proxy for family planning), and wealth index. These variables try to bring down the malnutrition level among the children. The variables such as work status, age of the child, birth order have a positive relationship with malnutrition. The table also shows that the probability of malnutrition decreases with male child, not working mother with better source of water and toilet facility, birth interval and higher education of the parents. Among the social background only SC and OBC are significant. As compared to the general social group the SC and OBC have high probability of being malnourished. Among the religious groups, Christians have lower probability of being underweight as compared to Hindus. The results of other religious groups are insignificant. The first month of antenatal check up, age at delivery, place of delivery, place of residence, sex of the household head, consumption of green leafy vegetable, mother's and fathers' education level below middle school and source of lighting have no effect on the being underweight as their coefficient and expectation are insignificant. These results reinforce the need for spreading awareness of supplementary diet after weaning, good

hygiene, proper health care facility to mothers and family planning for improving the nutritional level of the children.

3. SUMMARY

This study examines the inter-linkages between economic growth, poverty and malnutrition to see if economic growth leads to decline in number of poor and subsequently if this reduction in poverty has been significant enough to improve the nutritional status and decrease in malnutrition level in India. Over the last five decade, accelerating economic growth, increase in food production has made the country self-sufficient in food production. Despite high economic growth and adequate food availability the decline in poverty has not been steep enough nor has the declining food energy intake showed any improvements. The study found that there has been a declining trend in calorie consumption, protein intake and cereal based dietary intake in India. The shift toward non –cereal consumption and increasing non-food expenditure made us question if the choice of declining calorie intake has been voluntary or the people have been forced to hunger due to increasing food prices and targeted food subsidy programs. The analysis showed an indication toward voluntary choice but the self reporting hunger and the increasing number of people reporting zero meals contradict the voluntary view.

The malnutrition level in India shows a different picture. In spite of the sustained intervention to prevent and combat child malnutrition, the study found that there has been no substantial improvement especially since 1998-99 to 2005-06. Low intake of vegetables, fruits, lack of iron and other micro-nutrients are increasing the risk of morbidity and mortality as undernutrition begins in-uterus, gets aggravated in childhood due to poor feeding practice, inequitable intra-family distribution of food and lack of health care. The new trend that has emerged is of over-nutrition especially among the women which shows lack of nutrition education and awareness among the people. The nutritional intake and anthropometric indicators reinforces the debate about limitation of calorie intake as nutritional indicators to measure malnutrition levels. The inconsistencies between different data sources also create uncertainty about the recent trends in anthropometric indicators.

However the surprising observation found is the prevalence of malnutrition among the non-poor household and the stagnancy in proportion of underweight

children from 1998-99 to 2005-06 though poverty declined from 26 percent in 1999-00 to 21 percent 2004-05 by mixed recall period. The results of semi-log model showed prevalence of malnutrition even if poverty was eradicated in all three rounds. Thus we can conclude that poverty is not the major factor affecting the malnutrition level in India as the link between poverty and malnutrition is weak though being positive.

Whatever progress in economic growth led poverty reduction has been made has not been translated into commensurable increase in food/calorie intake or significant decline in undernutrition. The widening socio-economic inequality, illiteracy and some of the demographic characteristics becomes an obstacle in path to curb malnutrition level in India. Thus the paper concludes a positive connect between poverty and malnutrition at all India level though some state show disconnect between the two. The important fact to note is that reduction of poverty is not the only factor required to improve the nutritional level among the children and adults. The nutritional status does not only depend upon the economic background of the household but also other factors such as social, religious background, birth interval, parents education level also play important role to bring changes in malnutrition level among the non-poor households. The priority of the policy makers should aim at reducing the number of poor as well as food and nutrition security to provide the access to basket of food which can provide balanced diet with adequate micro and macro nutrients as defined in poverty line definition. The policy intervention should be targeted toward removing the malnutrition level with improved health and nutritional status of the population with special targeting to include the poor's in the policy design and economic growth should be inclusive to remove regional, socio-economic inequity and literacy which not only reduce poverty but also improve nutritional level in India.

ACKNOWLEDGMENT

I am grateful to Prof. S.K Thorat, Prof. Amaresh Dubey and Varghese K. for their insights and comments. Errors, if any, will solely be my responsibility.

REFERENCES

- Bhat, P., Mari, N., & Zavier, F. (1999). Findings of national family health survey: Regional analysis. *Economic and Political Weekly*, October 16-23, pp 3008-32.
- Dandekar, V. M., & Rath, N. (1971). Poverty in India. *Economic and Political Weekly*, January 2, & 9.
- Deaton, A., & Jean, D. (2002). Poverty and inequality in India: A re-examination. *Economic and Political Weekly*, September 7.
- Deaton, A., & Jean, D. (2009). Food and nutrition in India: Facts and interpretation. *Economic & Political Weekly*, 14 February.
- Government of India. (1993). *Report of the expert group on estimation of proportion and number of poor*. New Delhi: Perspective Planning Division, Planning Commission.
- (2000-01). Economic survey 2000-01. New Delhi: Ministry of Finance.
 - (2007). Poverty estimates for 2004-05. New Delhi: Press Information bureau, Planning Commission.
 - (2010-11). Economic survey 2010-11. New Delhi: Ministry of Finance.
 - (2012). Press note on poverty estimates 2009-10. New Delhi: Press Information bureau, Planning Commission
 - (2009). Report of The expert group to review the methodology for estimation of poverty. New Delhi: Planning Commission.
 - (2010). India country report :Mid-term statistical appraisal. New Delhi: Ministry of Statistics and Programme Implementation.
- Himanshu (2010). Towards new poverty lines for India. *Economic & Political Weekly*, January 2, Vol Xlv No 1, pp 38-48.
- Kumar, A. K. S. (2007). Why are levels of child malnutrition not improving? *Economic and Political Weekly*, Vol. 42, No. 15, April, pp 1337-1345.
- Meenakshi, J.V., & Vishwanathan, B. (2003). Calorie deprivation in rural India. *Economic and Political Weekly*, 38(4), pp 369-275.
- National Nutrition Monitoring Bureau. (1975). Report of the year 1975. Hyderabad: National Institute of Nutrition.
- (1991): Report of repeat survey (1988-90), Hyderabad: National Institute of Nutrition.
 - (1996). Nutritional status of rural population: Report of NNMB survey. Hyderabad: National Institute of Nutrition.
 - (1997). 25 years of National Nutrition Monitoring Bureau. Hyderabad: National Institute of Nutrition.
 - (1999). Report of second repeat survey-rural (1996-97). Hyderabad: National Institute of Nutrition.
 - (2000). Report on food and nutrient intake of individual (Rural). Hyderabad: National Institute of Nutrition.
 - (2002). Diet and nutritional status of rural population. Hyderabad: National Institute of Nutrition.

- (2005). Assessment of diet and nutritional status of individual and prevalence of hypertension in adult and anemia among men and women in rural communities. Hyderabad: National Institute of Nutrition.
 - (2006): Diet and nutritional status of individual and prevalence of hypertension in adult in rural areas. Hyderabad: National Institute of Nutrition.
- International Institute for Population Sciences (IIPS) and Macro International (2007) National Family Health Survey (NFHS-3), 2005–06: India. Volume I, Mumbai: IIPS.
- (2000) National Family Health Survey (NFHS-2), 1998–99: India, Mumbai: IIPS.
 - (1995) National Family Health Survey (NFHS-1), 1994-95: India. Bombay: IIPS.
- National Sample Survey Organization (1993-2010): Reports of NSSO quinquennial consumer expenditure survey, Department of Statistics. New Delhi: Government of India,
- Report No 405, Nutritional intake in India 1993-94. New Delhi: Government of India
 - Report No 508, Level and pattern of consumer expenditure 2004-05. New Delhi: Government of India
 - Report No. 471: Nutritional intake in India, 1999-2000. New Delhi: Government of India
 - Report No.540: Nutritional intake in India. New Delhi: Government of India
 - Report No 513, Nutritional intake in India 2004-05. New Delhi: Government of India
Retrieved from www.mospi.nic.in
- Pathak , P.K. (2009). Socioeconomic inequality in malnutrition in India, 1992-2005. Population Association of America (PAA) , USA, April 29-May 2.
- Pathak, P. K., & Singh, A. (2011). Trends in malnutrition among children in India: Growing Inequalities across different economic groups. *Social Science & Medicine*, Retrieved from doi:10.1016/j.socsci-med.2011.06.024
- Patnaik, U. (2007). Neoliberalism and rural poverty in India. *Economic & Political Weekly*, 28 July.
- Radhakrishna, R., & Ravi, C.(2004). Malnutrition in India: Trends and determinants. *Economic and Political Weekly*, Vol XXXIV, No 7, February 14-20.
- Radhakrishna, R., Rao, H., K., Ravi, C. & Reddy, B.S. (2004). Chronic poverty and malnutrition in 1990s. *Economic and Political Weekly*. 39(28), 3121-3130.
- Rajaram. S., Sunil, T. S., & Zottarelli, L.K. (2003). An analysis of childhood malnutrition in Kerala and Goa. *Journal of Biosocial sciences*, Vol. 35, Cambridge University Press, 335-351.
- Sen, A., & Himanshu (2004). Poverty and inequality in India: II: Widening disparities during the 1990', *Economic and Political Weekly*, Vol. 39, pp. 4361-4375.
- Sen, P (2005). Of calories and things: Reflections on nutritional norms, poverty lines and consumption behaviour in India. *Economic & Political Weekly*, 22 October.
- Subramanian, S (2005). The poverty line: Getting it wrong again. *Economic and Political Weekly*, Vol XLVI No. 48, November.
- Subramanyam M.A., Kawachi, I., Berkman LF, & Subramanian S.V. (2010). Socioeconomic inequalities in childhood undernutrition in India: Analyzing trends between 1992 and 2005. *PLoS ONE* 5(6): e11392. Retrieved from doi:10.1371/journal.pone.0011392
- Sukhatme, P.V., & Margen, S. (1981). Relationship between under-nutrition and poverty. *Indian Economic Review*, New Series, Vol. 16, No. 1/2 (January-June), pp 13-39.

Svedberg, P. (1999). 841 Million Undernourished? *World Development* Vol. 27, No. 12, pp. 2081-2098.

Tarozzi, A., & Mahajan, A. (2006). Child Nutrition in India in the nineties. *Economic Development and Cultural Change*, 55, pp 441-86.

Weiser, C.(2011). Determinants of the growth elasticity of poverty reduction: Why the impact on poverty reduction is large in some developing countries and small in others. *WIFO Working Papers*, No. 406, November. Retrieved from <http://www.wifo.ac.at/wwa/pubid/43042>

APPENDIX

Table A.1: MPCE classes by place of residence, 1993-94, 1999-00 & 2004-05 (in Rs).

MPCE Classes	50 th round		55 th round		61 st round	
	Rural	Urban	Rural	Urban	Rural	Urban
1	0 - 235	0 - 335	0-225	0-300	< 120	< 160
2	235 -270	335 - 395	225-255	300-350	120 - 140	160 - 190
3	270 - 320	395 - 485	255-300	350-425	140 - 165	190 - 230
4	320 - 365	485 - 580	300-340	425-500	165 - 190	230 - 265
5	365 - 410	580 - 675	340-380	500-575	190 - 210	265 - 310
6	410 - 455	675 - 790	380-420	575-665	210 - 235	310 - 355
7	455 - 510	790 - 930	420-470	665-775	235 - 265	355 - 410
8	510 - 580	930 - 1100	470-525	775-915	265 - 300	410 - 490
9	580 - 690	1100 - 1380	525-615	915-1120	300 - 355	490 - 605
10	690 - 890	1380 - 1880	615-775	1120-1500	355 - 455	605 - 825
11	890 - 1155	1880 - 2540	775-950	1500-1925	455 - 560	825 -1055
12	>1155	>2540	>950	>1925	> 560	> 1055

Source: NSS 50th, 55th, 61st, 66th round unit level data

Table A.2 Rural Food Consumption of BPL & APL class & percentage norm(2400 Kcal), State, 1993-94 to 2009-10

State	66 th round				61 st round			
	BPL	% of norm	APL	%of norm	BPL	%of norm	APL	%of norm
Andhra Pradesh	1776	74	2477	103	1550	65	2158	90
Assam	2029	85	2654	111	1686	70	2175	91
Bihar	1832	76	2315	96	1730	72	2285	95
Gujarat	1726	72	2480	103	1480	62	2026	84
Haryana	1655	69	2364	99	1577	66	2325	97
Himachal Pradesh	1851	77	2451	102	1696	71	2400	100
Jammu & Kashmir	2185	91	2632	110	1573	66	2401	100
Karnataka	1519	63	2010	84	1450	60	1948	81
Kerala	1465	61	2210	92	1279	53	2126	89
Madhya Pradesh	1600	67	2249	94	1599	67	2122	88
Orissa	1725	72	2193	91	1536	64	2100	87
Punjab	2069	86	2604	108	1692	70	2315	96
Rajasthan	1736	72	2422	101	1542	64	2309	96
Tamil Nadu	1959	82	2624	109	1689	70	2290	95
Uttar Pradesh	1548	64	2206	92	1399	58	1974	82
West Bengal	1299	76	2378	99	1762	73	2419	101

Table A.2 Rural Food Consumption of BPL & APL class & percentage norm(2400 Kcal), State, 1993-94 to 2009-10 (continues)

State	55 th round				50 th round			
	BPL	% of norm	APL	% of norm	BPL	% of norm	APL	% of norm
Andhra Pradesh	1377	57	2097	87	1474	61	2162	90
Assam	1581	66	2138	89	1715	71	2205	92
Bihar	1762	73	2400	100	1816	76	2528	105
Gujarat	1450	60	2060	86	1482	62	2141	89
Haryana	1575	66	2525	105	1762	73	2779	116
Himachal Pradesh	1975	82	2494	104	1836	77	2538	106
Jammu & Kashmir	1796	75	2665	111	2174	91	2582	108
Karnataka	1415	59	2150	90	1574	66	2288	95
Kerala	1259	52	2055	86	1399	58	2159	90
Madhya Pradesh	1645	69	2308	96	1741	73	2455	102
Orissa	1579	66	2142	89	1556	65	2174	91
Punjab	1788	74	2419	101	1859	77	2537	106
Rajasthan	1517	63	2436	101	1649	69	2521	105
Tamil Nadu	1746	73	2531	105	1861	78	2682	112
Uttar Pradesh	1292	54	1956	81	1419	59	2113	88
West Bengal	1839	77	2546	106	1881	78	2620	109

Source: NSS 50th, 55th, 61st, 66th round unit level data