INTER-STATE AND SOCIAL INEQUALITIES OF CHILD UNDERNUTRITION IN INDIA

Dissertation submitted to Jawaharlal Nehru University

in partial fulfilment of the requirements

for the award of the degree of

MASTER OF PHILOSOPHY

DHIRAJ BARMAN

CENTRE FOR THE STUDY OF REGIONAL DEVELOPMENT

SCHOOL OF SOCIAL SCIENCES

JAWAHARLAL NEHRU UNIVERSITY

NEW DELHI-110067

2011

Jawaharlal Nehru University

Centre for the Study of Regional Development

School of Social Science

New Delhi-110067

Date: 25 July, 2011

CERTIFICATE

This is to certify that dissertation entitled "**Inter-State and Social Inequalities of Child Undernutrition in India**", is my bona fide work for the degree of **Master of Philosophy**, and may be placed before the examiners for evaluation.

Dhiraj Barman

Dhiraj Barman

Forwarded By

Dr. Sachidanand Sinha	***Prof. Ravi Srivastava***
(Supervisor)	**(Chairperson)**
Centre for the Study of Reg. Dev. School of Social Sciences Jawaharlal Nehru University New Delhi-110067	Chairperson Centre for the Study of Reg. Dev. School of Social Sciences Jawaharlal Nehru University New Delhi-110067

Tel.26704463, Gram: JAYENU Fax :91-11-26742586, 26741504

To

Maa and Baba

"There are people in the world so hungry, that God cannot appear to them except in the form of bread".

-- *Mohandas K. Gandhi*

Acknowledgement

My first academic research work has finally accomplished! I take this as a special opportunity to express my heartiest gratitude to all those persons who helped me to articulate my thoughts into reality. Without their inspiration and support, perhaps my work would be incomplete. Firstly, I would like to express my sincere gratitude to my supervisor Dr. Sachidanand Sinha, whose critical suggestions, valuable inputs and support made this work successful. Today, I would like to thank him for all those priceless lectures during M.A days, which pulled my interest towards social geography and further to this area of interest on deprived social groups of India. I would also like to thank all my teachers of CSRD, JNU for their valuable support and encouragement, especial thanks to Prof. Butola and Prof. Vemuri. Prof. Butola has remained a great source of inspiration and encouragement since my M.A days. Thanks to Prof. Vemuri, who helped me in understanding the various dimensions of nutritional research aspects. I would like to present my sincere gratitude to my beloved and most respected two teachers Mr. Sumit Das and Mr. Parthapratim Roy, who have helped me during my difficult times.

I would also like to extend my sincere gratitude to the entire CSRD family, documentation unit of the centre, JNU library, for providing me necessary support in the research work. I will remain indebted to Debuda and Debabrata for their help in editing the final manuscript of this dissertation.

Special thanks to my best friend Sudipta. She always provides me the necessary help to her extent, does critical evaluation of my work and provides worthy moral support. Among the seniors Yadevandra and Pratap have helped me a lot, I have learned the use of SPSS and handling of the NFHS data from them. I would also like to thank my friend Ajit, as he always co-operated me and remained beside me when I needed the

most. I would also thank Tara, Keshri, Shewli, Sharda Prasad, Indranidi, Shantanuda for their encouragement during my work.

Lastly but most importantly, I place my sincere gratitude and respect to my most beloved parents, my ma and baba, who remained a constant source of inspiration throughout my life. The column of this acknowledgement would be incomplete if I do not acknowledge one of the sweetest person i.e. my elder sister, my Didi, who has always showered her love and care to me.

Dhiraj Barman

Contents

List of Tables

List of Figures

List of Maps

Abbreviation

ICDS	Integrated Child Development Services
LBW	Low Birth Weight
NCHS	National Centre for Health Statistics
NFHS	National Family and Health Survey
NSCHD	Non Scheduled (Population)
OBC	Other Backward Castes
RCH	Reproductive and Child Health
SC	Scheduled Caste
ST	Scheduled Tribe
SNP	Supplementary Nutritional Programme
WHO	World Health Organization
SCHD	Scheduled (Population)
MDG	Millennium Development Goals

Chapter-1

Introduction

1.1 Statement of the problem:

Undernutrition is considered as one of the major problems that the developing world is facing today. Millions of men, women and children are suffering from hunger and undernourishment. Lack of access to food causes thousands of deaths each year, while scores of people in the developing world die due to long term undernourishment. Child undernourishment which begins from the very early age of the baby is likely to affect their health throughout the life. It is not only detrimental to child's health but also to the country's economy, society and human capital. UNICEF[1] has estimated that presently 195 and 129 million children (under 5 years) in the developing world are suffering from stunting and underweight conditions respectively. South Asian region has persistently remained as the heartland for child undernutrition. According to the report, the proportion of undernourished children in India is one of the highest and the situation is even worse than some of the developing countries of Sub Saharan Africa. It contributes to the highest number of undernourished and low birth weight children among the developing world (31% stunted, 42% underweight, low birth weight 39%). The National Family and Health Survey (2005-06) suggests that in India about one half of children below 5 years of age were stunted (48%), one-fifth of them were wasted (19.8%) and four out of every ten children were reported to be underweight (42.5%). Chronic undernourishment among the socially and economically marginalized groups is widespread cutting across rural and urban areas and regions of India. Levels of undernourishment are found to be significantly higher among the Scheduled caste (hereinafter SC) and Scheduled tribe (hereinafter the ST) populations.

This dissertation analyses the problems and issues related to social and regional inequalities of child undernutrition in India. The analysis of the study is

[1]UNICEF (2009): *Tracking progress on child and maternal nutrition*; New York, USA, pp. 12-23.

based on the first, second and third rounds of National Family and Health Survey (NFHS) data.

The root cause of child malnutrition for developing countries is attributed to poverty[2]. Role of workload directly or indirectly may affect nutritional status of the over all population, as has been mentioned several scholars namely, Dasgupta[3], Radhakrishna[4]. In Indian context, according to Ramachandran[5], the linkages between undernutrition, poverty and several other aspects like food security, access to basic health care, amenities etc. are multidimensional in nature. Alderman[6] has noticed that in Asian context the percentage of decline of malnutrition is nearly half of the economic growth. It has also been observed in recent past that despite India's experience of very high economic growth the successive reduction in child and the overall undernourishment has been very dismal. Thus the term 'Asian enigma' coined by Ramalingaswami[7] to explain persistent level of malnutrition in South Asian region is also true in Indian scenario. According to Shivakumar[8] limited progress in ensuring universal health services and care to children, newborns, mothers and to women are important reasons behind the slow reduction of child malnutrition in India.

Child malnutrition in India is very high with widespread socio-economic and regional inequalities. Poor, rural population, slum dwellers and socially disadvantaged Scheduled populations (both SC/ST) are bearing tremendous burden of undernourished children. It has been observed that the growth profile and nutritional status among rural children is lower than their urban counterparts[9] . Wide cross

---

[2] Smith L. C. and Haddad L. (2000): *Explaining child malnutrition in developing countries: a cross- country analysis;* International Food Policy Research Institute, Washington, D.C., pp. 5-7.

[3]Dasgupta Partha (1997): "Nutritional status, the capacity for work, and poverty traps"*; Journal of Econometrics*, vol.77, no.1, pp. 5-37.

[4]Radhakrishna R (2005): "Food and nutrition security of the poor: emerging perspectives and policy issues"*; Economic & Political Weekly*, vol. 40, no. 18, pp. 1817-1821.

[5] Ramachandran P. (2007): "Poverty nutrition linkages"; *Indian Journal of Medical Research* 126; October, pp. 249-261.

[6]Alderman Harold (2005): "Linkages between poverty reduction strategies and child nutrition: an Asian perspective"; *Economic and Political Weekly,* vol. 40, no.46, November 12, pp. 4837-4842.

[7]Ramalingaswami, V, Johnson U and Rohde J. (1997): '*The Asian Enigma' in Progress of Nations*; UNICEF, New York.

[8]Shiva Kumar A. K. (2007): "Why are levels of child malnutrition not improving?"; *Economic and Political Weekly*, vol. 42, no. 15, pp. 1337-1345.

[9]Bharati P, Bharati S. et al (2009): "Growth and nutritional status of pre-school children in india: rural-urban and gender differences"; *Coll. Antropol.* vol. 33, no.1, pp. 7–21.

country study suggests that urban in comparison with rural has the lower level of malnourished children due to a series of favourable factors[10]. In Indian context, given the nature of social hierarchy, it is generally found that the socially disadvantaged scheduled castes population are the most vulnerable section, affected by multidimensional poverty and deprivation. On the other hand, Scheduled Tribes (ST), who are theoretically located outside the ambit of mainstream caste-based social structure are at the bottom of all development indices. ST population in India are historically neglected, at the same time their problem is also geographical. They inhabit in the most remote areas of the country, where the fruits of development seldom reach to them. The study by Baraik and Kulkarni[11] indicates that the level of infant mortality among the SC and ST population was substantially higher than the Non-scheduled population. Recent study has established the fact that scheduled (SC & ST) population in India has less access to health care facilities and their over all nutritional status is much lower[12]. Social inequality of child malnutrition between the SC, ST and the Non-Scheduled component has been studied by Sinha[13] and Mishra[14]. The former has raised several issues related to policies; while the later mainly has focused on socio-economic deprivation, which leads to higher level child malnutrition among the SCs and STs. Along with wide spread social inequality another aspect which is important from policy point of view is the widespread regional inequalities. The phenomenon of child malnutrition is found higher in few states in India. It is not only the poorer states, e.g. Bihar, Orissa, Madhya Pradesh; but few higher income states are also (e.g. Maharashtra, Gujarat) having higher child malnutrition level. Radhakrishna and Ravi[15] have observed that the lowest levels of malnutrition are

---

[10]Smith, L.C. et all (2005): "Why is child malnutrition lower in urban than rural areas? Evidence from 36 developing countries"; *World Development,* vol. 33, no.8, pp. 1285-1305.

[11]Baraik Vijay K. and Kulkarni Purushottam K. (2006): *Health status and access to health care services: disparities among the social groups in India;* working paper, Indian Institute of Dalit studies, vol. 1 no. 4, New Delhi.

[12]Roy T.K, Kulkarni S. and Vaidehi Y. (2004): "Social inequalities in health and nutrition in selected states", *Economic and political weekly*, vol-39. no.-7,Feb 14, pp. 667-683.

[13]Sinha Sachidanand (2005): "Reaching out to undernourished children: social inequities and policy perspectives"; *Journal of Health and Development*, vol. 1 no. 4, pp.71-90.

[14] Mishra R. N. (2006): *Dynamics of caste based deprivation in child under nutrition in India*; working paper, Centre for development studies, India (available at www.cds.edu).

[15] Radhakrishna R. and Ravi C. (2004): "Malnutrition in India, trends and determinants"*; Economic and political weekly,* vol-39. no.7, Feb: 14, pp. 671-676.

found in a few middle income states, like- Kerala, Tamil Nadu. According to Nair[16] other than poverty different socio-demographic factors are also associated with the regional difference of child malnutrition in India. Shivakumar[17] argues that the state level variations in health care services and access to health may be a possible explanation for it. The present study, therefore, attempts to address some of the pertinent issues associated with regional and social inequalities of child undernutrition in India.

1.2 Conceptual framework:

The conceptual framework has evolved from understanding the situations, in which undernutrition problems originates in the developing world. Poverty is the basic factor of undernutrition. Poverty, workloads and higher levels of morbidity among the poor working sections of the population creates 'poverty traps[18]' for them. Further, the vicious 'poverty traps' with the persistent undernourishment are also found to be 'inter-generational[19]' in nature. Extensive poverty and undernourishment causes ill health and lower nutritional status among the mother, which leads to intra-uterine growth retardation or foetal undernutrition. Therefore, as Ramalingaswami has mentioned that undernutrition mostly starts in the "mother's womb"[20]. Foetal undernutrition leads to low birth weights infants (hereinafter LBW). A LBW infant has higher chances to become undernourished than a child with normal weight at birth. Poverty, low nutritional status of the mother, numbers of siblings are the situations in which a new born child mostly sees his/her first surroundings. In addition, improper child care and feeding practices, poor access to basic health care facilities, inadequate supply of the safe drinking water, are some of the factors which

[16]Nair K R G (2007): "Malnourishment among children in India: a regional analysis"; *Economic and Political Weekly*, vol. 42, no.37, pp. 797-3803.

[17]Shiva Kumar A. K. *op. cit.*, pp. 1337-1345.

[18] Dasgupta Partha (2007): *Poverty traps: exploring the complexity of causation: 2020 focus brief on the world's poor and hungry people*; Washington, DC: IFPRI

[19] Caroline Harper, Rachel Marcus and Karen Moore (2003): "Enduring poverty and the conditions of childhood: life course and intergenerational poverty transmissions"; *World Development*, vol. 31, no.3, pp. 535–554.

[20] Osmani, S.R. (2001): "Hunger in South Asia: a study in contradiction"; *The Little Magazine*, vol. 2, pp. 35-40.

further aggravate the conditions of child undernutrition. Besides the above mentioned factors, the other aspects of child undernutrition are also socio-political in nature.

The conceptual framework of this study has been adapted from the work of Smith and Haddad[21]. The original framework was published by UNICEF[22]and subsequently modified by Engle, Menon, and Haddad[23]. This theoretical framework seems to be comprehensive and it allows better understanding of child undernourishment. This framework has incorporated both the biological and socio-economic causes of child malnutrition and it can be applied at both macro and micro levels. The framework recognizes three different types of factors leading to child undernutrition status i.e. immediate, underlying and basic determinants. Although, the factors are seems to be independent, but actually interlinked with one another. The immediate factors related to child undernutrition are child's dietary intake (i.e. consumption of food, types and quality of the food) and the child's health status. The immediate factors or determinants are mainly influenced by the several underlying factors for it. The underlying factors are manifestation of availability of three different resource bases, mainly at the household and community levels. Food security is necessary to lead healthy life for an individual. Therefore the resources necessary for that are food production and adequate income. Food can be also transferred from public distribution system of the government or by any other organization. Proper care for the children and mothers both are necessary. Care of the children such as feeding practices etc. also depends on the caregiver's i.e. mother's own health status, mental situation and her knowledge and beliefs, among several others. For ensuring good health of both the mothers and children it is also necessary that essential and adequate health care services are available within accessible distance. It is also necessary to ensure some other basic services such as sanitation, safe water, clean environment and proper living condition. The overall underlying determinants are mainly governed by one key determinant i.e. poverty. Finally all these immediate and underlying determinants of child undernutrition are mediated through certain basic

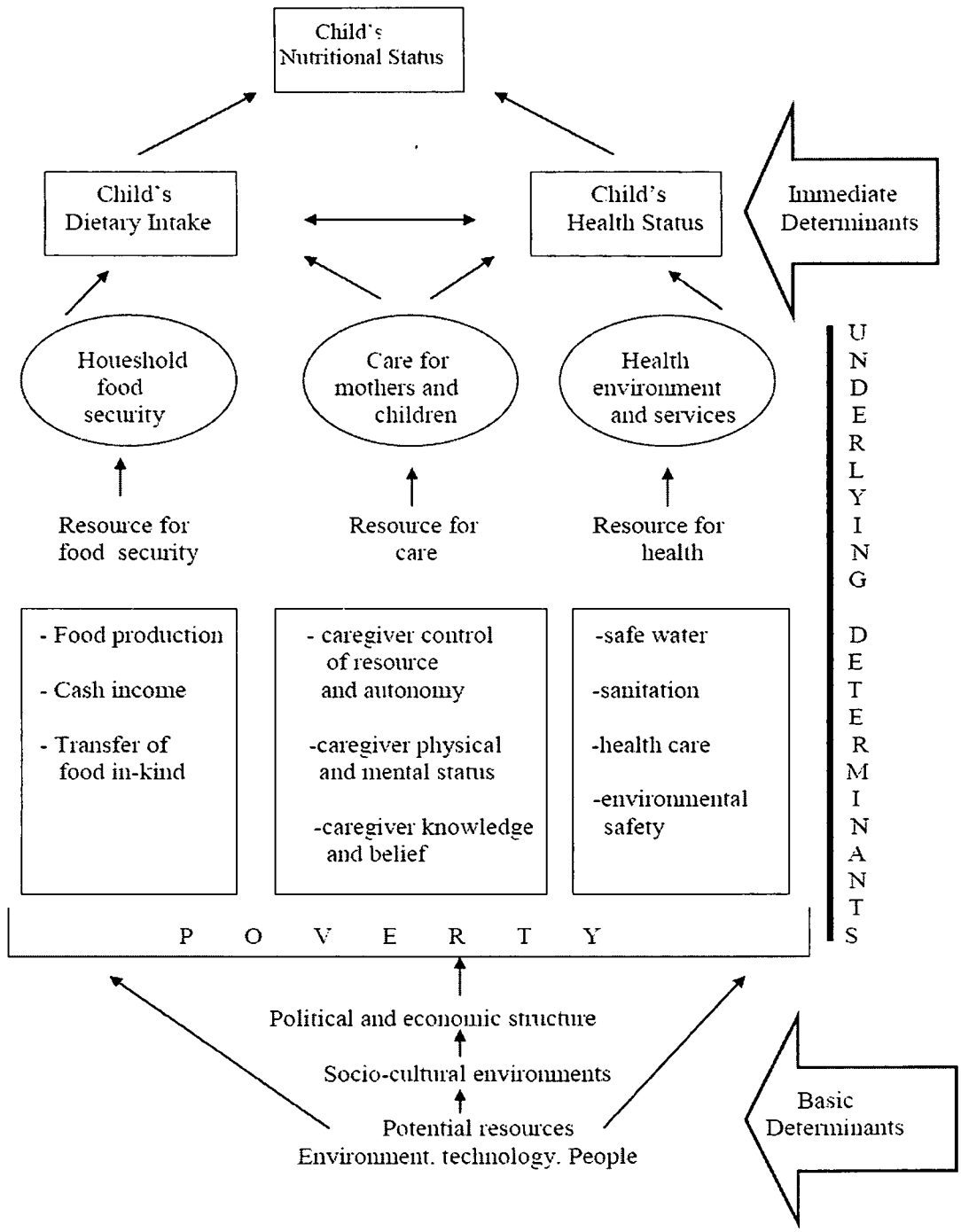
[21] Smith L. C. and Haddad L *op. cit.*, pp. 5-7.

[22] UNICEF (1990): *Strategy for improved nutrition of Children and women in developing countries;* pp. 22, New York.

[23] Engle, P., P. Menon, and L. Haddad (1999): "Care and nutrition: concepts and measurement"; *World Development, vol.* 27, no. 8, pp. 1309–1337.

determinates at the community level. Political economic structure; socio-cultural environment, and the potential and available resources i.e. environmental, technological and human and how they work have significant influence on prevalence of child undernutrition.

Conceptual Theoretical Framework of the study



Source: Smith L.C and Haddad L. 2000

The preceding theoretical and conceptual framework provides a clear idea about the multidimensional factors of child undernourishment. However, it does not offer direct explanation to the questions of social and regional inequalities. Therefore the above framework has to be linked with these two issues. In Indian context, the magnitude and severity of child undernutrition is more widespread among the Scheduled populations (both SC and ST), in comparision with the others social groups. There are vast empirical evidences, to suggest that SC and ST population are suffering from multiple deprivation and also exposed to various forms of discrimination in the public life. The undernourishment among SC and ST populations are primarily due to extensive poverty among them. Because of the higher levels of poverty and other underlying determining factors, like- household food security, care of the children, access to health and sanitation facilities etc. are also tend to effect. The framework thus provides conceptual understanding to this problem; however, explanation doesn't end here.

The persistent higher levels of poverty and undernutrition among the SC & ST population is also attributed to policy failures. Therefore the importance of political and economic factors also becomes important for understanding the causes of policy failures. The question of regional inequalities in child undernutrition can also be explained through this framework. There are certain Indian states where undernutrition levels are much higher in comparison to the other states or regions. The underlying reasons for differential policy outcomes may be located in the socio-political strucutures, and these must be subject to scrutiny, both at the macro and micro levels. ICDS and other key health programmes are not producing the desired results in terms of reduction in the child undernutrition levels, mainly because in many states have not implemented the programmes keeping the specific social and economic characteristics in mind.[24].

[24] For example: according to the FOCUS survey, in most of the backward states in India ICDS, especially supplementary nutrition programmes are not only functioning properly. *Focus on children under six* (2004) is available at www.righttofoodindia.

1.3 Significance of the study:

The question of inequities in public health sphere is gaining importance across the world. Child health and undernutrition are major areas, where the need for such research is now being seriously felt. In developing countries' scenario inequalities in all forms exist; between rural-urban, rich-poor and among the different social groups in forms of various classes and castes. Study on health inequities across the different social groups is important in order to understand the extent of the problems. Policies can be recommended only after understanding the sources and the nature of the problems. Child health and nutritional inequalities are intrinsically linked with the larger socio-economic inequalities, which exist among the different social groups. In India widespread inequalities among the different social groups prevail in different spheres of well-being (e.g. education, health, living standard etc.). In Indian context the problems are deeply entrenched due to caste-based social and economic stratification. Poverty and overall deprivation among the weaker section of population (SC/ST) lead to higher level of child undernutrition among them. An undernourished child has higher chances to remain undernourished and ill throughout his/her entire life. The undernourished poor working class people have the higher morbidity rate, thus they remain frequently absent from their jobs. At the same time, they also have lower productivity. Therefore, they never get freed from the 'poverty trap'[25]. Further the vicious cycle of poverty, undernutrition and ill-health is such that it leads to "intergenerational poverty and undernutrition"[26] (i.e. it gets transferred to the next generation of population). So, the social inequalities in child undernutrition have far reaching consequences as it is intergenerational in nature. Therefore, it is necessary to address the issues related to social inequalities of child undernutrition situation in India. Likewise, the understanding of the regional inequalities of child undernutrition is also important from policy point of view. The burden of undernutrition in India is found mostly in few states of the country and the problem is persistent in nature. It is imperative to study why such states are unable to address the problem of persistent undernutrition.

[25]Dasgupta Partha *op. cit.*

[26]Caroline Harper, Rachel Marcus and Karen Moore *op. cit.*, 535–554.

1.4 Objectives of the study:

This study seeks to achieve the following objectives:

1. To understand the nature of regional and social inequalities of child undernutrition in India.
2. To study the pattern of inequalities among the rural-urban and slum-non slum population in terms of child undernutrition in India.
3. To understand the reasons responsible for the persistent nature of regional and social inequities in the levels of child undernutrition in India.
4. To understand as to why in spite of ever expanding coverage of the Integrated Child Development Services (ICDS) the level of child undernutrition among the rural and scheduled populations has not achieved the desired outcomes.
5. To suggest some policy recommendations in order to reduce the regional and social inequalities of child undernutrition in India.

1.5 Research questions:

1. Whether the SC and ST populations are more vulnerable to child undernourishment in comparison to the Non-Scheduled (OBC & Other) components of the population?
2. How rural-urban, regional and locational dimensions affect the degree of social inequalities? The preliminary assumption is that in the rural areas the vulnerability pertaining to undernutrition among SCs and STs would be much higher compared to the non-scheduled population.
3. Whether the regional inequalities in child undernourishment primarily depend on the income of the state (i.e. poorer the state higher would be the level of undernourished children)?

4. To see whether the overall rural and slum dwellers would have relatively higher levels of undernourished children in comparison to their urban and non-slum counterparts?

5. Whether both regional and social inequities of child undernutrition are the results of larger socio-economic inequalities and deprivations in India?

6. Is the Integrated Child Development Service in India good enough for reducing the level of child undernutrition situation?

1.6 Data sources:

Different rounds of National Family and Health Survey (NFHS) data have been used in this study. The NFHS is has been carried out by International Institute of Population Sciences (Mumbai), with the financial and technical support given by USAID (United States Aid for International Development) and ORC Macro. The 1st and 2nd rounds of NFHS survey conducted during 1992-93 and 1989-99 respectively. The first two NFHS rounds provide information on undernutritional status, for the children below 4 and 3 years of age. NFHS-3, conducted during 2005-06 provides undernutritional information for the children up to 5 years of age. The NFHS dataset is useful because it is cross sectional and covers a wide range of issues related to different socio-economic aspects of the households like wealth, standard of living, amenities etc, along with the health and nutritional status of the mothers and children.

Various other data sources, and reports viz. Census 2001, Reserve Bank's data, Reproductive and Child Health Report (2002-04), Ministry of Women and Child Development (Govt. of India) data on ICDS expenditure, Health Information of India (2005) etc. also have been used here. Census of India provides information on the projected population for the child age group 0-5 for the year 2006. This has been useful while calculating the per-capita expenditure on ICDS for the financial years 2006-07. 'State Finances: A Study of Budgets of 2009-10, Reserve Bank of India', is Government of India's annual publication, which provides information on government health expenditure. The financial expenditure across the states may be of crucial importance for the state level variations in the levels of child malnutrition.

Ministry of Women and Child Development, Government of India, provides information on the financial expenditure of ICDS. The information on antenatal care has taken from Reproductive and Child Health Report (2002-04). Information on health care services has gathered from Health Information of India (2005).

Limitations of the data: While dealing with the wide variety of information some limitation in the existing data sources also has been found. According to the Supreme Court of India[27], each settlements of the country should have an ICDS centre. Further there are also some norms on numbers of children per ICDS centre. However, Ministry of women and child development (GOI) does not provide informations both on the actual geographical (settlement wise) and population wise coverage of the ICDS. Only information has been given on the numbers of beneficiaries on different programmes under the ICDS. Therefore, it is one of the important parameter which is lacking to the ICDS related information. To cope with this problem, the geographical coverage and utilization of ICDS has measured from the NFHS-3 dataset. Beside how different social groups are benefiting from the ICDS all over the country has not been taken care of. For policy research point of view such informations are need to be incorporated by the concerned department.

1.7 Methodology:

The analysis of the study is mainly based on the moderate level undernourishment, which is below minus (-) 2 standard deviation from the median value according international growth standard of WHO[28]. In order to study the above research questions the following methodology has been adopted in this study.

Statistical Technique:

(1) Uni-variate: The uni-variate has been carried out in order to study the percentages of distribution of underweight, stunted and wasted children. It has also been used for

[27] In a Public Interest Litigation (WP No. 196/2001) filed by PUCL the Supreme Court has given the following directions by order dated 28-11-2001 with regard to the ICDS Scheme: ordered that every settlement must have a disbursement centre and that every child aged 0-6, every pregnant and nursing mother and every adolescent girl be covered under the ICDS. Information is available at www.righttofoodindia.

[28] WHO (2006): Child growth standards and the identification of severe acute malnutrition in infants and children.

showing the percentages of the other important socio-economic and demographic indicators. Different scales were followed in order to show the uni-variate descriptive statistics such as at the aggregate level, state and city wise.

(2) Bi-variate: The bi-variate methods also have been carried out in this study. Cross tabulation method, in which each row or column is a frequency table for the observation of specific categories in one variable with another variable, was carried out. Cross tabulation shows the association of the variables. It is a useful tool for doing comparison between groups and across the sub categories under one variable.

(3) Multivariate: Multivariate logistic regression has been used in this study in order to know the net effect of the predicted variables on the response variable. The response or dependent variable in the study were dichotomous in nature i.e. Yes=1, No=2 kind. The dichotomous dependent variable for this study; stunting, underweight and wasting were recoded as Yes=1, No=0 for using them into the logistic model.

The most commonly used methods in dealing with such dichotomous predicted variables are:

(a) The Linear probability model (LPM)

(b) The Logit model or Logistic regression model

(c) The Probit model

(a) LPM is a special form of multiple regression model, used where the dependent variable is dichotomous in nature. The equation of LPM is,

$$C\hat{} = a+bE$$

Where, C^ denotes the values of C as predicted by the regression. E intercepted as the probability (P) that with a specific value of E, the value of C will be 1.

Although LPM deserve simplicity but it seriously suffered from different drawbacks. Such as, the difficulty of interpreting probabilities (P) >1 and < 0; heteroscedasticity, and constant marginal effects.

(i) The estimated probability can take values from negative or more than unity.

(ii) The linearity assumption is violated seriously. According to this assumption the expected values of C at any given value of 'e' falls on the regression line. But this is not possible for part the parts of the line for which P<0 or P> 1. In these regions the observed points are either all above the line or below the line.

(iii) The homoscedasticity assumption is seriously violated. The variance of the C values tent not to behave properly either. The variance of C tends to be much higher in the middle range of E than at the two extremes, where the values of C are either mostly zeroes or ones. In this situation the equal variance assumption is untenable.

(iv) Because the linearity and homoscedasticity assumptions are seriously violated, the usual procedures for hypothesis testing are in valid.

(v) R^2 tends to be very low. The fit of the line tends to be very poor. Because the response variable can assume only two values, 0 and 1, the C values tend not to cluster closely about the regression line.

Therefore we need such a probability model, where P increases as the value of predictor increases, but the value of P never goes beyond 0-1 interval and also the relationship between P and the predictor variable is non-linear. Probit and Logit model fulfil these two criteria. There are many scholars who believe that use of Probit or logit model is a matter of individual choice since both gives almost similar kinds of results[29] [30]. Logit model is preferred for here because of personal convenience.

The basis of the logistic regression is,

$$P = \frac{1}{1+ e^{-Z}}$$

Where, P is estimated probability, Z denotes the predictor variable and e is the base of natural logarithm with a value of 2.7183. The probability (P) ranges between 0 to 1

[29] Gujrati N Damodar and Sangeetha (2009): *Basic Econometrics;* 4th Edition, pp-627-628, Tata Mcgraw Hill Education Private Limited, New Delhi.

[30] Long, S. (1997) has mentioned that ' the choice between the logit and probit models is largely one of convenience and convention, since the substantive results are generally indistinguishable'. *Regression Models for Categorical and Limited Dependent Variables*, pp-83, Thousand Oaks, CA, Sage Publications.

and that of P is non-linearly related to Z [31]. After simplifying the above equation we got,

$$e^{-Z} = \frac{P}{1+P}$$

Now the P/ (1=P) is termed as odds ratio. The quantity of log P/ (1=P) is called the log odds or logit of P. Therefore the newt equation becomes,

$$\text{Logit } P = Z$$

In the multivariate logistic regression for the 'n' number of variables the equation is

$$P = \frac{1}{1+ e^{-(b0+b1x1+b2x2+.....bnxn)}}$$

Where, $b0$ is 'intercept' and b_1, b_2, b_3, and so on, are called the "regression coefficients" of $x1$, $x2$, $x3$ respectively. Each of the regression coefficients describes the size of the contribution of that risk factor. A positive regression coefficient means that the explanatory variable increases the probability of the outcome, while a negative regression coefficient means that the variable decreases the probability of that outcome; a large regression coefficient means that the risk factor strongly influences the probability of that outcome, while a near-zero regression coefficient means that that risk factor has little influence on the probability of that outcome.

(5) Correlation-Matrix: Correlation matix has been used in this study to understand the effect different socio-economic factors responsible for the regional inequalities of child undernutrition problems.

(6) Maps and diagrams: To represent the geographical distribution of child undernutrition in India different types of maps has been used. With the help of Arc GIS- 9.3 these maps were produced. To represent the findings, different types of graphs and diagrams has been used in this study.

[31] Gujrati N Damodar and Sangeetha *op. cit.*, pp-608-610

1.8 Organization of the study:

The present study comprises seven chapters. Introductory chapter deals with the problems and issues concerning undernutrition of child in India. It covers the conceptual framework, objectives, research questions, data sources and methodology of the study. The second chapter is an overview of relevant literature, classified and critically appraised in order to underline the current state of knowledge, methodological issues and research gaps on the vital question of child undernutrition. The third chapter presents a statistical overview of child undernutrition situation in India. The patterns of regional and social inequalities in child undernutrition are analysed in the following two chapters. The sixth chapter attempts to explain the reasons for the social and regional inequities in the levels of child undernutrition in India. Statistical methods such as logistic regression model and correlation matrices have been used wherever necessary. Finally, in the last chapter besides presenting a summary of conclusions, some policy issues have been addressed and recommendations made on the basis of the findings of this study.

Chapter-2

An Overview of Literature

2.1 Introduction:

This chapter comprises of the reviews of available literature on the problems and issues of child malnutrition in the developing countries in general and India in particular. Literatures from both published and unpublished sources related to above mentioned issues have been included here. The review primarily incorporates the literatures for the period from 1960 onwards up to 2010. Despite huge volumes of resourceful works, relatively fewer attempts have been made in order to establish the linkages among various aspects related to child undernutrition. Therefore, the focus of the literature review is primarily to understand the intrinsic linkages between different aspects child undernutrition problems in the third world countries. The specific focus has been laid on India with reference to the question of social and regional inequality. The entire review has been arranged into two broad sections. The first section deals mainly with the definitional and measurement issues of child malnutrition. The second part explores the issues of multiple interface of child malnutrition in relation to the various socio-economic aspects. Further, both these two sections are thematically classified into different sub-sections based on the major research themes.

2.2 Defining (child) malnutrition:

Nutritional status reflects the state of individual health in relation to the body nutrients at any point of time. Thus 'Mal'-nutrition implies unbalanced nutritional status of an individual or a group. Precisely, malnutrition can be defined as "a pathological state resulting from a relative or absolute deficiency or excess of one or more essential nutrients"[1]. It comprises not only undernutrition (due to infection and inadequate food

[1]Jelllife, D.B. (1966): *The assessment of the nutritional status of the community*; WHO Monograph, Series No.53, pp. 8.

intake) and overnutrition (due to over consumption of food) but also includes imbalance (disproportion among different nutrients) and specific deficiency or deficiency diseases (lack of particular nutrient in body).

Malnutrition applied to children of various age groups has been defined or described in many ways. "To summarize the common points, child malnutrition may be defined as a pathological state resulting from inadequate nutrition, including undernutrition (protein-energy malnutrition) due to insufficient intake of energy and other nutrients; over-nutrition (overweight and obesity) due to excessive consumption of energy and other nutrients; deficiency diseases due to insufficient intake of one or more specific nutrients such as vitamins or minerals"[2].

Nutritional status of a population according to Martorell[3] can be considered both as an 'input" as well as "output" indicator. Children's nutritional status as an "output" tends to capture the overall situations in which children are born and brought up in a population. There is no doubt about the fact that nutritional status of the children is a good yardstick for over all socio-economic development and its importance has been recognized by international organizations like WHO, UN etc.

2.2.1 Assessment of nutritional status among children:

There are different methods commonly used for the assessment of nutritional status of a population (including men, women and children). These are:

A. Clinical examination: Clinical examination is the most essential tool for evaluating the nutritional status of an individual or a group. It is the most simple and practical method of nutritional assessment.

"There are number of physical signs, some specific and many non-specific, known to be associated with states of malnutrition. When two or more clinical signs characteristic of a

[2] Ge Ke-you chang su-ying (2001): "Definition and measurement of child malnutrition"; Biomedical and environmental sciences, vol.40, no. 4.pp. 283-291.

[3] Martorell Reynaldo and Teresa J. (1984): "Malnutrition, morbidity, and mortality"; *Population and Development Review,* vol. 10, Supplement: Child Survival: Strategies for Research, pp. 49.

deficiency disease are present, simultaneously their diagnosis significance is greatly enhanced"[4].

Clinical Assessment has the following drawbacks: (i) malnutrition cannot be quantified on the basis of clinical signs; (ii) there are many deficiencies which cannot be identified through physical signs. Clinical assessment is often useful for identifying the acute malnutrition situation.

B. Biochemical evaluation: Different biochemical or laboratory tests enable a medical practitioner or nutritionist to assess the nutritional status of a patient. The most commonly used methods are haemoglobin estimation (for anaemia/iron deficiency), stool and urine tests (for intestinal parasites, chronic dysentery etc). Biochemical methods are the most precise ways of diagnosing a problem, but it is quite expensive and time consuming. They cannot be applied for the nutritional assessment of the entire population, even for large sample based surveys.

C. Functional assessment: Apart from clinical assessment and biochemical tests, functional assessment is another diagnostic tool to determine the nutritional status of population. Functional assessment of children which shows how different organs of the body are functioning and that gives indication of their nutritional and health status. Even body temperature of the children gives indication of her/his physical metabolism[5].

D. Anthropometry: Anthropometry is an accepted method for defining the nutritional status of children. Anthropometry is the most common and widely used method of nutritional assessment and can be performed by non-medical personnel in the field with some training. Anthropometric indicators are based on some physical measurements like weight, height, mid upper arm (MAC) circumference, sitting height or chormic indices, skin fold thickness etc. For the young infant children the additional measurement includes head and chest circumference. Anthropometry is useful as it captures the physical growth of body.

---

[4]Park K. (2005): *Park's textbook of preventive and social medicine*; Banarashidas Bhanoot Publishers, Jabalpur, 18th edition, pp. 471.

[5]Brooke O. G. (1972): "Influence of malnutrition on the body temperature of children"; *The British Medical Journal*, vol. 1, no. 5796, pp. 331-333.

The 'basic measurements' used in anthropometry are age, weight and height. Weight is a measure of total body mass and it is sensitive to any change that occurs in the amount of body fluids, muscle, fat storage, skeleton etc. The circumference of the arm captures the muscle development and fat size in that area. Skin fold captures fat restoration in the body. How entire skeleton or body structure develops (growth) can be captured through measurement of height and chest circumference. Generally skeletal changes such as height, chest circumference does not change rapidly. Any normal deviation in the skeletal structures requires relatively a long time. So, the measures of height and chest circumference tend to capture long time undernourishment; while the body weight, arm circumference, fat accumulation as skin fold tend to respond quickly with a situation of acute malnutrition [6].

2.2.2 Anthropometric indicators: All the 'basic measurements' i.e. body weight, height, and upper arm circumferences (also the age of the person) are one form of physical parameters. They are basically absolute measures, "Each of these variables provides one piece of information about a person. When they are used together they can provide important information about a person's nutritional status. When two of these variables are used together they are called an index"[7].

---

[6]WHO working group (1986): "Use and interpretation of anthropometric indicators of nutritional status"; *Bulletin of the World Health Organization,* vol. 64, pp. 929-941.

Rajesh Kumar, Arun K. Aggarwal and Sharad D. Iyengar (1996): "Nutritional status of children: validity of mid-upper arm circumference for screening undernutrition"; Indian Pediatrics; vol.33, no-3.pp.189-196

C.Gopalan, M, Chaterjee (1985): *Use of growth charts for promoting child nutrition: a review of global experiences;* special publication series 2, Nutrition foundation of India.pp. 1-33.

Gorstein J.J. et al. (1994): "Issues in the assessment of nutritional status using anthropometry"; *Bulletin of the World Health Organization*; vol. 72, no.2, pp 273-283.

Jelliffe DB (1969): "The arm circumference as a public health index of protein calorie malnutrition of early childhood"; J Trop Pediatr , vol. 15, pp.179-189.

Bern C, Nathanail L, (1995): "*Is mid-upper arm circumference a useful tool for screening in emergency settings?": Lancet*, 345, pp. 631-633.

[7]Cogill Bruce (2001): *Anthropometric indicators measurement guide; food and nutrition technical assistance project;* (E-book), Academy for Educational Development, Washington D.C.,Website: www.fantaproject.org pp. 11.

Different kinds of anthropometric indices (indicators) are used to capture malnutrition of various natures. The most commonly used anthropometric indicators for child malnutrition are weight-for-age, height-for-age and weight-for-height. The three indices are used to identify three nutritional conditions: underweight, stunting and wasting.

These indicators (indices) are having some biological properties.

"An index may be thought of as a biological concept; one can usefully discuss the different biological meanings of indices such as weight-for-height and height-for-age. An indicator would represent a social concept; one can discuss its value, e.g., its sensitivity and specificity, for a particular application"[8].

a. Weight-for-age: Low weight-for-age index identifies the condition of being underweight, for a specific age. The advantages of this index are that it may reflect both past (chronic) and/or present (acute) under nutrition, although it is unable to distinguish between the two.

Underweight: Underweight, based on weight-for-age, is a composite measure of stunting and wasting and is recommended as the indicator to assess changes in the magnitude of undernutrition over time.

b. Height-for-age: This index is an indicator of past undernutrition or chronic malnutrition. It cannot measure short term changes in undernutrition. For children below 2 years of age, the index is referred as length-for-age; and for above 2 years of age, the index is termed as height-for-age. Deficits in length-for-age or height-for-age are signs of stunting.

Stunting: Low length-for-age, stemming from slow physical growth of the foetus and the child which results in a failure to achieve expected length as compared to a healthy, well nourished child of the same age, is a sign of stunting. Stunting is an indicator of past growth failure. It is associated with a number of long-term factors including chronic

[8]WHO working group; *op. cit.*, pp. 929-941.

insufficient protein and energy intake, frequent infection, sustained inappropriate feeding practices and poverty. [9] .

c. Weight-for-height: This index helps to identify children suffering from current or acute undernutrition or wasting and is useful when exact ages are difficult to determine. Weight-for-length (for children under 2 years of age) or weight for- height (for children over 2 years of age) is appropriate for examining short-term effects such as seasonal changes in food supply or short-term nutritional stress brought about by illness.

Wasting: Wasting is the result of a weight falling, significantly below the weight expected from a child of the same length or height. Wasting indicates current or acute undernutrition resulting from failure to gain weight i.e. actual weight loss. Causes of weight loss include inadequate food intake, improper feeding practices, disease and infection or more frequently, a combination of these factors. Wasting in a child and a population group can change rapidly and shows marked seasonal patterns associated with changes in food availability or disease prevalence to which it is very sensitive. Because of its response to short-term influences, wasting may be used for screening. Weight-for-height is not advised for evaluation of change in a population since it is highly susceptible to seasonality.[10]

d. Mid-upper arm circumference (MUAC): MUAC is relatively easy to measure and a good predictor of immediate risk of death. It is used for rapid screening of acute undernutrition from 6-59 months age range. MUAC can be used for screening in emergency situations but it is not typically used for evaluation purposes.

A. References and Standards:

In construction of anthropometric indices references, standards and cut-offs are the methods which are commonly being used. Their basic purpose is to provide an international standard for the measurement undernourishment among the young children. It has been observed, that across the world rate of growth are among the healthy young

[9]Cogill Bruce *op. cit.*, pp.11.

[10]Ibid: pp. 12.

children similar. Therefore, some international standards and reference are normally being followed for measurement purposes and which are applicable across the world.

"A reference is a device for grouping and analysing data. Thus the average weight of a group of children has no meaning unless they happen to be exactly the same age, whereas the average value of the index 'weight-for-age' does have meaning. For the construction of such an index a reference population is necessary"[11].

"References are used to standardize a child's measurement by comparing the child's measurement with the median or average measure for children at the same age and sex" [12].

Basically standards and references are very much interrelated. In some literature they have been separately used (such as in WHO[13], Gorstein[14]) and in some others, they have been used as a unified concept (such as by Bruce Cogil[15]). The basic principle behind formulation of standards and references is to provide an international reference point or standard from where comparisons can be made.

"Use of a single international reference population allows comparison of results among different nutrition and health studies and, thus, greatly assists the interpretation of results"[16].

The most commonly used standards and references are as follows:

a. NCHS reference standards: Most commonly used reference standard was developed by the U.S. National Center for Health Statistics (NCHS) and is recommended for international use by the World Health Organization. The reference population chosen by

[11]WHO working group; *op. cit*

[12]Cogill Bruce *op. cit.,* pp.39.

[13]WHO working group; *op. cit*

[14]Gorstein J.J. et al. (1994): "Issues in the assessment of nutritional status using anthropometry"; *Bulletin of the World Health Organization*; vol. 72, no.2, pp 273-283.

[15]Cogill Bruce *op. cit*

[16]Dibley J. Michael et al. (1987): "Interpretation of Z-score anthropometric indicators from the international growth reference"; *American Journal of Clinical Nutrition*; vol. 46, pp. 749.

NCHS was statistically valid for any random population of healthy infants and children. Available evidences suggest that until the age of approximately 10 years, children from well-nourished and healthy families throughout the world grow approximately at the same rate and attain the same height and weight. The NCHS reference standards are available for the children up to 18 years old, but are most accurate when limited to the use for the children up to the age of 10 years.

Questions have frequently been raised about the validity of the US population based NCHS reference standards by several scholars and international organizations like WHO[17], Cutberto Garza and Mercedes De Onis [18].There were several reasons which questioned the validity of NCHS growth standards. Mainly because (i) huge deviation was observed when it was compared with the samples from other ethnic backgrounds; (ii) growth standards for the infants should be based on the well breastfed infants, but U.S. based NCHS standards don't possess such quality.

b. WHO's new growth standards (2006): Due to dissatisfaction with NCHS growth standards, WHO now has proposed a new growth standard for the children[19]. This new Growth standard is now internationally recommended.

B. Quantifying undernutrition: different scales or cut-off's

Quantifying undernutrition for a population in terms of prevalence or incidence, are based on the consideration of several scales, usually termed as the cut-off's. Based on these scales undernutrition levels are quantified from the statistical distribution of the collected anthropometric indices. Three different cut-off's or scales, commonly used in anthropometric measures are:

a. Percentiles
b. Percentage of the median
c. Standard deviation units or Z-scores

---

[17]World Health Organization (1995): *An evaluation of infant growth: the use and interpretation of anthropometry in infants*; vol.73, no. 2, pp. 167.

[18]Cutberto Garza and De Onis Mercedes (1997): "Time for a new growth reference"; *Pediatrics*; vol.100, no. e8.pp-1-2

Cutberto Garza and De Onis Mercedes (1999): "A new international growth reference for young children"; *American Journal of Clinical Nutrition;* vol. 70, pp. 169S–72S.

[19] WHO (2006): Child growth standards and the identification of severe acute malnutrition in infants and children

All these cut-offs or scales possess some statistical properties and they have abilities to measure undernutrition from the collected samples. Among these, the most commonly used cut-off is Standard deviation units or Z-scores, which is -2 standard deviations, irrespective of the indicators used. This means children with a Z-score for underweight, stunting or wasting, below -2 SD are considered moderately or severely malnourished (in case it is below-3SD). All though these cut-offs are separately used but they are statistically interrelated and can be interchangeably used.

C. Classification of undernutrition: Malnutrition has been classified on the basis of various biological considerations and is usually done through using different cut-offs. The important classification systems are as follow:

a.Gomez classification: In their classic work Gomez and others[20] It was widely popular in 60's and 70's. Now very few countries use this classification. It was applied to weight-for-age or underweight indicator and was based on percentage median of the NCHS standard. Malnutrition was graded on different categories.

b. RTH (Road to health) system: The Road-to-Health (RTH) system is typically seen in clinic-based growth-monitoring systems. Like the Gomez classification systems, RTH also typically uses weight-for-age[21].

c. WHO's classification: WHO uses standard deviations as cut-off's for any of the three popular indices mainly weight-for-age, weight-for-height and height-for-age. For any of these three indices below -2SD and below -3 SD would respectively mean moderate and severe undernutrition. These classifications are now widely used across the world in different anthropometric and Demographic-Health-Surveys (DHS).

[20]Gomez, F. et al. (1956): "Mortality in second and third degree malnutrition"; *Journal of tropical pediatrics and African child health*, vol-2, pp.77-83.

[21]Cogill Bruce *op. cit.*, pp.42.

2.3 Socio-economic factors and child undernutrition:

Child malnutrition is a complex topic, perhaps a much discussed one, next to the problems of poverty and hunger in the developing world. The complex nature of such topic also brings in the multidimensional aspects of it. Locating the problems and issues of child malnutrition in the various interfaces of Demographic (e.g.-population pressure, family size, birth order, inter and intra-household allocation of resources and various other dimensions), Economic (e.g.- poverty, food security, income inequality etc.), Social (e.g.- women status and gender inequality, social environment-education, work status, health; social inequality), Cultural (e.g.- different socio cultural taboos related to child feeding and childcare practices), Environmental (e.g.- natural endowments and its relation to poverty and economic well-being, nutritional-environmental epidemiology and aetiology), Epidemiological and Etiological (e.g.- different aspects of infection, child diseases, maternal and child health related issues), Political (e.g.- state interventions, importance of child malnutrition as becoming a political agenda like human rights, right to work/ right to food in political-democratic space, the role of civil societies), Policy issues (e.g.- budgetary allocations, priority issues- target groups and target areas), Geographical (e.g.- how poverty, wellbeing, hunger, food security and all other social-cultural aspects varies across the geographic space) and many other aspects including anthropological, historical and so on, essentially makes it much more complex . In academic discourse, a huge volume of works have already been contributed on malnutrition from different field of studies - ranging from nutrition science to economics and from demography to medicine. In the successive sections we shall focus on understanding the problems of child malnutrition in an interdisciplinary framework.

2.3.1 Demographic aspects of child undernutrition:

Third world's and demographic conditions constitute one of underlying basis for child undernutrition. In the developing countries of Asia and Africa pressure of population has been often referred as the main cause for widespread poverty, hunger, food insecurity, slow economic growth and stagnant overall developmental processes. At the background there are some demographic factors which directly or indirectly affect the child malnutrition in the developing world.

A. Maternal health and nutrition status of children:

Mother and child both are inseparable and can be viewed as one 'biological unit'. The prevailing health and nutritional condition of women is also the key determining factor for the health and nutrition status of infants and children. Maternal health and nutritional status can affect child's health both as an 'endogenous factor', as well as an 'exogenous factor' of child's health. In their famous analytical framework of child mortality Moseley and Chen[22] have tried to link maternal factors with child health; e.g. age, parity etc. It has been widely documented that the health and nutritional status of mothers during their pregnancy determines the health and nutrition of the baby. Studies have suggested that, improper health and nutritional status of mothers may result in pregnancy outcomes like foetal undernutrition, intra-uterine growth retardation, intra-uterine mortality, miscarriage, preterm birth, low birth weight and maternal and infant mortality.

From 1950's onwards attempt has been made to link maternal nutritional status with pregnancy results and child health. Maternal nutritional status may adversely affect the health and nutrition of a newly born baby. Nutritional stress during gestation and in the period of pregnancy as more prevalent among the women in low socio-economic strata affects the foetal tissue development, which mostly leads to low birth weight[23]. Lower nutritional status among the pregnant women measured in BMI, significantly affects their pregnancy outcomes and hence nutritional status of their children[24]. It is probably the iron deficiency, anaemia among the pregnant women which affect the preterm birth and foetal growth[25]. According Black, Allen and Onis et al. [26] maternal short stature and iron deficiency anaemia increase the risk of death of the mother at the time of delivery, accounting for at least 20% of maternal mortality. There are fewer evidences suggesting the effect of maternal undernutrition on the volume or composition

---

[22]Moseley and Chen (1984): "An analytical framework for the study of child survival in developing countries"; *Population and Development Review,* vol. 10.

[23]Venkatachalam P. S. (1962): "Maternal nutritional status and its effect on the newborn"; *Bulletin of World health organization*, vol. 26, pp. 193-201.

[24]WHO (1995*): Maternal anthropometry and pregnancy outcomes: a WHO collaborative study;* Bulletin of World Health Organization; 73, pp. 32–37.

[25] Allen H. L. (2001): "Biological Mechanisms That Might Underlie Iron's Effects on fetal growth and preterm birth"; *American Society for Nutritional Sciences.*vol.131, pp. 681s-689s.

[26]Black E. Robert, Allen H. L., De Onis Mercedes et al. (2008): "Maternal and child undernutrition: global and regional exposures and health consequences"; *Lancet*, January 17. vol. 371, no. 9608, pp. 243-260.

of breast-milk unless undernutrition is severe. The concentration of some micronutrients (vitamin A, iodine, thiamin, riboflavin, pyridoxine, and cobalamin) in breast milk is dependent on maternal nutritional status and intake. So the risk of infant undernutrition is increased by maternal nutritional deficiency. This factor is most evident in the case of vitamin A, where the content in breast milk is the main determinant of infant nutritional status. Maternal supplementation with these micronutrients increases the amount of those elements secreated in the breast milk, which can improve infant nutritional status[27].

The maternal nutritional status (BMI and anaemia) in Indian and south Asian context has been extensively studied. Study in Bangladesh, has shown that both the pregnant and non-pregnant women are suffering severely from widespread anaemia, low BMI and different micro nutrient deficiencies[28]. In India mostly the rural women including those belonging to lower socio-economic strata and engaged in manual works are the most sufferers of such deficiencies[29]. Insufficient nutritional intake has been found among the women with low nutritional status and anaemia[30]. According to WHO anaemia is a serious public health problem in the developing countries and significantly contributes maternal and child mortality[31]. Recently WHO[32] has estimated that more than 1.67 billion people are affected by iron deficiency or anaemia, which corresponds to 24.8% of the world population, of which most affected groups are pregnant women, pre-

[27]Allen H. L. *op. cit.,* pp. 681s-689s.

Agarwal K.N. et al.(2006): "Prevalence of anaemia in pregnant & lactating women in India"*; Indian J Med Res*, vol. 124, August, pp 173-184

Bentley M.E. and Griffiths P.L. (2003): "The burden of anemia among women in India"; *European Journal of Clinical Nutrition,* vol. 57, pp.52–60

Pathak Priyali, Kapil Umesh, Kapoor K. Suresh et al (2004): "Prevalence of Multiple micronutrient deficiencies amongst pregnant women in a rural area of Haryana"; *Indian Journal of Pediatrics,* vol. 71, no.7. pp.1007-1014.

[28]Ziauddin Hyder SM, Persson Lars-AÊ ke, Chowdhury AMR et al (2000): "Anaemia among non-pregnant women in rural Bangladesh"; *Public Health Nutrition*; vol. 4, no. 1, pp. 79-83.

[29]Bentley M.E. and Griffiths P.L. (2003): "The burden of anemia among women in India"*; European Journal of Clinical Nutrition*, vol. 57, pp.52–60..

[30]Pathak Priyali, Kapil Umesh, Kapoor K. Suresh et al (2004): "Prevalence of multiple micronutrient deficiencies amongst pregnant women in a rural area of Haryana"*; Indian Journal of Pediatrics*, vol. 71, no.7. pp.1007-1014.

[31]World Health Organization (1992): *The prevalence of anaemia in women: a tabulation of available information.* Maternal Health and Safe Motherhood Programme; Geneva, Switzerland.

[32]WHO (2008): *Worldwide prevalence of anaemia 1993–2005*; WHO Global Database on Anaemia.

school children, low-birth weight infants, other women of child-bearing age, the elderly and school-age children. Most of anaemic people of the world live in the Africa and South-East Asia. According to National Family and Health Survey-3 (2005-06) overall 55% women of the reproductive age group (ever married) in India were anaemic. So, the overall nutritional status of population and specially women both pregnant and lactating mothers significantly affect the nutritional status of the children in the developing world in general.

B. Low birth weight (LBW): Widespread low birth weight alone is a significant contributor to child morbidity and child mortality in the developing world[33]. Low birth weight has been defined by WHO as a birth weight less than 2500g. Low birth weight is governed by two major factors, namely duration of gestation or pre-maturity and intrauterine growth rate[34]. According to C. Gopalan[35] low birth weight in the developing countries is mostly due to preterm birth, which is mainly because of maternal ill health and nutritional status. The low birth weight children are having the higher chances of being malnourished in the childhood and throughout their life. It has been observed in several cohort studies that low birth weight children mostly have low educational attainment, lower health status as compared to those who were born with a normal weight[36].

---

[33]McCormick. M.C.(1985): "The contribution of low birth weight to infant and childhood morbidity"; *New England Journal of Medicine*, 312, pp. 82-90.

Saugstad, L.F. (1981): "Weight of all births and infant mortality"; *Journal of Epidemiology and Community Health*; vol.35, pp.185-191

Kramer M.S., Victoria C. (2001): Low birth weight and peri natal mortality; in Semba RD, Bloem MW edited *Nutrition and Health in Developing countries*, Human Press. pp-57-68.

[34]Kramer M.S (1987): "Determinants of low birth weight: methodological assessment and meta-analysis"; *Bulletin of World Health Organization*, vol. 65, no. 5.pp.663-737.

[35]Gopalan C. (1994): Low birth weights: significance and implications; in. Sachdev H.P.S and Chowdhary Panna edited *Nutrition in Children: Developing Country Concerns,* Dept. of Pediatrics, Maulana Azad Medical College, New Delhi.

[36]Hack Maureen, Daniel J. Flannery, Mark Schluchter et al. (2002): "Outcomes in young adulthood for very-low-birth-weight infants"; *The New England Journal of Medicine*, vol. 346, no. 3.pp.149-157.

_____ et. al. (1993): "Health of very low birth weight children during their first eight years"; *Journal of Pediatrics*, vol.122, pp. 887-892.

C. Birth interval and birth-order: In many demographic and public health studies attempt has been made to link birth interval and birth order with child undernutrition. Birth interval is the length of time between a child's birth and a previous or subsequent sibling's birth. Longer spacing between two births allows for the optimum use of the parent's time and resources for each child, which in turn, may improve child's health. Analysing the data of nineteen national demographic and health surveys Sommerfelt[37] has found that children born less than 24 months compare to those born more than 24months after a previous sibling are physically shorter. Study by Mozumder et. al.[38] on Bangladeshi children also have found the potential impact of birth interval on child undernutrition, i.e. lower birth interval affects the health of the children.

Birth order also has been identified as one of the factors affecting the child health and nutritional status. Susan Horton[39] in late nineties has found the negative impact of high birth order on health and nutritional status of children in Philippines. It has been found that children from earlier sibling positions are advantaged relative to those from born later. Various reasons can be placed for this, for example household resource availability and the time for child care may shrink with increasing birth order in the family; side by side more chances of spreading infections may also increase etc.

D. Family Size and intra-household allocation of resources: The impact of family size on undernutrition has been studied by Donald and Haydee[40] in Santo Dominigo. Family size may have both positive and negative impacts on child health and nutritional status. As has been observed taking care of children in most of the developing countries is performed by many other family members, additional members in the family thus serve as an asset for the sound upbringing of a child. However large family can push pressure on income and intra household allocation of resources. Intra-household allocation of

[37]Sommerfelt, A.E. (1991): *Comparative analysis of the determinants of children's nutritional status*; paper presented at the Demographic and Health Surveys World Conference, Washington, DC, August5–7, pp.9.

[38]A.B.M. Khorshed Alam Mozumder et. al. (2000): "The effect of birth interval on malnutrition in Bangladeshi infants and young children"; *Journal of biosocial Science*; vol. 32, pp. 289–300.

[39]Susan Horton (1988): "Birth order and child nutritional status: evidence from the Philippines"; *Economic Development and Cultural Change*, vol. 36, no. 2, pp. 341-354.

[40] Donald W. MacCorquodale and Haydee Rondon de Nova (1974): "Family size and malnutrition in Santo Domingo"; *Public Health Reports*; vol. 92, no. 5 , pp. 453-457.

resources may also affect child nutritional status in different ways. In the South Asian context it may reflect different dimensions, e.g. class, caste and gender[41]. Gender biased allocation may affect the mother's health and nutritional status of the family, which in turn can affect the nutritional status of children. Several social values-attitudes are also attached with it, apart from family income and family size.

2.3.2 Economic aspects of child undernutrition:

Undernutrition is the result of different forms of economic deprivation- poverty, hunger, food insecurity, low income, inequality etc. And as a consequence the poor and the marginalized have lower intake of nutritious food, less access to health and sanitation facilities which make them become unhealthy and malnourished. Such synergic linkages among the different forms of economic deprivations and undernutrition have been repeated in most of the economic literature related to hunger, poverty and undernutrition [42]. According to Smith & Haddad[43] poverty forms the basic underlying cause of under nutrition in the developing world. While poverty is the basic cause of undernutrition, undernutrition also leads to poverty in the developing countries. Widespread poverty in

---

[41]Miller D. Barbara (1977): "Social class, gender and intra household food allocations to children in South Asia"; *Social Science Medicine*; vol.44, no. 11, pp. 1685-1695.

[42]Dasgupta Partha (1997): "Nutritional status, the capacity for work, and poverty traps"; *Journal of Econometrics*, vol. 77; pp. 5-37.

_____ (1998): "The economics of poverty in poor countries"; *The Scandinavian Journal of Economics,* vol. 100, no. 1.pp. 41-68.

_____Dasgupta Partha (2007): *Poverty traps: exploring the complexity of causation: 2020 focus brief on the world's poor and hungry people*"; Washington, DC: IFPRI.

_____Sukhatme P. V. (1980): "Nutrition policy: need for reorientation"; *Economic and Political Weekly*, vol. 15, no. 26, Jun. 28, pp. 1101-1105.

_____Sukhatme P. V. (1981): "Measuring the incidence of undernutrition: a comment"; *Economic and Political Weekly,* vol. 16, no. 23, Jun. 6, pp. 1034-1036.

_____Behrman R. Jere, Alderman Harold and Hoddinott John (2004): *Hunger and malnutrition: copenhagen consensus – challenges and opportunities*; challenger Paper.

_____Ravallion Martin (1990): "Income effects on undernutrition"; *Economic Development and Cultural Change*, vol. 38, no. 3, pp. 489-515.

[43]Smith L.C. and Haddad L. (2000): *Explaining child malnutrition in developing countries: a cross- country analysis*; International Food Policy Research Institute, Washington, D.C.

developing countries makes people ill fed and eventually leads them to become undernourished. These undernourished poor working class people have the higher morbidity rate, thus they remain frequently absent from their jobs. At the same time they also have lower work output. As a consequence they never get freed from this 'poverty trap'[44]. Furthermore, the vicious cycle of poverty, undernutrition and ill-health is such that it leads to "intergenerational poverty and undernutrition"[45] (i.e. transferred into the next generation of population). The intergenerational transfer of poverty and undernutrition in most developing countries 'starts mostly in mother's womb' (used by S. R. Osmani[46]) in the form of foetal undernourishment. Foetal undernourishment leads to Low Birth Weight infants (Below 2500 gm). The Low Birth Weight infants have high chances of death and morbidity and at the same time throughout their early childhood and often through their entire life they remained malnourished which eventually makes them low productive in their jobs[47]. Other than poverty, income inequality and persistent low income in primary sector are other reasons for undernutrition in general. The wide bodies of empirical literature suggest that economic inequality in terms of living standards, access to basic health care facilities are the major underlying causes of child undernutrition across the different regions of the world. Larreaa and Kawachi[48] have shown that income inequality is the important cause for child malnutrition in Equador. Zhuo Chen et al. [49] have found that income inequality is one of the basic constraints for improving malnutrition status among the children in China. Michel Nelson's[50] work has shown that even in England though a small number of children are malnourished but they

[44]Dasgupta Partha (2007); *op. cit.*.

[45]Harper Caroline, Marcus Rachel and Moore Karen (2003): "Enduring poverty and the conditions of childhood: life course and intergenerational poverty transmissions"; World Development ,vol. 31, no. 3, pp. 535–554,

[46]Osmani, S.R. (2001): "Hunger in South Asia: a study in contradiction"; *The Little Magazine,* vol. 2, pp. 35-40.

[47]Gopalan C. (1994): Low birth weights: significance and implications; in. Sachdev H.P.S and Chowdhary Panna edited N*utrition in Children: Developing Country Concerns,* Dept. of Pediatrics, Maulana Azad Medical College, New Delhi.

[48]Carlos Larreaa,, Ichiro Kawachi(2005): "Does economic inequality affect child malnutrition? The case of Ecuador"; *Social Science & Medicine*: vol. 60, pp. 165–178.

[49]Chen Zhuo, Eastwood B. David, YEN T. Steven (2007): "A decade's story of childhood malnutrition inequality in China: Where you live does matter"; *China Economic Review,* vol. 18, pp. 139–154.

[50] Nelson Michael (2005): "Childhood nutrition and poverty"; *Proceedings of the Nutrition Society*, vol. 59, pp. 307–315.

are from poor households. Study by Rathavuth Hong, James E Banta et al.[51], and Rathavuth Hong and Vinod Mishra[52] have shown that wealth inequality leads to the childhood undernutrition among the Combodian and Bagladeshi children. The children from the poor households are at the greater risk of being undernourished (two to three times more) as compared to the wealthy families.

For understanding the economic aspects of undernutrition at the macro level many economists have tried to use economic growth represented by national income (GDP) as a criterion. Studies have shown that due to higher income inequality in the developing countries growth in national income does not lead to reduction in undernutrition. It has been noticed by Ramalingaswami[53] that "Asian Enigma" in the form of malnutrition has not got reduce at an expected level in response to growth in developing economies. How far economic growth leads to reduction of undernutrition level in the developing countries has been studied by World Bank[54]. The study suggests that even sustained economic growth in many developing countries does not ensure the reduction in child undernutrition until proper health and nutritional intervention are adopted by these countries. Alderman[55] has noticed that in Asian context the percentage of decline of malnutrition is nearly half of the economic growth. Behrman and Rosenzweig[56] have reported that cross-country variation in per capita GDP is inversely with the percentage of low birth weight (LBW, <2.5 kg,) and is consistent with almost half of the variation in the percentage of births that are LBW across countries. Stephan Klasen[57] also has found such

---

[51] Hong Rathavuth, Banta E. James and Betancourt A. Jose (2006): "Relationship between household wealth inequality and chronic childhood undernutrition in Bangladesh"; International Journal for Equity in Health, open access journal, available at http://www.equityhealthj.com/content/5/1/15.

[52] _____and Mishra Vinod (2006): "Effect of wealth inequality on chronic undernutrition in Cambodian children"; *Journal of Health Pouplation and Nutrition*, Mar; vol. 24, no. 1, pp. 89-99.

[53]Ramalingaswami V, U Johnson and J Rohde (1997): 'The Asian Enigma' in Progress of Nations; UNICEF, New York.

[54] L. Hadded, Alderman H. et al. (2003): "Reducing child malnutrition : how far does income growth take us ?"; *The world bank economic review,* vol.17, no. 1, pp 107-131.

[55]Alderman H. (2005): "Linkages between poverty reduction strategies and child nutrition: an Asian perspective"; *Economic and Political Weekly*, vol. 40, no. 46. November 12.pp.4837-4842.

[56]Behrman, J. and M. Rosenzweig (2004): "Returns to birthweight"; *Review of Economics and Statistics.*vol.86, no.2.pp.586-601.

[57]Klasen Stephan (2006): *Poverty, undernutrition, and child mortality: some inter-regional puzzles and their implications for research and policy; Discussion Paper No. 2509,* University of Göttingen and IZA Bonn.

interregional puzzles where persistent child undernutrition is not reducing although income growth is taking place all over. Cross country analysis by Alberto Gabriele et al.[58] using the homogeneous World Bank dataset have shown that child undernutrition and mortality indicators have strong but negative correlation with the GDP or per capita income. In Indian context child undernutrition from the perspective of economic incapabilities has been tried to explore by many scholars. Prema Ramachandran[59] has elaborately discussed the undernutrition problems as the consequence of income incapability at the different interfaces- poverty, food security, unemployment, work load etc. Shailen Nandy et al.[60] have shown that the different types of child undernutrition are highly correlated with respective mean standard of living, as calculated from the NFHS-2 dataset. All the above mentioned studies suggest that the poverty and income inequality are the underlying causes for child undernutrition in India. The contested arguments also have been found in Shivakumar's[61] paper. According to him poverty, income inequality and low income are more myths than the reality related to child undernutrition in Indian context. His explanation was child undernutrition in India is not only due to large scale poverty, but it is primarily contributed by other factors like child feeding and child care practices. In Indian context, malnourished children are not only found among the poor, but also among the rich. As very few are able to spend much time on feeding, children remain consuming lower calories even among the rich households. At the same time the problem is aggravated due to the absence of proper knowledge about the child feeding practices. According to Shivakumar [62] limited progress in ensuring universal health services and care to children, newborns and to mothers and women are important reasons for slow reduction of child undernutrition in India.

---

[58]Gabriele, Alberto and Schettino, Francesco(2007): *Child malnutrition and mortality in developing countries: evidence from a cross-country analysis*; Polytechnic University of Marche, University of Rome "la Sapienza" and UNCTAD-UN: Online at http://mpra.ub.uni-muenchen.de/3132/ .MPRA Paper No. 3132.

[59] Ramachandran Prema (2007): "Poverty nutrition linkages"; *Indian J Med Res*, no. 126, October, pp. 249-261.

[60]Nandy Shailen, Michelle Irving, David Gordon et al. (2005): "Poverty, child undernutrition and morbidity: new evidence from India"; *Bulletin of the World Health Organization*, March, vol. 83, no. 3.

[61]Shivakumar A.K. (2002): "Child malnutrition: myths and realities"; *Little Mgazine*, vol. 2, no. 6; available at: http://www.littlemag.com.

[62]_____ (2007): "Why are levels of child malnutrition not improving?"; *Economic and Political Weekly*, vol-42. No. 15, pp. 1337-1345.

2.3.3 Social aspects of child undernutrition:

Social aspects of undernutrition are divergent and complex in nature. The major social aspects related to childhood under nutrition can be discussed broadly in the following headings- A: women status and gender inequality; B: social wellbeing and child undernutrition (in terms of access to education, basic health and child care services such as I.C.D.S.) and C: social inequality and relative deprivation among the class, caste, race and religion in terms of different welfare aspects.

A. Women status, gender inequity and child under nutrition: In South-Asian context, child undernutrition is deeply influenced by the women status and gender inequities in the society. In 'Asian Enigma', Ramalingaswami[63] considers the overall low status of women as an important contributing factor to the persistent child undernutrition in the South-Asia. In one of his essay Amartya Sen[64] has mentioned that the neglect of women in general leads to maternal undernutrition, which has far reaching impacts on child health and nutrition. Understanding the importance of women status in child health and nutrition in South-Asia, IFPRI (International Food Policy and Research Institute[65]) has given emphasis on it. Women status can be simply define as the "women's power relative to the men's in the society, both within household and in community[66]". Women status greatly affect the access to education, basic health facilities, income and wages, knowledges and practices, in the family decision making process and importantly on decision for child's health. According to IFPRI, if women and men have equal status in South-Asia, with all other factors held as it is, the percentage of underweight children would decline from 46 to 33 percent—a reduction of 13.4 million malnourished children. In South-Asian context, the multiple links between gender discrimination and child undernutrition also have been conceptualised most recently by Santosh Mehrotra[67]. He has tried to explore

[63]Ramalingaswami, V, U Johnson and J Rohde (1997): '*The asian enigma 'in progress of nations*; UNICEF, New York.

[64]Sen Amartya (2002) : "Hunger: old torments and new blunders"; *Little magazine*, vol. 2, no. 6. available at: http://www.littlemag.com.

[65]Smith L.C, Ramakrishna U, Ndiaye A. et al(2003): *The importance of women's status for child nutrition in developing countries*; International Food Policy Research Institute,Washington,Dc, Department Of International Health, Emory University

[66]Ibid.

[67]Mehrotra Santosh (2006): "Child malnutrition and gender discrimination in South Asia"; *Economic and Political Weekly*, March 11,pp. 912-918.

the complex linkages of it; women status has been linked with food security, child care, household income and directly with maternal and child health.

In the South-Asian context the gender bias mortality in general and child mortality in particular, suggest the existing gender inequities in the society. It has come out through the writings of different scholars[68]. Discriminations in food, child care, feeding practices against the girls has been identified by many scholars. Gender differences in child health across the developing world have been studied by Hill[69] using demographic and health survey data of 38 countries. Gender discrimination in the intra-household allocation of food and resources in Bangladesh has been studied in early 80's by Chen, Haq and D'Souja[70]. Sen and Sengupta [71] in one of their works also have mentioned such sex-bias in the society. Similar observation has been noticed in different anthropological studies. In Indian context recent study on this issue has done by Misra, Roy and Retherford[72], where they have explored the different contours of several types of gender inequities, the child hood feeding and health care facilitates and its implication on the nutritional status.

B. Social environment and child undernutrition: The social environment at the household and community level can also significantly affect the child health and nutritional status of the children. In social environment a range of factors can come into play, as for example importance of parental education and decision making regarding child health etc. Nutrition and health status of any individual has very often been tried to link with education and family decision makings process. This linkage also holds for Child undernutrition. Parental education plays a vital role in determining child health and nutritional status. In developing countries it is mother's education which is considered

---

[68] Basu Malwade Alaka (1989): "Is discrimination in food really necessary for explaining sex differentials in childhood mortality?"; *Population Studies,* vol. 43, no. 2 , pp. 193-210.

Sudha S. and Irudaya Rajan S. (2003): "Persistent daughter disadvantage: what do estimated sex ratios at birth and sex ratios of child mortality risk reveal?"; *Economic and Political Weekly,* vol. 38, no. 41 , pp. 4361-4369.

[69] Hill Kenneth and Upchurch M. Dawn (1995): "Gender differences in child health: evidence from the demographic and health surveys"; *Population and Development Review*; vol. 21, no.1 , pp. 127-151.

[70]Chen Lincoln C., Huq Emdadul, D'Souza Stan (1981): "Sex bias in the family allocation of food and health care in rural Bangladesh"; Population and Development Review, vol. 7, no. 1 , pp. 55-70

[71] Sen Amartya and Sengupta Sunil (1983): "Malnutrition of rural children and the sex bias"; *Economic and Political Weekly*, vol. 18, no. 19/21, Annual Number , pp. 855-864.

[72] Mishra Vinod, Roy T. K. and Retherford D. Robert (2004): "Sex differentials in childhood feeding, health care, and nutritional status in India"; *Population and Development Review*, vol. 30, no. 2, pp. 269-295.

more vital than that of father. Demographer Caldwell has discussed the impact of education on overall health and nutritional status of population in general and infants in particular in many of his papers. He has tried to convey that education, specially the mother's education is an important social-cultural determinant of child health[73]. Bicego & Borema[74] have studied the impact of maternal education on child health based on cross country dataset. Study on Bangaldeshi children to know the impact of mother's education has been done by Pradip K. Muhuri[75]. Study on Morrocco and in Mexico has been done respectively by Paul Glewwe [76] and Robert A. LeVine, Sarah E. LeVine et al.[77]. All the studies have suggested the positive impact of maternal education on child health and nutritional status in developing countries. Among the different social environmental factors, which have been explored by many scholars there is parental decision making on day to day child caring, feeding and health.

C. Socio-economic inequities and child undernutrition: Socio-economic status can be an effective explanation for inequities in public health. Social position itself can lead deprivation and exclusion to the marginal segments of the population in various sectors of well-being, which can lead to social inequalities in health, nutrition etc.

"Amid the legacy left by Durkheim is the idea that social conditions are central to the sustenance of life itself. In Suicide (Durkheim:1897), social factors weren't just a contributor to patterns of suicide but a central, irreducible determinant of those

---

[73]Caldwell, J.C. (1979): "Education as a factor in mortality decline"; *Popualtion Studies,* vol-33, no-9.pp.395-413.

_____ and P. Mcdonald (1982): "The influence of maternal education on infant and child mortality: levels and causes"; *Health Policy and education*, vol 2, pp. 251-267.

_____ (1990): "Cultural and social factors of mortality decline"; *Annals of the American Academy of Political and Social science,* no. 510, pp. 44-59.

[74]Bicego, T.G. and J.T. Boerma (1993): "Maternal education and child survival: a comparative study of survey data from 17 countries"; *Social Science and medicine*, vol- 36, no-9: pp-1207-1227,

[75]Muhuri Pradip K. (1995): "Health programs, maternal education, and differential child mortality in matlab, Bangladesh"; *Population and Development Review*, vol. 21, no. 4 (Dec), pp. 813-834

[76] Glewwe Paul (1999): "Why does mother's schooling raise child health in developing countries? evidence from Morocco"; *The Journal of Human Resources,* vol. 34, no. 1, pp. 124-159

[77]Robert A. LeVine, Sarah E. LeVine et al.(1991): "Women's schooling and child care in the demographic transition: a Mexican case study"; *Population and Development Review,* vol. 17, no. 3, pp. 459-496

patterns....Durkheim's Suicide represents a bold model for medical sociology with strong links to core sociological principles."[78]

Such a strong argument can also be the guiding principle in the context of persistent socio-economic inequities of health and nutrition in different parts of the world. Socio-economic inequality in undernutrition refers to the degree to which childhood undernutrition rates differ between more and less socially and economically advantaged groups[79]. Because societies are mostly found to be stratified based on class, caste, ethnicity and religion with varying economic status people have unequal well-being, access and opportunities. Among the different groups the disadvantaged section mostly faces several kinds of deprivation and discrimination. Therefore socio-economic inequality can be a major area of thrust from research and policy point of view.

Socio-economic, regional, and ethnic factors frequently play a significant role in nutritional outcomes in many developing countries. Study on socio-economic inequities of nutrition and health can be grouped into two categories: region specific macro studies and field based micro studies. Wagstaff [80] has shown that in the developing countries huge socio-economic inequity prevails in the level of child mortality. A recent World Bank's report[81] showed that in the developing countries a widespread socio-economic disparity exists in the overall health and nutritional status of the population. Study by Ellen Van de Poel et. al [82] have also suggested that socio-economic inequality of child undernutrition is pervasive among the developing countries. The study is based on cross country analysis of DHS data set of 47 developing countries of the world. Apart from "socio-economic inequity" in the developing countries "social inequity" in the form of racial, ethnicity, caste and religion based inequity has also been observed in many studies.

---

[78]Jo C. Phelan, Bruce G Link et al. (2004): "Fundamental causes of social inequalities in mortality: a test of the theory"; *Journal of Health and Social Behavior*, vol. 45 (September): pp. 265-285.

[79]Ellen Van de Poel et al. (2008): "Socioeconomic inequality in malnutrition in developing countries"; *Bulletin of the World Health Organization*, April, vol. 86, no. 4.pp. 282-291.

[80]Wagstaff A. (2000): "Socioeconomic inequalities in child mortality: comparisons across nine developing countries"; *Bulletin of the World Health Organization*, vol. 78, no. 1, pp. 19-29.

[81]Davidson R. Gwatkin, Shea Rutstein, Kiersten Johnson et. al. (2007): *Socio-economic differences in health, nutrition, and population within developing countries; World Bank*

[82]Ellen Van de Poel et al. *op. cit.*

Study by Carlos Larrea and Wilma Freire[83] have suggested that strong social inequities prevail in the level of child undernutrition in four South-American countries. The indigenous ethnic population and disadvantaged social groups are bearing the brunt of malnourished children. A South-African study[84] shows significant socio-economic differences in under-five child undernutrition (stunting and underweight) which is more pervasive among the poor. Stunting is found more predominant among the colured population in South-Africa. Among the whites all three anthropometric indicators i.e. underweight, wasting and stunting are found to be low. In Indian context social inequities mainly prevail among the scheduled (SC & ST) and non-scheduled population. The different dimensions of health disparities including infant health, morbidity and mortality among the social groups in India have come out from the study by Baraik and Kulkarni[85]. It shows that the children from scheduled population have higher morbidity and mortality rates (under five) in India. The scheduled children also have less immunization and access to other health priorities compared to the non-scheduled population. Caste based social inequity in child undernutrition has been addressed by Sinha[86] and Mishra[87]. Mishra has linked social inequalities of undernutrition with the caste based discrimination in India. Sinha has argued that overall regional development, rural infrastructure and functioning of ICDS are the mechanism through which social inequities and overall nutritional status of the children may be improved. A recent effort to measure the caste based child undernutrition has been done by EllenVan de Poel and Niko Speybroeck [88]. Using the 'DHS' dataset they have tried to decompose the socio-economic factors of undernutrition existed among the scheduled and non-scheduled population in India.

---

[83]Carlos Larreaa, Ichiro Kawachi(2005): "Does economic inequality affect child malnutrition? the case of Ecuador"; *Social Science & Medicine*; no. 60, pp. 165–178.

[84] Eyob Zere and Diane McIntyre(2003): "Inequities in under-five child malnutrition in South Africa"; *International Journal for Equity in Health, vol.2 , no-7, open acces journal vailable at http://www.ncbi.nlm.nih.gov/pmc/articles/PMC201028.*

[85]Baraik K. Vijay and Kulkarni P.M (2006): *Health status and access to health care services – disparities among social groups in India;* Working Paper, Indian Institute of Dalit Studies, vol-1, no-4.

[86] Sinha Sachidanand (2005): "Reaching out to undernourished children: social inequities and policy perspectives"; *Journal of Health and Development,* vol.1, no.4. pp. 71-90.

[87]Mishra Narayan Rudra (2006): *Dynamics of caste-based deprivation in child undernutrition in India*; Working paper, Centre for development studies, India (available at www.cds.edu).

[88]EllenVan de Poel and Niko Speybroeck (2009): "Decomposing malnutrition inequalities between scheduled castes and tribes and the remaining Indian population"; *Ethnicity & Health*, vol.14, no.3, pp. 271-287.

All the above mentioned studies were mainly done at the macro level; there are many other field based studies which also suggest the social inequities of child undernutrition. There are many anthropological and small survey based studies suggesting the caste and ethnicity based discrimination and inequities in the level of child undernutrition in different parts of India[89].

In recent times many studies also have been done on caste based discrimination and inequalities in various government initiated food, nutrition and health related policy programmes in India. Thorat and Joel[90] have shown that in major food and nutrition based policy programmes (such as mid-day meal and public distribution system) caste based discrimination is prevalent in many parts of India. This is study based on a survey which has been carried out in five states of India. The caste based discrimination has been measure taking into consideration of different qualitative aspects such as 'access', 'participatory empowerment and ownership', and 'treatment'. In another field based survey Acharya[91] has also explore the degree of discrimination in health care for dalit children in various spheres. The consequences of discriminatory practices severely limit dalit children from accessing health services and can be attributed to the poor health and high level of mortality of dalit children in the studied areas (Rajasthan and Gujarat).

2.3.4 Etiological aspects of child undernutrition:

Epidemiological or etiological aspect of child undernutrition is a major area of concern especially for the health policy makers. Various infections and diseases significantly

[89] Sain Ruby (1994): " Nutritional status of tribal children in Birbhum"; *Economic and Political Weekly*, vol. 29, no. 25 , pp. 1513.

Jood Sudesh, Bishnoi Saroj et. al.(2000): "Nutritional status of rural pre-school children of Haryana state"; *Indian Journal of Pediatrics;* vol. 67, no. 3. pp. 189-196.

Rao V. G., Yadav Rajeev et al. (2005): "Undernutrition & childhood morbidities among tribal preschool Children"; Indian J Med Res, no.122, pp. 43-47.

Bharati Premananda et al. (2006): "Nutritional status of preschool children of raj gond – a tribal population in Madhya Pradesh, India", *Mal J Nutr,* vol. 12, no.2, pp.147-155.

[90] Thorat Sukhadeo and Joel Lee (2006): *Dalits and the right to food–discrimination and exclusion in food-related government programms;* Working Paper, Indian Institute of Dalit Studies, vol-1, no-3.

[91] Acharya S. Sanghmitra (2010): *Access to health care and patterns of discrimination: a study of dalit children in selected villages of Gujarat and Rajasthan;* Working Paper, Indian Institute of Dalit Studies and UNICEF

determine the overall health condition of the population. In the developing world, young women, pregnant women and their infants and children frequently experience a cycle where undernutrition (macronutrient and micronutrient) and repeated infection; including parasitic infections, lead to adverse consequences that can continue from one generation to the next[92]. It is also important to mention here that many times the pregnant mothers can be infected by many of these infections, which indirectly may affect the health of their children, through fetal growth retardation, low birth weight, transmission of infection from mother to child's health etc[93].

A. Malaria: Malaria infection is endemic across the tropics and subtropics. It is one of the single most reasons for highest morbidity and mortality in some parts of the world. Malaria among the pregnant women's can affect the health of the children. It contributes to poor pregnancy outcomes of prematurity and intra-uterine growth retardation[94]. Malaria in the early childhood also significantly affects the nutritional status among the children. It has been observed that malaria greatly affects the stunting among the children, which culminates in prolonged undernourishment[95]. Malaria may also be found associated with the incidence of anaemia and iron deficiency among the children[96]. Malnourished children with malaria infection are also susceptible to other infections and ill-health like diarrhoea[97]. Study in Papua New Guinea also suggests that susceptibility of

---

[92]Steketee W. Richard (2003): "Pregnancy, nutrition and parasitic diseases"; *American Society for Nutritional Sciences,* pp. 1661-1667.

[93]Ibid, pp-1663

[94]Ibid, pp-1665

[95]R Snow , C Molyneux ,E Njeru et al. (1997): "The effects of malaria control on nutritional status in infancy"; *Acta Tropica,* no. 65, pp. 1–10.

Nyakeriga AM, Troye-Blomberg M et al. (2004): "Malaria and nutritional status in children living on the coast of Kenya", *American Journal of Clinical Nutrition*, no. 80, pp. 1604–1610.

Friedman Jenifer, Kwena M. Arthur et al. (2005): "Malaria and nutritional status among pre-school children: results from cross-sectional surveys in Western Kenya"; *American Journal of Tropical Medicine and Hygiene*, vol. 73, no. 4,pp.698–704

[96]Verhoef H et. al.(2002): "Stunting may determine the severity of malaria-associated anemia"; *African children. Pediatrics*; vol. 110, no. 48.

Friedman Jenifer, Kwena M. Arthur et al. (2005): "Malaria and nutritional status among pre-school children: results from cross-sectional surveys in western Kenya"; *American Journal of Tropical Medicine and Hygiene*, vol. 73, no. 4, pp.698–704.

[97]Ibid

the malarial infection among the children is also influenced by their prevailing nutritional status[98].

B. Intestinal infections: Association of intestinal infections like hook worm, ascaris and low nutritional status among the women has been found in many developing countries. In Nepal, Bangladesh it has been noticed that hookworm infections are common in several cases. Especially among the pregnant women it can affect their pregnancy outcomes in the form of intra-uterine growth retardation and low birth weight. Among the children hookworm and ascaris infection and low nutritional status have been noticed in many cases. It has been observed that de-worming of ascaris among the infected children in Kenya was helpful for their nutritional improvement[99]. But among the Ethiopian children it has been noticed that ascaris treatment does not lead to improvement in nutritional status[100].

C. Diarrhoea: It is one of the main reasons for child morbidity and child mortality in the developing countries. Although the main causes for diarrhoea in the developing countries are infection, feeding practices, lack of sanitation and pure water; undernutrition also significantly affect the incidence of diarrhoea among the children[101]. Study in Bangladesh suggests that undernutrition significantly determines the diarrhoeal duration among the children[102]. In developing countries, where recurrent diarrhoea is common, a vicious cycle of diarrhoea and undernutrition is commonly formed[103]. Diarrhoea and malnutrition both significantly affect each other. Incidence of diarrhoea associated with high undernutrition level has been observed in many developing countries; for example in

---

[98] Blaise Genton,Fadwa Al-Yaman et al. (1998): "Relation of anthropometry to malaria morbidity and immunity in Papua New Guinean children"; *The* American Journal of Clinical Nutrition; no. 68, pp.734–741.

[99]Stephenson L.S., Crompton D. W. T et al (1980): "Relationships between Ascaris infection and growth of malnourished preschool children in Kenya": *The American Journal of Clinical Nutrition,* no. 33, pp.1165-1172.

[100]Lennart Freiji et al.(1979*):* "Ascariasis and malnutrition .a study in urban Ethiopian children"*; The American Journal of Clinical Nutrition*; vol 32,pp.1545-1553.

[101] Thapar Nikhil and Sandersin Ian R (2004): "Diarrhoea in children: an interface between developing and developed countries"*; The Lancet,* vol. 363 no. 9409. pp. 641-653.

[102]Black E. Robert (1984): "Malnutrition is a determining factor in diarrheal duration, but not incidence, among young children in a longitudinal study in rural Bangladesh"; *American Journal of Clinical Nutrition,* no. 37.

[103]Thapar Nikhil and Sandersin Ian R *op. cit.*. pp. 641-653.

Pakistan[104]. It is documented that diarrhoea leads to weight faltering among the African children up to two years of age[105].

2.3.5 Environmental aspects of child undernutrition:

Environmental aspect of child undernutrition encompasses a boarder area, which comes under environmental–epidemiology of child health. Child's immediate surroundings such as sanitation, hygiene, air-water-light and chances of exposure to any infections are some important environmental factors. However there are macro environmental factors also such as climate, topography, air and water quality etc which affect child health. Malaria, diarrhoea and other infectious diseases, which significantly affect child's healths are determined these physical environmental factors. Study shows that access to safe water and improved sanitation can alone reduce many preventable diseases[106] . Different parental practices such as smoking can also significantly affect the child's health[107]. Environmental components lead, arsenic, mercury, and other heavy metals that enter the food chain can seriously deplete body stores of iron, vitamin C and other essential nutrients leading to decreased immune defences, intra-uterine growth retardation, impaired psycho-social faculties and other disabilities associated with undernutrition[108]. Recent study has shown that outdoor pollution may have serious impacts on pregnancy outcomes and may lead to low birth weight and preterm birth[109].

---

[104]Suzan David &Marie L. Lobo (1995): "Childhood diarrhea and malnutrition in Pakistan, Part I: incidence and prevalence"; *Journal of Pediatric Nursing,* vol 10, no 2.

[105]Michael GM Rowland et. al. (1988): "Impact of infection on the growth of children from 0 to 2 Years in an urban West African community"; American Journal of Clinical Nutrition, vol 47, pp. 134-8.

[106]Esrey S.A. , Potash J.B., Roberts L. and Shiff C. (1991*):* "Effects of improved water supply and sanitation on ascariasis, diarrhoea, dracunculiasis, hookworm infection, schistosomiasis, and trachoma"*; Bulletin of the World Health Organization*, vol 69, no. 5.pp. 609-621.

[107]Cora M. Kai Sun et al (2007): "Parental tobacco use is associated with increased risk of child malnutrition in Bangladesh"*; Nutrition*, vol. 23, pp. 731–738.

[108]G. VenkateshIyengar and Padmanabhan P. Nair (2000*):* "Global outlook on nutrition and the environment: meeting the challenges of the next millennium"*; The Science of the Total Environment* , vol 249, pp. 331-346

[109]Bobak Martin (2000): "Outdoor air pollution, low birth weight, and prematurity"*; Environmental Health Perspectives,* vol 108, Number 2. pp. 173-176.

2.3.6 Geographical aspect of child undernutrition:

Geographical aspect of child undernutrition includes physical settings (e.g. climate), as well as socio-cultural background (e.g. child care practices, gender role etc.). Both of them considerably vary across the geographical space. The geographical understanding is still a neglected aspect in the child health and nutritional study. Study in Bolivia[110] has shown that geography significantly affects the child's health and nutritional status. The physical settings (seasonality of undernutrition) and the space specificity of several socio-cultural factors are found explanatory for the spatial variation of child undernutrition in the country. In Indian context, socio-cultural settings have been region specific. Dyson[111] has suggested that India can be classified into different macro-regions on the basis of social demography. A study by Paula Griffiths and others[112] has suggested that socio-cultural and behavioural factors which affect nutritional status of children in India in different regional settings are diversified. The differences cannot be explained through one common socio-demographic understanding. It suggests that due to regional/spatial diversity/variation of different socio-demographic factors of child undernutrition in India, state specific and community specific programmes of interventions are required to alleviate the situation of pervasive and deeply entrenched malnutrition in India.

[110]Morales Rolando, Aguilar AnaMaria and Calzadilla Alvaro (2000): "*Geography and culture matter for malnutrition in Bolivia*"; *Economics and Human Biology*, vol. 2, pp. 373–389.

[111]Dyson T. ,& Moore M.(1983): "On kinship structure, female autonomy ,and demographic behaviour in India"; *Population and Development Review;* vol 9, no. 1,pp. 35–54.

[112] Griths Paula, Zoe Matthews Andrew Hinde (2002): "Gender, family, and the nutritional status of children in three culturally contrasting states of India"; *Social Science & Medicine,* vol 55, pp. 775–790.

2.4 Research gaps and conclusion:

Understanding on child undernutritional problems has been gradually developed over the years. From individual measurements (clinical diagnosis) anthropometric indices have emerged as a major tool for measuring child undernourishment across different sets of population. The measurements tools of undernutrition have got an international standard over the years. Further, many refinements have been done on the different outfit of it.

Since 1970's onwards until now the major issues pertaining undernourishment problems, especially the economic and demographic aspects have remained more or less the same. During this entire period, the major economic and demographic issues have been poverty, food security, maternal nutrition, access to health etc. However, from socio-political point of view some changes have take place, mainly in terms of the approaches to address this problem. Since 1990's the major issues which have emerged are gender, social and political-economy aspects of undernutritional problems. In recent time, a new approach has also been found i.e. right based approach. The access to nutritious food, health care services etc. has been seen as an individual right of every children in the society[113].

After an in-depth review of the existing literature on the problems and issues related to child undernutrition following research gaps can be indentified. First of all existing literature mainly study the issue from two broad disciplinary points of view, i.e. demographic and economic. The literature related to demography mainly emphasises on the demographic factors, like-mother's age and her nutritional status, birth order, birth weight of the baby etc. On the other hand economic literatures have given emphasis on the economic factors like poverty, household and budgetary expenditures. It is true that over the years there are many studies which have emerged from both of these two disciplines and gradually they tend to become more interdisciplinary in nature. However the numbers of such works are limited. The research gaps that exist in child nutritional studies are essentially not in terms of the content of the study; but in terms of the approaches followed in those researches. Secondly, as par as subject matter of the study is concern, much works have not been done on the issue of inter-regional inequalities of

[113] Dreze Zean (2006): "Universalisation with quality: ICDS in a rights perspective"; *Economic and Political Weekly,* vol. 41, no. 34, pp. 3706-3715.

child undernutrition although it has a significant importance from the policy point of view. Thirdly, limited works have been done related to the problems in the existing policies and programmes which target the reduction of undernutrition levels in India. Fourthly, in Indian context, limited works have been found on the issues of social inequality of the child undernutrition problems. The degree and nature in which the problem is deeply rooted in the country is needed to be explored. The question of undernutrition problems in India can also be addressed from the political economic point of view. These are some of the research gaps which have been indentified through the survey of literature. Given the limited scope of the research this work among many of the issues discussed above focuses on regional and social inequalities of child undernutrition, which as evident from the preceding discussion has great bearing on child's health and policy issues in India.

Chapter-3

Child undernutrition in India: An overview

3.1 Introduction:

India is the homeland of millions of malnourished men, women and children. Interestingly it also suffers from both the dual burdens of undernourished and obese population. Undernourishment among the young children in India is widespread, along with higher levels of low birth weight, infant and child mortality rates. The purpose of the present chapter is to provide an overview of child undernutritional situation in India, at the aggregate level. Before going into in-depth analysis of the focal themes we discuss some important issues related to regional and social inequities.

3.2 Undernutrition among children:

In the year 2005-06 the estimated numbers of undernourished children in India, in terms of underweight, stunting and wasting were respectively 5.94, 6.70 and 2.79 crores. The levels of stunting and underweight are found to be relatively higher among the Indian children in comparison to the wasting.

Figure: 3.1

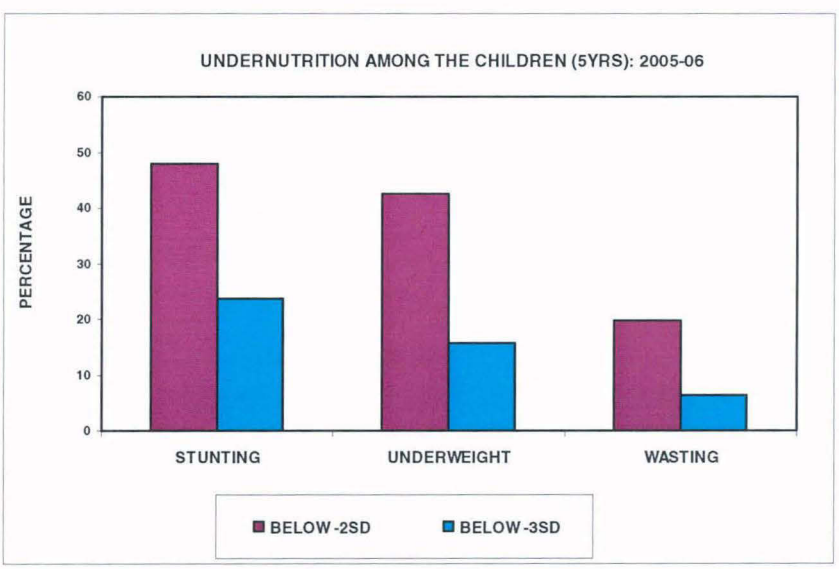


Table: 3.1 Undernutrition level among the Indian children : 2005-06 (5Yrs)

Types of undernourishment	Category within each type	
	Below -2SD	Below -3SD
Stunting	48.0	23.7
Underweight	42.5	15.8
Wasting	19.8	6.4

Source: Calculated from NFHS-3 dataset

Table: 3.2 Trends in the child undernutrition scenario at the national level (3Yrs) : NFHS-1, 2 & 3

Types of undernourishment	Below -2SD			Below -3SD		
	NFHS-1 (1992-93)	NFHS-2 (1998-99)	NFHS-3 (2005-06)	NFHS-1 (1992-93)	NFHS-2 (1998-99)	NFHS-3 (2005-06)
Stunting	47.1	44.9	44.9	25.0	22.6	22.1
Underweight	52.4	46.7	40.4	21.4	17.7	15.8
Wasting	19.3	15.7	22.8	3.6	2.8	7.9

Source: Calculated from NFHS-1,2 & 3 dataset

The latest 3rd National Family and Health Survey (NFHS-3, 2005-06) has reported that 48%, 42% and 20% of the children under 5 years of age are respectively stunted, underweight and wasted. Moreover out of total stunted children, 24% fall in the category of severely undernourished (i.e. below the -3 SD from the median point). Likewise, 16% underweight and 6% wasted children are also considered to be suffering seriously from severe types of undernourishment. Therefore about half of the total stunted, and more than 1/3rd of the total underweight and wasted children in India are suffering from severe undernutrition. Between NFHS-1 & 3, at the national level undernutrition scenario has not changed much. From 1992-93 to 2005-06 the overall reduction of stunting (Below-2SD) is merely 2%. During this time periods levels of wasting have gone up by around 3.5%. The only success recorded is that the underweight levels have been reduced by 12 percentages. For the period of NFHS-1 & 2 stunting, wasting and underweight, all these three types of undernutrition (below -2SD) has got reduced by 2%, 5% and 4% respectively. Improvements are also noticed in reduction of severe undernutrition (below -3SD). Severe undernutrition (below -3SD) for stunting, underweight and wasting has got reduced respectively by 2%, 4% and 1% points. During NFHS-2 & 3 period, only underweight rate has got reduced, while the rate of stunting remains unchanged and wasting rate increases

severely. Severe type of wasting (below -3SD) has increased severely from 2.8 to 7.9 percentage points.

Figure: 3.2

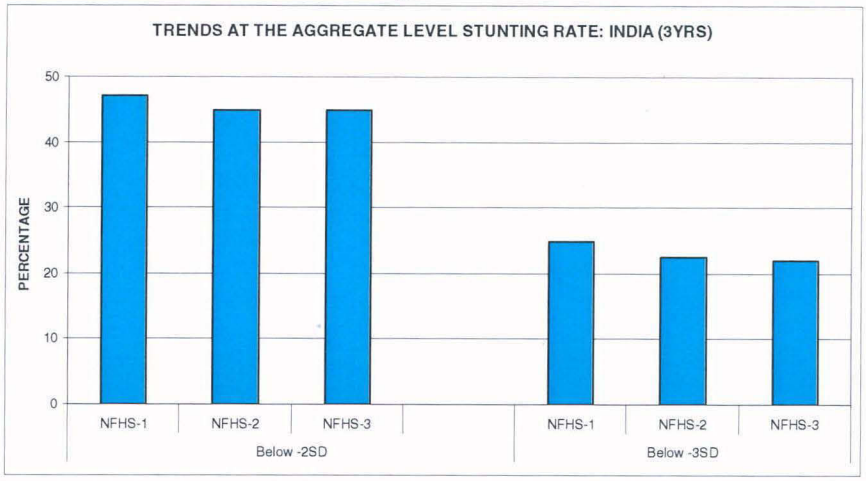


Figure: 3.3

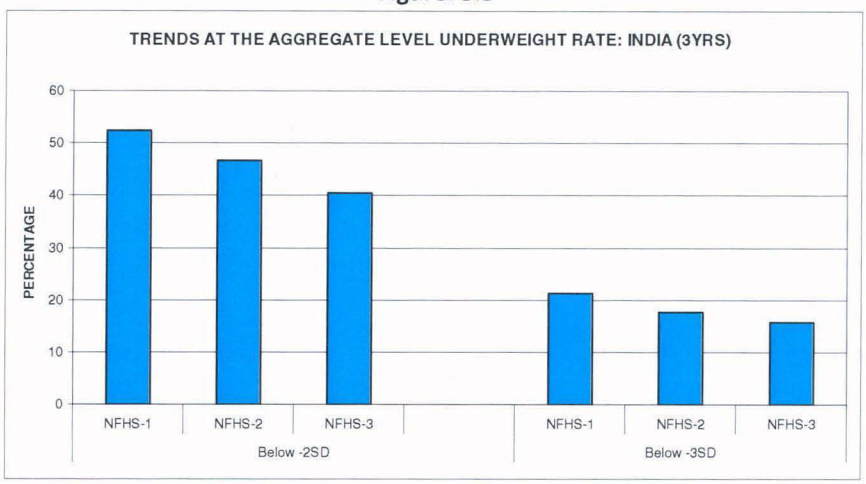
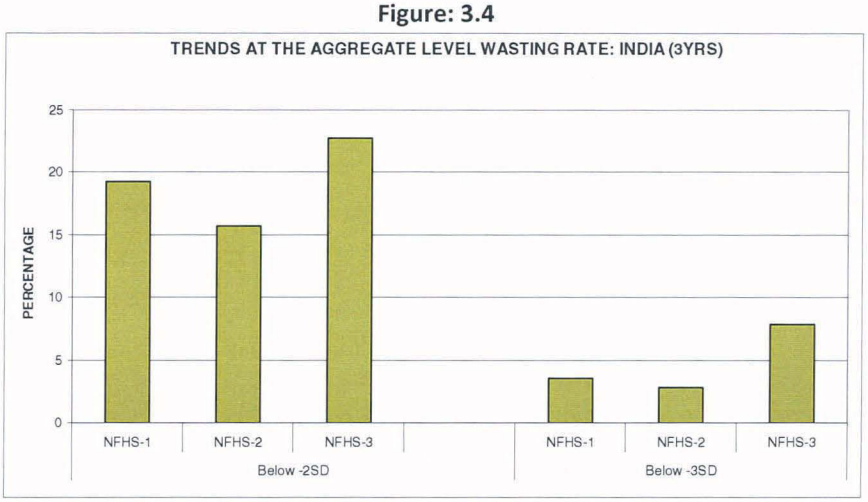


Figure: 3.4



3.3 Nature and levels of child undernutrition in India:

Child undernutrition in India is significantly higher along with several types of disparities, like rural-urban, social (caste), economic, regional etc. The rural children are more prone to become malnourished as compared to the children from urban areas. All three types of undernourishment are found to be higher in rural areas.

Table: 3.3 Levels of child undernutrition across different set of population (5 Yrs, below -2SD) : 2005-06

Categories	Stunting	Underweight	Wasting
Urban	39.9	32.8	16.8
Rural	50.7	45.7	20.8
Male	48.1	42.0	20.5
Female	48.0	43.0	19.1
SC	53.7	48.0	21.2
ST	53.7	55.0	27.8
OBC	48.9	43.2	20.0
Others	40.5	33.3	16.2
Total Scheduled	54.0	50.1	23.1
Total Non-scheduled	45.5	39.4	18.6
Total	48.0	42.5	19.8

Source: Calculated from the NFHS-3 dataset

As far as gender is concerned, there are not so stark inequities existed; both the boys and girls children are found to be almost equally undernourished at the aggregate level. The major inequities in terms of child undernutrition are observed among the various social groups in India. The highest percentages of stunted, underweight and wasted children are found among the ST and SC population. OBC children are also having higher percentages of undernourished children. The lowest levels have been observed among the others i.e. non-backward social groups. Around 54% of the SC & ST children are found to be suffering from stunting. Contrary to this, among the others this level is 40%. In case of underweight, STs and SCs are found to be undernourished respectively by 55% and 48 %. The levels of wasting recorded among them are respectively 28% and 21%. Among the children from others social group the levels of underweight and wasting are found respectively 33% and 16%.

Figure: 3.5

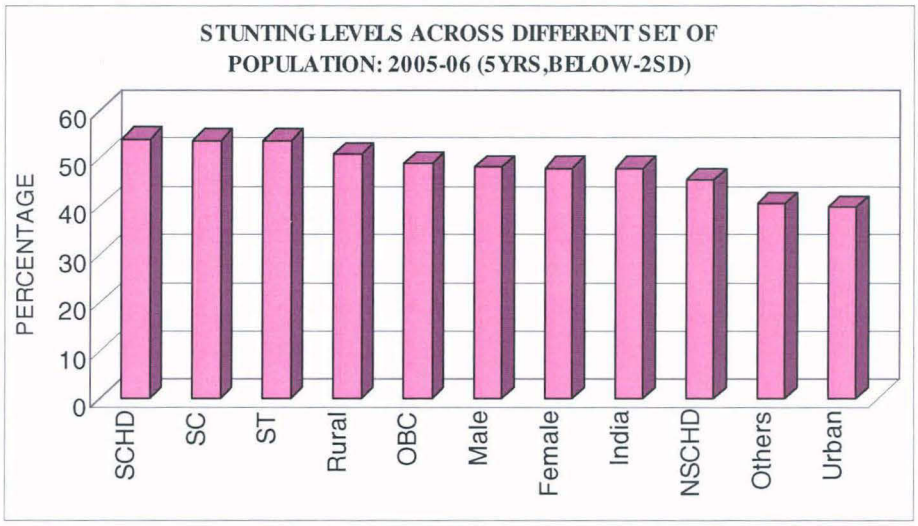


Figure: 3.6

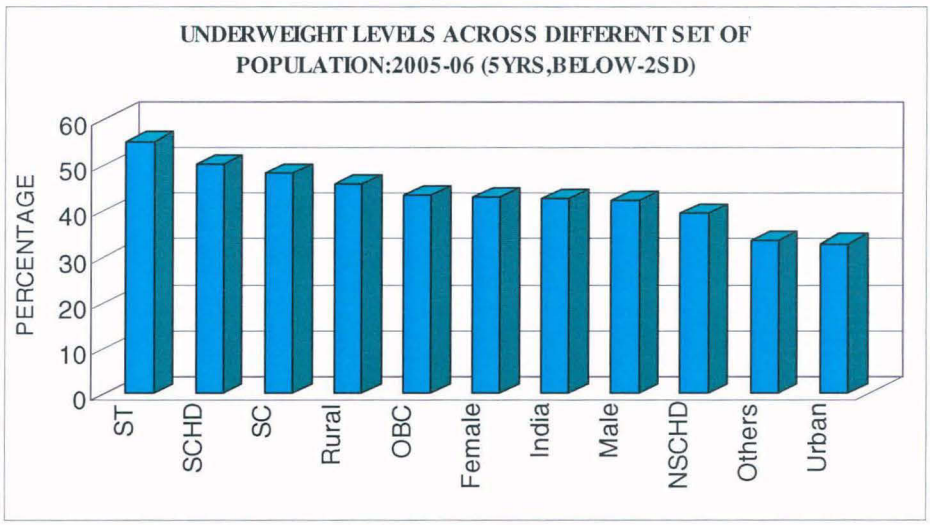
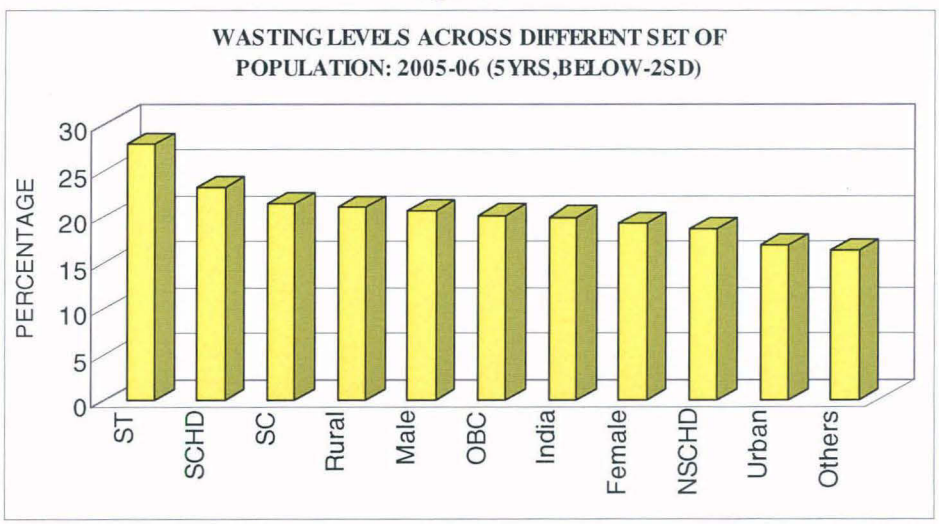


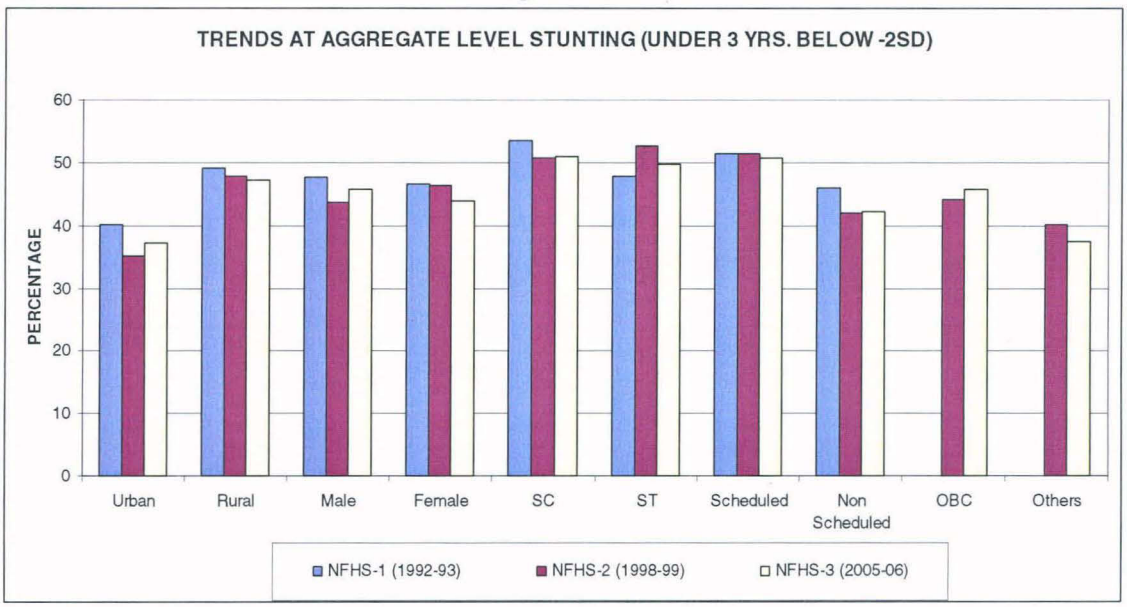
Figure: 3.7



3.4 Temporal changes in levels of undernutrition:

(A) Stunting: During NFHS-1 & 2 at the aggregate level the overall reductions in stunting in rural and urban areas are respectively1 and 5 percentage points. For the male children, the reduction is 4% and in case of female children no reduction has been noticed. Among the different social groups, while the reduction for the SC is only 2.7%, the ST population on the contrary has recorded an increase by 4.7%. For the total non-scheduled population stunting percentage has decreased by 4%. But for the total scheduled population no improvement has been noticed.

Figure: 3.8



In between NFHS-2 & 3 survey it has been found that stunting among the urban children has increased by 2%. For the rural children a very small decrease has been noticed. Male stunting has increased, but for the female children a small reduction has been observed. Among the SC, OBC population stunting has slightly increased, but a small decline has been observed among the ST children. For others the same has recorded a reduction of 3%. For both the total scheduled and total non-scheduled component of population no improvements have been observed.

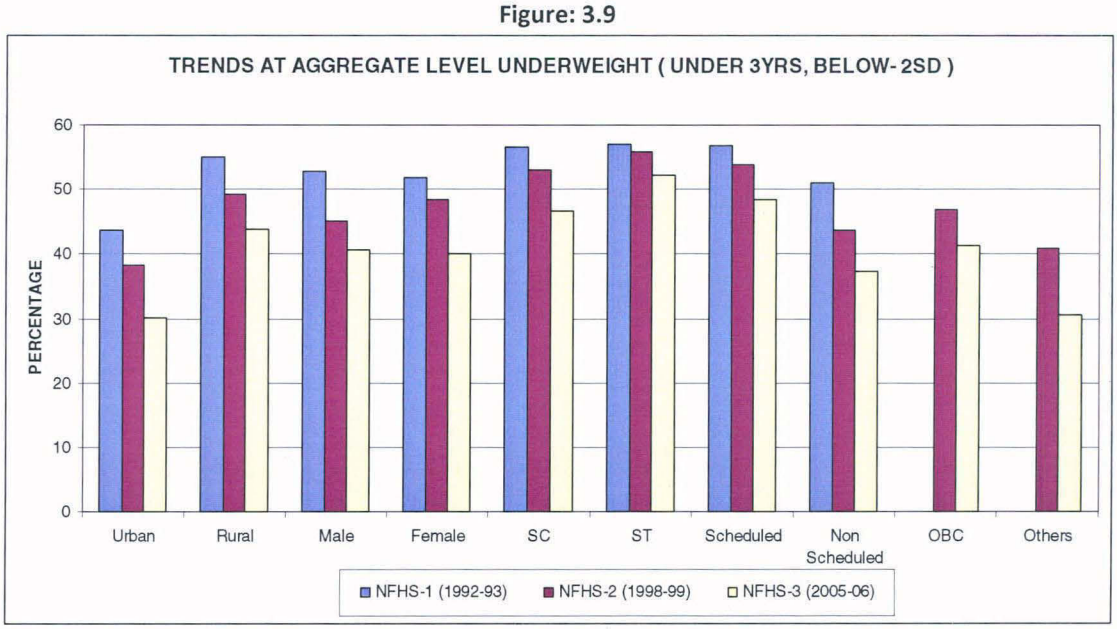
Table No. 3.4 Trends in levels of stunted by population categories: 1992-93 to 2005-06 (under 3 Yrs, below -2SD)

Categories	NFHS-1 (1992-93)	NFHS-2 (1998-99)	NFHS-3 (2005-06)
Urban	40.1	35.2	37.3
Rural	49.2	47.9	47.3
Male	47.6	43.6	45.8
Female	46.6	46.4	43.9
SC	53.6	50.9	51.1
ST	47.9	52.6	49.8
OBC	na	44.1	45.7
Others	na	40.1	37.4
Scheduled	51.5	51.5	50.9
Non Scheduled	46	42	42.3

Source: Calculated from the NFHS datasets

(B) Underweight: Over the years underweight rates for the children (under 3 years of age) have showed a gradual improvement at the aggregate level. In between NFHS-1 & 2, for both urban and rural children underweight rates have got reduced respectively by 5.5% and 5.7%. The reduction for the male children is found relatively higher (8%) in comparison to the female children (3%). For the SC and ST population the reductions of underweight are noticed to be 4% and 1% respectively. For the overall scheduled and non-scheduled population overall reductions of 3% and 7.5% have been found respectively.

Figure: 3.9



Considering the changes taken place during NFHS-2 & 3 surveys it has found that underweight rates have reduced for all the different sets of population. Urban and rural underweight rates are reduced respectively by 8% and 5.5%. While among the male children 4% reduction has been noticed, for the female children significant improvements have been observed (reduction by 8.4%). For the SC, ST and OBC children the reductions are respectively 6.4%, 3.7% and 6%. But the highest reduction among the all social groups has been noticed for the other category of population (from 40.8% to 30.5%). The overall reductions for the total scheduled and total non-scheduled population are 5.5 % and 6.4% respectively.

Table No. 3.5 Trends in levels of underweight by population categories: 1992-93 to 2005-06 (under 3 Yrs, below -2SD)

Categories	NFHS-1 (1992-93)	NFHS-2 (1998-99)	NFHS-3 (2005-06)
Urban	43.7	38.2	30.1
Rural	55	49.3	43.8
Male	52.9	45	40.7
Female	51.9	48.5	40.1
SC	56.7	53	46.6
ST	57.1	55.9	52.2
OBC	na	46.9	41.2
Others	na	40.8	30.5
Scheduled	56.9	53.9	48.4
Non Scheduled	51.1	43.6	37.2

Source: Calculated from the NFHS datasets

(C) Wasting: While an overall improvement in the wasting situation has been observed during NFHS-1 & 2 time period, but in the 3rd NFHS round the situation has comparatively got worsened. Between NFHS-1 & 2 both urban and rural wasting have showed tremendous improvements (3% to 5% reduction). For the male children reduction has been 5% and for the female it is just 2%. Among the various social groups the highest level of reduction has been noticed among the SCs (4.5%). For STs the reduction is close to 2%. The overall reductions for both total scheduled and total non-scheduled population are close to 4 percentages. Between NFHS-2 & 3 wasting rate has increased by 6 and 8 percentage points respectively for urban and rural children. For both male and female children the same has increase by 7 each. On the other hand for the SC, ST, OBC and others the increments are respectively 8%, 9.5%, 6.7% and 5.4%. The overall increases for each total scheduled and total non-scheduled population are 8.4 and 6.7 percentages respectively.

Figure: 3.10

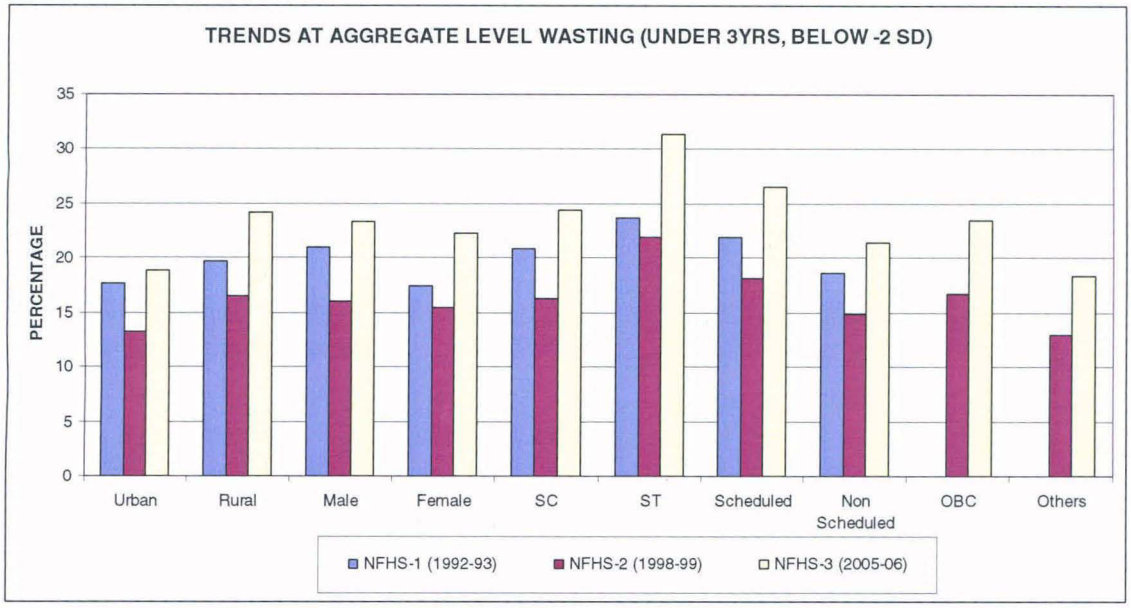


Table No. 3.6 Trends in levels of wasted by population categories: 1992-93 to 2005-06 (under 3 Yrs, below -2SD)

Categories	NFHS-1	NFHS-2	NFHS-3
Urban	17.7	13.2	18.9
Rural	19.7	16.5	24.1
Male	21	16	23.3
Female	17.5	15.4	22.3
SC	20.8	16.3	24.4
ST	23.7	21.9	31.4
OBC	na	16.7	23.4
Others	na	13	18.4
Scheduled	21.9	18.1	26.5
Non Scheduled	18.6	14.8	21.5

Source: Calculated from the NFHS datasets

3.5 Socio-economic and demographic characteristics of child undernutrition:

Different socio-economic and demographic characteristics tend to affect the level of child undernutritional status both at the individual (family) and aggregate level. There are series of such socio-demographic factors related to child undernutritional status, ranging from mother's education, birth order and living condition to family income.

Mother's education forms an important background characteristic of child undernutrition. With the increase in the level of mother's education child undernutrition levels tend to reduce significantly. Uneducated motherhood inflicts more number of undernourished children. Among the 'illiterate mothers' category 57,

52 and 23 percentage of children are found to be stunted, underweight and wasted respectively. In case of the higher educated mothers around 19%, 16% and 13% are found to be undernourished in respective categories. When birth order is considered, it is observed that rise in the birth order tends to increase the undernutritional levels. In the birth order of '≤2 number of children', 41%, 36% and 19% are found to be respectively stunted, underweight and wasted. On the other hand, in birth order category of '5 or more number of children 56%, 54% and 23%' are respectively found stunted, underweight and wasted. Mother's age being the background characteristic has revealed that the early (below 18 yrs) and late aged (above 35 years) mothers have slightly higher levels of undernourished children. The middle aged mothers (both early and late middle (i.e. 19-24 and 25-34) have relatively lower percentages of under-nourished children. Mother's own nutritional status has been cross tabulated with child undernutritional indicators. It is observed that increase in BMI levels among them may lead to good nutritional condition of the children. Among the mothers, having lower BMI status 54%, 52% and 25% of their children are respectively found to be stunted, underweight and wasted. Mothers with normal BMI have 46%, 39% and 17% of stunted, underweight and wasted children in India. On the other hand, the obese mothers have respectively 32%, 20% and 9% of stunted, underweight and wasted children. Low birth weight children have higher propensity to become undernourished as compared to the normal birth weight children. Among the low birth weight category 47%, 46% and 23% are respectively found to be stunted, underweight and wasted. On the other hand, in the non- low birth weight categories 33, 27 and 15 percentages of children are found to be undernourished. With the rise in living standard undernutrition among the children tends to recede. Among the lower living standard households child undernutrition situation are found to be very high (59%, 55% and 24% are respectively stunted, underweight and wasted) in comparison to high living standard households, where undernourishment levels are found to minimal (35%, 29% and 15% are respectively stunted, underweight and wasted).

Table No. 3.7 Background characteristics of child undernutrition status: 2005-06 (5Yrs, , Below -2SD)

Background Characteristics	Stunting	Underweight	Wasting
Mother's Education Level			
No education	57.1	51.9	22.7
Primary	48.6	42.5	19.8
Secondary	38.2	32.1	16.4
Higher	19.4	15.8	13.0
Birth Order			
Less than equal to 2	41.2	36.2	18.7
3 to 4	52.0	45.6	19.9
5 or above	59.3	53.7	22.6
Mother's Age			
15-18	47.9	45.7	24.0
19-24	47.3	40.9	20.2
25-34	47.5	42.3	19.0
Above 35	54.6	49.5	20.7
Mother's BMI status			
Thin	53.5	51.9	25.1
Normal	46.2	38.6	17.3
Obese	31.5	20.2	9.2
Low Birth Weight			
LBW	47.2	45.7	22.8
Non-LBW	33.2	27.3	15.4
Standard of living			
Low	58.9	54.5	24.0
Medium	51.2	45.3	20.0
High	34.8	28.6	15.1
Wealth Quintiles			
Poorest	59.9	56.7	25.1
Poor	54.4	49.4	22.1
Middle	48.8	41.5	18.9
Richer	40.8	33.6	16.5
Richest	25.6	19.7	12.7

Source: Calculated from the NFHS datasets

3.6 Conclusion:

This chapter primarily provides a general overview of the child undernutrition situation of India, at the aggregate level. From the above discussion it is clear that,the overwhelming percentages of children in the country are suffering from undernourishment. According to NFHS-3 about 48%, 42% and 20% of the children below 5 years of age are respectively stunted, underweight and wasted. Moreover, about 1/2 of the total stunted, and more than $1/3^{rd}$ of the total underweight and wasted children are suffering from severe undernutritional problems (Below – 3SD).The main observations of the chapter can be summarised as follows-

- At the aggregate level, huge disparities have observed in the undernourishment situations among different sets of population. The rural and scheduled population have the highest percentages of undernourished children, as compared to the urban and non-scheduled components of the population. Both the STs and SCs are found to be most vulnerable to the effect of child undernourishment. Among STs, the levels of stunted, underweight and wasted children were respectively 54, 55 and 28 percentages. The lowest levels of undernourishment were found among the others, followed by the OBCs. The levels of stunting, underweight and wasting among the others were respectively 44, 33 and 16 percentages.

  Seen from the gender point of view, no such gaps have been observed between the male and female children in terms of their levels of undernourishment.

- The undernutrition problems in the country are found to be more or less persistent in nature. It has been noticed that, although moderate underweight rate has improved over the decades (12%). However, moderate stunting rate has not changed much (merely 2 % reduction) and moderate levels wasting has gone up by few percentage points (3.5 %). Furthermore, during 1^{st} to 3^{rd} round of the NFHS, the reductions of severe underweight and stunting rates were 3 and 5 percentages respectively. Contrary to these changes, over the year's severe types of the wasting levels has increased from 2.8 to 7.9 percentage points.

- Among the different set of populations, undernourishment continues to exist among the vulnerable section of population i.e. SCs, STs and rural inhabitants. It appears that underweight and stunting levels have been improving among them.

These declines were found to be minimal in case of stunting as compared to the underweight rate. Over the years the wasting rate among all set of populations have been increased, which posing an ill effect especially among SCs, STs and rural population.

- As far as socio-economic and demographic characteristics are concerned, wide disparities are also found across mother's educational status, mother's age and BMI levels, birth order and birth weight of children, living standards and income of the family. Mothers with low educational level, lower nutritional status and low family income increase the propensity of undernourished children. Likewise, children with low birth weight and high birth order- important background characteristics of undernourishment.

The preceding observation suggests the nature of child undernourishment problems in India. From the macro level it broadly indicates that the existing social-economic and locational (rural/urban) divides through which some sections of the population are perpetually bearing the brunt of undernourishment- mainly the SCs, STs and rural inhabitants. It also has been observed that over the years, undernourishment levels for these disadvantaged social groups are not reducing at the expected levels. The explanation for this observable fact needs further scrutiny and it has great importance from policy points of view. The above findings are also needed to be address through state level analysis. Therefore we will move into the next chapters, where attempts have been made to examine the spatial/inter-state variations in the levels of child undernutrition.

Chapter: 4

Child undernutrition in India: Inter-state patterns

4.1. Introduction:

One of the important aspects of child undernutrition in India is the widespread regional inequalities. In a few states the levels of undernutrition have remained persistently high. These states are - Madhya Pradesh, Bihar, Orissa etc. On the other side, in the states like Kerala, Tamil Nadu and Punjab relatively low levels of undernutrition prevails. The regional inequities of child undernutrition in India are also persistent in nature. Over the years disparities are not reducing at the expected level. These may have some necessary implications from the policy point of view. In certain states, if undernutrition is not improving over the years, then additional policy measures should be taken up. The regional inequities are affected by various factors; like state-wise variations in poverty and income levels, public sector expenditure etc. One of the important points that many researchers have observed that along with some poorer states (e.g. Bihar, Orissa, MP), few higher income states (e.g. Maharashtra, Gujarat) are also having higher child malnutrition levels in the country. Radhakrishna and Ravi[1] has observed that the lowest levels of malnutrition are found in a few middle income states; like-Kerala, Tamil Nadu. According to Nair[2], other than poverty different socio-demographic factors (e.g. child feeding practices) are also responsible for the regional differentiation of child malnutrition. According to Shivakumar[3], the state level variations in health care services and access to health may be an explanation for this regional inequality. The regional inequalities of child undernutrition can be understood in two ways, firstly inter-regional (i.e. inter-state

[1]Radhakrishna and C. Ravi (2004): "Malnutrition in India, trends and detriments"; *Economic and political weekly,* vol. 39, no. 7, pp. 671-976.

_____(2004): "Chronic poverty and malnutrition in 1990's"; *Economic and political weekly.* vol. 39, no. 28, July 10.

[2] Nair K R G (2007): "Malnourishment among children in India: a regional analysis"; *Economic and Political Weekly*, vol. 42, no. 37, pp. 3797-3803.

[3] Shiva Kumar A. K. (2007): "Why are levels of child malnutrition not improving?"; *Economic and Political Weekly*, vol. 42, no. 15, pp. 1337-1345.

disparity) and secondly intra-regional (i.e. disparities across the different micro regions and between rural-urban areas within the states). As the study is primarily based on NFHS-3 dataset, analysis would not be possible below the state level. In the following sections the chapter would addresses the issue from the macro level, focusing on inter-state and rural-urban disparities of child undernutrition. Additionally it would also include the overall variations in child undernutrition across the selected Indian cities. It also studies the slum & non slum inequalities of child undernutrition within these metropolitan cities.

4.2 Regional inequalities of child undernutrition in India:

Regional inequities in child undernutrition are observed both in terms of share and distribution of undernourishment. Share expresses, the aggregate level undernourishment contributed by the different states. On the other hand, distribution expresses the geographical pattern of undernourished children in the country. Share may affected by the size of the population in many cases, but geographical pattern mainly depends on the prevalence of undernourishment within each states or regions.

4.2.1 State wise share of undernourished children:

In terms of share, some of the most populated and economically weaker states are bearing the burden of malnourished children in India. The highest share is found in Uttar Pradesh (UP), the home of more than 20% stunted, 24% underweight and 15% wasted children below 5 years of age. Bihar accounts roughly 11-13 percentages of undernourished children, in all three types of measures (i.e. stunted, underweight and wasted). In Madhya Pradesh (MP) the proportions of stunted, underweight and wasted children are respectively 10%, 7% and 13%. Maharashtra, Rajasthan and West Bengal also contribute to a relatively higher share of undernourished children. Geographically, the North Indian states consist of larger shares of the undernourished children in India. The four North Indian states i.e. UP, Bihar, MP and Rajasthan are comprises of about half of the malnourished children. The South Indian states are having relatively lower share of malnourished children of the country. The lowest shares are found among states like Kerala, Punjab, Uttaranchal, North East (ex. Assam), Delhi, Jammu & Kashmir and Himachal Pradesh.

Figure: 4.1

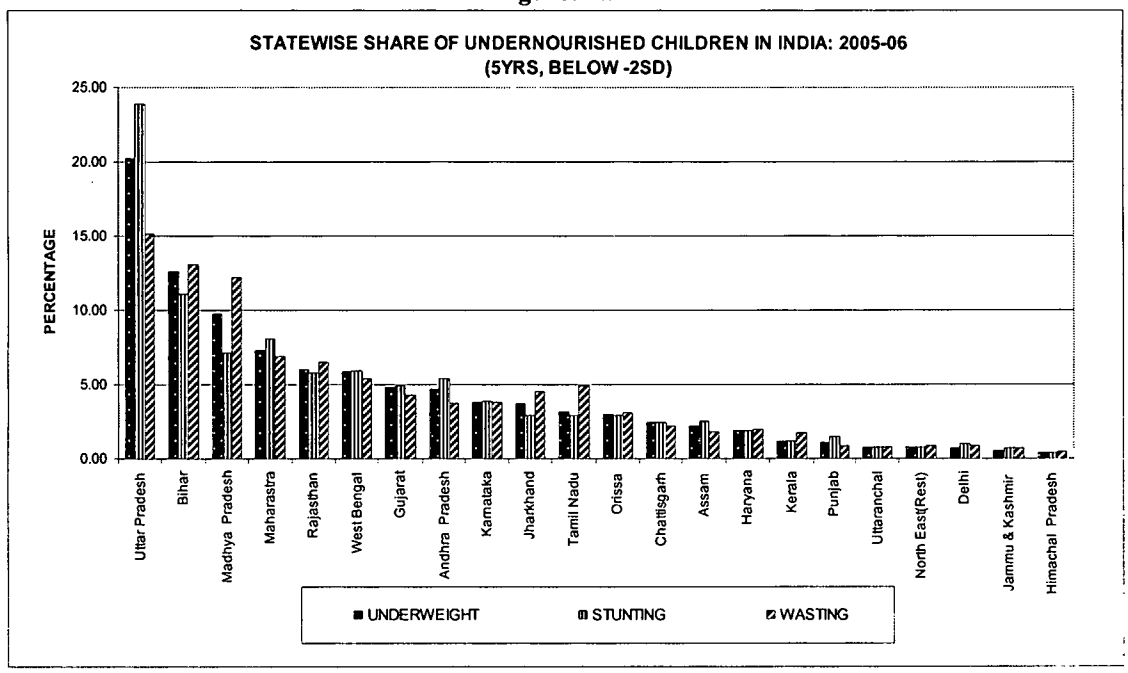


Table: 4.1 State-wise share of undernourished children in India: 2005-06 (5Yrs, Below-2SD)

State	Underweight	Stunting	Wasting
Uttar Pradesh	20.20	23.91	15.15
Bihar	12.60	11.09	13.06
Madhya Pradesh	9.73	7.17	12.20
Maharashtra	7.28	8.12	6.87
Rajasthan	6.03	5.83	6.51
West Bengal	5.84	5.94	5.41
Gujarat	4.85	4.95	4.29
Andhra Pradesh	4.68	5.41	3.75
Karnataka	3.80	3.91	3.83
Jharkhand	3.74	2.90	4.56
Tamil Nadu	3.15	2.93	4.88
Orissa	3.00	2.93	3.06
Chhattisgarh	2.47	2.47	2.21
Assam	2.25	2.52	1.79
Haryana	1.91	1.94	2.00
Kerala	1.20	1.15	1.78
Punjab	1.14	1.50	0.88
Uttaranchal	0.78	0.81	0.83
North East(Rest)	0.76	0.83	0.91
Delhi	0.71	1.00	0.91
Jammu & Kashmir	0.58	0.71	0.70
Himachal Pradesh	0.41	0.38	0.47

Source: Calculated from NFHS-3 dataset

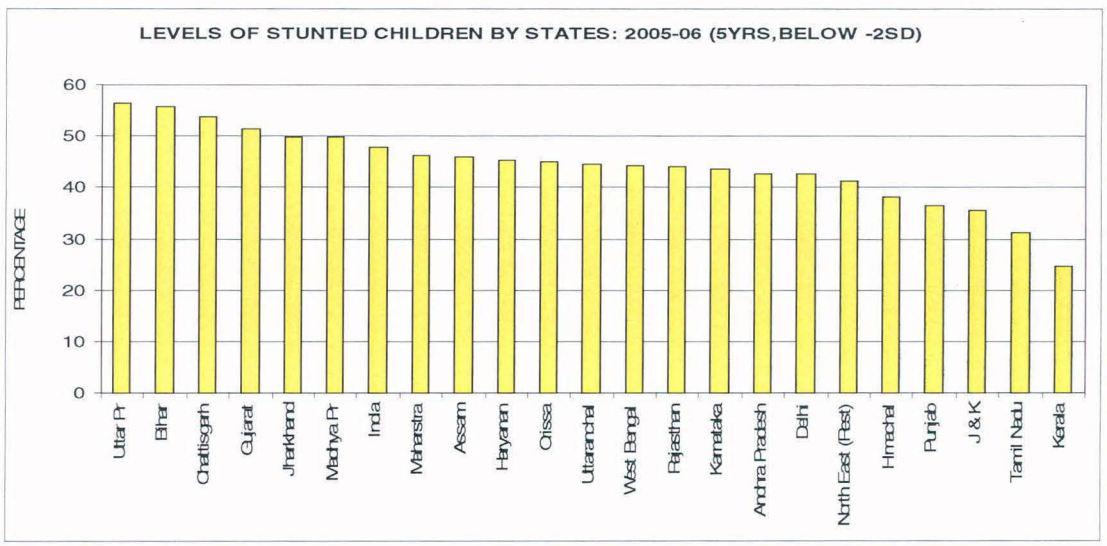
*States are arranged in descending order of child underweight shares

4.2.2 Regional pattern of child undernourishment:

It is important to understand that how child undernourishment is geographically distributed in India. A query of the regional pattern will be helpful to know which states more are vulnerable to the effect of undernourishment problems in the country.

(A) Stunting: A higher levels of stunting has been observed across the entire geographical spread of the country. Out of 23 in 21 states more than 1/3rd i.e. 33% of children are found to be stunted. Uttar Pradesh, the most populous state, also has the highest level of stunting among children. Around 57% of the children are found to be stunted in UP.

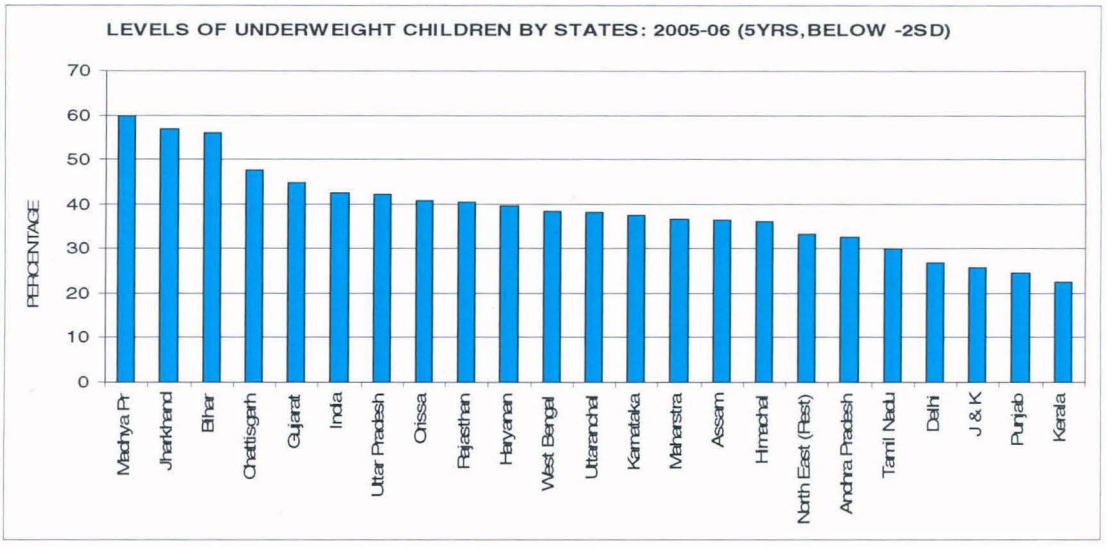
Figure: 4.2



In six North Indian states (i.e. UP, Bihar, Chhattisgarh, Gujarat, M.P. and Jharkhand) more than one-half of the children have clear sign of growth retardation. Kerala (25%) is the only state, where the level of stunting can be considered to be relatively lower in comparison to the other regions of the country.

(B)Underweight: Like Stunting, the higher levels of underweight children are also found to be widespread in India. In 17 states, over 1/3rd of the children are found to be underweight. Highest levels of underweight rates are mostly found in North-Indian states, like M.P, Jharkhand, Bihar and Chhattisgarh.

Figure: 4.3



Highest level of underweight rate is noticed in Madhya Pradesh, where 60% of the children i.e. every 6th are found to be underweight. In Jharkhand and Bihar more than half of the children are found to be underweight. In remaining other parts of the country the underweight rates are found to be high. For example in Chhattisgarh, Gujarat, UP, Orissa and Rajasthan, more than 40% of the children are found to be underweight. Relatively lower levels of child underweight rates are found in the Southern states (e.g. Tamil Nadu and Kerala) and in Jammu and Kashmir, capital Delhi and agriculturally developed Punjab. In Kerala and Punjab respectively 23% and 25% children are measured as underweight.

(C) Wasting: Wasting suggest more severe form of undernutrition. It indicates insufficient food-intake for a prolonged time period. Thus, in normal situation, unlike the endemic hunger, level of wasting is found to be lower in comparison to stunting and underweight. In India average 20% of the children i.e.1/5th are found to be wasted. Highest level is noticed in Madhya Pradesh and Jharkhand, where more than 1/3rd children are wasted. It is also relatively higher in Bihar (27%). In Tamil Nadu 22% of the children have measured to be wasted and this figure is higher in comparison to Rajasthan, Chhattisgarh and Orissa. The lowest level of wasting is observed in Punjab (only 9%). Other states, where wasting rates found lower are Andhra Pradesh, Assam, J & K, UP and Kerala. Interestingly it is found that Kerala's (16%) wasting level is higher in comparison to Uttar Pradesh (15%). In terms of

regional inequalities of child undernutrition problems in India it is noticed that a widespread differences exist. Highest inequality has observed for the underweight level, the value of standard deviation is 10.1 percentages. For stunting and wasting the standard deviation values are respectively 7.7 and 6.1 percentages.

Figure: 4.4

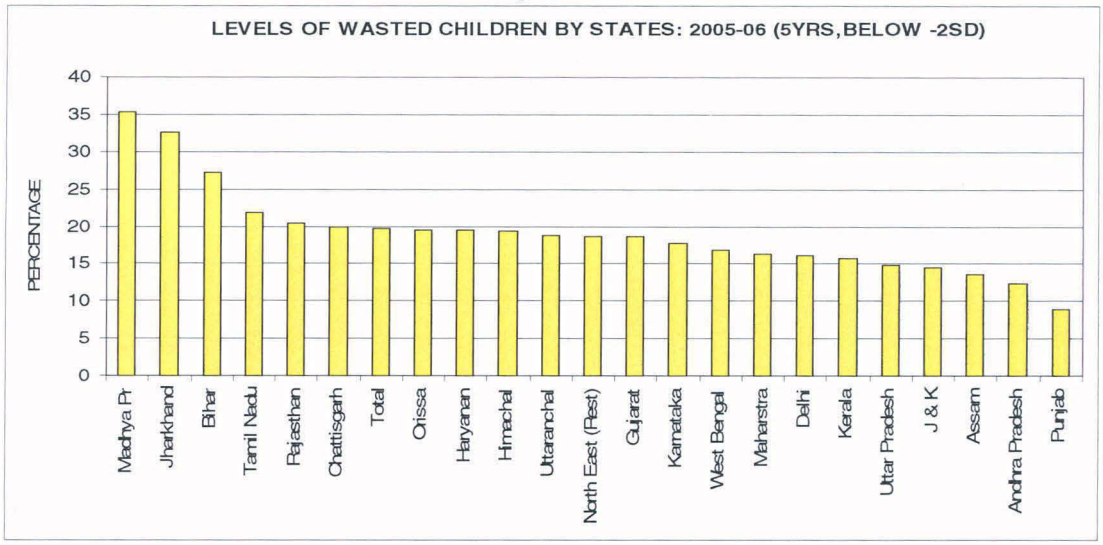


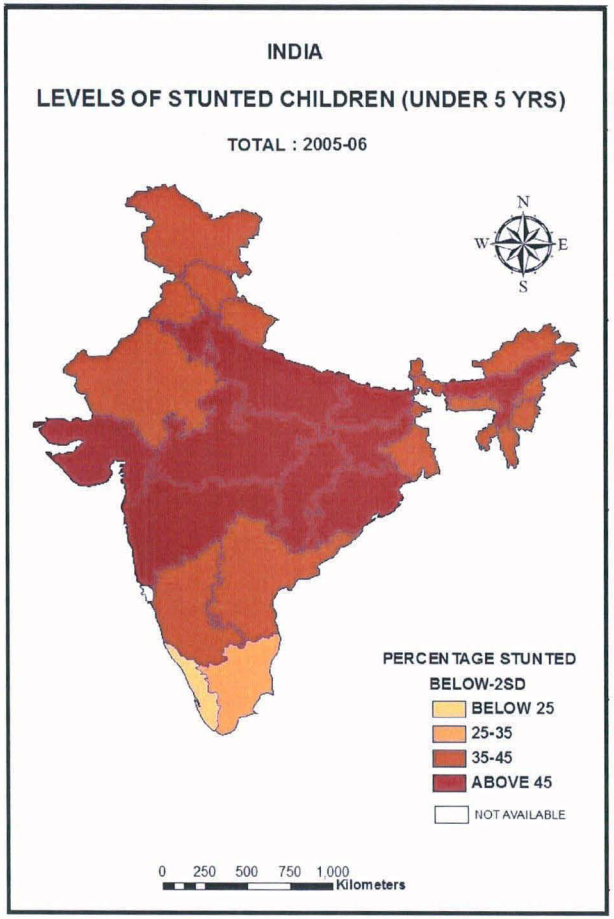
Table: 4.2 State-wise child undernutrition levels in India: 2005-06 (5yrs, below -2SD)

State	Stunting	Underweight	Wasting
Jammu and Kashmir	35.6	25.7	14.5
Himachal Pradesh	38.2	36.3	19.3
Punjab	36.5	24.6	8.9
Uttaranchal	44.7	38.1	18.9
Haryana	45.4	39.7	19.5
Delhi	42.6	26.9	16.1
Rajasthan	44.1	40.4	20.5
Uttar Pradesh	56.5	42.3	14.9
Bihar	55.7	56.1	27.3
North East (Rest)	41.3	33.2	18.7
Assam	46.1	36.4	13.6
West Bengal	44.3	38.6	16.8
Jharkhand	49.8	57	32.6
Orissa	45.1	40.9	19.6
Chhattisgarh	53.8	47.7	20
Madhya Pradesh	49.8	59.9	35.3
Gujarat	51.5	44.7	18.6
Maharashtra	46.3	36.8	16.3
Andhra Pradesh	42.7	32.7	12.3
Karnataka	43.6	37.6	17.8
Kerala	24.6	22.7	15.8
Tamil Nadu	31.4	30	21.8
India	48	42.5	19.8
Standard Deviation	7.7	10.1	6.1

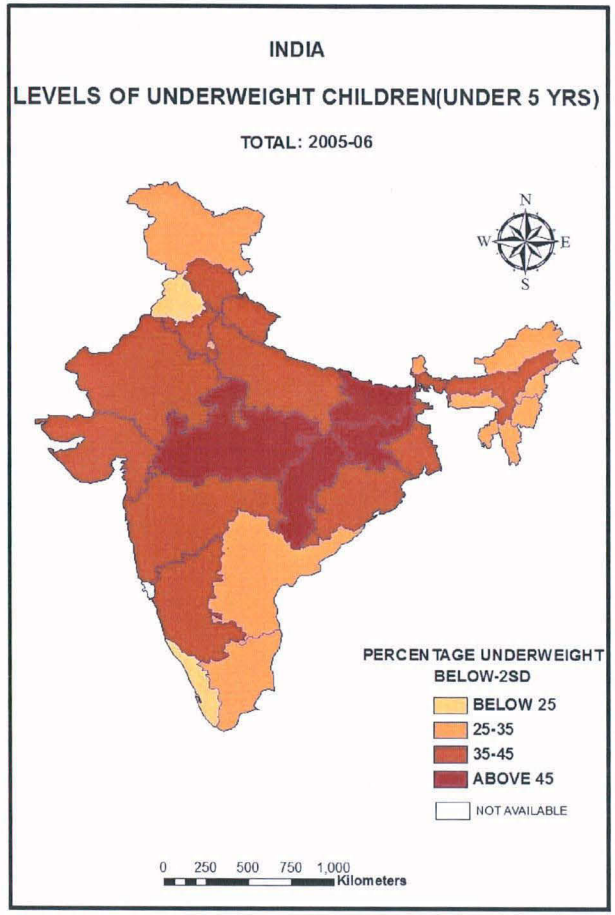
Source: Calculated from the NFHS-3 dataset

Child undernutrition in India: Inter-state patterns

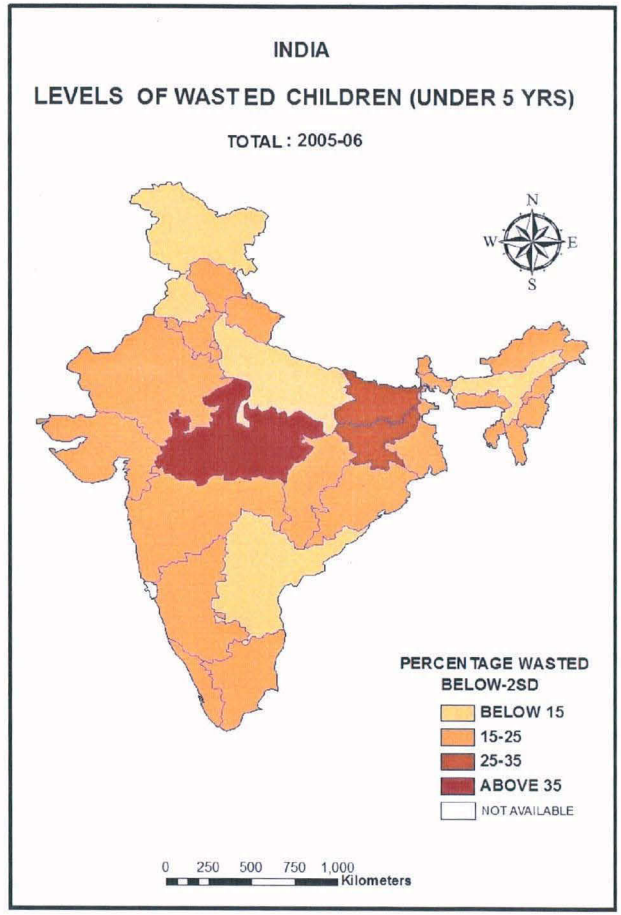
Map: 4.1



Map: 4.2



Map: 4.3

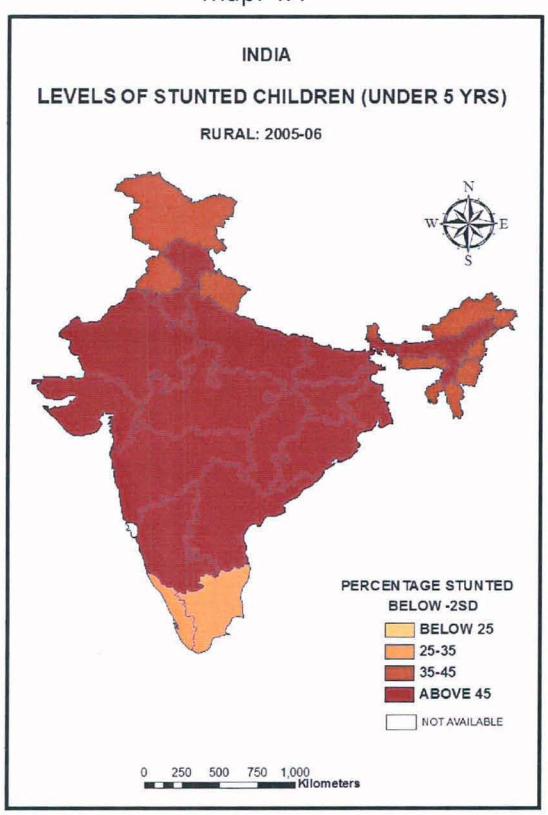


4.3 Rural-urban inequalities of child undernutrition:

Rural-urban inequalities of child undernutrition are also widespread in India. The rural-urban inequalities are observed because of the unequal social and economic developments. Due to overall lesser socio-economic development, and lacks of infrastructures and basic services rural malnutrition in all forms are found higher compare to the urban areas.

(A) Stunting: In 8 Indian states (i.e. U.P, Bihar, Chhattisgarh, Gujarat, Jharkhand, Delhi, MP and Uttaranchal) more than half of the children were found stunted. Highest level of stunting for the rural children was observed in Uttar Pradesh (58%), which is also the home of highest number of total under-nourished children in India. The lower levels of rural stunting were found in Kerala (25%), Tamil Nadu, J & K and Punjab. For the urban place of residence, stunting were found higher in UP (50%), Bihar, Gujarat and MP. The lower levels of urban stunting have observed in Kerala (22%), Himachal Pradesh, Uttaranchal and J & K.

Map: 4.4



Map: 4.5

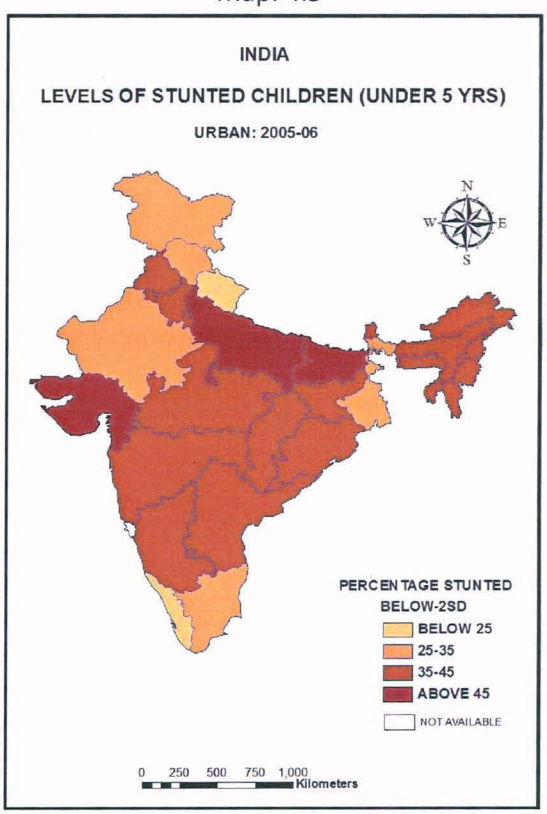
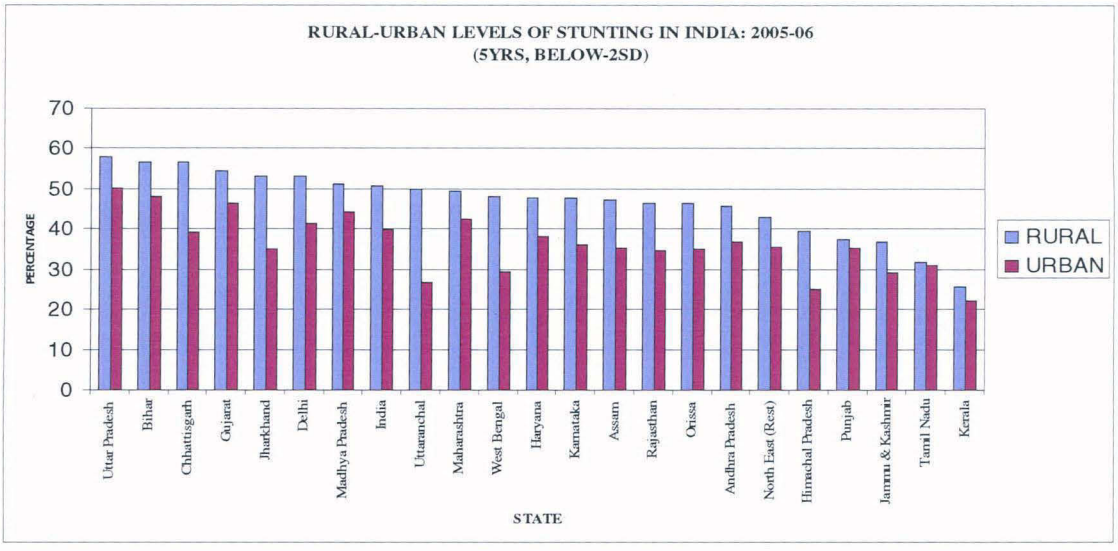
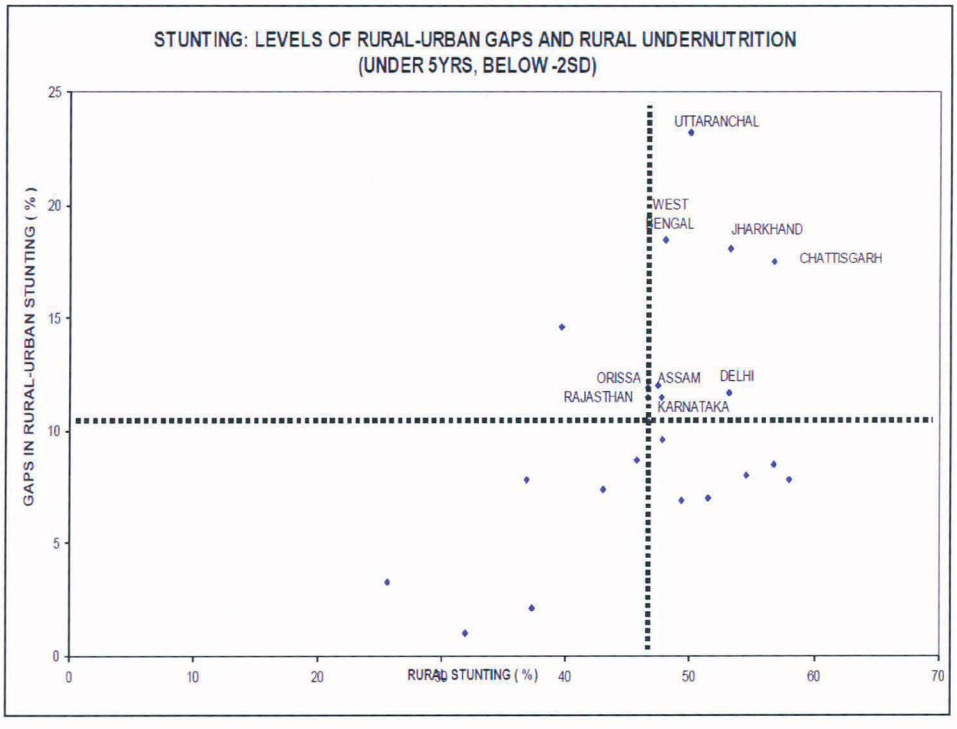


Figure: 4.5



At the national level rural-urban gap in stunting is 11 percentage points. The highest gaps are found in the states of Uttaranchal (23%), West Bengal (18.5%), Jharkhand (18.1%) and Chhattisgarh (17.5%). The lowest gaps are found in Tamil Nadu (just 1%). In Punjab and Kerala also lowest gaps were observed.

Figure: 4.6



The figure 4.6 depicts the nature of rural-urban inequalities in child undernutrition situations, across the different states in India. The state wise rural-urban gaps are plotted here against the levels of rural stunting. The dotted lines represent the

averages at the national level. It is evident that there are many states, where both the rural-urban gaps, as well as the levels of rural stunting are found to be relatively higher. In 7 states (Uttaranchal, West Bengal, Jharkhand, Chhattisgarh, Delhi, Assam, Karnataka) both the gaps and the level of rural undernourishment are found to be higher than the national averages. Additionally, Orissa and Rajasthan can also be included in this category. In these states rural undernutritional problems are much severe than the urban areas. Further, in 6 other states (namely-Uttar Pradesh, Bihar, Gujarat, Maharashtra, Haryana and Madhya Pradesh) both rural-urban undernutrition are found to be higher although the relative gaps are comparatively lower than the national averages.

Table: 4.3 State wise rural-urban inequities in the levels of stunting : 2005-06 (5 yrs, below -2SD)

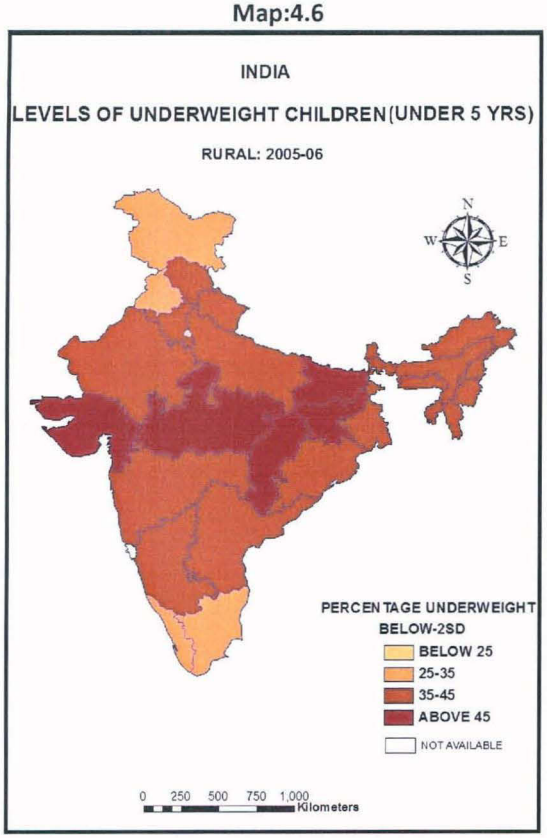
State	Rural	Urban	Gap
Jammu & Kashmir	36.8	29	7.8
Himachal Pradesh	39.6	25	14.6
Punjab	37.3	35.2	2.1
Uttaranchal	50	26.8	23.2
Haryana	47.8	38.2	9.6
Delhi	53.1	41.4	11.7
Rajasthan	46.6	34.7	11.9
Uttar Pradesh	58	50.2	7.8
Bihar	56.7	48.2	8.5
North East (Rest)	43	35.6	7.4
Assam	47.4	35.4	12
West Bengal	48	29.5	18.5
Jharkhand	53.2	35.1	18.1
Orissa	46.6	35.1	11.5
Chhattisgarh	56.7	39.2	17.5
Madhya Pradesh	51.4	44.4	7
Gujarat	54.5	46.5	8
Maharashtra	49.3	42.4	6.9
Andhra Pradesh	45.7	37	8.7
Karnataka	47.7	36.2	11.5
Kerala	25.6	22.3	3.3
Tamil Nadu	31.9	30.9	1
Average	46.7	36.3	10.4
India	50.7	39.8	10.9

Source: Calculated from the NFHS-3 dataset

(B)Underweight: Rural underweight percentages are found higher in Madhya Pradesh (62.5%), Jharkhand (61.2%), Bihar (57.1%) and Chhattisgarh. In these states 50% children are having anthropometric signs of weight faltering. Lower levels of rural underweight children are found in the states of Delhi (23%), Kerala (26%), Punjab (27%) and J & K (28%). The higher levels of urban underweight rates are

found in MP and Bihar (51% and 49% respectively). On the other hand the lower levels have observed in Kerala and J & K. The highest levels of rural-urban gaps for the underweight children in India are noticed in Jharkhand (21.6%), Chhattisgarh (18.7%) and Uttaranchal (17.9%). The lower gaps are found in Punjab (5%), Haryana (6%) and Tamil Nadu (6%). In the capital Delhi rural underweight percentage is found to be much lower then urban areas, so a negative gap is found (-4.8%).

Map:4.6



Map:4.7

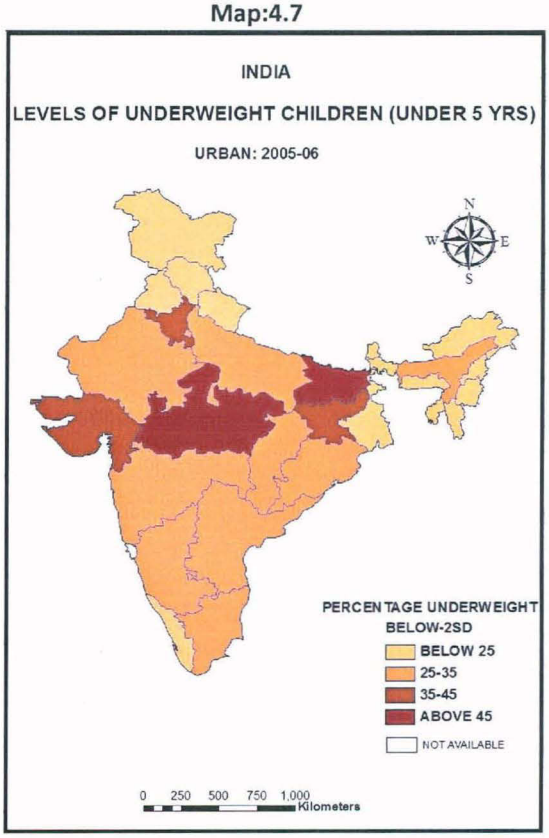


Figure: 4.7

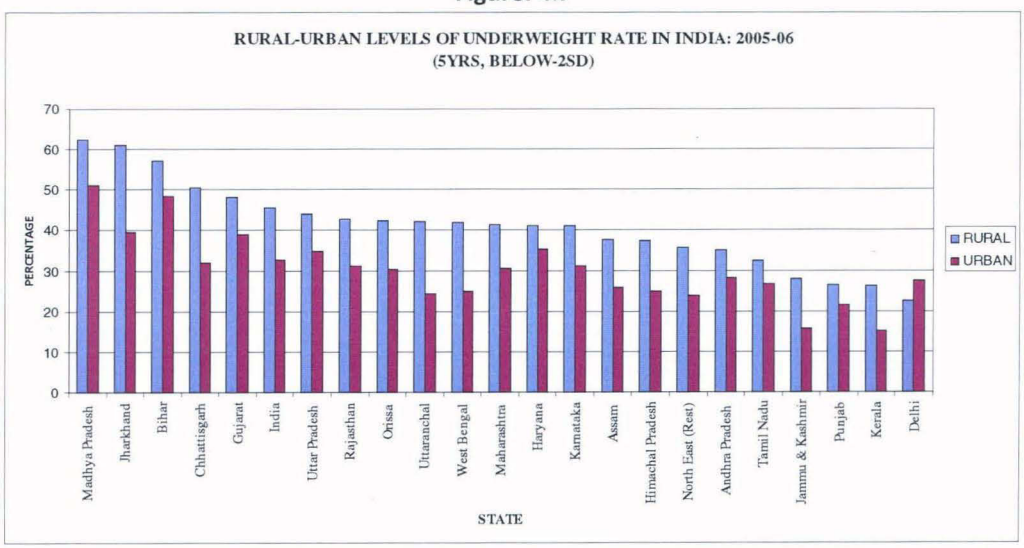
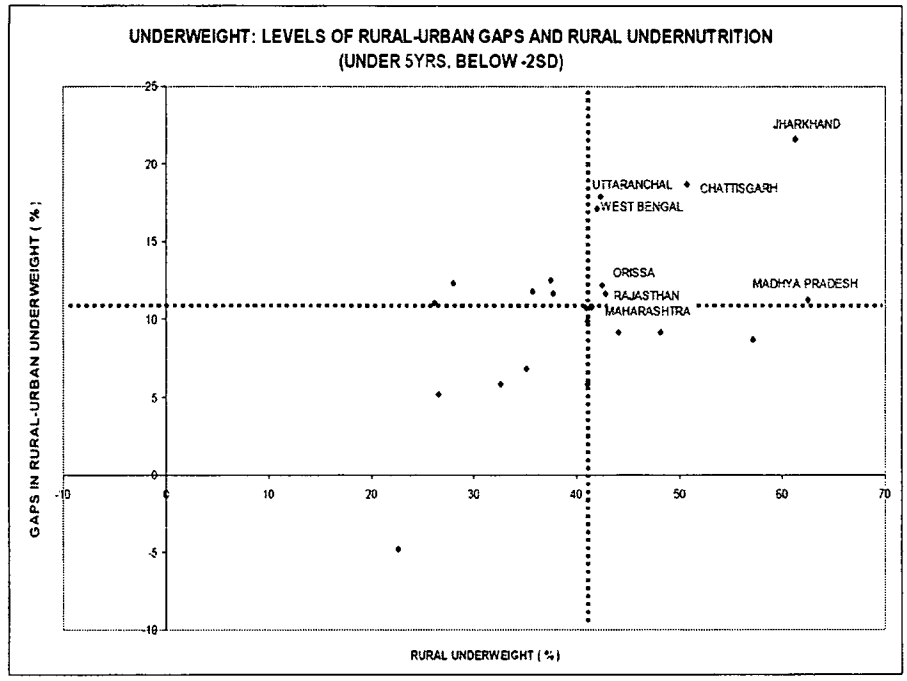


Figure: 4.8



In the figure: 4.8,the distribution of rural-urban gaps and levels of rural underweight rates across the states has plotted. Total 8 states in the country (namely-Jharkhand, Chhattisgarh, Uttaranchal, West Bengal, Madhya Pradesh, Orissa, Rajasthan and Maharashtra) are bearing the burdens of both higher levels rural undernourishment accompanied with huge rural-urban gaps. In 5 other states both the rural and urban underweight levels among the children are found to be higher than the national averages (Uttar Pradesh, Bihar, Gujarat, Karnataka and Haryana). In Punjab, Tamil Nadu and Andhra Pradesh both rural and urban underweight rates are found to be lower than the national averages.

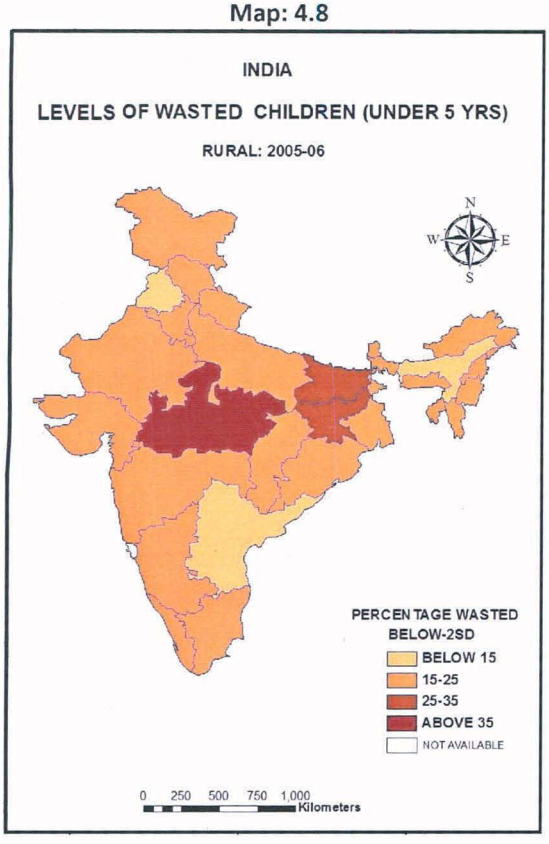
Table: 4.4 State wise rural-urban inequities in the levels of underweight: 2005-06 (5yrs, below-2SD)

State	Rural	Urban	Gap
Jammu & Kashmir	28	15.7	12.3
Himachal Pradesh	37.5	25	12.5
Punjab	26.6	21.4	5.2
Uttaranchal	42.3	24.4	17.9
Haryana	41.1	35.3	5.8
Delhi	22.6	27.4	-4.8
Rajasthan	42.8	31.1	11.7
Uttar Pradesh	44.1	34.9	9.2
Bihar	57.1	48.4	8.7
North East (Rest)	35.7	23.9	11.8
Assam	37.7	26	11.7
West Bengal	42	24.9	17.1
Jharkhand	61.2	39.6	21.6
Orissa	42.5	30.3	12.2
Chhattisgarh	50.7	32	18.7
Madhya Pradesh	62.5	51.2	11.3
Gujarat	48.2	39	9.2
Maharashtra	41.5	30.7	10.8
Andhra Pradesh	35.1	28.3	6.8
Karnataka	41.1	31.2	9.9
Kerala	26.2	15.1	11.1
Tamil Nadu	32.6	26.8	5.8
Average	40.9	30.1	10.8
India	45.7	32.8	12.9

Source: Calculated from the NFHS-3 dataset

(C) Wasting: The levels of wasting among the Indian children are found relatively lower in comparison to the other two types of undernutrition i.e. stunting and underweight. Both the rural and urban wasting was found higher in states of Madhya Pradesh (36% and 32%), Jharkhand (35% and 25%) and Bihar (28% and 26%). Similarly rural-urban wasting both found lower in Punjab (both 9%), Andhra Pradesh (13% and 11%) and Assam (13.5% and 14.2%). Unlike the underweight and stunting, the rural-urban gaps in wasting are noticed comparatively much smaller in India. In Delhi (-0.5), Rajasthan (-0.5) and Assam (-0.7) the gaps were found to be negative. In Punjab no rural-urban gap was found. The higher levels of rural-urban gaps were found in Uttaranchal (10%), Jharkhand (10%), Kerala (7%), and Orissa (7%). In the rest of the other states the rural-urban disparity in wasting are recorded lower than 5 percentage points.

Map: 4.8



Map:4.9

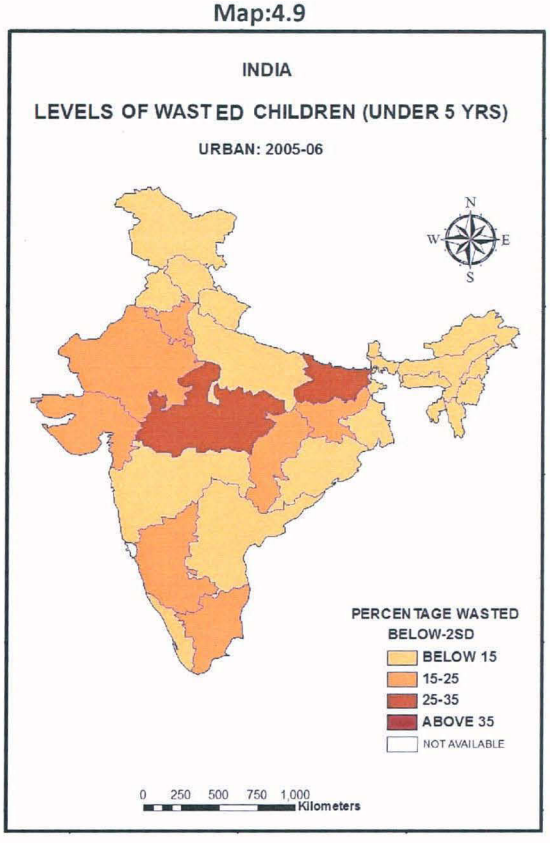
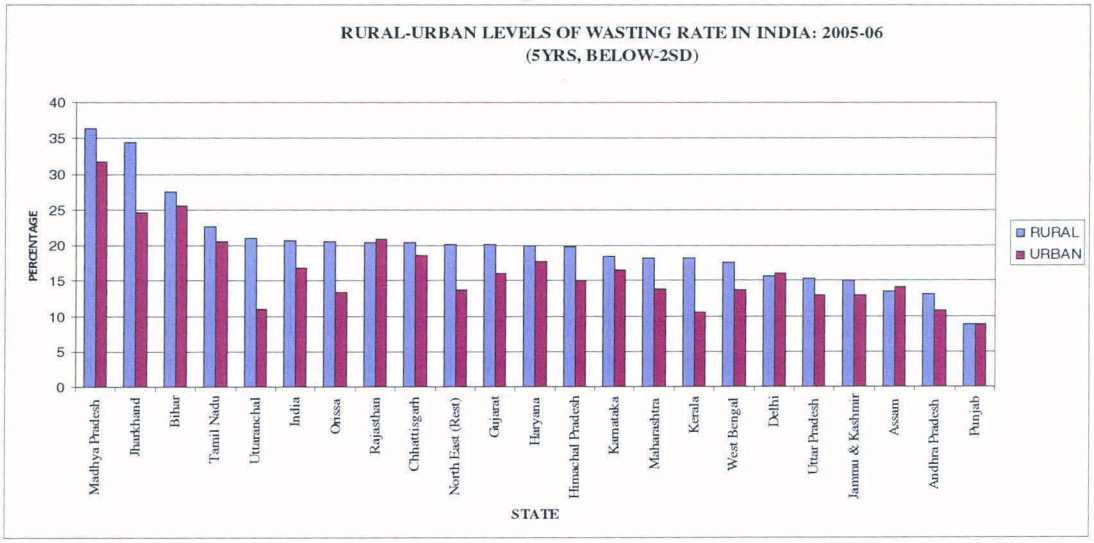


Figure: 4.9



The figure 4.10 showed that state wise distribution of child wasting rate and the prevailing rural-urban gaps in it. There are 6 Indian states (Uttaranchal, Jharkhand, Madhya Pradesh, Orissa, North East and Gujarat) where the levels of rural wasting and its gaps between rural and urban areas are found to be higher in comparison to the national averages. In Tamil Nadu, Bihar and Haryana both the rural and urban wasting levels are found to be above the national averages, though the gaps are comparatively lower.

Figure: 4.10

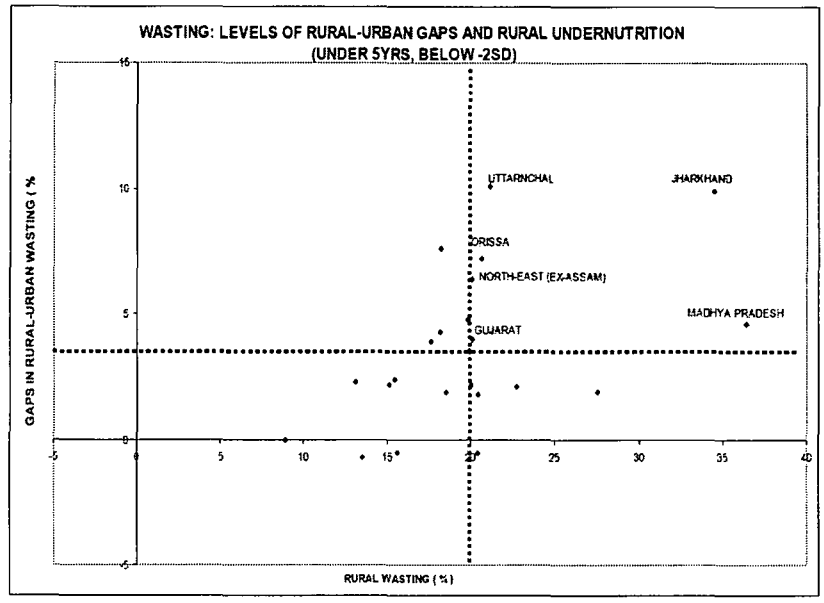


Table: 4.5 State wise rural-urban inequities in the levels of wasting: 2005-06 (5 yrs, below -2SD)

STATE	RURAL	URBAN	GAP
Jammu & Kashmir	15.1	12.9	2.2
Himachal Pradesh	19.8	15	4.8
Punjab	8.9	8.9	0
Uttaranchal	21.1	11	10.1
Haryana	20	17.8	2.2
Delhi	15.6	16.1	-0.5
Rajasthan	20.4	20.9	-0.5
Uttar Pradesh	15.4	13	2.4
Bihar	27.5	25.6	1.9
North East (Rest)	20.1	13.7	6.4
Assam	13.5	14.2	-0.7
West Bengal	17.6	13.7	3.9
Jharkhand	34.5	24.6	9.9
Orissa	20.6	13.4	7.2
Chhattisgarh	20.4	18.6	1.8
Madhya Pradesh	36.4	31.8	4.6
Gujarat	20.1	16.1	4
Maharashtra	18.2	13.9	4.3
Andhra Pradesh	13.1	10.8	2.3
Karnataka	18.5	16.6	1.9
Kerala	18.2	10.6	7.6
Tamil Nadu	22.7	20.6	2.1
Average	19.9	16.4	3.5
India	20.8	16.8	4

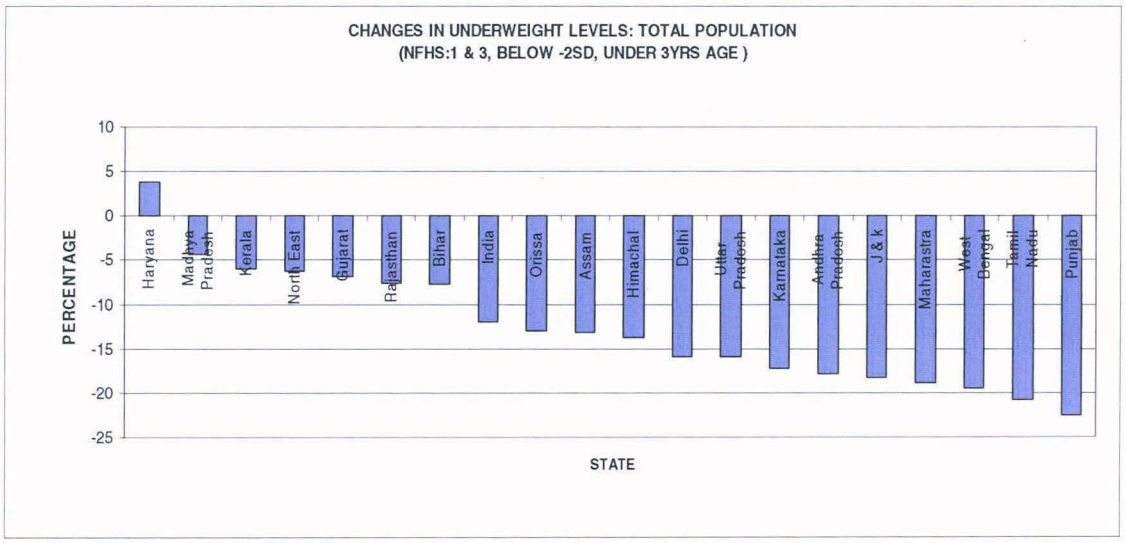
Source: Calculated from the NFHS-3 dataset

4.4 Changes in state level undernutrition situation:

(A)Underweight:

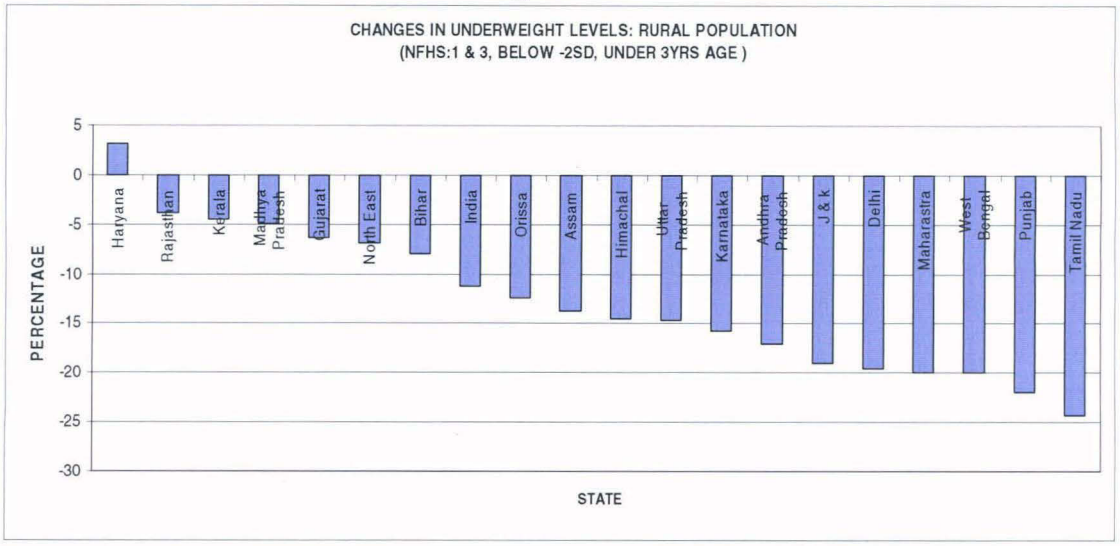
(a) NFHS-1 & 3: Over the years, the child underweight situations in India have shown gradual improvements in most of the states or regions. It has reflected from the following figures (Figure: 4.14, 4.15 and 4.16) that in almost all the states of the country (except Haryana) underweight rates has reduced. The highest levels of reductions are noticed in Punjab (22.5%) and Tamil Nadu (20.7%). There are total 12 Indian states, where the overall reductions are above 10%. Additionally in 5 other states, reductions of more than 5 percentages are noticed. Madhya Pradesh a slight improvement is found (4.4%). Haryana is the only state, where the underweight level has gone up by around 4%.

Figure: 4.11



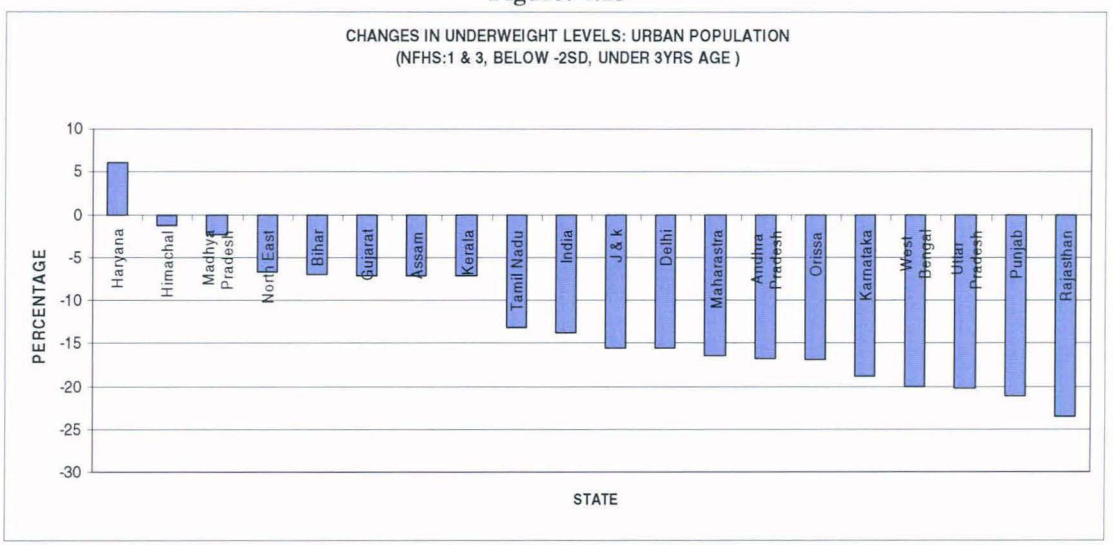
In case of rural underweight rate an overall 11% reduction is achieved at the national level. Tamil Nadu, Punjab, Maharashtra and West Bengal have experienced around 20% reductions in their rural underweight levels. Some other states also have experienced appreciable success in terms of rural underweight rate. For example in J & K, Andhra Pradesh, Karnataka, Delhi, Uttar Pradesh, Himachal Pradesh, Assam and Orissa the reductions are over 10%. In Haryana negative improvements are seen during this period of time.

Figure: 4.12



For the urban underweight an overall 14% percent of reduction has been achieved at the national level. The highest levels of reductions are experienced in Rajasthan (23.6%), Punjab (21%), Uttar Pradesh (20%) and West Bengal (20%). In six other states reductions by more than 15% has been noticed (i.e. Karnataka, Orissa, Andhra Pradesh, Maharashtra, Delhi and J & K). Assam, Kerala, Bihar, Gujarat and North Eastern region have experienced reductions by more than 5%. In Madhya Pradesh and Himachal the situations have not been improved much, while in Haryana the underweight level has gone up.

Figure: 4.13



(b) NFHS-1 & 2: Between NFHS-1 & 2, the overall reduction of stunting in India is 5.7 percentages. During this time, period the highest level of reduction is observed in Punjab (17%). In two Indian states, Assam and Tamil Nadu the reductions are more than 10 percentage points. There are total seven states in the country (Andhra Pradesh, Bihar, Delhi, J & k, Karnataka, U.P and West Bengal), where overall reductions in stunting by more than 5 percentages are noticed. On the other hand, in some of the states like Haryana, Himachal, Kerala the situation has remained unchanged. In two states, Orissa (-2.0) and Rajasthan (-6.4) negative reductions are observed i.e. underweight situation has worsened during this period. The reductions of urban and rural underweight in India from NFHS-1 & 2 are respectively 5.5 and 5.7 percentages. In Punjab both highest level of reductions are observed for the urban and rural underweight rate. In Andhra Pradesh and West Bengal, close to 12% of reduction in urban underweight rate has observed. In Haryana, Maharashtra and North- Eastern states (Rest) the urban underweight rate has actually gone up in between this time period. Except three states (i.e. Delhi, Orissa and Rajasthan) in all other parts of the country, Rural underweight rate has improved between the NFHS-1 & 2. In rural Rajasthan underweight rate has gone up by alarmingly 8.5 percentages. Punjab and Tamil Nadu recorded reductions in rural underweight rate by more then 15 percentages.

(c) NFHS-2 & 3: Between NFHS-2 & 3 the reduction in the overall child underweight rate is 6.3 percentages, suggesting a higher level of reduction than previous time period. Orissa and Rajasthan have come out with tremendous improvements from a situation of negative growth to an overall reduction of underweight rate by respectively 15.0 and 13.9 percentages. Kerala, Himachal Pradesh and Maharashtra have shown important improvements during this time period. States like West Bengal, Andhra Pradesh, Delhi, J & K, Tamil Nadu and Uttar Pradesh has maintained their previous track records through successive reduction in the overall underweight rate. Other hand, in three states- Bihar, Haryana and Madhya Pradesh the underweight situation has worsened during this time period. Considering the urban underweight rate an overall 8% reduction is noticed. In 4 states the situation has worsened (i.e. Assam, Haryana, Madhya Pradesh and Punjab). Haryana has

shown a successive increase in urban child underweight rate. In most of the other states, the urban underweight rate has reduced. In Rajasthan, Maharashtra and Orissa tremendous reductions in the urban underweight rates are noticed. The rural the underweight rates are reduced by 5.5%, at the aggregate level. Highest reduction is observed in Delhi. Andhra Pradesh, Himachal Pradesh, Gujarat, J & K, Orissa, Rajasthan, West Bengal, Uttar Pradesh and Tamil Nadu have revealed some significant reduction in the rate of rural underweight rate.

Table: 4.6 State-wise changes in the underweight levels (3 yrs, below -2SD)

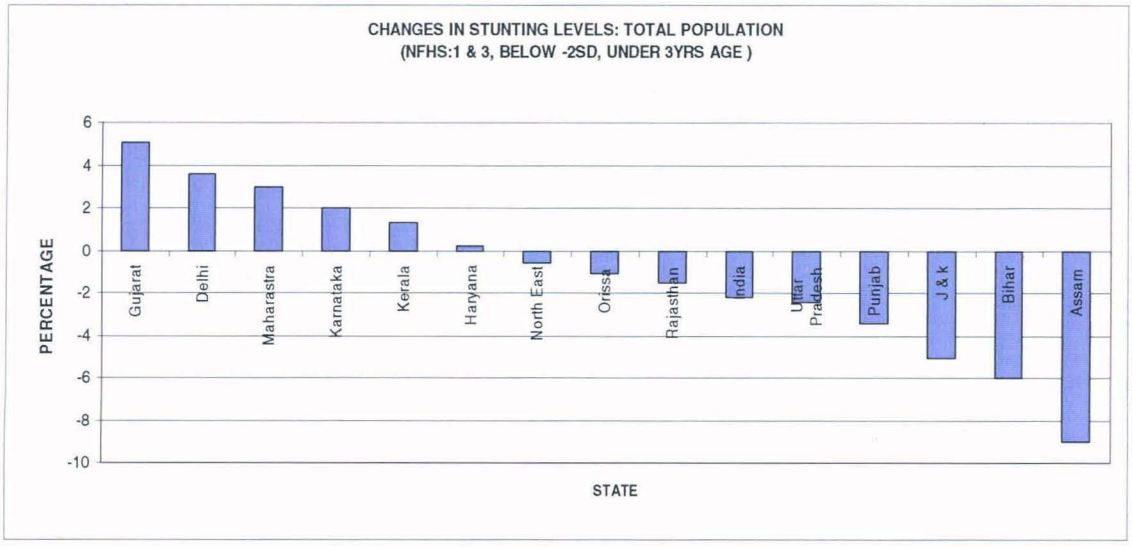
	NFHS-1 & 2			NFHS-2 & 3			NFHS-1 & 3		
States	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural
Andhra Pradesh	-9.9	-11.9	-9.2	-7.9	-4.8	-7.8	-17.8	-16.7	-17
Assam	-13	-8.5	-14	-0.2	1.3	0.2	-13.2	-7.2	-13.8
Bihar	-8.3	-3.4	-9.5	0.6	-3.7	1.6	-7.7	-7	-7.9
Delhi	-6.4	-8.2	10.5	-9.6	-7.3	-30	-15.9	-15.6	-19.5
Gujarat	-2.9	-4.4	-1.2	-4	-2.6	-5.1	-6.9	-7.1	-6.3
Haryana	0	0.8	-0.2	3.8	5.3	3.4	3.8	6.1	3.2
Himachal	-1.4	-1.3	-1.6	-12.3	0	-13	-13.7	-1.3	-14.6
J & K	-7.8	-8.8	-8.3	-10.5	-6.6	-10.7	-18.3	-15.5	-19
Karnataka	-6.7	-6.4	-6.5	-10.6	-12.3	-9.2	-17.3	-18.8	-15.7
Kerala	-0.2	-0.1	-0.5	-5.7	-7.1	-4	-5.9	-7.2	-4.5
Madhya Pradesh	-4.5	-5.7	-3.9	0.1	3.3	-0.9	-4.4	-2.4	-4.9
Maharashtra	-1.8	0.6	-3.5	-17.1	-17	-16.5	-18.9	-16.4	-19.9
North East	-3.8	2.5	-6.2	-2.5	-9.2	-0.7	-6.3	-6.7	-6.9
Orissa	2	-0.2	2	-15	-16.7	-14.3	-13	-16.9	-12.4
Punjab	-17.3	-22.2	-15.7	-5.2	1.2	-6.3	-22.5	-21.1	-22
Rajasthan	6.4	-3.3	8.5	-13.9	-20.2	-12.3	-7.5	-23.6	-3.8
Tamil Nadu	-10.3	-2.4	-15.1	-10.5	-10.7	-9.2	-20.7	-13.1	-24.3
Uttar Pradesh	-5.7	-8.6	-5	-10.2	-11.7	-9.7	-15.9	-20.3	-14.7
West Bengal	-7.9	-12.6	-7.8	-11.5	-7.3	-12.1	-19.4	-20	-19.9
India	-5.7	-5.5	-5.7	-6.3	-8.2	-5.5	-11.9	-13.7	-11.3

Source: Calculated from NFHS Datasets

(B) Stunting:

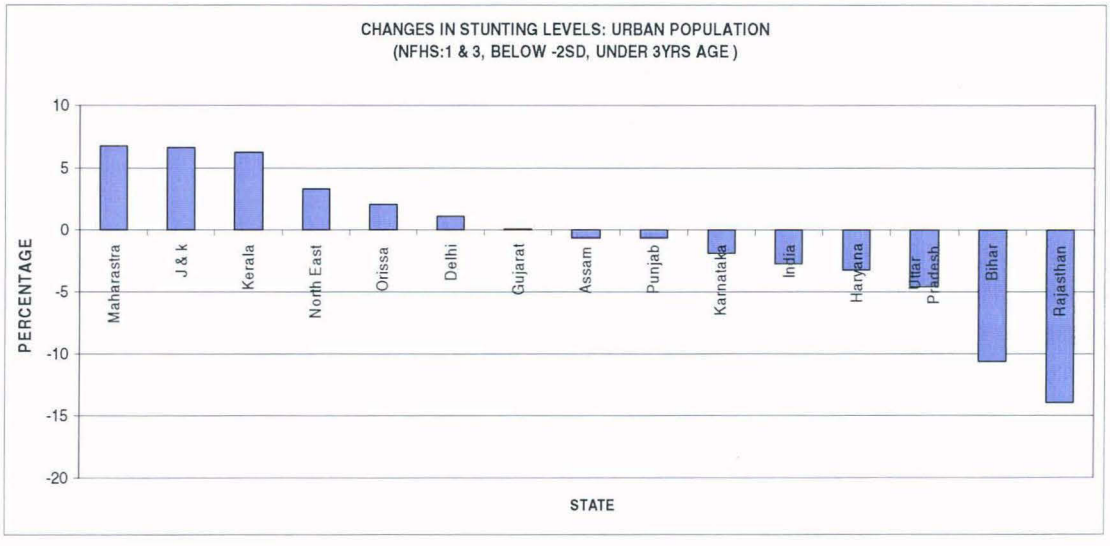
(a) NFHS-1 & 3: From 1st to 3rd rounds of NFHS the overall stunting situation in India has not improved much, at the aggregate level the reduction is just mere 2.2%. Assam, Bihar, J & K are the states, where stunting levels are reduced by more than 5%, while in Rajasthan, Orissa and North East no improvements take place. In rest of the other states the level of stunting has gone up over the years.

Figure: 4.14



In case of urban stunting Rajasthan and Bihar are the only two states, where significant decline have been noticed. In Uttar Pradesh, Haryana, Karnataka, Assam and Punjab, the situations have remained unchanged. In rest of the other parts of the country urban stunting levels have worsened during this time period. Kerala, J&K and Maharashtra also experienced such increase in their stunting rate.

Figure: 4.15



In case of rural stunting major improvement is noticed in Assam (9.7%). In J & K and Orissa marginal improvements took place. In the other states the levels of stunting has increased over the years. In Delhi and Gujarat the increase are respectively 27 and 8 percentage points.

Figure: 4.16

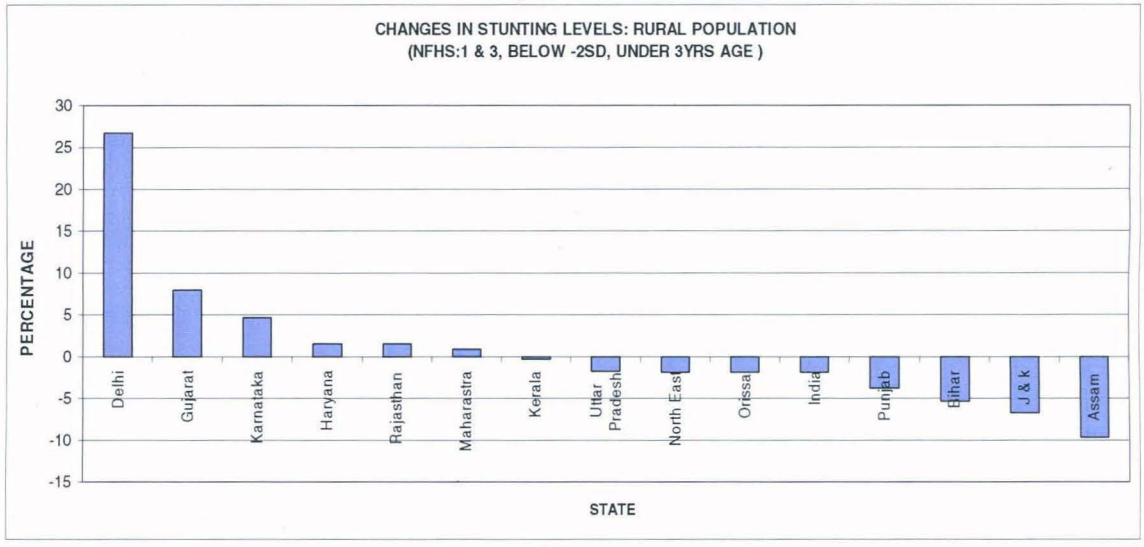


Table: 4.7 State-wise changes in the stunting levels (3 yrs, below -2SD)

States	NFHS-1 & 2			NFHS-2 & 3			NFHS-1 & 3		
	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural
Andhra Pradesh	NA	NA	NA	-0.3	3.5	-0.6	NA	NA	NA
Assam	0	0.6	-0.8	-9	-1.2	-8.9	-9	-0.6	-9.7
Bihar	-1.9	-7.8	-1.6	-4.1	-2.9	-3.7	-6	-10.6	-5.3
Delhi	-3	-5	16.7	6.6	6.1	10	3.6	1.1	26.7
Gujarat	-0.4	-3.5	1.7	5.5	3.6	6.1	5.1	0.1	7.9
Haryana	7	1.4	9	-6.8	-4.5	-7.5	0.2	-3.2	1.5
Himachal	NA	NA	NA	-7.1	0	-7.3	NA	NA	NA
J & K	0.6	5	0.5	-5.8	1.7	-7.2	-5.1	6.7	-6.7
Karnataka	-3.9	-5	-3.1	5.9	3.1	7.8	2	-1.9	4.7
Kerala	-3.1	-2.7	-3.8	4.4	8.9	3.5	1.3	6.3	-0.3
Madhya Pradesh	NA	NA	NA	-3.1	1.9	-4.6	NA	NA	NA
Maharashtra	-1	0.1	-1.7	4	6.7	2.7	3	6.8	0.9
North East	-0.3	6.8	-2.5	-0.3	-3.5	0.6	-0.6	3.3	-1.8
Orissa	-1	3.1	-2.1	-0.1	-1	0.3	-1.1	2.1	-1.8
Punjab	1.1	-4.4	2.8	-4.4	3.8	-6.5	-3.4	-0.6	-3.7
Rajasthan	10.4	1	12.7	-11.9	-15	-11.2	-1.5	-14	1.5
Tamil Nadu	NA	NA	NA	1.8	3.1	1.3	NA	NA	NA
Uttar Pradesh	1.2	-3.3	2.2	-3.6	-1.3	-4	-2.4	-4.6	-1.7
West Bengal	NA	NA	NA	0.1	3.6	-0.4	NA	NA	NA
India	-2.2	-4.9	-1.3	0	2.1	-0.6	-2.2	-2.7	-1.9

Source: Calculated from NFHS Datasets

(b) NFHS-1 & 2: Between NFHS-1 & 2 and NFHS-2 & 3 the overall reduction of stunting for the children under 3 years of age are respectively 2.2 and 0 percentages; suggesting the persistent nature of this type of undernutrition problems in the country.

During NFHS-1 & 2 time periods there were 5 states in India, where stunting have increased (Haryana, J & K, Punjab, Rajasthan and UP). Highest increases were found in Rajasthan (10.4%) and Haryana (7.2%). In Assam, Gujarat, Maharashtra, Orissa and North Eastern states stunting remains the same. In Delhi, Bihar, Karnataka and Kerala marginal improvements are noticed. The reduction of urban stunting between NFHS-1 & 2 is 4.9%, much higher in comparison to the reduction in the rural areas (1.3%). Assam, Haryana, J & K, Maharashtra, North-East (Rest), Orissa and Rajasthan have experienced an increase in the rates of urban stunting. On the other hand, states like Bihar, Delhi and Karnataka has shown improvements.. In the rural areas the reduction in stunting rates has remained much slower. Delhi, Rajasthan and Haryana experienced rise in rural stunting rates. In Kerala and Karnataka slight improvements are noticed.

(c) NFHS-2 & 3: Between NFHS-2 & 3 the overall stunting situation has remained unchanged at the aggregate level. During this period many Indian states like Assam, Bihar, Himachal Pradesh, Madhya Pradesh have shown improvements from their previous situation. Some of the poor performing states (e.g. Haryana, Punjab, Rajasthan and Uttar Pradesh) have also able to overcome their past performances. Kerala, Tamil Nadu, Gujarat, Maharashtra and Delhi are the states where situations have worsened during this time period. Considering the changes in urban areas, it is noticed that most of the states have performed poorly in this time period. In Delhi, Kerala, Maharashtra the stunting rates are increased by more than 5 percentages. Rajasthan have shown a tremendous improvement through reducing urban stunting rate by 15%. For the rural stunting, 8 states have shown an increase. In Delhi, Karnataka and Gujarat the increase are very high, more than 5 percentage. In the other hand, states like Rajasthan, Assam, Haryana, Himachal Pradesh, J & K and Punjab shown good performances in terms of reduction of rural stunting.

(C) Wasting:

(a) NFHS-1 & 3: Over the years wasting situation has actually gone up in India, which indicates that the poverty and hunger are still persistent. Comparing the changes over the decades it is noticed that during NFHS-1 & 2 time period, there is a

reduction in the of overall wasting rate by 3.6%, which in the last round of NFHS has increased by 7.1%. Because of this, the overall wasting level has increased. Haryana, Bihar, Assam, North-East (Ex-Assam) are the states, where the overall wasting levels have increased over the years. Likewise, the stunting and underweight levels, wasting rate in Haryana has shown a significant increase over the years (close to 17%). In Bihar, Assam and rest of the North-Eastern region increase by more than 5% have recorded. On the other hand, states like Gujarat, Karnataka, Maharashtra and Punjab have recorded decline in their wasting levels. In Punjab the situation has significantly improved where more than 11% decline has recorded. In rest of the other regions of the country situations have not improved.

The rural wasting levels have declined in Punjab, Maharashtra and Delhi. Contrary to this, it has significantly increased in Haryana, Bihar, Kerala and North-Eastern region. In other parts of the country no improvements have noticed. Similarly in case of urban wasting, states like Haryana, Bihar, Assam and North-East have shown an increase. Slight improvements has noticed in UP, Karnataka, Kerala and Orissa. In three states i.e. Rajasthan, Maharashtra and Punjab the urban wasting levels have significantly over the years.

(b)NFHS-1 & 2: During NFHS-1 & 2 there are 10 total states in the country, where improvements have noticed. Highest levels of improvements noticed in three northern states Punjab , Rajasthan and Uttar Pradesh. In 4 remaining states i.e. Assam, Delhi, Karnataka and Orissa, wasting has increased. For the urban wasting during this time period, Assam,Bihar and Orissa has experienced an increase. The remaining 11 states have shown improvements in it. For the rural areas, highest levels of improvements are noticed in Punjab, Rajasthan, Uttar Pradesh and J & K. During this period some of the poor performing states are Delhi, Karnataka, Assam, Maharashtra and Orissa.

Figure: 4.17

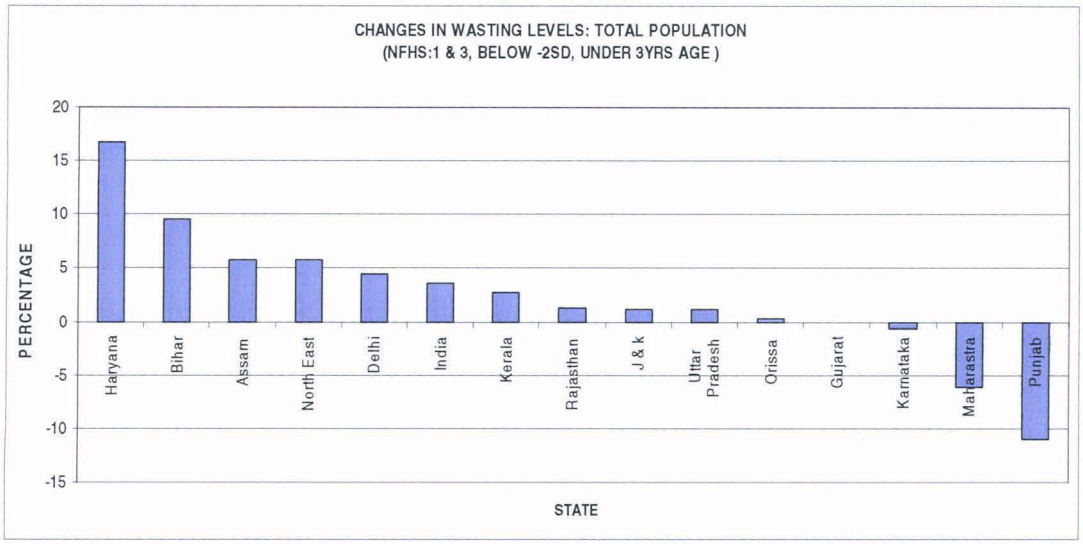


Figure: 4.18

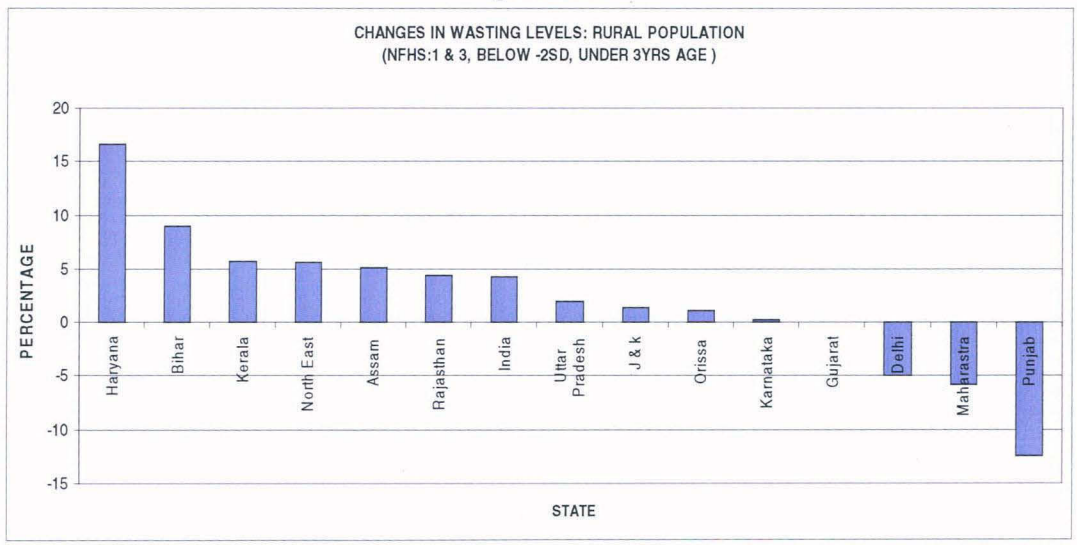
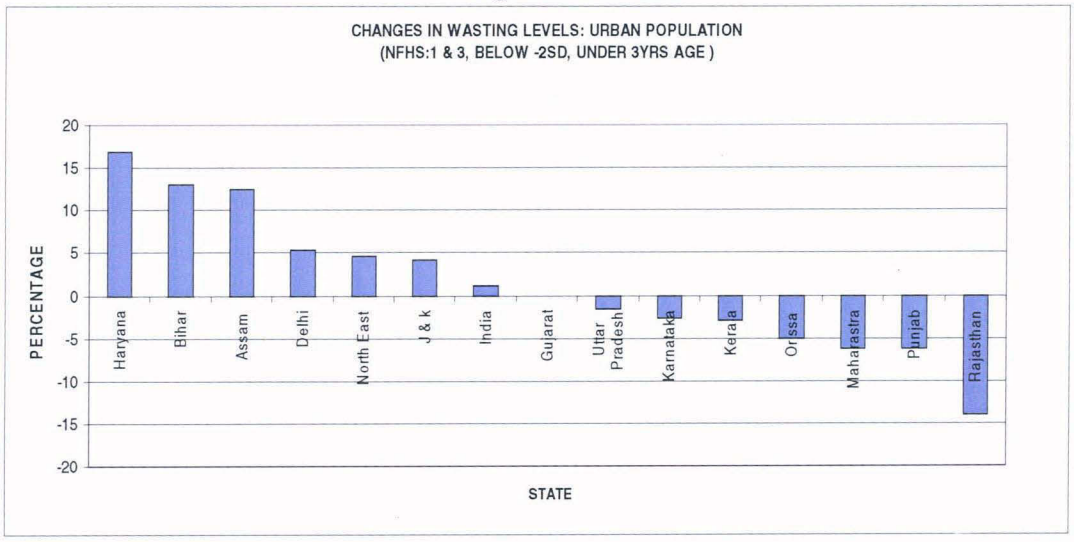


Figure: 4.19



(c) NFHS-2 & 3: During NFHS-2 & 3 surveys almost all the states have shown an increase in the rate of stunting (except Karnataka, Orissa and Maharashtra). The highest increases in are noticed Haryana (17.6%) and Madhya Pradesh (16.1%). Regarding urban wasting, Orissa is the only state which has performed well. Kerala also showed slight reduction in it. In rest of the country, the urban wasting level has gone up severely. In Haryana and Madhya Pradesh 17-18 percentages of increase have spotted. In almost all Indian states, rural stunting has gone up during this time period. Maharashtra, Karnataka and Delhi, are the states where rural wasting has fall. Bihar, Haryana, Madhya Pradesh and Rajasthan have shown increase by more than 10 percentages.

Table: 4.8 State-wise changes in the wasting levels (3 yrs, below -2SD)

	NFHS-1 & 2			NFHS-2 & 3			NFHS-1 & 3		
States	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural
Andhra Pradesh	NA	NA	NA	5.6	6.8	5.2	NA	NA	NA
Assam	2.3	3	2	3.5	9.5	3	5.8	12.5	5.1
Bihar	-2.7	0.2	-3.4	12.3	12.8	12.4	9.6	13	9
Delhi	-0.3	-1.4	8.6	4.6	6.8	-13.6	4.4	5.4	-5
Gujarat	-3.4	-5.8	-1.6	3.3	5.8	1.6	-0.1	-0.1	0
Haryana	-0.6	-1.1	-0.5	17.3	18	17.1	16.7	16.9	16.6
Himachal Pradesh	NA	NA	NA	2.7	9.1	2	NA	NA	NA
J & K	-4.9	-3.2	-5	6.1	7.3	6.4	1.2	4.1	1.4
Karnataka	0.4	-3.5	2.2	-1.1	0.9	-1.9	-0.7	-2.6	0.3
Kerala	-1.8	-1.2	-2.1	4.6	-1.7	7.8	2.8	-2.9	5.7
Madhya Pradesh	NA	NA	NA	15.8	17.1	15.5	NA	NA	NA
Maharashtra	-2	-5.2	0.1	-4.1	-0.9	-5.9	-6.1	-6.2	-5.8
North East	-3	-0.4	-3.9	8.8	5	9.6	5.8	4.6	5.6
Orissa	1.1	5.1	0.4	-0.8	-10.2	0.8	0.3	-5.1	1.1
Punjab	-14.1	-9.3	-15.4	3.1	3	3	-11	-6.3	-12.4
Rajasthan	-9.4	-24.8	-6.1	10.6	10.8	10.5	1.3	-14	4.4
Tamil Nadu	NA	NA	NA	3.3	2.1	4.2	NA	NA	NA
Uttar Pradesh	-7.2	-8.3	-7	8.5	6.7	8.9	1.2	-1.6	1.9
West Bengal	NA	NA	NA	5.5	4.6	5.8	NA	NA	NA
India	-3.6	-4.6	-3.3	7.1	5.7	7.6	3.6	1.2	4.3

Source: Calculated from NFHS Datasets

4.5 Inequities of child undernutrition among the slum and non-slum population in urban India:

Socio economic inequities of child undernutrition in India are not confined between the rural- urban population, but it also prevails in between the slum and non-slum population groups. NFHS-3 provides information on child undernutrition both for slum and non-slum population, across the eight metropolitan cities of India, which is helpful to understand their levels of inequality. At the aggregate level, the rates of stunting, underweight and wasting among the slum population in India are respectively 44, 34 and 17 percentages. On the other hand, among non-slum population these percentages are 34, 24 and 16 respectively for stunted, underweight and wasted. It appears that, at the aggregate level inequalities between the slum and non-slum population are greater in case of stunting and underweight as compared to the wasting. The results of wide cross tabulations of various socio-economic variables have given below, suggesting the further inequalities in between these two groups of population.

(A) Stunting: Across the various social groups in India, slum & non-slum inequalities in the level of stunting, prevail. The highest gap between slum and non-slum level of stunting is found among ST (25%) population. ST from slum areas has highest level of stunting among the all social groups (58%). However, the situation of the non-slum ST children is comparable with the OBC and others in terms of the stunting level. The lowest gaps are found among the SC and others. Both in slum and non-slum situation the SCs have higher levels of stunting compared to the other social groups. On the other hand, among the others stunting rates is minimal in both areas. Children from slum areas are prone to be stunted in comparison to the non-slum children, irrespective of the different social-economic background considered here. Both the LBW and non-LBW, and vaccinated and non-vaccinated children from slum areas have higher propensity to higher chances to become stunted in comparison to the non-slum children. However, the degree or propensity are higher for the LBW and non-vaccinated children in comparison to those with normal weight at birth and fully vaccinated. In case of birth weight highest inequality is found in case of children with birth order 2 or less. Children from birth order 2 or less are found 11 more stunted in

comparison to the non-slum children. In case of mother's nutritional status as the background characteristics, the highest inequality is found in case of obese mothers. In case of mothers education highest slum and non-slum inequality is found among secondary and higher educated mother's category. As per as wealth index is concerned it has appears that, children of poor house hold from slum areas are better off in comparison to the non-slum locals.

Table: 4.9 Stunting among the slum and non-slum population: 2005-06 (5Yrs, Below-2SD)

Categories	SLUM	NON-SLUM	GAP
Social Group			
SC	51.2	44.1	7.1
ST	58.3	33.3	25
OBC	43.5	30.9	12.6
OTHERS	40.7	33.2	7.6
SCHD	50.5	43.6	6.9
NSCHD	42.3	32.1	10.2
Birth Weight			
LBW	55.1	40.7	14.3
NON-LBW	35.6	28.4	7.3
Vaccination			
Vaccinated	40.3	32.8	7.5
Non Vaccinated	48.3	35.3	13
Birth Order			
Less or Equal To 2	40	28.7	11.3
3 To 4	47.4	43.7	3.7
5 Or Above	56.8	55.3	1.6
Mother's Nutritional Status			
Thin	50.0	42.8	7.2
Normal	43.5	33.6	9.9
Obese	36.3	26.3	9.9
Mother's Educational Status			
No Education	53.8	50.9	2.8
Primary	44.8	43.8	1.1
Secondary and above	39.4	29.2	10.1
Wealth Index			
Poor	55.6	70.6	-15
Middle	51.4	47.5	4
Rich	41.7	31.4	10.3
India	43.8	33.8	10

(B) Underweight: In case of underweight rate, similar pattern are emerges in terms of slum and non-slum inequalities. Across all the different social groups, slum and non-slum inequalities prevail. The highest and lowest level inequalities are found respectively among the ST and SC population. LBW and Non-vaccinated children

have higher levels of gaps as compared to the Non-LBW and vaccinated children. Irrespective of their birth order and mothers nutritional status, slum children are found to be more prone to be undernourished. Interestingly, mothers educated up to primary level from non-slum areas have higher levels of underweight children. Children from slum areas, in all types of wealth quintiles have higher levels of underweight rate in comparison to the non-slum place of residence.

Table: 4.10 Underweight among the slum and non-slum population: 2005-06 (5Yrs, Below-2SD

Categories	SLUM	NON-SLUM	GAP
Social Group			
SC	35.4	31.1	4.3
ST	58.3	33.3	25
OBC	36.1	26.1	10
OTHERS	31.5	21.1	10.4
SCHD	37.9	31.2	6.7
NSCHD	32.5	22.9	9.6
Birth Weight			
LBW	55.1	32.1	23
NON-LBW	25.8	19.8	6
Vaccination			
Vaccinated	32.9	23.6	9.4
Non Vaccinated	35.6	25	10.6
Birth Order			
Less or Equal To 2	33.2	21.5	11.8
3 To 4	33.3	28.7	4.6
5 Or Above	40.9	36.8	4.1
Mother's Nutritional Status			
Thin	46.3	37.7	8.6
Normal	34.3	23.9	10.4
Obese	17.8	14.4	3.3
Mother's Educational Status			
No Education	42.9	35.2	7.6
Primary	28.8	32.8	-4
Secondary and above	31.2	20.8	10.4
Wealth Index			
Poor	50	47.1	2.9
Middle	44.3	40	4.3
Rich	31.3	22	9.3
Total	34	24.1	9.9

Source: Calculated from NFHS-3 data

(C) Wasting: In case of wasting, the slum and non-slum gaps are found to be relatively lower than that of stunting and underweight. Among the SCs and total scheduled from the non-slum areas have higher levels wasting in comparison to the

slum areas. For the STs the wasting rates are similar in both slum and non-slum areas. LBW children from slum areas have higher percentages of wasted children. But, wasting rates are found higher among non-slum LBW children in comparison to the slum areas. Among non-slum children, those who were vaccinated, having obese and primary educated mothers have higher levels of wasting in comparison to the children from slum areas.

Table: 4.11 Wasting among the slum and non-slum population: 2005-06 (5Yrs, Below-2SD)

Categories	SLUM	NON-SLUM	GAP
Social Group			
SC	13.4	17.6	-4.2
ST	25	25	0
OBC	20.4	16.3	4.1
OTHERS	14.9	14.7	0.2
SCHD	14.7	17.3	-2.6
NSCHD	16.3	15.6	0.7
Birth Weight			
LBW	29	21.3	7.7
Non-LBW	13.6	14.3	-0.7
Vaccination			
Vaccinated	13.6	15.1	-1.5
Non vaccinated	19.3	17.2	2.1
Birth Order			
Less or equal to 2	16.7	16.6	0.1
3 to 4	14.8	13.8	1
5 or above	18.2	13.2	5
Mother's nutritional status			
Thin	20.4	19.6	0.8
Normal	17.6	16.8	0.8
Obese	7.7	10.7	-3
Mother's educational status			
No education	18.5	15.1	3.4
Primary	10.2	18.8	-8.6
Secondary	16.7	15.6	1.1
Wealth index			
Poor	22.2	17.6	4.6
Middle	17.1	18.3	-1.2
Rich	15.9	15.4	0.5
Total	16.3	15.8	0.5

Source: Calculated from NFHS-3 data

4.6 Characteristics of urban undernutrition: a study of selected metropolitan cities

NFHS-3 survey provides information for eight major Indian cities, namely Kolkata, Chennai, Mumbai, Delhi, Meerut, Nagpur, Hyderabad and Indore. Preliminary analyses have shown following patterns

(A) Stunting: The highest level of over all stunting is observed in Mumbai (45%), followed by Meerut and Delhi. The lowest level is found in Chennai (27%). In terms of gap between the slum and non-slum areas wide variations are observed. Among slum population the highest level of stunting is found in capital Delhi (more than 50%). Chennai has the lowest level of stunting in the slum areas in comparison to the other cities. In case of non-slum population the highest and lowest levels are found respectively in Mumbai (41%) and Kolkata (21%). The level in Mumbai is nearly double of the stunting rate of Kolkata. In terms prevailing slum and non-slum gaps, the highest and lowest gaps were found respectively in Nagpur (22%) and Chennai (.7%).

Figure: 4.20

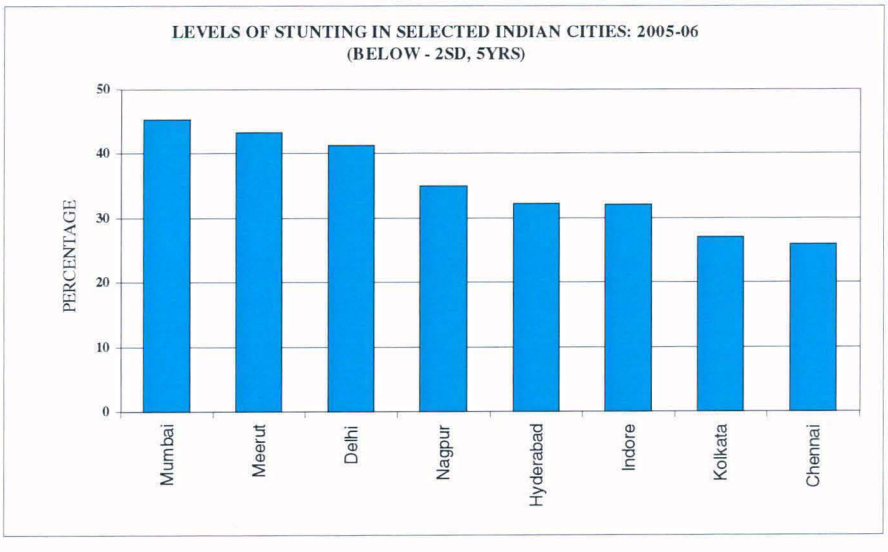


Table: 4.12 Levels of stunting among the slum and non-slum population in selected metropolitan cities: 2005-06 (5 yrs, below -2SD)

City	Total	Slum	Non Slum	Gap
Delhi	41.4	50.8	38.6	12.2
Meerut	43.4	NA	NA	NA
Kolkata	27	32	21.7	10.3
Indore	32.2	NA	30.4	NA
Mumbai	45.3	47.3	41.5	5.8
Nagpur	35.1	48.4	26.1	22.3
Hyderabad	32.3	NA	32.1	NA
Chennai	26	26.7	26	0.7
India	37.6	43.8	33.8	10

Source: Calculated from NFHS-3 Dataset

(B) Underweight:

Among the metropolitan cities, the highest and lowest levels of underweight rate are respectively found in Indore (40%) and Kolkata (19.8). In case of slum population, Nagpur has the highest level of underweight rate (42%) and the lowest level is observed in Kolkata (26%). For the non-slum underweight rate, again Kolkata has the lowest level as compared to the other Indian cities. Indore on the other hand, has the highest level of underweight rate among the non-slum children. In terms of slum and non-slum gaps in underweight rate an over all 10% gap is noticed. Nagpur and Mumbai has respectively the highest and lowest gaps.

Figure: 4.21

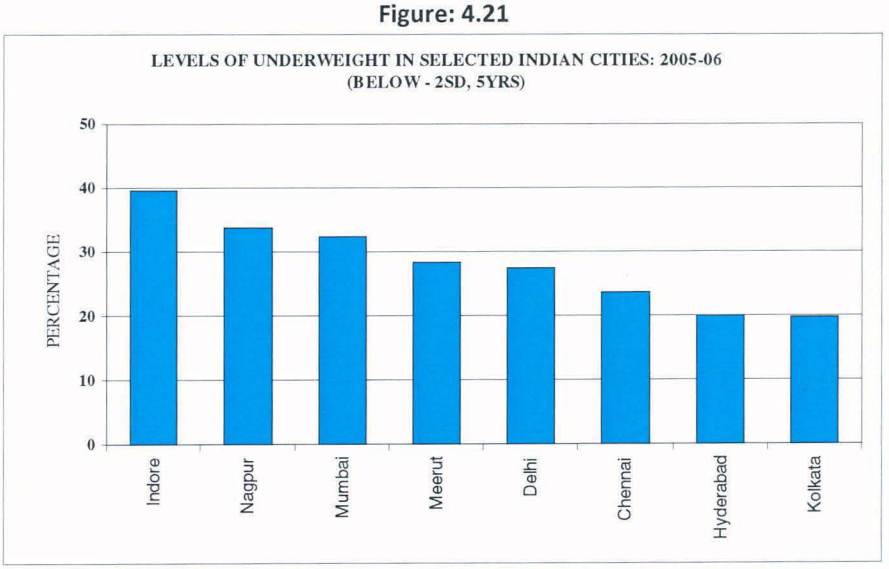


Table: 4.13 Levels of underweight among the slum and non-slum population in selected metropolitan cities: 2005-06 (5 yrs, below -2SD)

City	Total	Slum	Non Slum	Gap
Delhi	27.4	34.9	24.9	10
Meerut	28.3	NA	NA	NA
Kolkata	19.8	26	15	11
Indore	39.7	NA	37	NA
Mumbai	32.4	35.6	25.6	9.9
Nagpur	33.8	41.9	28.3	13.7
Hyderabad	20	NA	18.9	NA
Chennai	23.7	32.3	21	11.3
India	27.9	34	24	10

Source: Calculated from NFHS-3 Dataset

(C) Wasting:

City wise results have shown that, the highest and lowest levels of wasting are found in respectively Indore (29%) and Meerut (9%). For the slum population the highest and lowest levels of wasting are found in respectively Chennai (22.6%) and Delhi (14.3%). Children from non-slum background, have highest and lowest levels of wasting respectively in Indore and Hyderabad. The highest slum and non-slum gaps is found in Chennai. In Delhi and Mumbai negative gaps are found, among the slum and non-slum population.

Figure: 4.22

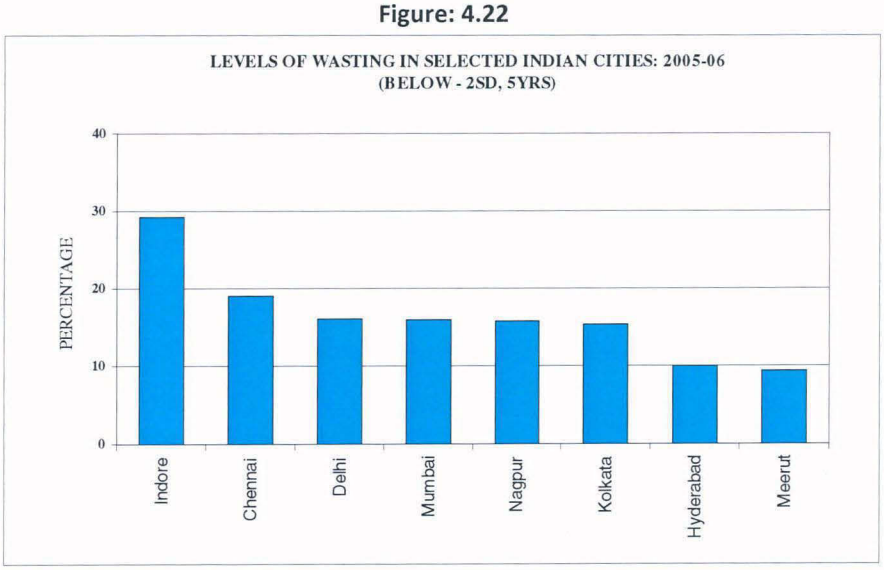


Table: 4.14 Levels of wasting among the slum and non-slum population in selected metropolitan cities: 2005-06 (5 yrs, below -2SD)

City	Total	Slum	Non Slum	Gap
Delhi	16.1	14.3	16.7	-2.4
Meerut	9.4	NA	NA	NA
Kolkata	15.3	16	13.3	2.7
Indore	29.3	NA	28.3	NA
Mumbai	15.9	15.8	16.2	-0.5
Nagpur	15.8	16.7	15.2	1.4
Hyderabad	10	NA	9.5	NA
Chennai	19.1	22.6	18	4.6
India	16	15.9	15.9	0

Source: Calculated from NFHS-3 Dataset

4.7 Conclusion:

The present chapter seeks to understand the nature and patterns of regional inequalities in India's child undernutrition. The state level investigations have been largely carried out for that purpose. Regional inequalities have been explained both in terms of inter-state and intra-state (i.e. disparities between rural and urban areas) levels. The study also focuses on urban undernutrition situation across the 7 metroploitan cities in the country and especially in terms of disparities between the slum and non-slum place of residence. The major findings of this section are followings-

- In terms of share, some of the most populated states have highest proportions of undernourished children in India. These states are- Uttar Pradesh, Bihar, Madhya Pradesh, Maharashtra and Rajasthan. These six states accounts for over half of the India's undernourished children. Uttar Pradesh alone accounts for 20% of stunted, 24% of underweight and 15% of total wasted children.

- State level examination reveals the wide geographical variations in the distribution of child undernourishment. The highest levels of stunting are found to be respectively in Uttar Pradesh (56.5%), Bihar (55.7%), Chattisgarh and Gujarat. In case of underweight rate the states are respectively Madhya Pradesh (60%), Jharkhand (57%) and Bihar (56.1). The levels of wasting are

found higher in Madhya Pradesh (35%), Jharkhand (33%) and Bihar (27.3%). Higher levels of undernourishment are mostly found in few northern and middle Indian states. Among the south and north-eastern states, relatively low levels of undernutrition prevail (like- Kerala, Tamil Nadu, and Assam etc). Apart from these states, Punjab, J&K and Himachal Pradesh relatively low levels of undernourishment have been found.

- In rural areas child undernourishment levels are high, which is because of the lower socio-economic development and extensive levels of poverty. Rural undernourishment is found to be higher across every state in the country in comparison with the urban areas. States with relatively high levels of rural undernourishment are Uttar Pradesh, Bihar, Jharkhand, Chhattisgarh, Madhya Pradesh etc. Even in few developed states such as Gujarat (in case of underweight and stunting) rural undernourishment levels are also found to be higher.

- Urban undernourishment is found to be low as compared to rural areas. Uttar Pradesh, Bihar, Jharkhand, Madhya Pradesh are the states where urban undernourishment are found to be higher than the rest of the country. Lower levels of undernourishment have been observed in Kerala, J&K, Himachal Pradesh and Uttaranchal.

- Undernourishment levels, which is concentrated in the rural areas leads to disparities between the rural and urban locals. It has found that highest levels of rural urban inequalities (gaps) are found in the following states, like- Uttaranchal, West Bengal, Jharkhand, Chhattisgarh, Delhi, Assam, Orissa and Rajasthan. Even in few developed states like Maharashtra and Gujarat the gaps are found to be higher. In these states policy intervention are needed to address rural undernourishment. However, in certain other states like Bihar and Uttar Pradesh, both the rural and urban areas are suffering from the ill effects of undernourishment. Therefore in these states reductions of undernourishment in both rural and urban areas are posing a serious challenge.

- Discussions have revealed wide disparities across selected metropolitan cities in the levels undernourishment. Though a definite pattern has not been found

but across them wide gap has been observed between the slum and non-slum levels of undernourishment. Slum and non-slum inequalities are observed within all the background characteristics and social groups. The rural-urban inequalities are found relatively much greater in comparison to the slum and non-slum inequalities of child undernutrition.

- ❖ State levels trend suggests that over the years underweight levels have been improving across most parts of the country (except-Haryana). However, similar kinds of achievements have not been found in case of stunting and wasting. In many Indian states, such as Maharashtra, Gujarat and Karnataka stunting levels have gone up. In the case of wasting, the rate has gone up in most of the states (Assam, Bihar, North East etc).

- ❖ It has been found that in most of the states, the reductions of undernourishment in the rural areas are sluggish in comparison to urban counterparts. Trends show that in many states significant changes have not been taking place in the reduction of rural undernourishment such as Haryana, Orissa, Madhya Pradesh, Gujarat etc. Therefore critical understanding is further required on this issue. In case of urban undernourishment (stunting) have seen increased in few developed states like- Maharashtra, Punjab. The effect of migration may have a bearing of some kind.

The above findings broadly suggest that in some parts of country undernourishment problems have persistently remained higher. Likewise, most of the rural areas are also continually suffering from it. Therefore, it is imperative to understand that why certain pockets are not getting freed from this problem. This may be an indication that, despite all possible efforts intended benefits never reached in certain areas of the country. This is an important issue which need further scrutiny and holds significant importance from future policy point of view. In the subsequent chapter study focuses on social inequalities of child undernutrition.

Chapter-5

Child undernutrition in India: Social patterns

5.1 Introduction:

Social inequality is one of the major areas, which most of development and policy researchers are concerned with. In India social inequalities are found in every aspect of socio-economic well-being, such as education, health, income etc. Child health and nutrition are also not out side of the ambit of such overarching realities. The basic form of social inequalities in India is rooted in caste based social hierarchies. Indian society is highly stratified into the different social groups based on the caste structure. The caste based social stratification has broad implication in the society, causing several forms of discrimination and exclusion for certain social group i.e. lower caste Scheduled (SC) communities. The Scheduled Caste (SC) communities are also known as "untouchables" in some parts of the country. An overall deprivation and backwardness are found among these lower caste communities (SC) in India in comparison to the others or non-deprived social groups. On the other hand the Scheduled Tribe (ST) population in India are considered as the most deprived among all the social groups in the country. The tribal social groups (ST) are historically remained outside of the traditional caste based social stratification. The deprivation among the ST is not because of their exclusion from main stream development processes, but also due to some geographical factors. The history of peopling of the tribal population in India was such that at present time they live in the most inaccessible parts of the country. So, the benefit of several development schemes seldom reaches to them. Other than these two groups the OBC or Other Backward Caste communities are also considered as another disadvantaged section of population. Other than SC, ST and OBC population, there are others or the higher castes social groups. The others are considered as non-deprived and relatively better-off among the various social groups in India. There are vast empirical evidences, which suggest the caste based discrimination and exclusion for the ST and SC population in India.

Study by Baraik and Kulkrni[1] indicates that the level of infant mortality among the SC and ST population was substantially higher than the Non-scheduled population. Among the SC and ST, infant mortality was 83 and 84 and but for the Non-scheduled population it was 68/1000 live births for 1998-2000. A recent study[2] has established the fact that scheduled (SC & ST) population in India has less access to health care facilities and there over all nutritional status is much lower. Social inequality of child malnutrition among the SC, ST and the Non-Scheduled component also has been studied by Sinha[3] and Mishra[4] . While, the former study have raised several issues related to policies; later mainly focused on socio-economic deprivation, which lead to higher level child malnutrition among the SC and ST.

In the upcoming sections the present chapter will address the issue of social inequalities of child undernutrition, both at the aggregate and state levels.

5.2 Nature of social inequalities of child undernutrition in India:

It is evident from Table: 5.1, that social stratification has a definite implication for explaining the inequities in child undernutrition situations across the different social groups. Among the different social groups the scheduled population (both SC & ST) are mainly found to be vulnerable to the effect of child-undernourishment. In all three types of nutritional measures the ST population have the highest percentages of undernourished children. It is the SC population which comes after them in terms of majority of children found to be undernourished. Among the OBC's also a relatively higher percentages of undernutrition has observed.

---

[1] Baraik, Vijay K. and Kulkarni Purushottam K. (2006): *Health status and access to health care services: disparities among the social groups in India;* working paper, Indian Institute of Dalit studies, vol. 1 no. 4, New Delhi.

[2] Roy T.K, Kulkarni S. and Vaidehi Y. (2004): "Social inequalities in health and nutrition in selected states"; *Economic and political weekly*, vol-39. no.7,Feb 14, pp. 667-683.

[3] Sinha Sachidanand (2005): "Reaching out to undernourished children: social inequities and policy perspectives"; *Journal of Health and Development,* vol. 1 no. 4.

[4] Mishra R. N(2006): *Dynamics of caste based deprivation in child under nutrition in India*; working paper , Centre for development studies

Figure: 5.1

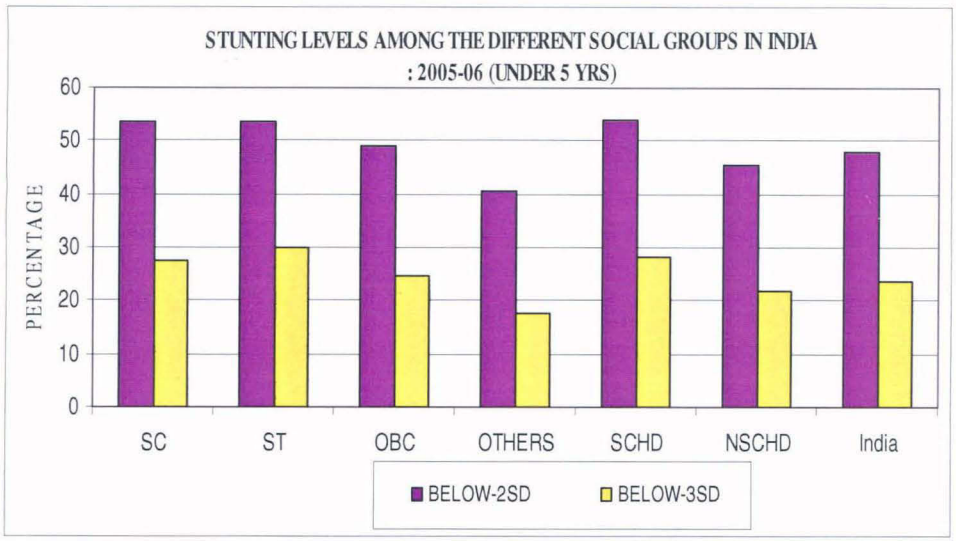


Figure: 5.2

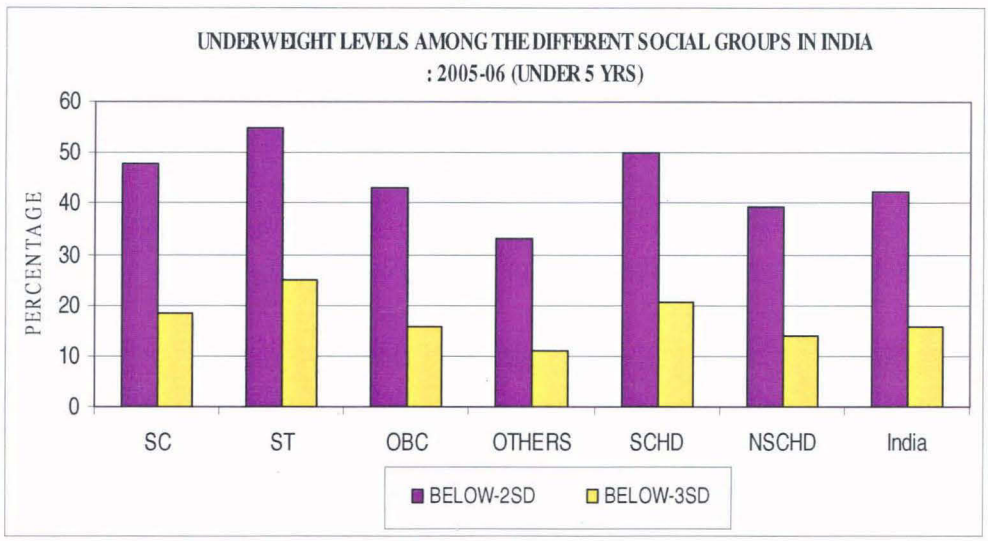


Figure: 5.3

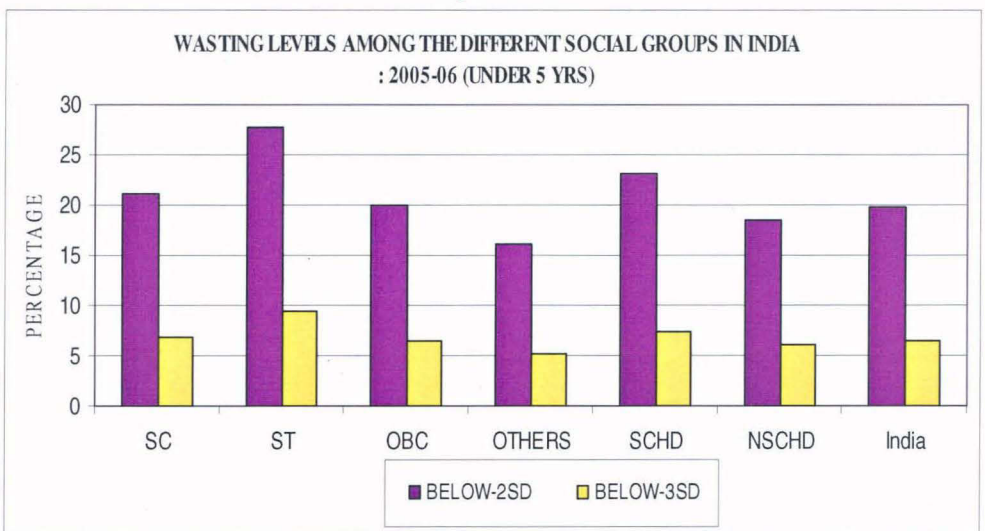


Table: 5.1 Child undernutrition among the different social groups, at the aggregate level: 2005-06

Social Groups	Stunting		Underweight		Wasting	
	Below-2 SD	Below-3 SD	Below-2 SD	Below-3 SD	Below-2 SD	Below-3 SD
SC	53.7	27.5	48.0	18.5	21.2	6.8
ST	53.7	29.9	55.0	25.0	27.8	9.5
OBC	48.9	24.7	43.2	15.9	20.0	6.5
Others	40.5	17.5	33.3	11.0	16.2	5.2
SCHD	54.0	28.2	50.1	20.6	23.1	7.5
NSCHD	45.5	22.0	39.4	14.0	18.6	6.1
India	48.0	23.7	42.5	15.8	19.8	6.4

Source: Calculated from the NFHS-3 dataset

Compared to these three social groups the others or higher caste population have relatively much lower levels of undernutrition among the children. So, child undernutrition status in India is found to be very much analogous with the different social hierarchies. In the following sections the focus would be to see the nature of the problems in more elaborate manner.

5.3 Social inequities according to the place of residence:

At the aggregate level the place of residence (rural and urban) and the social groups (caste or tribe) together forms an important background characteristic. The children from rural areas irrespective of their social background have higher levels of undernutrition in comparison to the same caste group children from the urban areas. But within rural with their added disadvantaged of being scheduled; the ST and SC children are found to be bearing the burden of undernutrition. In all three types of indices i.e. stunting, underweight and wasting the rural ST children have the highest levels of undernutrition in comparison to all other social groups. Among the rural ST children 55% are found to be both stunted and underweight, while 29% are considered as wasted. Among the rural SC children the levels of undernutrition are found nearly similar to that of rural ST children. Among the rural OBCs almost half of them are found to be underweight and 46% stunted and $1/5^{th}$ of them are wasted.

Figure: 5.4

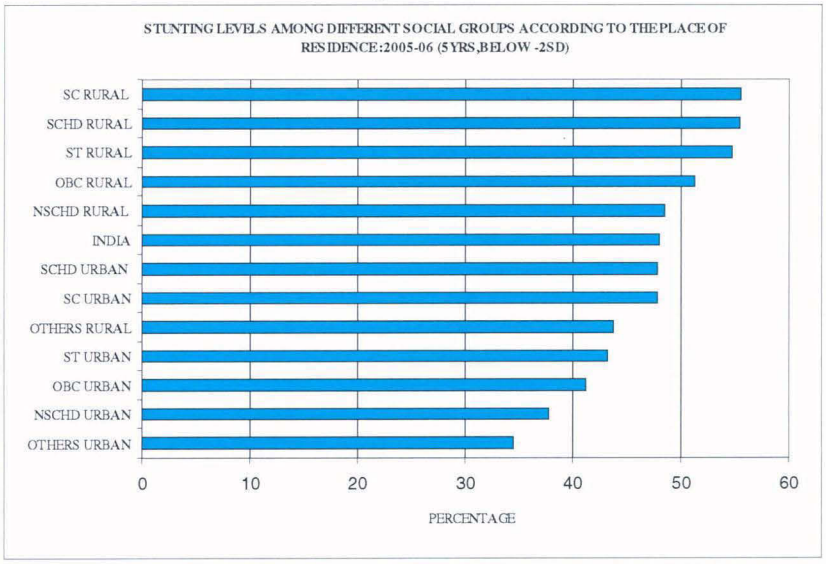


Figure: 5.5

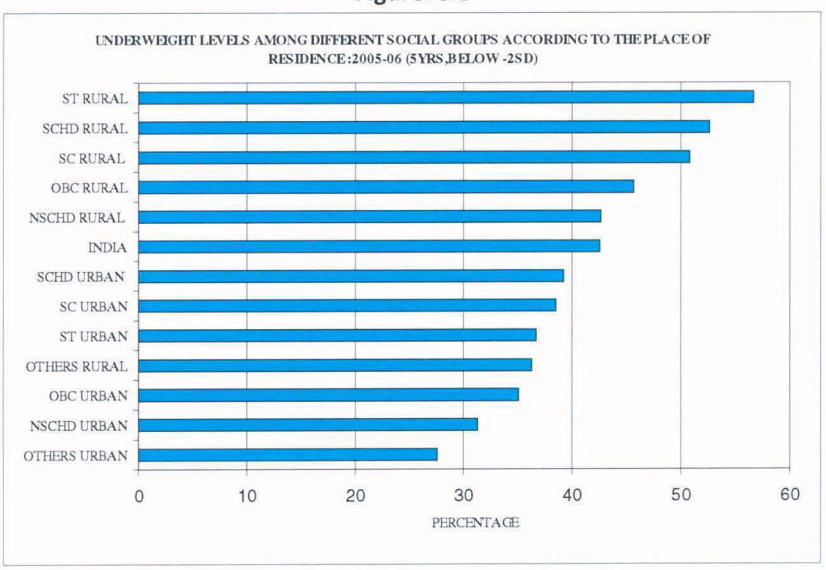


Figure: 5.6

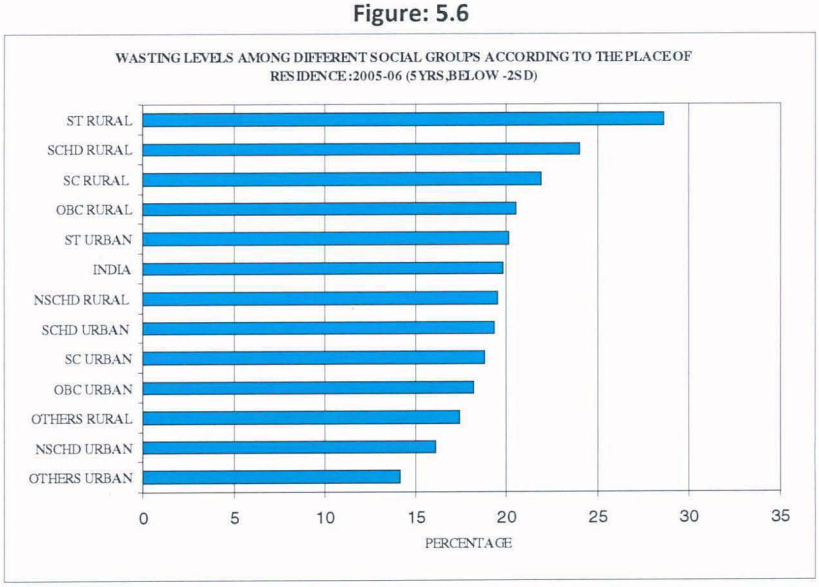


Table: 5.2 Child undernutrition among social groups, according to place of residence: 2005-06 (5yrs, Below -2SD)

Categories	Stunting	Underweight	Wasting
SC URBAN	47.8	38.5	18.8
ST URBAN	43.2	36.7	20.1
OBC URBAN	41.2	35.1	18.2
OTHERS URBAN	34.5	27.6	14.1
SCHD URBAN	47.8	39.2	19.3
NSCHD URBAN	37.8	31.3	16.1
SC RURAL	55.5	50.8	21.9
ST RURAL	54.7	56.7	28.6
OBC RURAL	51.3	45.7	20.5
OTHERS RURAL	43.8	36.3	17.4
SCHD RURAL	55.4	52.6	24
NSCHD RURAL	48.5	42.6	19.5
India	48	42.5	19.8

Source: Calculated from the NFHS-3 dataset

The rural others or upper castes children have comparative advantages over all other social groups (44%, 36% and 17% of them are respectively found stunted, underweight and wasted). The overall non-scheduled children from rural areas have advantages over their rural scheduled counterparts.Within urban areas the others have the lowest levels of child undernutrition (34.5%, 27.6% & 14% percent are respectively found to be stunted, underweight and wasted). The urban SCs have the highest levels of stunted and underweight children, while the urban STs have the highest proportion of wasted children in India. Next to them, the OBC children also have higher levels of undernutrition among the children. With the change in the place of residence, from rural to urban the levels of undernutrition improves across all the social groups in India but the nutritional status according to social hierarchies remained unchanged.

5.4 Undernourishment trends at the aggregate level, social groups with the place of residence:

It is also important to see the nature of temporal changes in each of these social groups over the years. It may be indicative to the overall changes in the wellbeing for the social groups.

(A) Stunting: For stunting, among the urban dwelling total scheduled population successive improvements have been noticed. But still huge gaps are there between the urban scheduled and non-scheduled component of the population (around 10% during NFHS-3). It has observed that between NFHS-1 & 2 there were reductions in the stunting rates for both the scheduled and non-scheduled population. But, during NFHS-3 survey stunting for the total Scheduled population has shown no change at all and for the Non-Scheduled it has marginally went up. For the urban SC & ST, the achievements were respectively 8% and 6% percentages of reduction over this prolonged 13 years of time period (1992-93 to 2005-06). The urban STs have noticed a greater success in the later phase (between NFHS-2 & 3). Among the urban OBC children stunting has increases by 4 percentages during NFHS-2 & 3. For the others no improvement has been noticed during NFHS-2 & 3. For the rural total Scheduled population stunting has persistently remained very high. But among the rural total non-scheduled an overall improvements has been noticed in this respect although it was not up to the expected level. For the rural SC merely 1% reduction has been observed from NFHS-1 to 3 surveys. For the ST population no improvement has been observed (NFHS-1 & 3). For the Rural OBC the stunting problem has not changed during NFHS-2 & 3. The others have experienced a reduction in the stunting rate between NFHS-2 & 3 surveys.

Table: 5.3 Changes in the stunting levels, social groups with the place of residence (3Yrs, Below -2SD)

Categories	NFHS-1	NFHS-2	NFHS-3
SC URBAN	53.2	44.5	45.2
ST URBAN	42.2	45.9	36.4
OBC URBAN	NA	32.9	38.2
OTHERS URBAN	NA	32.4	32.9
SCHD URBAN	50.5	44.8	45
NSCHD URBAN	38.6	32.6	35.3
SC RURAL	53.7	52.4	52.8
ST RURAL	48.5	53.5	51.1
OBC RURAL	NA	47.4	47.9
OTHERS RURAL	NA	43.5	39.7
SCHD RURAL	51.6	52.8	52.2
NSCHD RURAL	48.5	45.4	45

Calculated from NFHS Datasets

Figure: 5.7

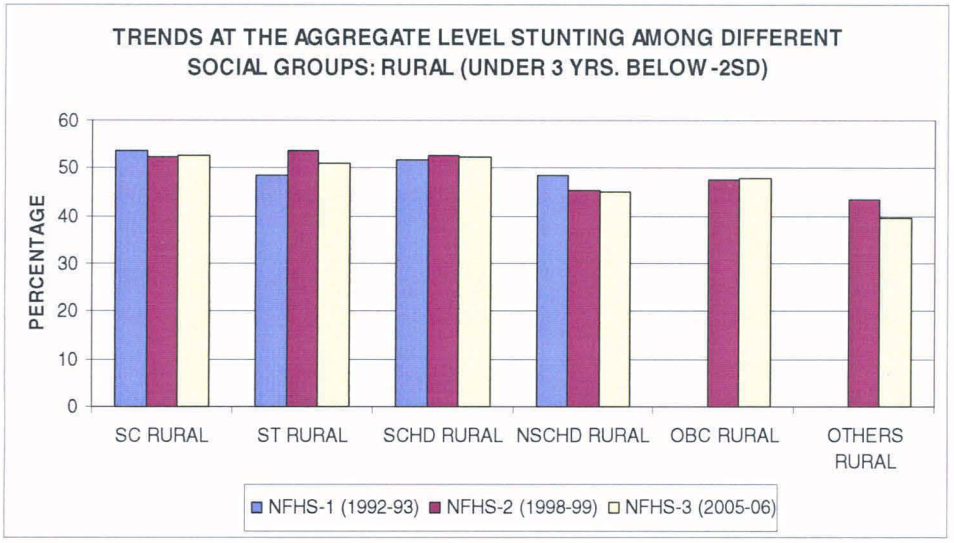
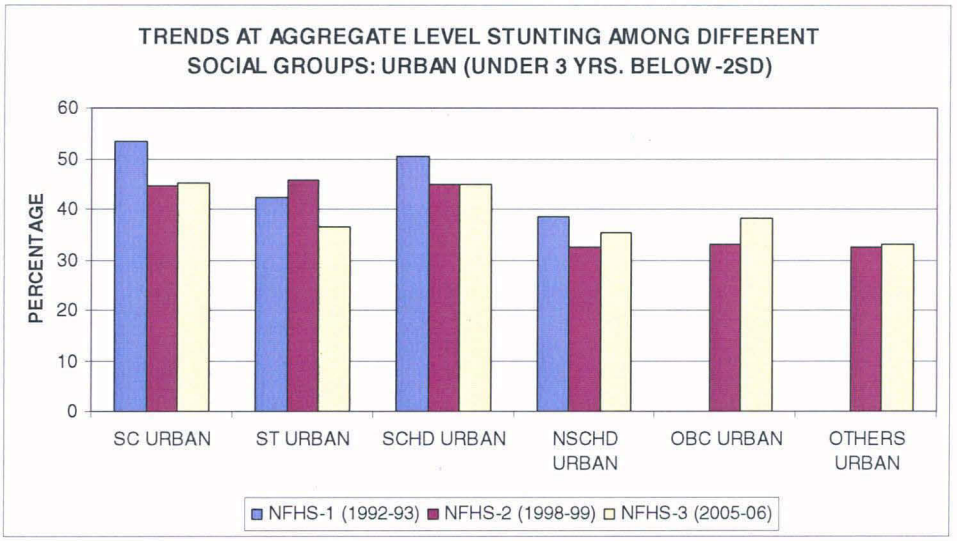


Figure: 5.8



(B) Underweight: Over the year's underweight situation has improved, but compared to rural the rates improvement was faster for the urban areas. Between NFHS-1 & 2 surveys rural underweight rate for the SCs & STs has been reduced by 2-3 percentages, while in urban areas the reductions were recorded 4-5 percentages. For the total Scheduled and total Non-Scheduled population reductions were 2.5% and 7% respectively in the urban areas. On the other hand in the rural areas reductions were found 2.9% and 7.6% in the respective categories.

Figure: 5.9

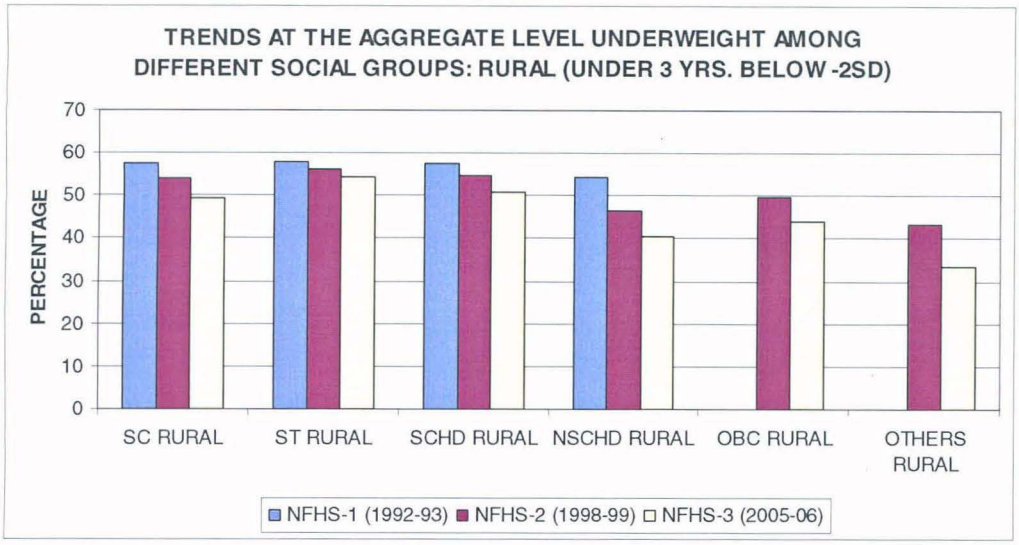


Figure: 5.10

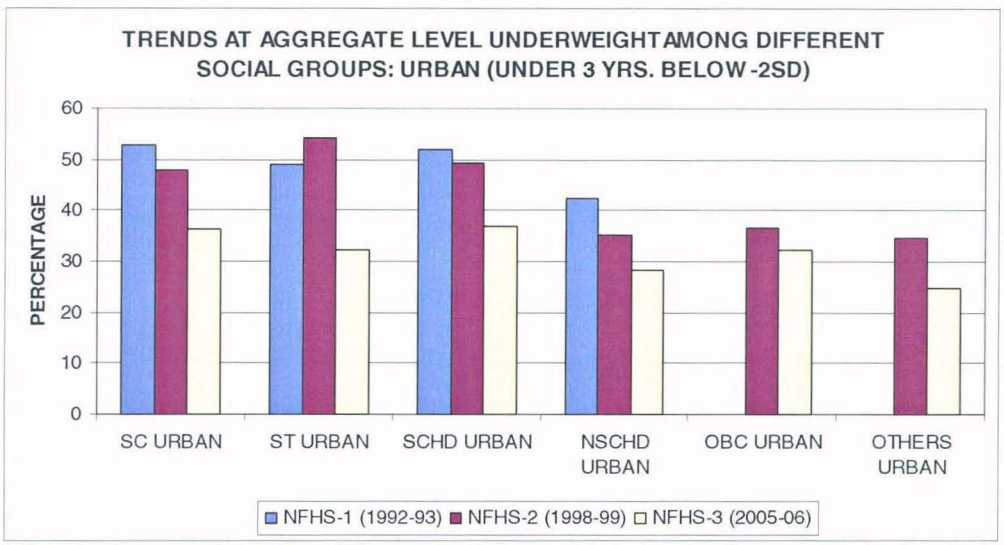


Table: 5.4 Changes in the underweight levels, social groups with the place of residence (3Yrs, Below -2SD)

Categories	NFHS-1	NFHS-2	NFHS-3
SC URBAN	52.9	48	36.4
ST URBAN	48.9	54.3	32.2
OBC URBAN	NA	36.5	32.2
OTHERS URBAN	NA	34.5	24.8
SCHD URBAN	51.9	49.4	36.8
NSCHD URBAN	42.5	35.3	28.4
SC RURAL	57.4	54.1	49.5
ST RURAL	58	56.1	54.2
OBC RURAL	NA	49.8	44
OTHERS RURAL	NA	43.5	33.5
SCHD RURAL	57.7	54.8	50.9
NSCHD RURAL	54.2	46.6	40.5

Calculated from NFHS Datasets

During NFHS-2 & 3 survey reductions for the SC, ST, OBC and Others in the urban areas were respectively 11.6%, 22%, 4% and 9.7%. In rural areas the reductions were found for these social groups were 4.6%, 4%, 5% and 12%.The reductions for the total scheduled and Non-scheduled population were 12.6% and 7% in the urban areas and 4% and 6% in the rural areas.

(C) Wasting: Wasting has shown some mixed and complex results in terms of changes over the years. During NFHS-1 & 2 a gross reduction were noticed for all social groups but during the third survey (NFHS-3) it has shown a reversal. For the urban SC the wasting rate in NFHS-3 was the same, as it was noticed during the first survey (NFHS-1). For the urban ST a marginal improvement has been noticed. During NFHS-1 & 2 performance was very good, but wasting rate has been increased during the later survey (NFHS-3).

Table: 5.5 Changes in the wasting levels, social groups with the place of residence: (3Yrs, Below -2SD)

Categories	NFHS-1	NFHS-2	NFHS-3
SC URBAN	20.2	13.9	20.1
ST URBAN	26.1	16.7	21
OBC URBAN	NA	14.9	21.7
OTHERS URBAN	NA	11.6	15.5
SCHD URBAN	21.6	14.5	20.7
NSCHD URBAN	17.2	12.9	18.6
SC RURAL	20.9	16.9	25.6
ST RURAL	23.5	22.5	32.4
OBC RURAL	NA	17.2	23.8
OTHERS RURAL	NA	13.7	19.9
SCHD RURAL	21.9	18.8	27.8
NSCHD RURAL	19.1	15.4	22.6

Calculated from NFHS Datasets

Between last two surveys it were noticed that wasting rate has worsened for both urban OBCs and others. Both the total Scheduled and Non-Scheduled population experienced increase in the wasting rate from NFHS-2 to 3. As compared to the urban the rural scheduled population over the years experienced a tremendous increase in wasting rate. For the SC it has gone up by around 5 percentages over the entire periods. During NFHS-2 to 3 periods the increases were around 11 percentage points.

Figure: 5.11

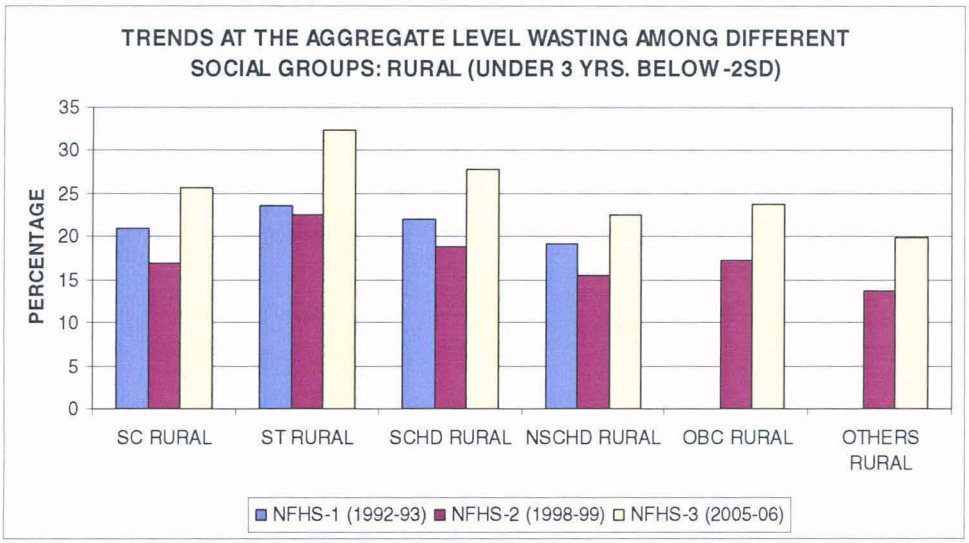
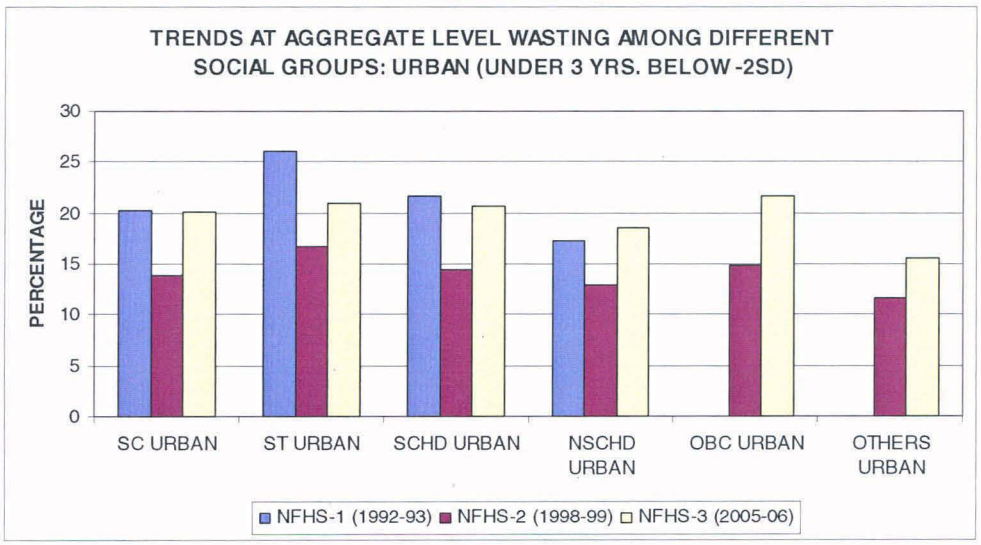


Figure: 5.12



The rural ST children seem to become most vulnerable to wasting, as over the years the level has been shot up from 24% (NFHS-1) to 32% (NFHS-3). A gross increase of 10 percentages was noticed during NFHS-2 to 3 for the rural ST. From NFHS-2 to 3 among the urban OBC and Others wasting situation has worsened. For both the social groups 6% increases were noticed. The overall wasting situation for the all rural social groups has increased at very high rates during the last NFHS-3 survey.

5.5 Social inequities of child undernutrition in India, a state level inquiry:

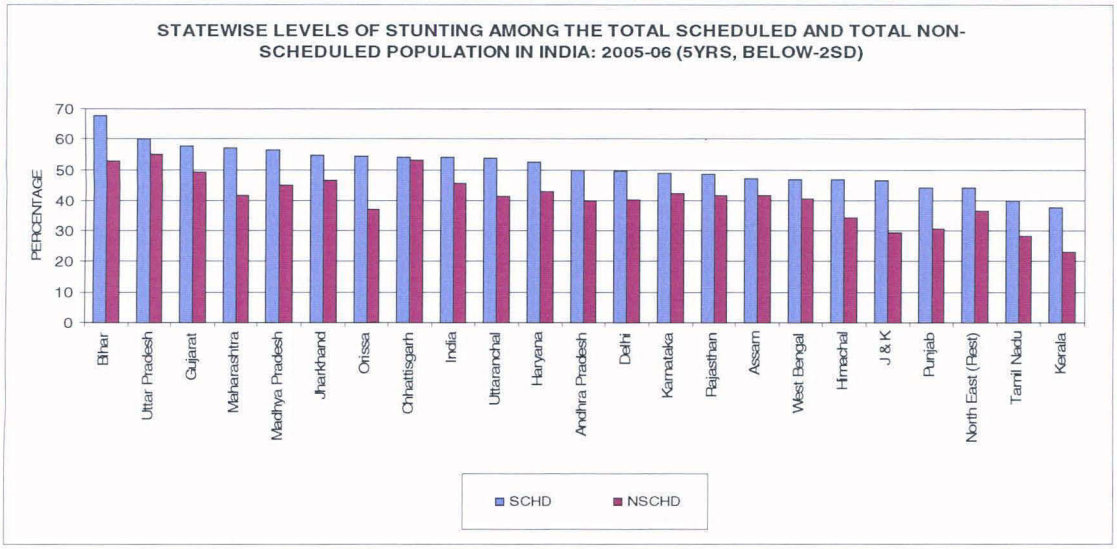
Social inequality in the levels of child undernutrition is a serious problem in India and it has plagued the disadvantaged social groups, especially the SC & ST. Since the SC and ST population are not ubiquitous across all the geographic regions of the country and secondly due to some of the limitation of the NFHS dataset in many cases comparison across all the states in India have not been possible[5]. Therefore in order to understand the prevailing social inequities across the different regions of the country many states have not been incorporated. The disparities has been studied between the disadvantaged scheduled (SC & ST) and Non-scheduled (OBC & General caste) population across all the major regions in India. Further study has extended at the state level (for the selected states) for the SC & ST population where adequate sample sizes were available.

(A) Stunting:

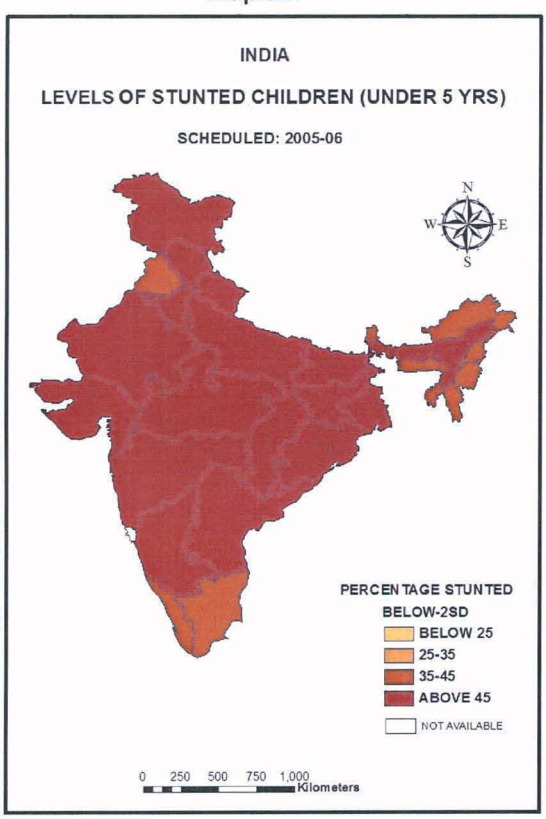
(a) Overall Scheduled and Non-Scheduled population: Across the states, levels of stunting among the scheduled children are found to be higher in comparison to the non-scheduled group. In 10 states (Bihar, Uttar Pradesh, Gujarat, Maharashtra, Madhya Pradesh, Jharkhand, Chhattisgarh, Orissa, Uttaranchal and Haryana) the percentages of stunting are found to be more than 50%. In Bihar the stunting percentage is alarmingly 68% among total scheduled children i.e. 7 out of 10 children are stunted. The lowest levels of stunting are found in Kerala (38%) and Tamil Nadu. In rest of the other states stunting levels are also found to be higher (more than 40%). For the non- scheduled population the highest levels of stunting are found in UP (55%), Chhattisgarh (53%) and Bihar (53%), while the lower levels are found in Kerala (23%), Tamil Nadu (28%), J & K (29.5%) and Punjab (30.6%).

[5] e.g. in the first NFHS round (1992-93) information on stunting and wasting are not collected from the 5 states i.e. Andhra Pradesh, Himachal Pradesh, Madhya Pradesh, Tamil Nadu and West Bengal (See. NFHS-1 Report, pp. 281). Further, there are also having other limitations like adequate sample size have been found in all the three rounds of NFHS dataset, for the SC and ST population in some of the states.

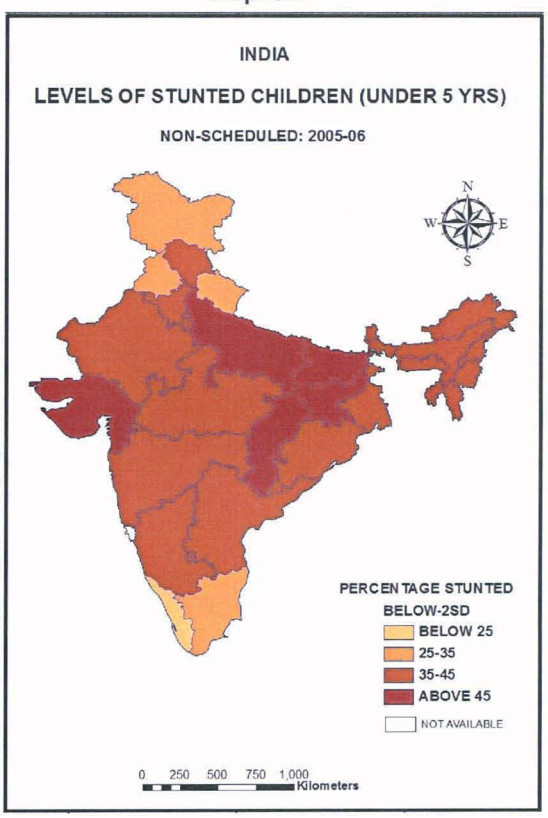
Figure: 5.13



Map:5.1



Map: 5.2



The gaps between the scheduled and non-scheduled percentages of stunted children are found to relatively higher in the states of Orissa, J & K, and Maharashtra (more than 15 percentage points). In Bihar, Kerala, Punjab, Uttaranchal, Himachal Pradesh, Tamil Nadu and Madhya Pradesh the differences are also quite higher (more than 10 percentages). The lowest gaps are found in Chhattisgarh (merely 1%), Uttar Pradesh (5%) and Assam (5.5%).

(b) Scheduled Caste population: Among the SC children overall 54% are found to be stunted at the aggregate level. The following map (5.3) depicts that in almost all geographic regions the levels of stunting among the SCs are awfully higher. The highest level of stunting has observed in Bihar (67%). In total 13 Indian states half of them are found having shorter height in comparison to their respective age groups. Relatively lower levels are observed in Kerala and North-Eastern states. As par as inequality is concerned, across the different states huge gaps have been found among the SC's and others. Highest undernutritional gap among the SCs and others is found in J & K (stunting is found to be around 30% higher among the SCs in comparison to the others). In 5 other states the gaps are found to be more than 15%; namely Chhattisgarh, Himachal Pradesh, Bihar, Orissa, Madhya Pradesh and Karnataka. Lowest disparities have found in West Bengal, North East (excluding: Assam) and Delhi. In other parts of the country the gaps are found to be more than 10%.

(c) Scheduled Tribe population: For the Scheduled tribe children highest levels of stunting are found to be higher mostly in Uttar Pradesh (63%), Gujarat, Maharashtra, Orissa and MP.On the other hand, the lowest levels have observed in Assam, J & K and rest of the North-Eastern states. At the aggregate level the gap in stunting among ST and others is 13%. The highest gaps among them have observed in Orissa (24.5%) and Gujarat (22%). In 7 states, namely- Chhattisgarh, Jharkhand, J& K, MP, Karnataka, UP and Maharashtra, the gaps are found to be more than 15%. The lowest gaps have found in Assam and Bihar.

(d) Other Backward Castes population: In UP (58.5%), Gujarat (57%), Chhattisgarh (56%) and Bihar (55%). stunting levels among the OBC children are found to be relatively very higher. Contrary to this, in states like Kerala (25%), Punjab (27%), West Bengal (27%) and Tamil Nadu (29%) the situations are relatively better-off. In terms of inequalities with the respect to the others, widespread gaps in the stunting rate are found. In Himachal Pradesh and Chhattisgarh the gaps are 23% and 22% respectively. On the other hand, in the states like Delhi, Kerala, Maharashtra, Assam, Punjab and West Bengal lowest gaps have been found. In the 4

states namely Maharashtra, Assam, Punjab and West Bengal stunting level among the OBC are found to be lower than the others.

(e) Others: The stunting situation of the others is found to be relatively better in comparison to the other social groups. In Bihar and Uttar Pradesh the stunting levels among them are relatively higher in India. The lowest levels have observed in Kerala and J & K (just 22%).

Table No. 5.6 State-wise social inequities in the levels of stunting: 2005-06 (5Yrs, Below -2SD)

State	Percentages of stunted children						Gaps in stunting rate			
	SCHD	NSCHD	SC	ST	OBC	Others	SCHD & NSCHD	SC & Others	ST & Others	OBC & Others
J & K	46.7	29.5	52.3	40	41.2	22.6	17.2	29.7	17.4	18.6
Himachal Pradesh	46.9	34.5	50	NA	51.5	28.3	12.4	21.7	NA	23.2
Punjab	44.1	30.6	45.1	NA	26.8	30.9	13.5	14.2	NA	-4.1
Uttaranchal	53.8	41.4	53.1	NA	51.7	38.8	12.4	14.3	NA	12.9
Haryana	52.4	43	52.8	NA	50	39.6	9.4	13.2	NA	10.4
Delhi	49.4	40.4	48.5	NA	45.5	40.6	9	7.9	NA	4.9
Rajasthan	48.6	41.5	48.8	48.4	43	37.6	7.1	11.2	10.8	5.4
Uttar Pradesh	60.1	55.2	59.6	63.3	58.5	47.6	4.9	12	15.7	10.9
Bihar	67.7	52.8	67	47.4	54.9	47.9	14.9	19.1	-0.5	7
North East (rest)	44.1	36.8	38.3	44.9	41.5	34.4	7.3	3.9	10.5	7.1
Assam	47.2	41.7	53.8	38.9	39.1	42.3	5.5	11.5	-3.4	-3.2
West Bengal	47	40.7	44.8	56	27.1	42.2	6.3	2.6	13.8	-15.1
Jharkhand	54.7	46.5	52.2	55.5	49.1	37.6	8.2	14.6	17.9	11.5
Orissa	54.4	37	50.5	56.8	42	32.3	17.4	18.2	24.5	9.7
Chhattisgarh	54.2	53.3	57.9	52.9	55.9	33.8	0.9	24.1	19.1	22.1
Madhya Pradesh	56.3	44.9	55.8	56.7	46.9	39.8	11.4	16	16.9	7.1
Gujarat	57.7	49.3	54.2	61.2	56.9	39.5	8.4	14.7	21.7	17.4
Maharashtra	57	41.7	55.5	57.7	40.8	42.5	15.3	13	15.2	-1.7
Andhra Pradesh	49.8	40.1	48	51.2	42.1	36.6	9.7	11.4	14.6	5.5
Karnataka	48.8	42.3	50.7	51.4	42.8	35.1	6.5	15.6	16.3	7.7
Kerala	37.8	23.1	32.3	NA	25.2	22	14.7	10.3	NA	3.2
Tamil Nadu	39.9	28.4	38.8	NA	29	NA	11.5	NA	NA	NA
India	54	45.5	53.7	53.7	48.9	40.5	8.5	13.2	13.2	8.4

Source: Calculated from NFHS-3 dataset

Figure: 5.14

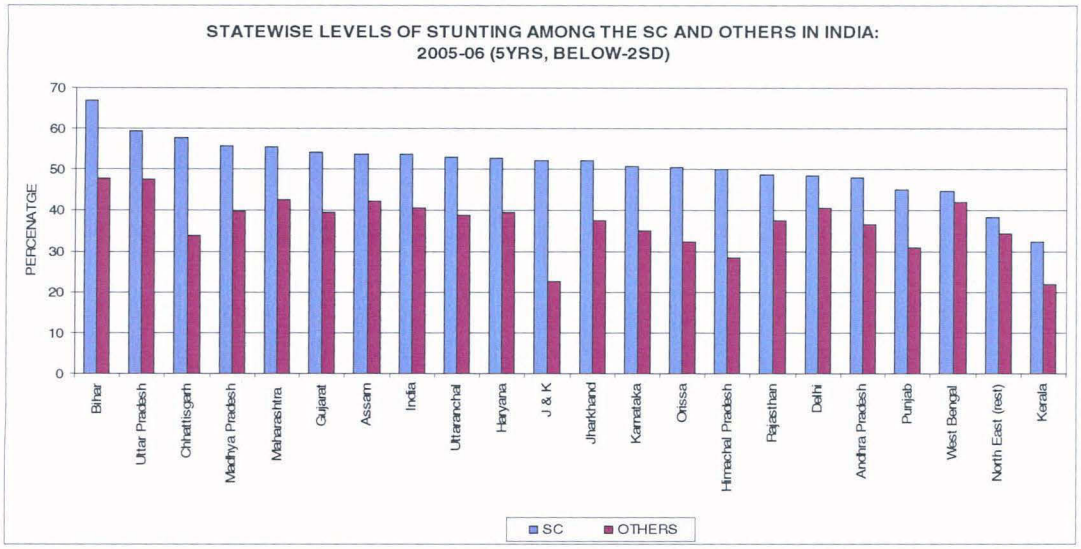


Figure: 5.15

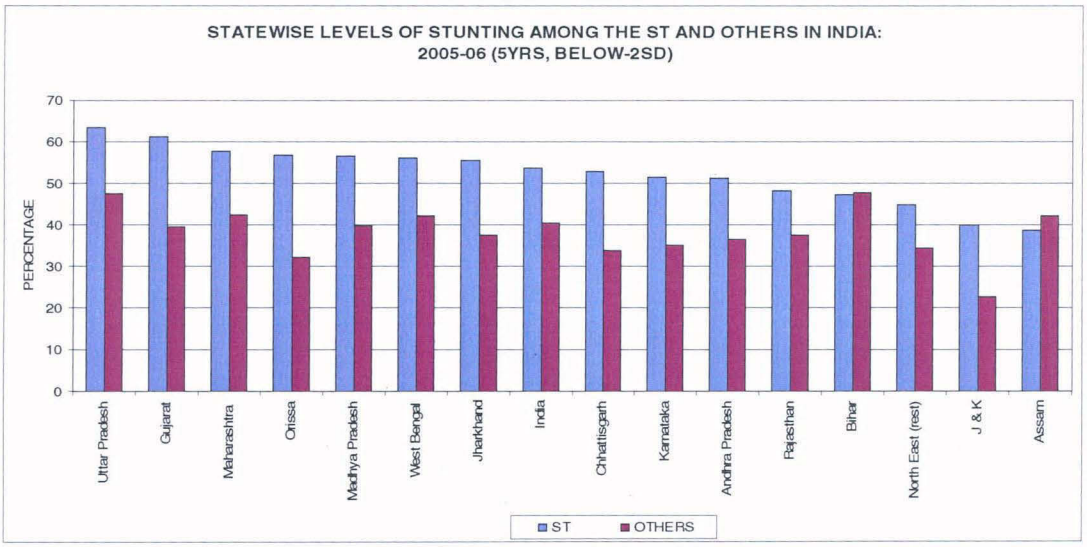
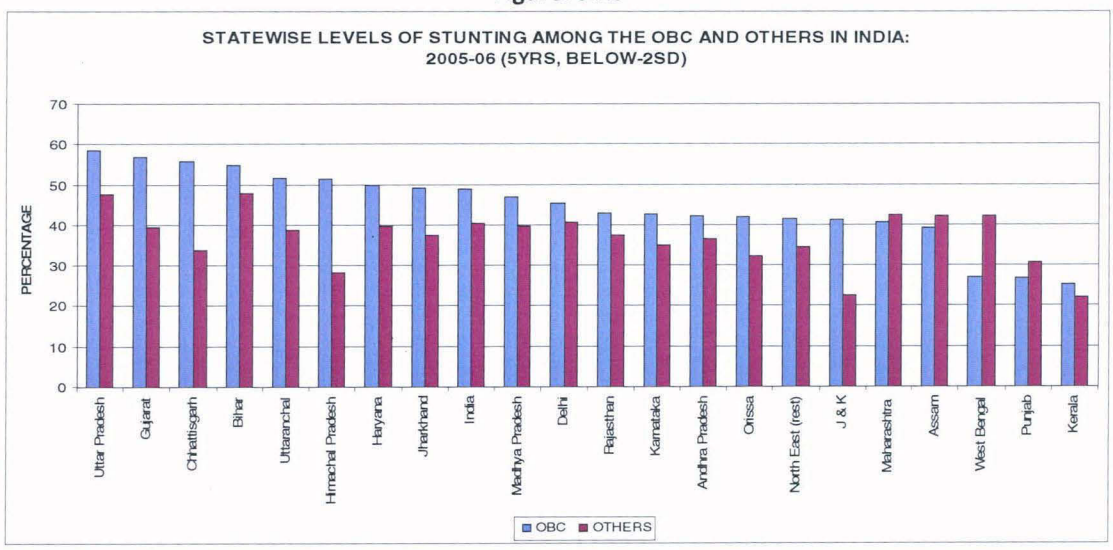
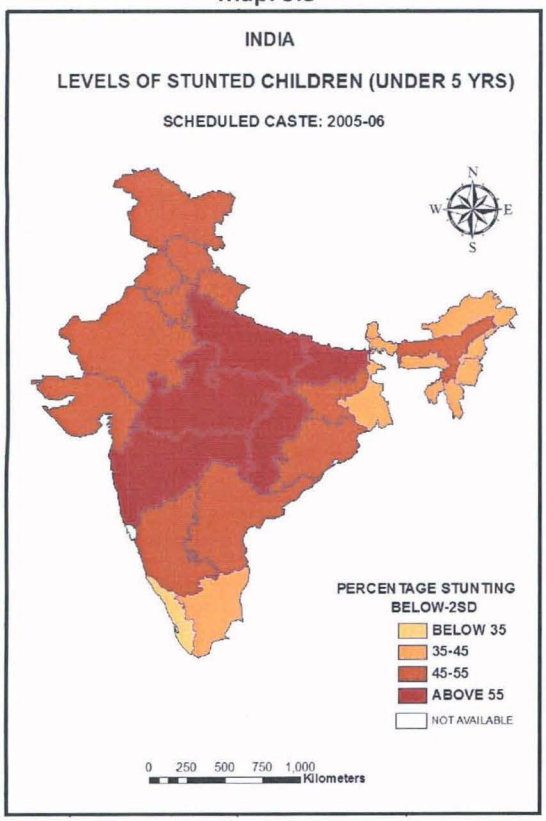


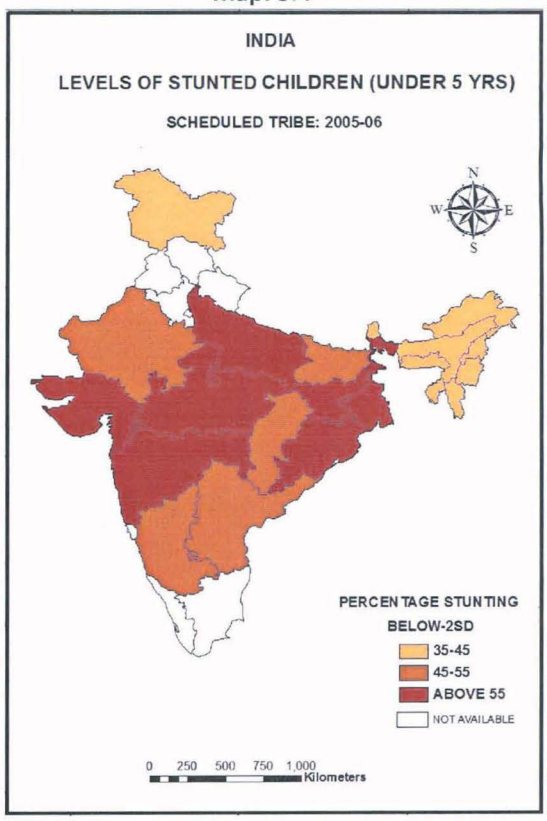
Figure: 5.16



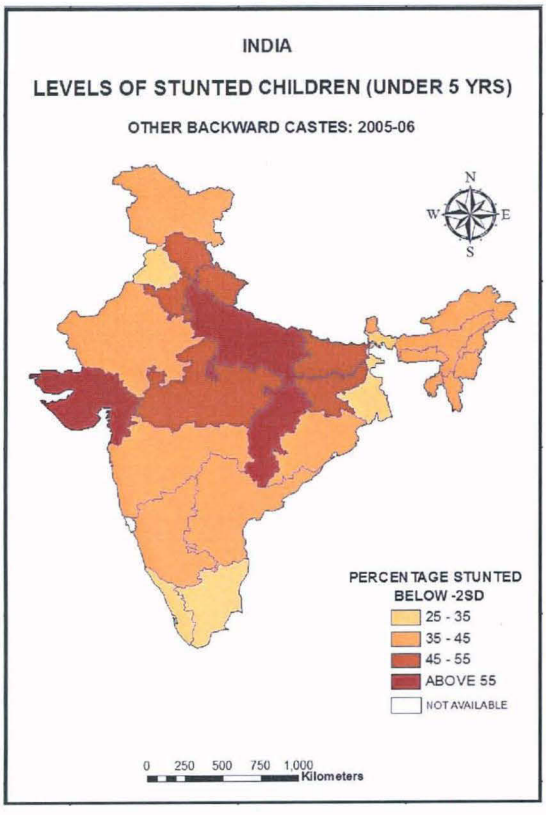
Map: 5.3



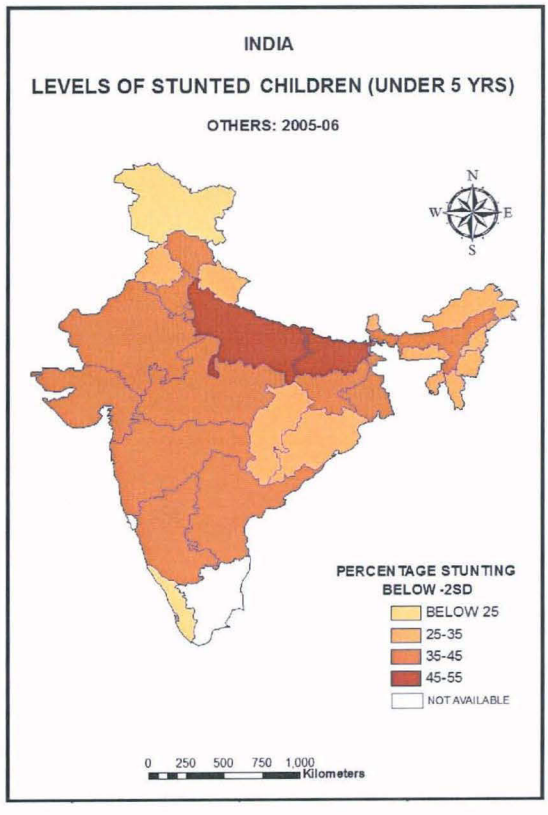
Map: 5.4



Map: 5.5



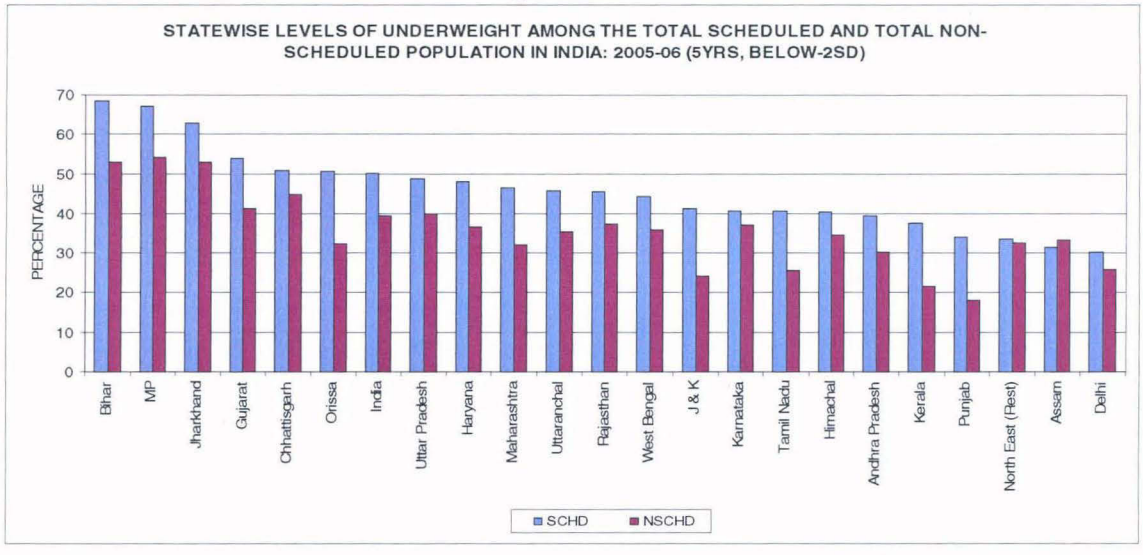
Map: 5.6



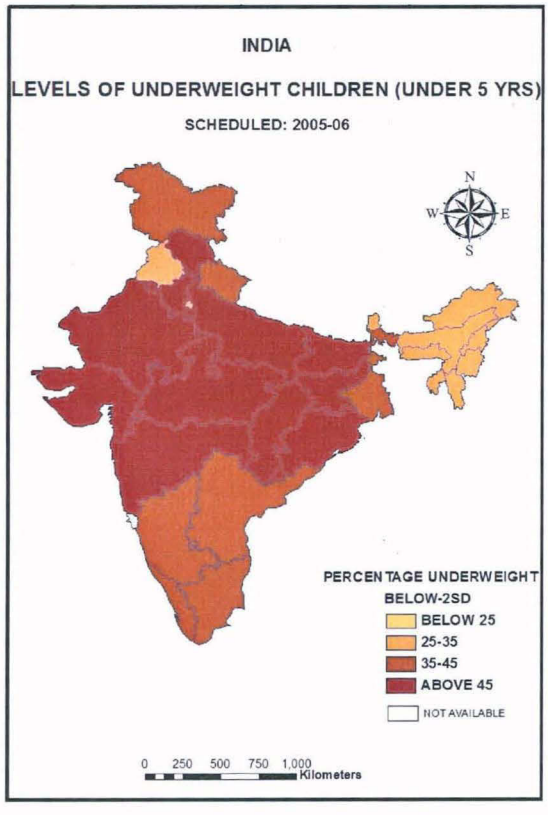
(B) Underweight:

(a) Overall Scheduled and Non-Scheduled population: For the Scheduled children underweight rates are found to be fairly higher in Bihar (68%), Madhya Pradesh (68%), Jharkhand (63%), Gujarat (54%) and Chhattisgarh (51%). On the other hand, the lower levels of underweight rates are found in Delhi (30%), Assam (31%), North-Eastern states (34%) and Punjab (34%).

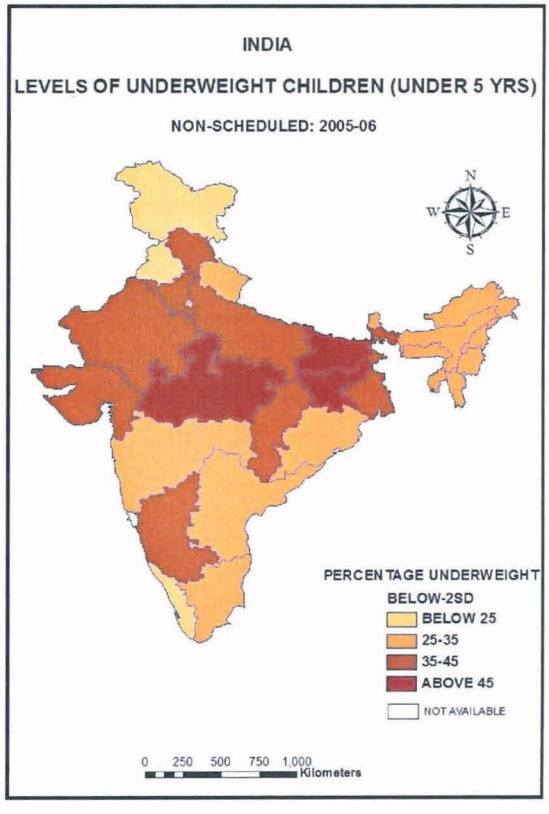
Figure: 5.17



Map: 5.7



Map: 5.8



The underweight rates for the non-scheduled children are found higher in the states of Madhya Pradesh (54%), Bihar (53%) and Jharkhand (53%). The lower levels are found in Punjab (18%), Kerala (21.6%), J&K (24%) and Tamil Nadu (26%). In terms of gap, the highest differences among the scheduled and non-scheduled groups have found in Orissa (18%), J & K (17%), Kerala (16%), Punjab (16%), Bihar and Tamil Nadu; in all of these states the existing gaps are more than 15%. The relatively lower gaps have found in Assam (-1.7%), North-East (1%), Karnataka (3.7%) and Delhi (4.4%).

(b) Scheduled Caste population: The levels of underweight among SC children are found to be pretty higher in Bihar (67%), Madhya Pradesh (63%) and Jharkhand (61%). Conversely, the lower levels of underweight rates are relatively found in Delhi (30%), Kerala (33%), Punjab (35%) North East (36%) and Karnataka (38%) . In rest of the states the underweight levels are found to be more than 40%. In terms of gap in the underweight rate among SC and with respect to others, the highest levels are observed in J & K (25%), Bihar (22%) and Jharkhand (20%). In 6 other states this gap is found to be more than 15% (Chhattisgarh, Orissa, Punjab, Himachal Pradesh, UP and MP). The states with lower nutritional gaps are North East, Delhi, West Bengal and Rajasthan.

(c) Scheduled Tribe population: Wide inter-state variation has observed in the underweight rate among the STs. In several states the levels are found to be very high (e.g. MP, Orissa, Chhattisgarh, Jharkhand, UP, Gujarat, West Bengal, and Maharashtra etc.). The highest and lowest level have respectively observed in Madhya Pradesh (71%), Assam (21%). In terms of gaps in comparison to the others, the highest levels are respectively found in UP, Gujarat, Orissa, Chhattisgarh and Maharashtra (over 25% gaps have observed in all these states).The states with lowest gaps are Bihar, Assam and North-East. In Bihar and Assam negative gaps have found. Among these lowest gap states, Assam and North-East are predominantly ST populated, while in Bihar the proportion of STs is less than 1%.

(d) Other Backward Castes population: Among the OBCs the highest levels of underweight rate have observed in Madhya Pradesh (57%), Jharkhand (56%) and Bihar (56%). Contrary to this, underweight levels are relatively found to be lower in Punjab (16%) and Kerala (18%). In terms of gap with the others, the highest levels are observed in Himachal Pradesh (27%), Chhattisgarh (19%) and Jharkhand (15%). On the other hand, in West Bengal, Kerala, Assam, Punjab, Rajasthan and Maharashtra this gap are found to be negative. In North-East also the gap is found to be lower.

(e) Others: In comparison to the different social groups, child underweight rate among the others are found to be much lower across the different states. The highest levels have been found in Madhya Pradesh and Bihar (47% in both); while the lowest levels have noticed Punjab (17%), Kerala (22%), J & K (22%) and Delhi (24%). In rest of the other regions, underweight levels for them are ranges between 25 to 40 percentages.

Figure: 5.18

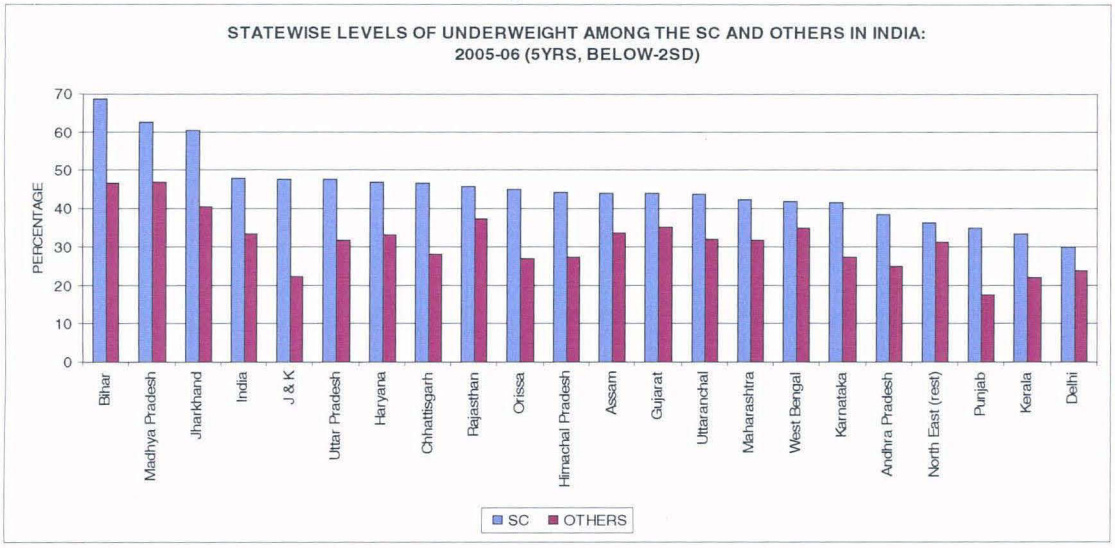


Figure: 5.19

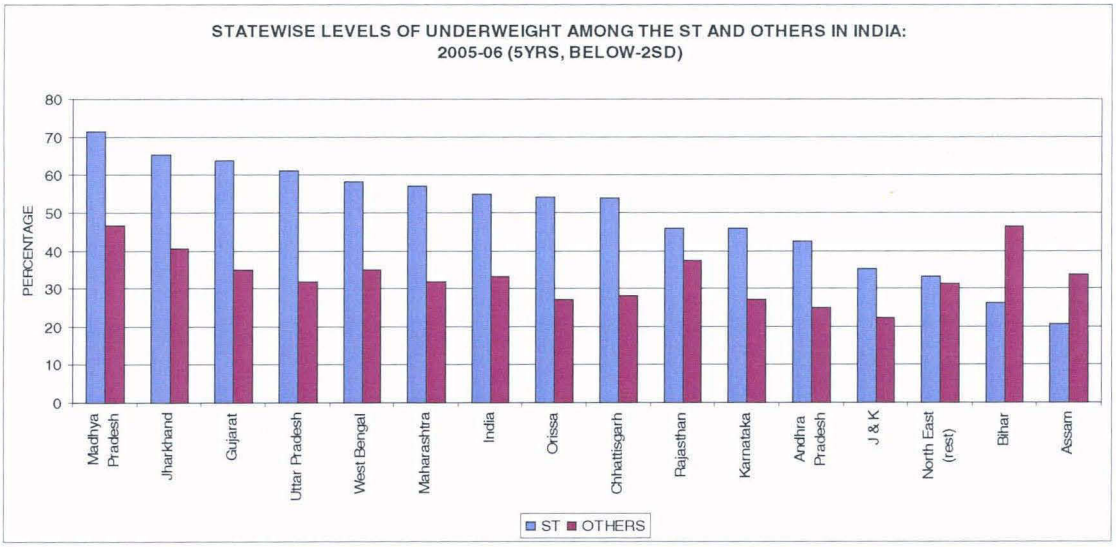
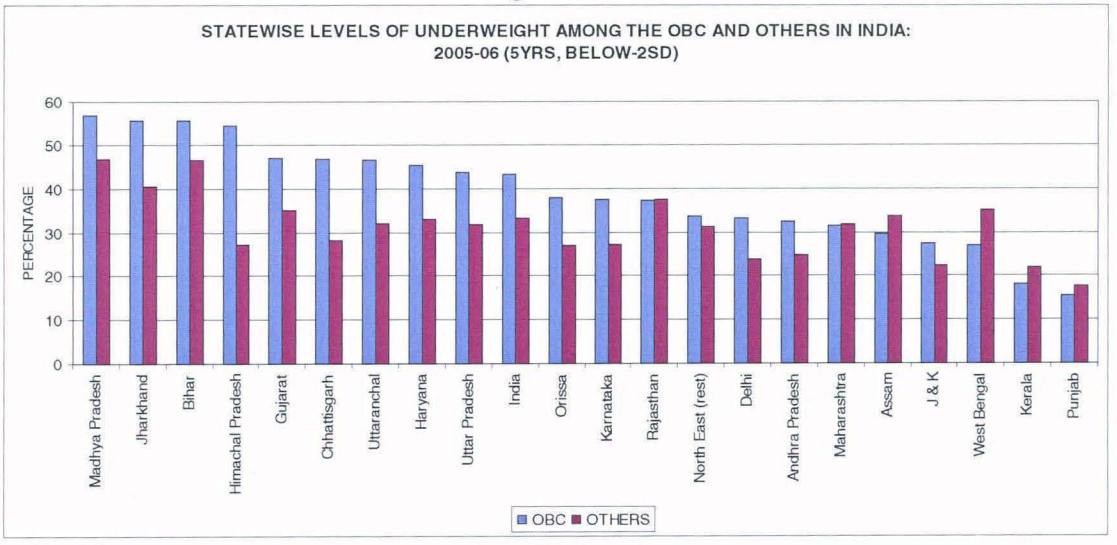
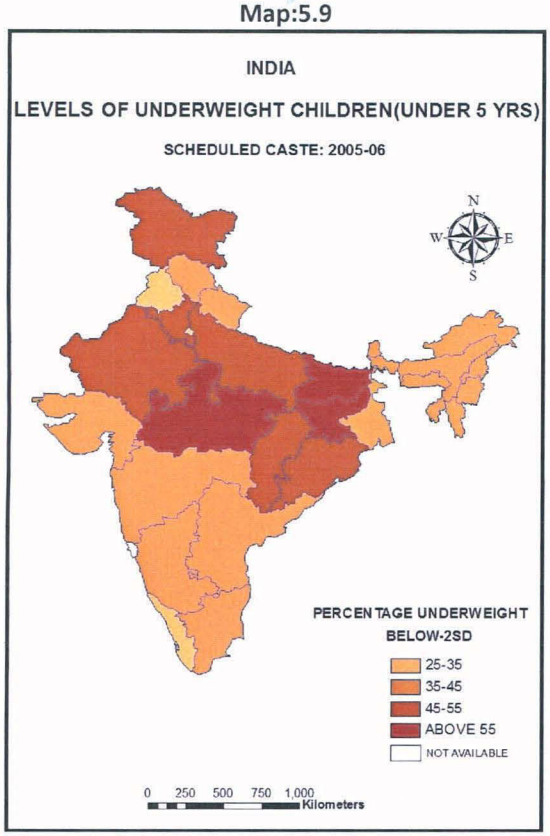


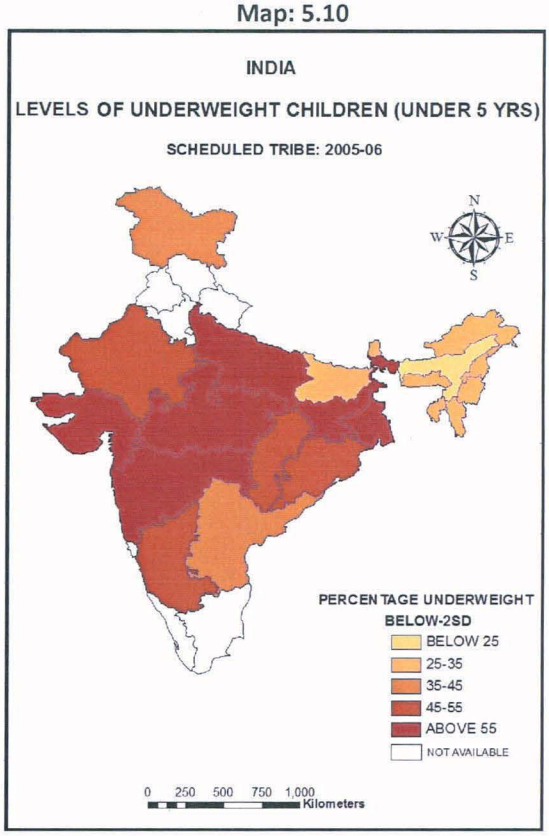
Figure: 5.20



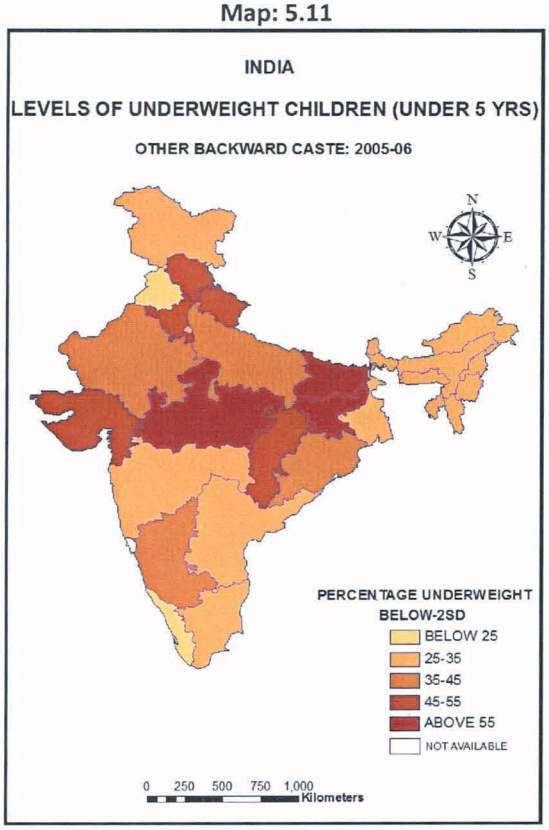
Map:5.9



Map: 5.10



Map: 5.11



Map: 5.12

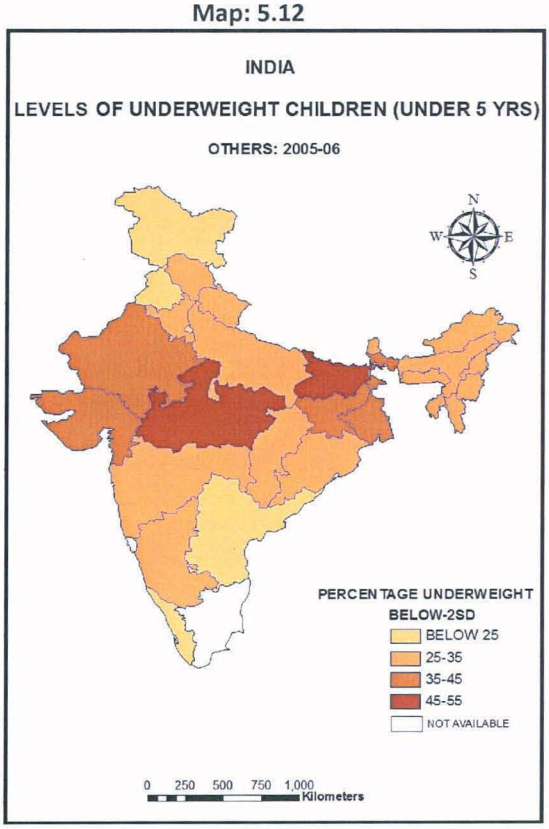


Table No. 5.7 State wise social inequities in the levels of underweight : 2005-06 (5Yrs, Below -2SD)

State	Percentages of underweight children						Gaps in underweight rate			
	SCHD	NSCHD	SC	ST	OBC	Others	SCHD & NSCHD	SC & Others	ST & Others	OBC & Others
J & K	41.3	24.1	47.7	35.3	27.5	22.4	17.2	25.3	12.9	5.1
Himachal Pradesh	40.6	34.5	44.4	NA	54.5	27.2	6.1	17.2	NA	27.3
Punjab	34.1	18.1	34.9	NA	15.5	17.6	16	17.3	NA	-2.1
Uttaranchal	45.7	35.4	43.8	NA	46.6	32	10.3	11.8	NA	14.6
Haryana	48.2	36.6	47	NA	45.5	33.1	11.6	13.9	NA	12.4
Delhi	30.3	25.9	29.9	NA	33.3	23.9	4.4	6	NA	9.4
Rajasthan	45.6	37.5	45.9	45.9	37.2	37.5	8.1	8.4	8.4	-0.3
Uttar Pradesh	48.9	40	47.7	61.2	43.7	31.8	8.9	15.9	29.4	11.9
Bihar	68.5	53	68.7	26.3	55.7	46.6	15.5	22.1	-20.3	9.1
North East (rest)	33.6	32.6	36.2	33.3	33.8	31.4	1	4.8	1.9	2.4
Assam	31.6	33.3	44.1	20.8	29.6	33.8	-1.7	10.3	-13	-4.2
West Bengal	44.2	36	41.8	58.2	27.1	35.1	8.2	6.7	23.1	-8
Jharkhand	62.9	53	60.5	65.3	55.8	40.6	9.9	19.9	24.7	15.2
Orissa	50.6	32.3	45.1	54.2	38.1	27	18.3	18.1	27.2	11.1
Chhattisgarh	50.9	44.7	46.6	53.9	46.8	28.2	6.2	18.4	25.7	18.6
Madhya Pradesh	67.3	54.3	62.5	71.4	57	46.9	13	15.6	24.5	10.1
Gujarat	54	41.2	44	63.8	47.1	35.2	12.8	8.8	28.6	11.9
Maharashtra	46.7	32.2	42.5	57.1	31.6	31.8	14.5	10.7	25.3	-0.2
Andhra Pradesh	39.5	30.2	38.4	42.4	32.6	24.9	9.3	13.5	17.5	7.7
Karnataka	40.8	37.1	41.7	45.9	37.5	27.2	3.7	14.5	18.7	10.3
Kerala	37.8	21.6	33.3	NA	18.2	22	16.2	11.3	NA	-3.8
Tamil Nadu	40.8	25.8	40.5	NA	26	NA	15	NA	NA	NA
India	50.1	39.4	48	54.9	43.2	33.3	10.7	14.7	21.6	9.9

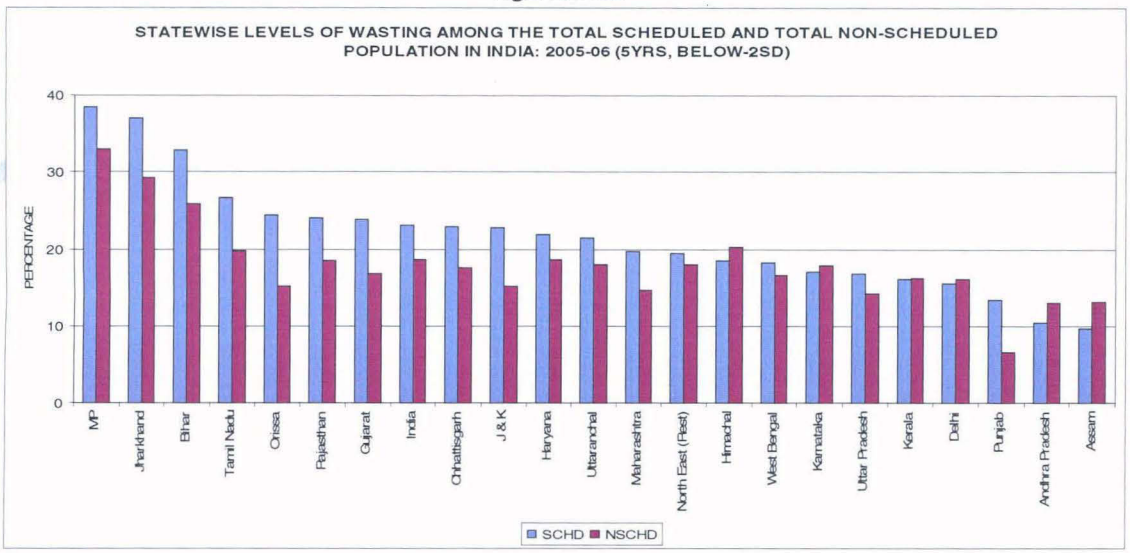
Source: Calculated from NFHS-3 dataset

(C) Wasting:

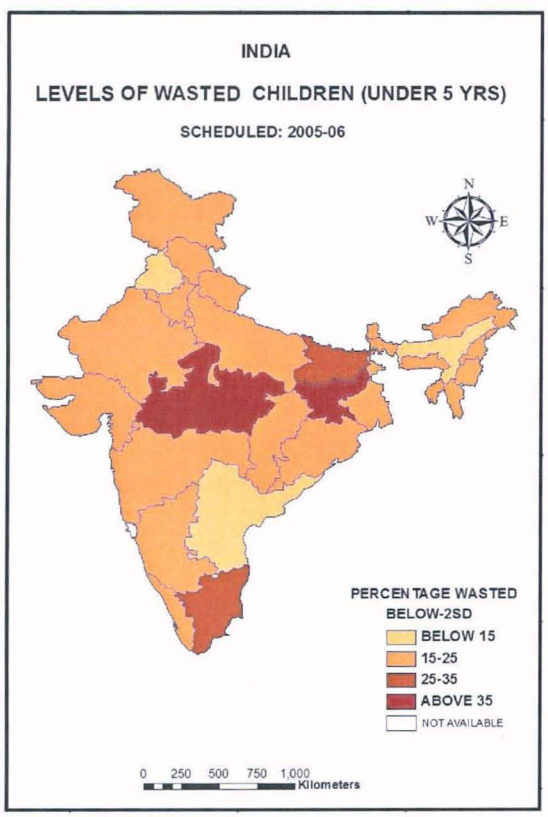
(a) Overall Scheduled and Non-Scheduled population: Unlike stunting and underweight, the inequalities among the scheduled and non-scheduled population are found to be comparatively lower in case of wasting. The levels of wasting for both the Scheduled and Non-Scheduled groups are found to be higher in the states of Madhya Pradesh, Jharkhand, Bihar and Tamil Nadu. In Madhya Pradesh 38.5% of the scheduled and 33% of the Non-Scheduled children are found to be stunted, which are the highest across the different states. The lower levels of wasting for the both scheduled and non-scheduled population are found in Assam, Andhra Pradesh and

Punjab. In Assam 10% of the Scheduled and in Punjab only 6.6% of the Non-Scheduled children are found to be wasted.

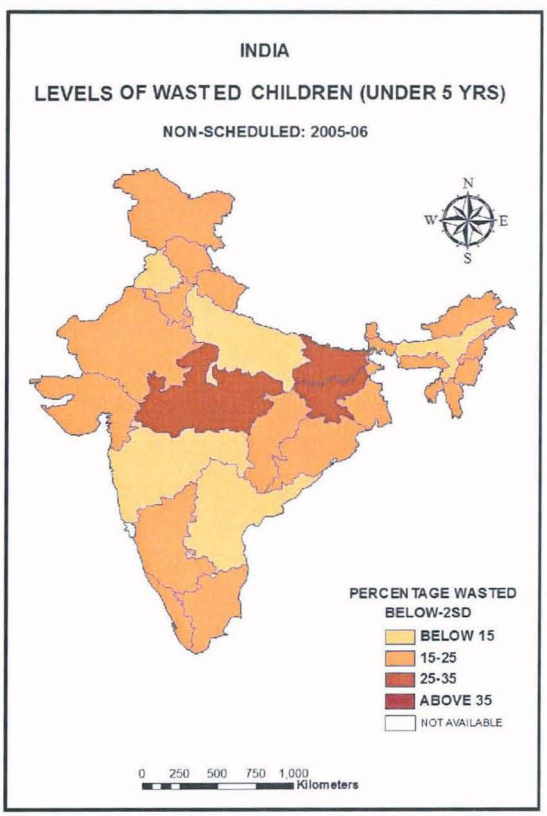
Figure: 5.21



Map: 5.13



Map: 5.14



The highest gaps in the stunting rate between these two social groups are found in Orissa (9%), Jharkhand (7.7%), J & K (7.6%), Bihar (7%), Gujarat (7%) and Tamil Nadu (7%). Negative and the lower levels of gaps, have observed in Assam (-3.5%),

Andhra Pradesh (-2.6%), Himachal Pradesh (-1.8%), Karnataka (-.8%), Delhi (-.6%), Kerala (.01%), North-East (1.4%), West Bengal (1.7%) and UP (2.5%). These suggest that wasting which is indicative to insufficient food intake over prolonged time period caused by poverty is also present among the Non-Scheduled component of the population. The level of wasting among the Non-Scheduled component of population may be attributed to the Muslim population. Sachar Committee Report[6] has shown that significant proportions of Muslims population are living below the poverty line.

(b)Scheduled Caste population: Among the SCs, the highest levels of wasting have been found in Madhya Pradesh, Jharkhand and Bihar, respectively 34.7%, 33.3% and 32.6%. On the other hand, in Andhra Pradesh 10.7% of the ST children have the indication of weight faltering. In Punjab, Assam and Kerala the situation are also found to be relatively better. In terms of gaps among the ST with the others in the rate of wasting, the highest levels have been found in Punjab and Bihar. The lowest disparity states were Kerala, Chhattisgarh, Rajasthan, Delhi, Himachal, Karnataka etc.

(c) Scheduled Tribe population: The highest level of wasting rate among the tribal children have found in Madhya Pradesh (41%), Jharkhand and Uttar Pradesh. On the other hand, in Assam just 7% of them are recorded as wasted. In terms of inequality with respect to the others, the highest gaps have been found in Uttar Pradesh (22%), Jharkhand (14%), Orissa (13%) and Gujarat (11%). In Assam (-4.6) and Bihar (-4.1) gaps are found inverse. In North-East, Karnataka and Rajasthan lower levels of gaps have found.

(d) Other Backward Castes population: Children from OBC background are found with higher levels of wasting in Madhya Pradesh (34%) and Jharkhand (32%). The lower levels of wasting are found in Punjab (just 5%), J & K, Kerala and Delhi. The gaps among the OBC and others in the wasting rate are found to be relatively lower in

[6] Ministry of Minority Affairs, GOI.(2006): *Social, Economic and Educational Status of the Muslim Community of India: A Report.* According to this SCs/STs together are the most poor in the country (Head count Ratio of 35%) followed by the Muslims who record the second highest incidence of poverty with 31 % people below the poverty line. pp-157.

comparison to that of ST and SCs. In Andhra Pradesh the highest level of gas has observed (8%). In most of the other states this gap are found to be lower. In many states inverse gaps have also noticed such as Chhattisgarh, Maharashtra, Delhi, Punjab, J & K, Rajasthan and Kerala.

(e) Others: Among the others the highest level of wasting is found in Madhya Pradesh (31%), followed by Jharkhand and Rajasthan (both 24%). The lowest levels of wasting are found in Punjab and Andhra Pradesh (around 7% both).

Table: 5.8 State wise social inequities in the levels of wasting: 2005-06 (5Yrs, Below -2SD)

State	Percentages of wasted children						Gaps in underweight rate			
	SCHD	NSCHD	SC	ST	OBC	Others	SCHD & NSCHD	SC & Others	ST & Others	OBC & Others
J & K	22.8	15.2	22.7	22	11.8	16.5	7.6	6.2	5.5	-4.7
Himachal Pradesh	18.5	20.3	20.4	NA	24.2	19.3	-1.8	1.1	NA	4.9
Punjab	13.4	6.6	12.9	NA	5.2	6.7	6.8	6.2	NA	-1.5
Uttaranchal	21.5	18	21.3	NA	20.7	17.3	3.5	4	NA	3.4
Haryana	22	18.6	20.9	NA	24.5	16.9	3.4	4	NA	7.6
Delhi	15.6	16.2	16.4	NA	13	16.7	-0.6	-0.3	NA	-3.7
Rajasthan	24.1	18.5	21.9	26.8	16.5	24.1	5.6	-2.2	2.7	-7.6
Uttar Pradesh	16.8	14.3	16.3	34.7	14.9	12.7	2.5	3.6	22	2.2
Bihar	32.9	25.9	33.3	17.9	27.2	22	7	11.3	-4.1	5.2
North East (rest)	19.5	18.1	23.4	19	18.5	18	1.4	5.4	1	0.5
Assam	9.7	13.2	13.3	7.1	14.9	11.7	-3.5	1.6	-4.6	3.2
West Bengal	18.3	16.6	17.7	24.2	20.2	15.9	1.7	1.8	8.3	4.3
Jharkhand	37	29.3	32.6	38.3	31.6	24.3	7.7	8.3	14	7.3
Orissa	24.4	15.2	20.4	27.5	17	14.3	9.2	6.1	13.2	2.7
Chhattisgarh	22.9	17.6	15.2	26.9	17.5	18.3	5.3	-3.1	8.6	-0.8
Madhya Pradesh	38.5	33	34.7	41	33.8	31.6	5.5	3.1	9.4	2.2
Gujarat	23.9	16.9	21.8	26.3	17.6	15.7	7	6.1	10.6	1.9
Maharashtra	19.7	14.7	21.4	21.1	13.6	14.4	5	7	6.7	-0.8
Andhra Pradesh	10.4	13	10.7	12.3	15.1	7.3	-2.6	3.4	5	7.8
Karnataka	17.1	17.9	16.9	17.1	18.3	15.8	-0.8	1.1	1.3	2.5
Kerala	16.2	16.3	14.6	NA	12.2	18.4	-0.1	-3.8	NA	-6.2
Tamil Nadu	26.7	19.8	27.5	NA	19.8		6.9	NA	NA	NA
India	23.1	18.6	21.2	27.8	20	16.2	4.5	5	11.6	3.8

Source: Calculated from NFHS-3 dataset

Figure: 5.22

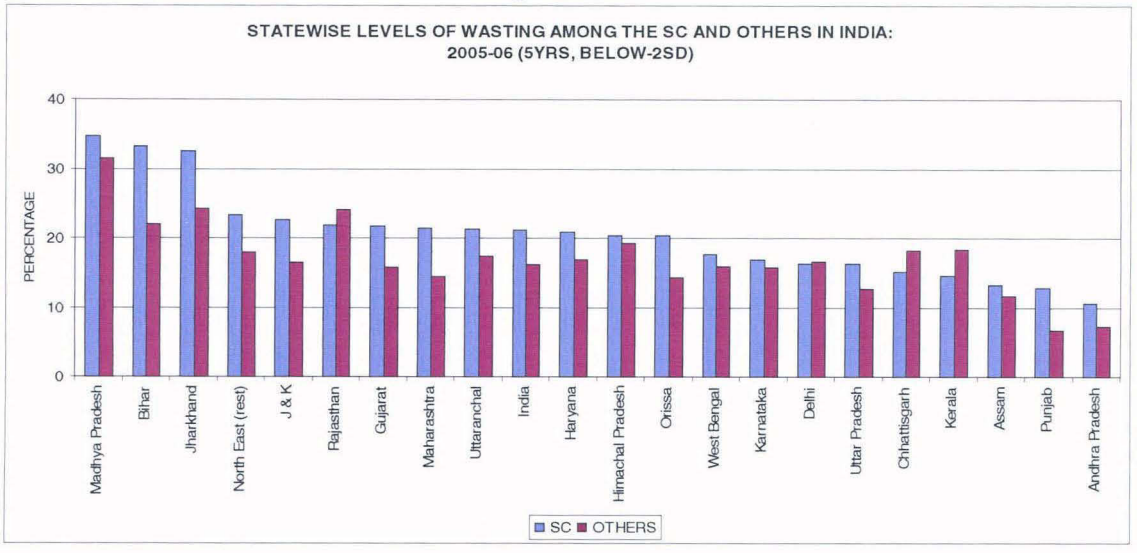


Figure: 5.23

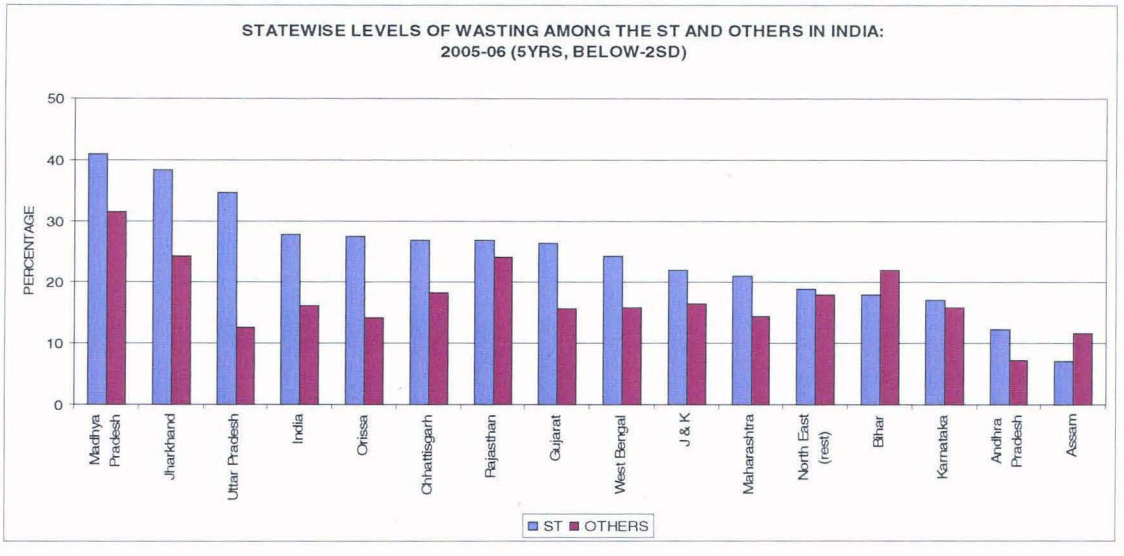
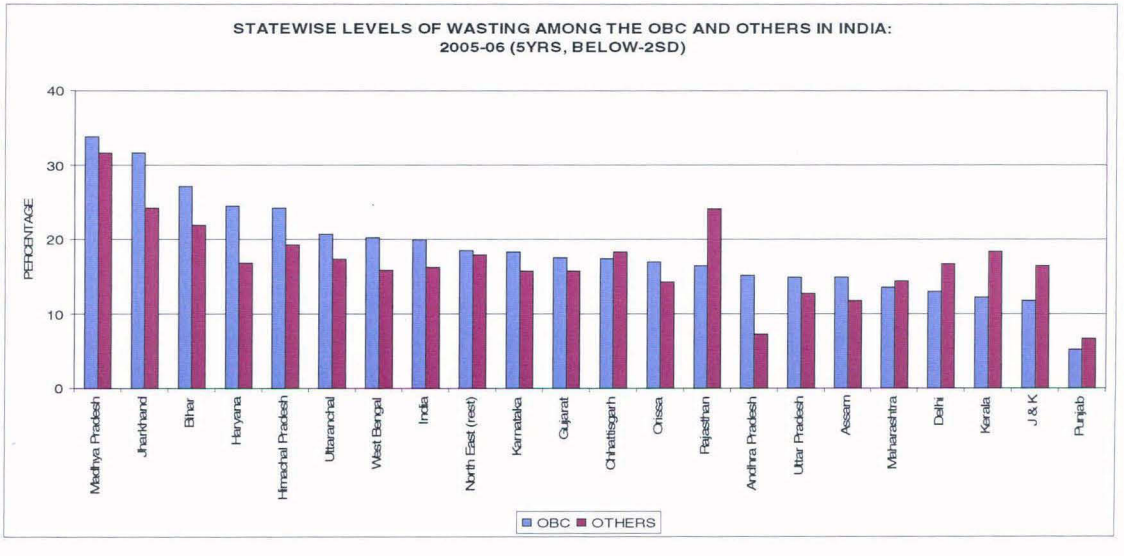
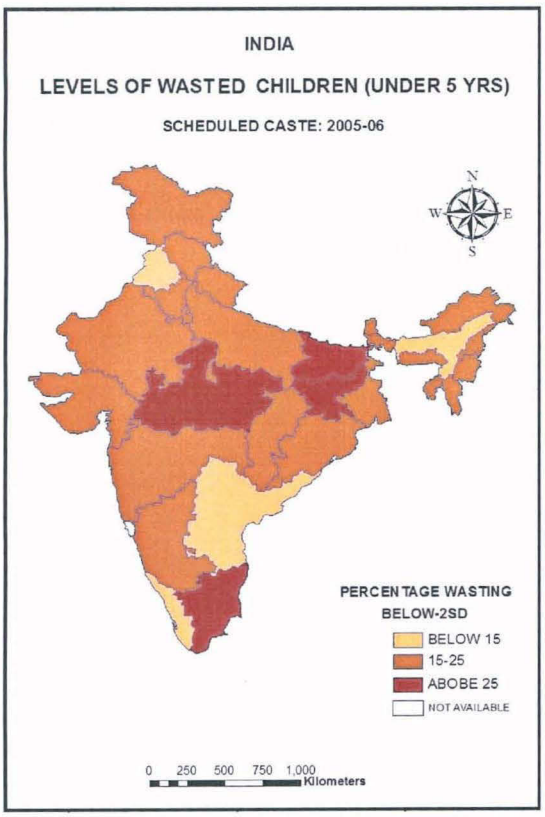


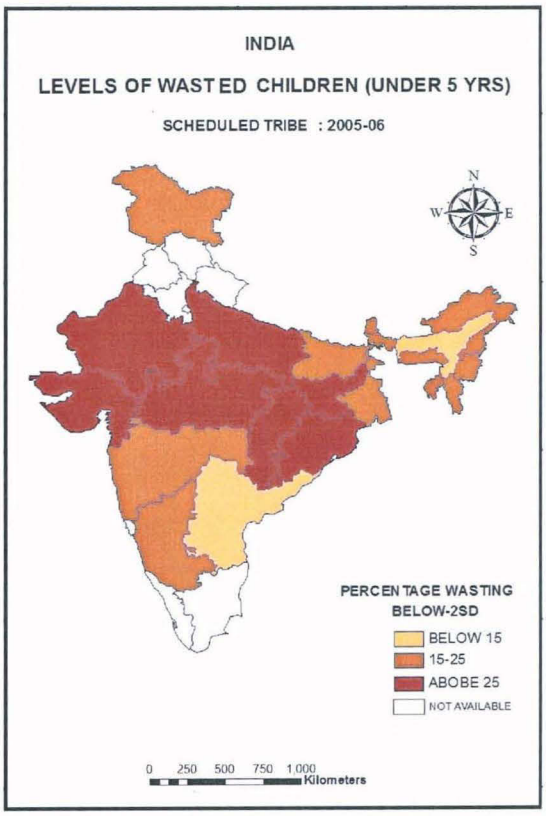
Figure: 5.24



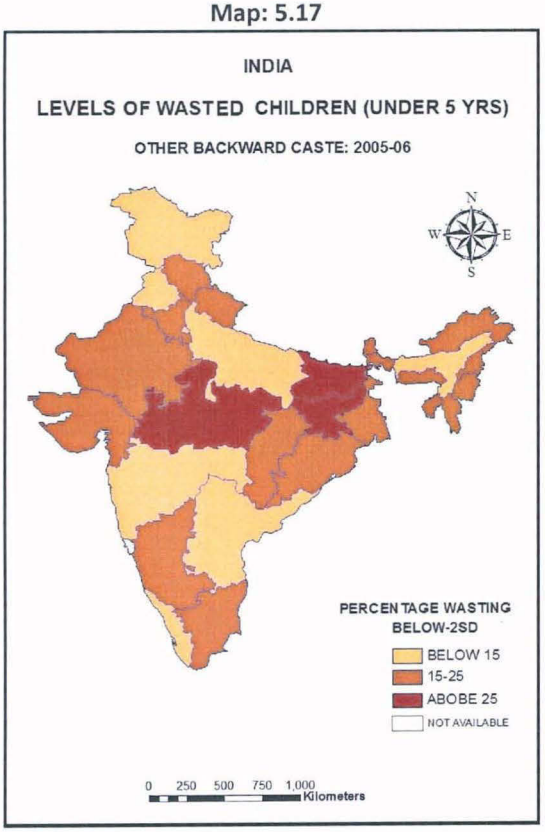
Map: 5.15



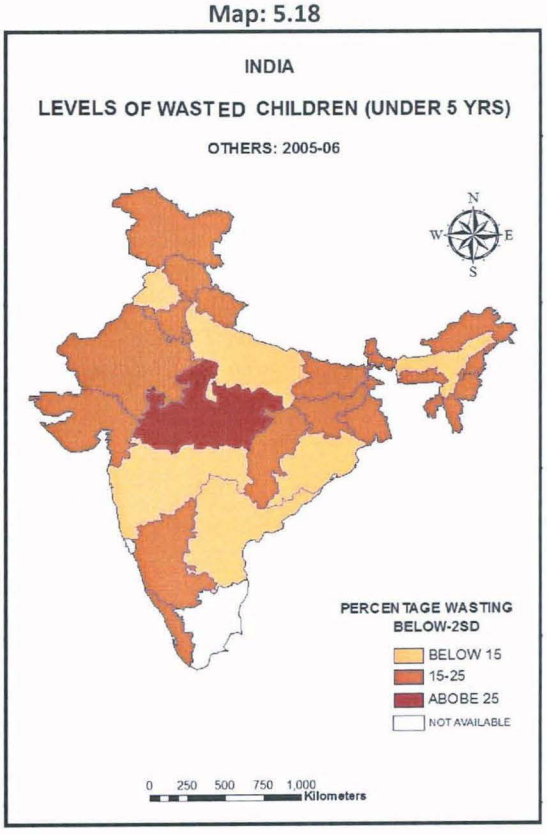
Map: 5.16



Map: 5.17



Map: 5.18



5.6 Understanding the social inequities of child undernutrition, in relation to proportions of SC & ST population:

In the previous analysis it has been largely documented that across the different parts of the country undernourishment levels among the SCs and STs are significantly higher in comparison to the non-scheduled social group (especially the others). Now in the current section, focuses would be to comprehend whether there is any association between the state-wise proportion of SCs, and STs and their corresponding undernourishment levels. It will examine the relative undernourishment levels among scheduled population especially in those states where they are their presence is preponderant. In order to understand that, the undernourishment gaps among the social groups have been plotted against the state wise percentages of scheduled population (according to 2001 census).

(a) The undernourishment gaps between the Scheduled and Non-Scheduled population:

The following three diagrams (Figure: 5.25, 5.26 and 5.27) shows that, in many scheduled preponderant states corresponding levels of undernourishment among scheduled population are significantly higher than the national averages. These states are- Madhya Pradesh, Himachal Pradesh, Jharkhand, Chhattisgarh, Orissa, Punjab and Rajasthan. Three states have been found namely- Madhya Pradesh, Punjab and Orissa; where all three types of undernutrition are found to higher among scheduled group. Additionally, in 4 states namely- Himachal Pradesh, Jharkhand, Chhattisgarh and Rajasthan one types of undernutrition is significantly prevail among the scheduled group.

A careful glimpse of the Table: 5.9, where certain cut-offs have been considered for the better understanding of this situation, reveals the following facts-

(i) In case of stunting, across 9 scheduled dominated states (Orissa, Madhya Pradesh, Punjab, Himachal Pradesh, Uttaranchal, Tamil Nadu, Maharashtra, Jammu and Kashmir and Bihar) significant undernutritional gaps have observed.

(ii) For underweight, 10 states fall into this category (Orissa, Madhya Pradesh, Punjab, Gujarat, Uttaranchal, Tamil Nadu, Haryana, Maharashtra, Jammu and Kashmir and Bihar), where scheduled children are found to be very much exposed to weight faltering.

(iii) Regarding wasting, in 8 states scheduled children are found to be seriously suffering from this undernourishment. These states are- Chhattisgarh, Orissa, Jharkhand, Madhya Pradesh, Rajasthan, Punjab, Tamil Nadu and Jammu & Kashmir.

(iv) In 5 Indian states (i.e. Orissa, Madhya Pradesh, Punjab, Tamil Nadu and J & K) all three types undernourishment among the scheduled population are found very higher. In Uttaranchal, Maharashtra and Bihar two types undernutrition i.e. stunting and underweight are found above the cut-off levels.

Table: 5.9 Scheduled population preponderant states with higher levels of undernourishment gaps between the Scheduled and Non-Scheduled population: 2005-06 (5yrs, Below-2SD)

State*	SCHD population (Cut-off 15%)	Undernutritional gaps between the scheduled and non-scheduled		
		Stunting (Cut-off 10%)	Underweight (Cut-off 10%)	Wasting (Cut-off 5%)
North East (Rest)	64.1	7.3	1	1.4
Chhattisgarh	43.4	0.9	6.2	***5.3***
Orissa	*38.7*	***17.4***	***18.3***	***9.2***
Jharkhand	38.1	8.2	9.9	***7.7***
Madhya Pradesh	35.4	***11.4***	***13***	***5.5***
Rajasthan	29.7	7.1	8.1	***5.6***
Punjab	28.9	***13.5***	***16***	***6.8***
Himachal Pradesh	28.7	***12.4***	6.1	-1.8
West Bengal	28.5	6.3	8.2	1.7
Andhra	22.8	9.7	9.3	-2.6
Karnataka	22.8	6.5	3.7	-0.8
Gujarat	21.9	8.4	***12.8***	7
Uttar Pradesh	21.2	4.9	8.9	2.5
Uttaranchal	20.9	***12.4***	***10.3***	3.5
Tamil Nadu	20.0	***11.5***	***15***	***6.9***
Haryana	19.3	9.4	***11.6***	3.4
Assam	19.3	5.5	-1.7	-3.5
Maharashtra	19.1	***15.3***	***14.5***	5
Jammu and Kashmir	18.5	***17.2***	***17.2***	***7.6***
Delhi	16.9	9	4.4	-0.6
Bihar	16.6	***14.9***	***15.5***	7
Kerala	11.0	14.7	16.2	-0.1
India	24.4	8.5	10.7	4.5

Source: Computed from NFHS-3 dataset

*States have arranged in the descending order according to the percentages of scheduled population. Values in bold italics indentify the preponderant states with higher levels undernourishment among the scheduled population.

Figure: 5.25

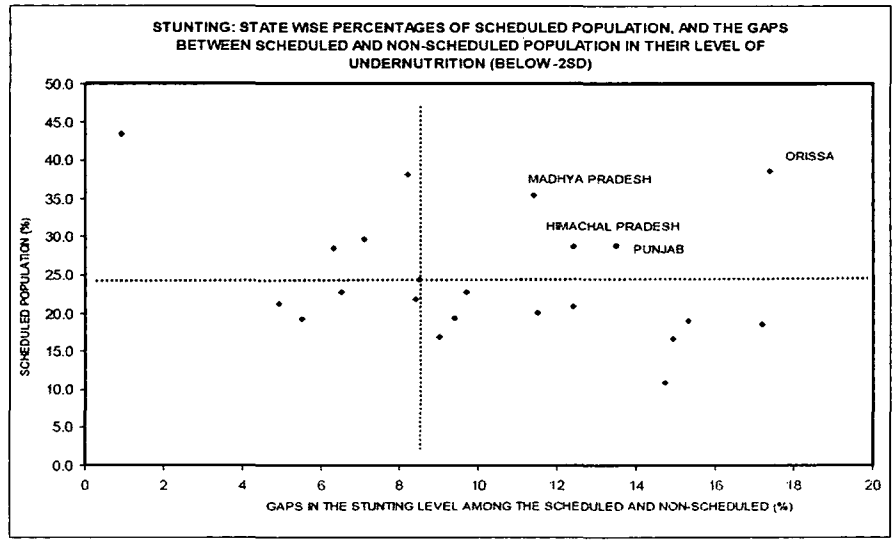


Figure: 5.26

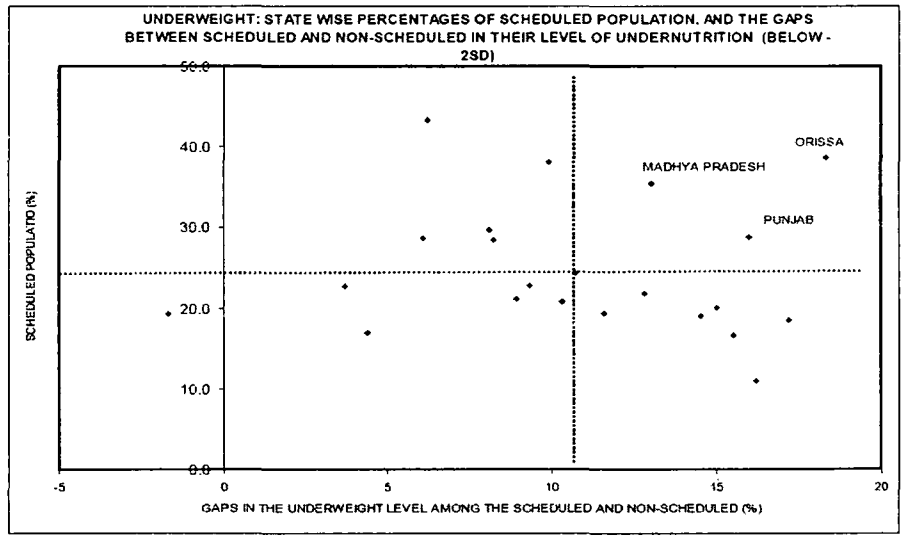
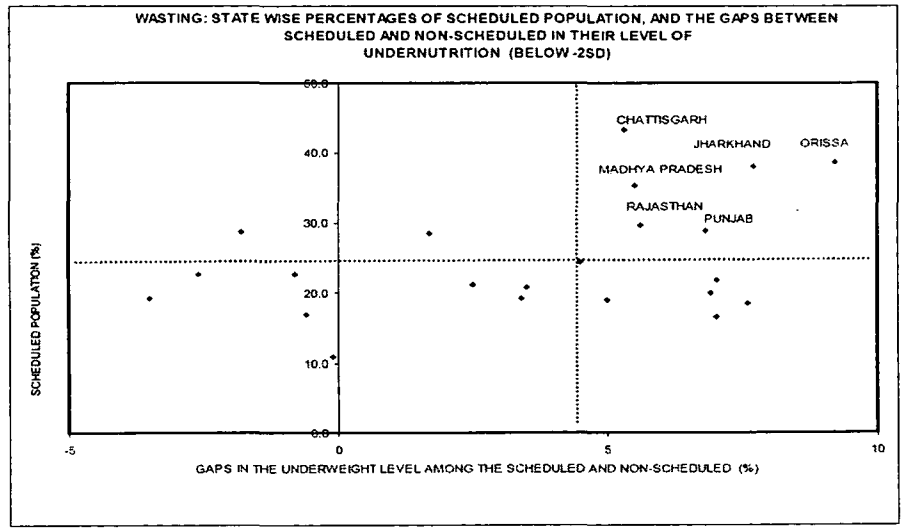


Figure: 5.27



(b) The undernourishment gaps between the Scheduled Caste population and others:

According to the 2001 census proportion of SC population in India was 16.2% at the national level the. During 3rd round of NFHS, the undernourishment gaps among the SC and others in all three types of indices i.e. stunting, underweight and wasting were measured to be respectively 13.2, 14.7 and 5 percentages at the aggregate level.

(i) Punjab, Himachal Pradesh, Haryana, Uttaranchal, Karnataka and Orissa are the states where both the nutritional gaps in terms of stunting and proportion of the SC population are found higher than national averages (Fig: 5.28). In case of underweight rate 4 such states have found - Punjab, Himachal Pradesh, Uttar Pradesh and Orissa (Fig: 5.29). Orissa and Punjab are the only two states which exhibit similar characteristics in case of levels of wasting (Fig: 5.30). Punjab and Orissa are the two states, where all three types of undernutritional gaps are found above the national averages.

A further brief look from the table 5.10 showed that,

(ii) In 15 SC preponderant states (considering 10% cut-off level) the gaps in the levels of stunting (with respect to others) are above 10 percentages. These states are- Punjab, Himachal Pradesh, Uttar Pradesh, Haryana, Uttaranchal, Karnataka, Orissa, Rajasthan, Andhra Pradesh, Bihar, Madhya Pradesh, Jharkhand, Chhattisgarh, Kerala and Maharashtra.

(iii) In case of underweight levels 14 such states have been identified (except Rajasthan all other states as in the case of stunting).

(iv) For the levels of wasting 5 states have been found where the similar kind's nutritional gaps are above 5% i.e. Punjab, Bihar, Orissa, Jharkhand and Maharashtra.

(v) Punjab, Bihar, Orissa, Jharkhand and Maharashtra are states where all three types of undernutrition levels are found to be higher than the cut-off points.

Figure: 5.28

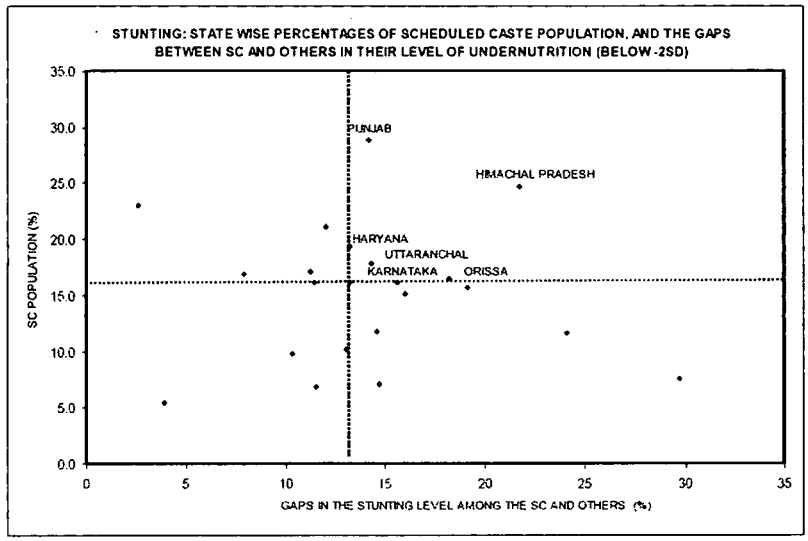


Figure: 5.29

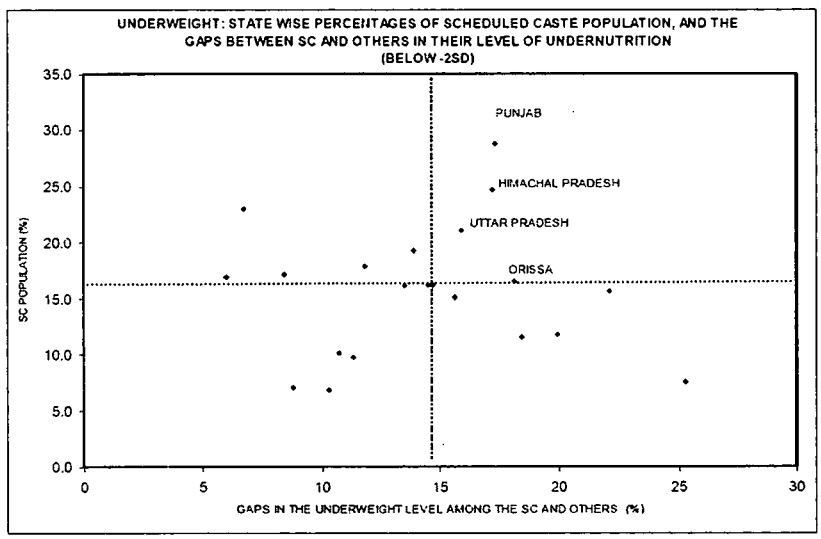


Figure: 5.30

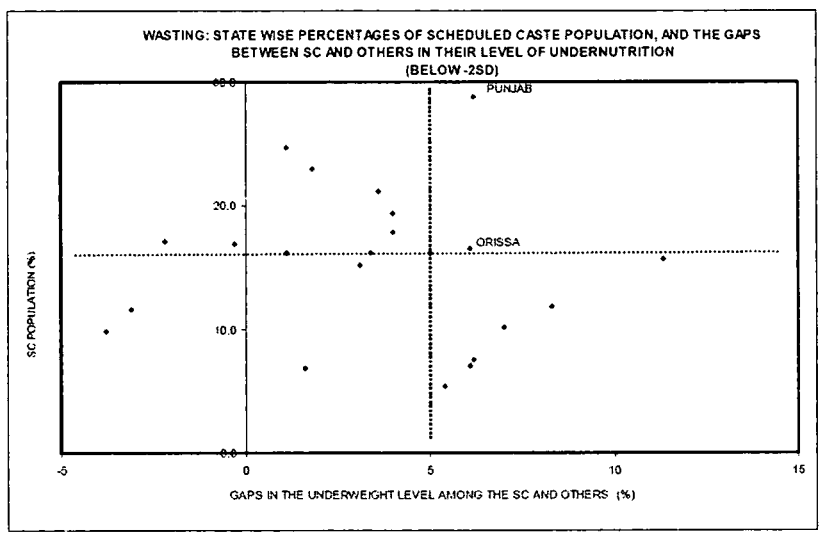


Table: 5.10 SC preponderant states with higher levels of undernourishment gaps between the SC and Others: 2005-06 (5yrs, Below-2SD)

State*	SC population (Cut-off 10%)	Undernutritional gaps between the SC and Others		
		Stunting (Cut-off 10%)	Underweight (Cut-off 10%)	Wasting (Cut-off 5%)
Punjab	28.9	***14.2***	***17.3***	***6.2***
Himachal Pradesh	24.7	***21.7***	***17.2***	1.1
West Bengal	23.0	2.6	6.7	1.8
Uttar Pradesh	21.1	***12***	***15.9***	3.6
Haryana	19.3	***13.2***	***13.9***	4
Tamil Nadu	19.0	NA	NA	NA
Uttaranchal	17.9	***14.3***	***11.8***	4
Rajasthan	17.2	***11.2***	8.4	-2.2
Delhi	16.9	7.9	6	-0.3
Orissa	16.5	***18.2***	***18.1***	***6.1***
Karnataka	16.2	***15.6***	***14.5***	1.1
Andhra Pradesh	16.2	***11.4***	***13.5***	3.4
Bihar	15.7	***19.1***	***22.1***	***11.3***
Madhya Pradesh	15.2	***16***	***15.6***	3.1
Jharkhand	11.8	***14.6***	***19.9***	***8.3***
Chhattisgarh	11.6	***24.1***	***18.4***	-3.1
Maharashtra	10.2	***13***	***10.7***	***7***
Kerala	9.8	***10.3***	***11.3***	-3.8
Jammu and Kashmir	7.6	29.7	25.3	6.2
Gujarat	7.1	14.7	8.8	6.1
Assam	6.9	11.5	10.3	1.6
North East (Rest)	5.4	3.9	4.8	5.4
India	16.2	13.2	14.7	5

Source: Computed from NFHS-3 dataset

*States have arranged in the descending order according to the percentages of Scheduled caste population.

Values in bold italics indentify the preponderant states with higher levels undernourishment among the scheduled caste population.

(C) The undernourishment gaps between the Scheduled Tribe population and others:

The total proportion tribal population in India is recorded to be 8.2% in 2001. During NFHS-3 survey, the gaps among the ST and others in stunting, underweight and wasting are found respectively 13.2%, 21.6% and 11.6%.

(i) In total 7 states have indentified, where both the stunting gaps among ST and others, and the size of ST population are found to be higher. These states are- Chhattisgarh, Jharkhand, Orissa, Madhya Pradesh, Gujarat, J & K and Maharashtra. (Fig: 5.31). Likewise, across 6 states the levels of gap in the underweight rate are

found to be higher than the national averages (Fig: 5.32). These states are- Chhattisgarh, Jharkhand, Orissa, Madhya Pradesh, Gujarat and Maharashtra. In Jharkhand and Orissa all three types of nutritional gaps are found to be above the national averages.

Additional queries from the Table: 5.11, reveals that,

(ii) Across 12 states (where ST population is above 5 percentages) the stunting gaps among the ST and others are found to be more than 10 percentages. The states are North-East (ex-Assam), Chhattisgarh, Jharkhand, Orissa, Madhya Pradesh, Gujarat, Rajasthan, J & K, Maharashtra, Andhra Pradesh, Karnataka and West Bengal.

(iii) In case of underweight levels, 11 states have been found where the gaps are above 10 percentages. These states are North-East (Rest), Chhattisgarh, Jharkhand, Orissa, Madhya Pradesh, Gujarat, J & K, Maharashtra, Andhra Pradesh, Karnataka and West Bengal.

(iv) In case of wasting, there are 9 states where the nutritional gaps between ST and others are above 5%. The states are Chhattisgarh, Jharkhand, Orissa, Madhya Pradesh, Gujarat, J & K, Maharashtra, Andhra Pradesh and West Bengal.

(v) Chhattisgarh, Jharkhand, Orissa, Madhya Pradesh, Gujarat, J & K, Maharashtra, Andhra Pradesh and West Bengal are the 9 Indian states, where all three types of undernutritional gaps between the ST and others are found to be higher than the selected cut-off points.

Figure: 5.31

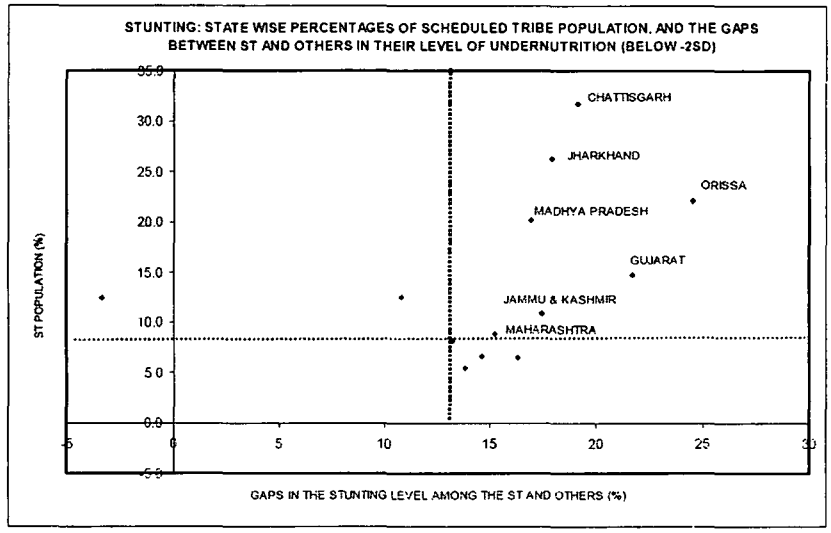


Figure: 5.32

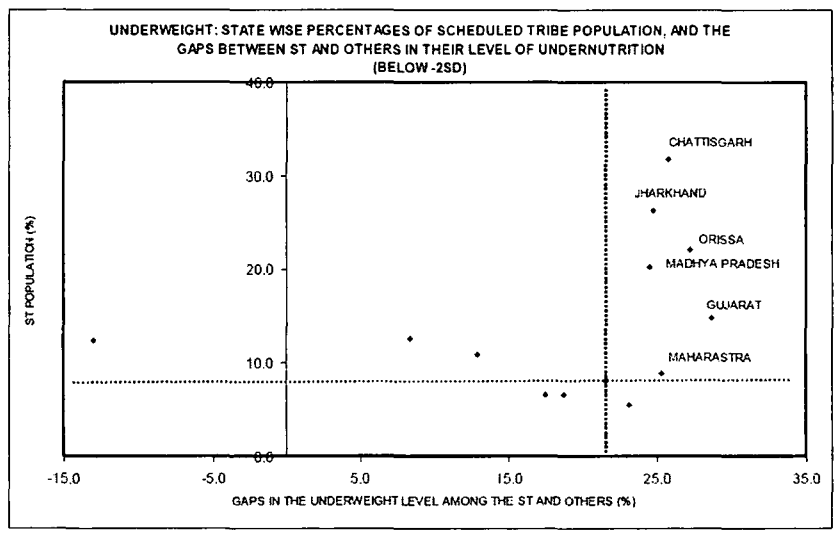


Figure: 5.33

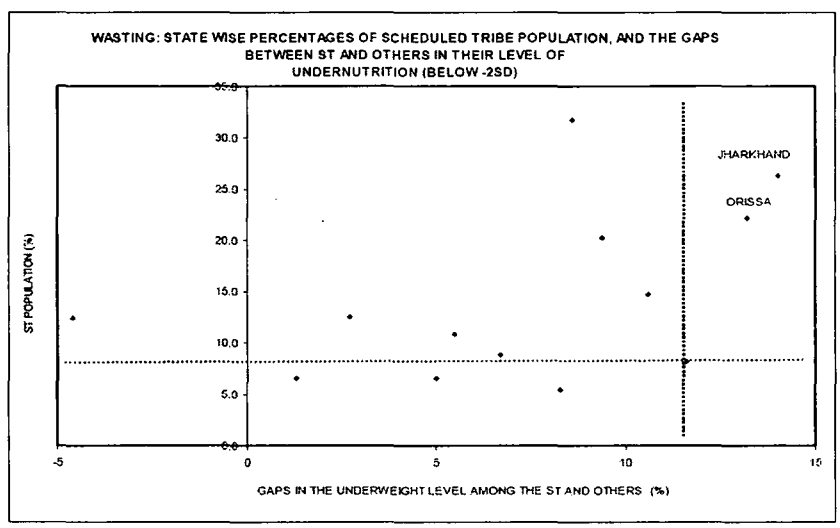


Table: 5.11 ST preponderant states with higher levels of undernourishment gaps between the ST and Others: 2005-06 (5yrs, Below-2SD)

State*	ST Population (Cut-off 5%)	Undernutritional Gaps between the ST and Others		
		Stunting (Cut-off 10%)	Underweight (Cut-off 10%)	Wasting (Cut-off 5%)
North East (Rest)	58.7	***10.5***	***1.9***	1
Chhattisgarh	31.8	***19.1***	***25.7***	***8.6***
Jharkhand	26.3	***17.9***	***24.7***	***14***
Orissa	22.1	***24.5***	***27.2***	***13.2***
Madhya Pradesh	20.3	***16.9***	***24.5***	***9.4***
Gujarat	14.8	***21.7***	***28.6***	***10.6***
Rajasthan	12.6	***10.8***	8.4	2.7
Assam	12.4	-3.4	-13	-4.6
Jammu and Kashmir	10.9	***17.4***	***12.9***	***5.5***
Maharashtra	8.9	***15.2***	***25.3***	***6.7***
Andhra Pradesh	6.6	***14.6***	***17.5***	***5***
Karnataka	6.6	***16.3***	***18.7***	1.3
West Bengal	5.5	***13.8***	***23.1***	***8.3***
Himachal Pradesh	4.0	NA	NA	NA
Uttaranchal	3.0	NA	NA	NA
Kerala	1.1	NA	NA	NA
Tamil Nadu	1.0	NA	NA	NA
Bihar	0.9	-0.5	-20.3	-4.1
Uttar Pradesh	0.1	15.7	29.4	22
India	8.2	13.2	21.6	11.6

Source: Computed from NFHS-3 dataset

*States have arranged in the descending order according to the percentages of Scheduled Tribe population Values in bold italics indentify the preponderant states with higher levels undernourishment among the scheduled tribe population.

5.7 Changes in the state level child undernutrition scenario among the different social groups:

It is important to carry a state level investigation to got acquainted with the nature of changes occurred in the undernutrition situations among the different social groups over the years. State level changes will also be helpful in order to understand the situation from a regional perspective.

(A) Underweight:

(a) Total Scheduled and Non-Scheduled Population:

(i) NFHS 1 & 3: From 1st to 3rd rounds of NFHS, the reductions of underweight rate for the Scheduled and Non-Scheduled population are respectively 8.5% and 13.9% at the aggregate level. During this time period, in most of the states underweight levels have reduced for both the scheduled and non-scheduled group.

Figure: 5.34

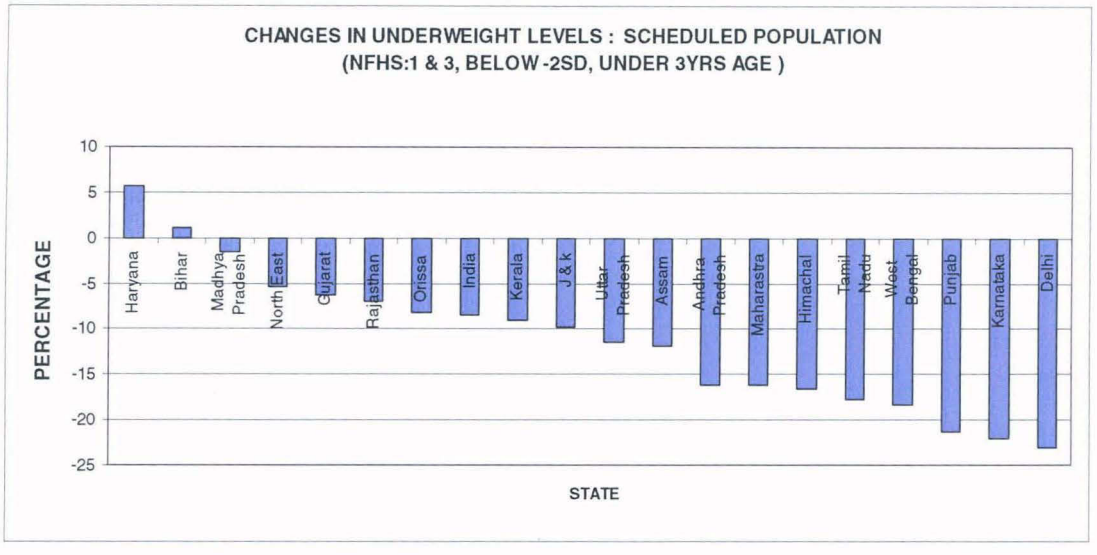
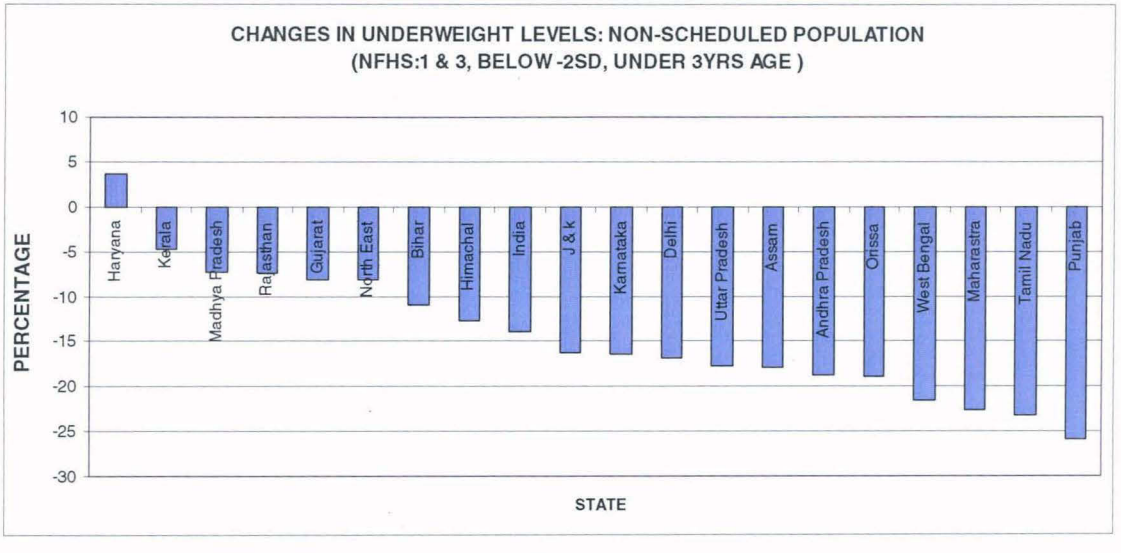


Figure: 5.35



Delhi, Karnataka, Punjab, West Bengal, Tamil Nadu, Himachal Pradesh Maharashtra are the states where the reductions of underweight levels for the scheduled population are higher than 15%. Likewise, Assam, Uttar Pradesh and J & K have also experienced close to 10% reductions in the underweight levels for the scheduled

population. In some other parts of the country moderate reductions have been observed. Madhya Pradesh is the only state where no such improvement has happened over the years. On the other hand, Bihar and Haryana are the only two states, where underweight levels for the scheduled population have gone up during this time period. In case of total Non-Scheduled population, except Haryana, all other regions have experienced reduction in the underweight level. Highest level of reduction is noticed in Punjab (26%). In 11 state reductions have been found to be more than 15%. These states are Punjab, Tamil Nadu, Maharashtra, West Bengal, Orissa, Andhra Pradesh, Assam, Uttar Pradesh, Delhi, Karnataka and J & K. In two other states (Bihar and Himachal Pradesh) the reductions are more than 10%.

Table: 5.12A State level changes in the child underweight rate among the different social groups: (3 Yrs, -2SD)

	NFHS-1 & 2		NFHS-2 & 3		NFHS-1 & 3	
States	SCHD	NSCHD	SCHD	NSCHD	SCHD	NSCHD
Andhra Pradesh	-9	-10.7	-7.2	-8.1	-16.2	-18.8
Assam	-18	-9.5	6.1	-8.4	-11.8	-17.9
Bihar	-6	-9.5	7.1	-1.4	1.2	-10.9
Delhi	-13.5	-7.2	-9.6	-9.6	-23.1	-16.8
Gujarat	-6	-4.2	-0.2	-3.9	-6.2	-8.1
Haryana	-3.3	1.8	9.1	1.8	5.7	3.6
Himachal	0.8	-0.5	-17.4	-12.1	-16.6	-12.7
J & k	1.3	-7.8	-11.1	-8.4	-9.8	-16.2
Karnataka	-4.2	-8.7	-17.8	-7.7	-22	-16.4
Kerala	1.6	-1.2	-10.5	-3.5	-9	-4.7
Madhya Pradesh	-1.1	-7.1	-0.4	-0.3	-1.5	-7.3
Maharashtra	-4	-2.4	-12.2	-20.2	-16.2	-22.6
North East	-3.6	-3.8	-1.8	-4.4	-5.4	-8.1
Orissa	1.6	0.6	-9.7	-19.6	-8.1	-19
Punjab	-14.8	-20.3	-6.5	-5.6	-21.3	-25.9
Rajasthan	7.7	6.1	-14.8	-13.5	-7	-7.4
Tamil Nadu	-5.8	-12.7	-12	-10.5	-17.8	-23.2
Uttar Pradesh	0.4	-7.9	-11.8	-9.8	-11.4	-17.7
West Bengal	-5.6	-10.4	-12.6	-11.2	-18.3	-21.6
India	-3	-7.5	-5.5	-6.4	-8.5	-13.9

Source: Calculated from NFHS datasets

(ii) NFHS 1 & 2: During NFHS-1 to 2 time period the reduction of overall underweight percentages among the scheduled population is 3% as compared to 7.5%

for the Non-Scheduled population. The highest reduction for the scheduled population is observed in Assam (18%). The performance by Punjab, Delhi, Andhra Pradesh, West Bengal, Bihar and Gujarat are highly suitable. Himachal, J & K and Uttar Pradesh have experienced increase in the underweight rate for the scheduled population. In Rajasthan and Orissa underweight rates have increased for both the social groups. For the Non-Scheduled population, except Haryana, Orissa and Rajasthan, 16 remaining states have experienced reductions in the underweight rate. Punjab experienced around 20 percentage of reduction in it. Andhra Pradesh, Assam, Bihar, Delhi, J & K, Karnataka, Madhya Pradesh, Tamil Nadu, Uttar Pradesh and West Bengal have witnessed high reduction in the underweight rate for the Non-Scheduled children.

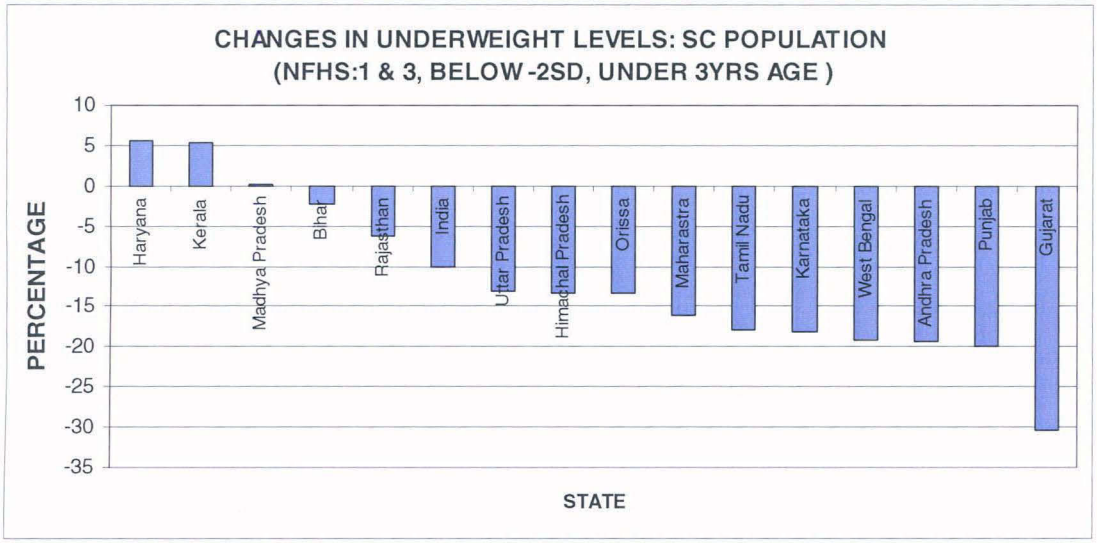
(ii) NFHS 2 & 3: Assam, Bihar and Haryana are the three states where underweight rates have gone raised for the scheduled population during NFHS-2 & 3 time period. Most of the other states have performed very well in reducing the underweight level among the Scheduled population. Himachal Pradesh, J & K, Karnataka, Kerala, Maharashtra, Orissa, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal, all have noticed high levels of reduction in the underweight rate. For the Non-Scheduled population, the overall reduction is recorded as 6.4%. In Maharashtra and Orissa the reductions are found to be around 20%. In several other states higher levels of reduction also has been noticed, such as Andhra Pradesh, Assam, Delhi, Himachal, Karnataka, Punjab, Tamil Nadu, Uttar Pradesh and West Bengal. Haryana is the state, which has successively performed very poorly in terms of the reduction in the child underweight rates.

(b) Scheduled Caste Population:

(i) NFHS 1 & 3: The overall reduction of underweight rate for the SC population from 1st to 3rd rounds of the NFHS is 10%. Bihar, Madhya Pradesh, Kerala and Haryana are the poor performing states. In Madhya Pradesh, Kerala and Haryana underweight levels for the SCs has actually gone up during this period. In Gujarat, highest reduction is achieved (30%). Punjab, West Bengal, Andhra Pradesh,

Karnataka, Tamil Nadu and Maharashtra are the states where the reductions are above 15%. In three other states (Orissa, Himachal Pradesh, Uttar Pradesh) the reductions are also found to be very high (10%).

Figure: 5.36



(ii) NFHS 1 & 2: During NFHS-1 & 2 time period, underweight rate for the SC has been reduced by 3.6%. Highest levels of improvements are noticed in Gujarat (26%), Punjab and Bihar. On the other hand, Kerala and Rajasthan are the two states, where underweight rate has gone up during this period.

(iii) NFHS 2 & 3: During the last NFHS round, reduction by 6.4% is noticed for the SC population in India. Karnataka and West Bengal have experienced higher levels of reductions in their underweight rate. Even Rajasthan and Kerala, which performed badly in the previous survey, have experienced reductions in the underweight levels for the scheduled caste population. Madhya Pradesh, Bihar, Haryana and Assam have performed badly during this time period.

(c) Scheduled Tribe Population:

(ii) NFHS 1 & 3: During this entire period, much improvement is not seen in the reduction of underweight rate among the ST (at the aggregate level just 4.8%),

although they are the most vulnerable section of the population. Highest level of reduction is seen in Karnataka and Assam. Orissa, Bihar, Madhya Pradesh, Uttar Pradesh and Gujarat are the poor performing states. In Madhya Pradesh, Uttar Pradesh and Gujarat the levels of underweight rate has actually gone up over the years.

Figure: 5.37

(ii) NFHS 1 & 2: For the ST population, reduction in underweight rate during the period NFHS-1 & 2 is 1.3%, suggesting no such improvements at the national level. Assam has experienced highest level of reduction (21%) during this time period. Other important states, where it got reduced are Andhra Pradesh, Karnataka and West Bengal. In rest of the other parts of the country no improvements have noticed. Rather, in many states the situation has been worsened. UP, Rajasthan, Orissa, Gujarat, Maharashtra and Madhya Pradesh have experienced increase in the underweight levels.

(ii) NFHS 2 & 3: During NFHS 2 & 3 survey the overall reduction of the underweight rate for the STs is found to be mere 3.5%. Andhra Pradesh, Assam, Bihar, Gujarat, Madhya Pradesh and West Bengal are the states where underweight levels are either went up or remained same. Contrary to this, in Karnataka, Rajasthan, Maharashtra, Orissa and Uttar Pradesh underweight levels have fallen during this time period.

(d) Other Backward Caste Population: During NFHS-2 & 3 time period the overall reduction for the OBCs is 3.5%. Remarkable improvements are noticed in Punjab, Maharashtra, Orissa and Rajasthan. A moderate reduction is experienced in the states like Gujarat, West Bengal, Karnataka and Uttar Pradesh. Haryana is the only state where the situation has remained the same.

Table: 5.12B State level changes in the child underweight rate among the different social group: (3 Yrs, Below -2SD)

State	NFHS-1 & 2		NFHS-2 & 3				NFHS-1 & 3	
	SC	ST	SC	ST	OBC	OTHERS	SC	ST
Andhra Pradesh	-7.4	-11.1	-12	5.7	NA	-7.4	-19.4	-5.4
Assam	NA	-21.3	13.1	-1.1	NA	-11.6	NA	-22.4
Bihar	-10	-0.5	7.7	-0.3	-1	-0.4	-2.3	-0.8
Delhi	NA	NA	-12.2	NA	NA	-6.9	NA	NA
Gujarat	-25.7	2.3	-4.7	5.3	-5.7	-5.5	-30.4	7.6
Haryana	-3.1	NA	8.6	NA	0.3	2	5.5	NA
Himachal Pradesh	NA	NA	NA	NA	NA	-11.1	-13.3	NA
J & K	NA	NA	NA	NA	NA	-8.8	NA	NA
Karnataka	-2.1	-10.3	-16.1	-16.8	-7.7	-13.2	-18.2	-27.1
Kerala	16.8		-11.5	NA	-14.2	2.4	5.3	NA
Madhya Pradesh	0	0.4	0.1	-0.2	-2.7	3.2	0.1	0.2
Maharashtra	-7.1	1.7	-9	-12.4	-20	-20.9	-16.1	-10.7
North East	NA	-5.2	NA	-0.6	NA	-4.2	NA	-5.8
Orissa	-1.1	2.9	-12.2	-7.5	-18.5	-17.7	-13.3	-4.6
Punjab	-14.5	NA	-5.5	NA	-22.4	-1.3	-20	NA
Rajasthan	7.1	8.7	-13.3	-16.8	-18	-10.6	-6.2	-8.1
Tamil Nadu	-5.9	NA	-12	NA	-10.7	NA	-17.9	NA
Uttar Pradesh	-0.2	10.6	-12.9	-6.5	-9.8	-16.3	-13.1	4.1
West Bengal	-4.3	-7.9	-14.8	0.2	-5.7	-13	-19.1	-7.7
India	-3.6	-1.3	-6.4	-3.5	-5.6	-10.3	-10	-4.8

Source: Calculated from NFHS Datasets

(e) Others: During NFHS-2 & 3 survey, the overall reduction for the others in terms of underweight rate is 10%. Maharashtra, Orissa and Uttar Pradesh have experienced a high level of reduction in it. In Punjab and Bihar no further improvements are noticed. Haryana, Kerala and Madhya Pradesh are the states where underweight rate has increased during this time period.

(B) Stunting:

(a) Total Scheduled and Non-Scheduled Population:

(i) NFHS 1 & 3: Unlike the underweight rate, the stunting situation in India has not improved much over the years. From 1992-93 to 1998-99 and 1998-99 to 2005-06 the reductions for the Scheduled population are respectively 0 and 0.5 percentages, which means hardly any improvement has been achieved over the years. For the Non-Scheduled population during the first phase (NFHS-1 & 2) 4% reduction in the stunting is noticed, but during later phase (NFHS-2 & 3) a minute increase is there. These two lead to an overall reduction of 3.6% from 1992-93 to 2005-06.

Figure: 5.38

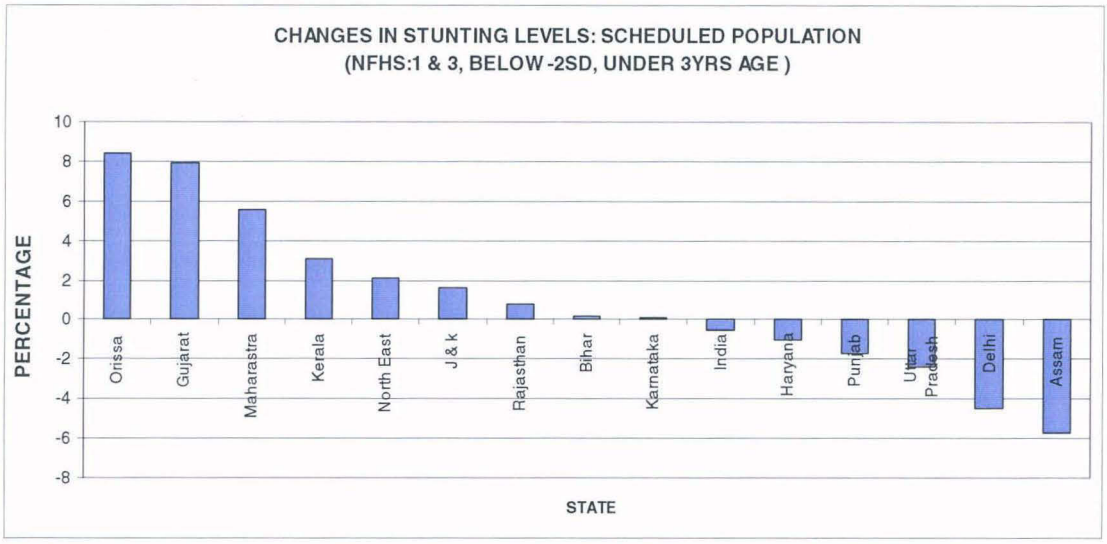
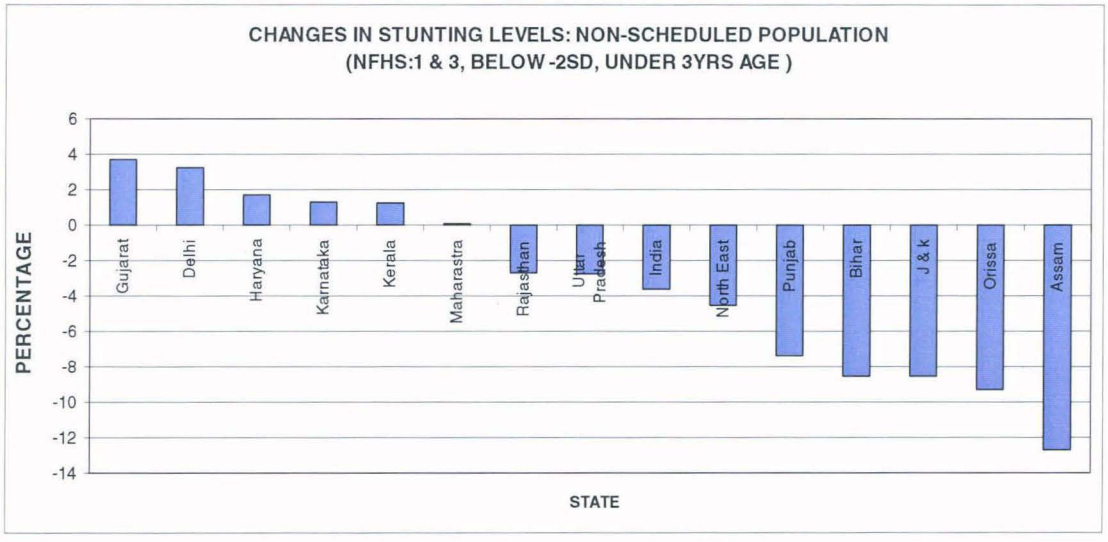


Figure: 5.39



For the total scheduled population only Assam and Delhi have experienced a slight improvement over the years. In Uttar Pradesh, Punjab and Haryana, no such changes are there. In rest of the other parts of the country stunting level for the scheduled population, has gone up. In case of total non-scheduled population, Assam, Orissa, Bihar, J & K, Punjab and North East (excluding-Assam) have experienced an improvement. In Uttar Pradesh and Rajasthan no such changes are observed. In rest of the other parts of the country stunting level for the non-scheduled population, has gone up.

Table: 5.13A State level changes in the child stunting rate among the different social groups: (3 Yrs, Below -2SD)

State	NFHS-1 & 2		NFHS-2 & 3		NFHS-1 & 3	
	SCHD	NSCHD	SCHD	NSCHD	SCHD	NSCHD
Andhra Pradesh	NA	NA	1.9	-1	NA	NA
Assam	-1.3	1.8	-4.4	-14.5	-5.7	-12.7
Bihar	-2.2	-2.5	2.4	-6	0.2	-8.5
Delhi	-4.2	-4.8	-0.3	8	-4.5	3.2
Gujarat	-2.3	-1.2	10.2	4.9	7.9	3.7
Haryana	2.2	9.8	-3.2	-8.1	-1	1.7
Himachal	NA	NA	-14.3	-5.4	NA	NA
J & k	-2.1	2.1	3.7	-10.6	1.6	-8.5
Karnataka	-4.4	-4.6	4.5	5.9	0.1	1.3
Kerala	-2.2	-3.9	5.3	5.1	3.1	1.2
Madhya Pradesh	NA	NA	-5.2	-2.1	NA	NA
Maharashtra	0.7	-2.7	4.9	2.8	5.6	0.1
North East	0.4	-1.2	1.7	-3.3	2.1	-4.5
Orissa	3.9	-5.4	4.5	-4	8.4	-9.3
Punjab	5.1	-2.7	-6.8	-4.7	-1.7	-7.4
Rajasthan	13	9.3	-12.3	-12	0.8	-2.7
Tamil Nadu	NA	NA	-1.8	2.8	NA	NA
Uttar Pradesh	5.3	-0.8	-7.7	-2	-2.4	-2.8
West Bengal	NA	NA	-3.1	0.2	NA	NA
India	0	-4	-0.5	0.3	-0.5	-3.6

Source: Calculated from NFHS datasets

(i) NFHS 1 & 2: At the state level, wide variations in the rate of change are noticed during this time period. For the Scheduled population, states like- Haryana, Maharashtra, North East (Rest), Orissa, Punjab, Rajasthan and UP have noticed an overall increase in the stunting rate. In Rajasthan 13% increase is noticed. J & K,

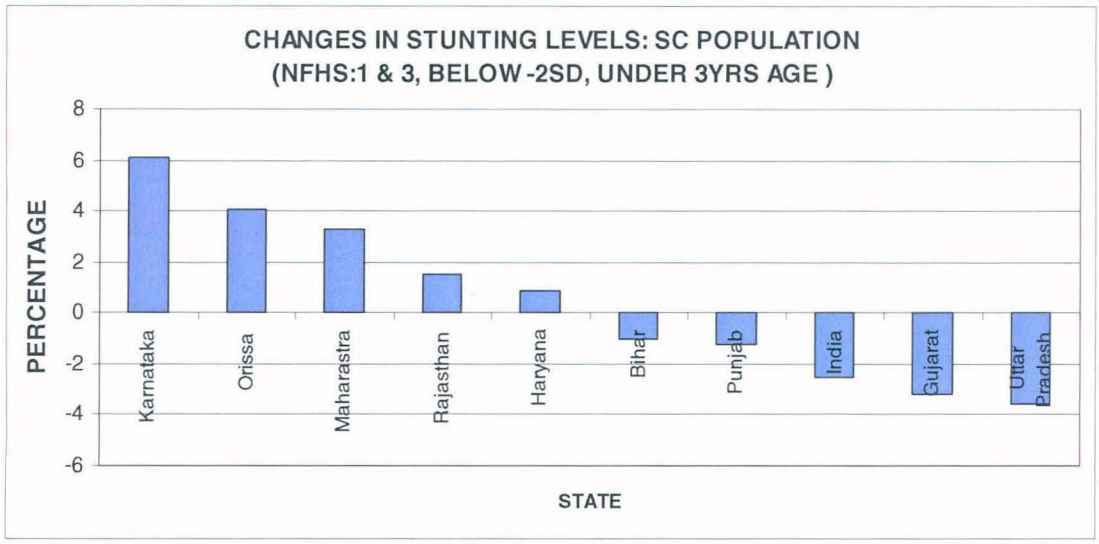
Delhi and Karnataka are able to reduce it at a marginal scale. For the non-scheduled population, Assam, Haryana, J & K and Rajasthan have experienced increase in the stunting rate during this period. On the other hand, in couple of other states, (e.g. Maharashtra, North-East (Rest), Orissa, Punjab and UP) stunting levels are found to be reduced for the non-scheduled population. Although in theses states the performance for the scheduled population are worst. In other states like Kerala, Karnataka, Bihar, Delhi and Gujarat, improvements are noticed for both the social groups.

(iii) NFHS 2 & 3: Assam, Haryana, Himachal Pradesh, Madhya Pradesh, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal are the states where stunting among the Scheduled group has reduced between NFHS-2 & 3 surveys. Haryana, Rajasthan and Punjab seem to have overcome their past experiences. Karnataka and Kerala the South Indian duo have performed very badly in this period. In Gujarat an increase by 10% is noticed. States like Orissa, Maharashtra and North-East (Rest) have shown successive failure. For the Non-Scheduled population Assam, Bihar, Haryana, Himachal, J & K, Punjab and Rajasthan etc. have performed very well; while Delhi, Gujarat, Karnataka, Kerala, Tamil Nadu, Maharashtra and West Bengal have performed badly regarding the Non-Scheduled population.

(b) Scheduled Caste Population:

(i) NFHS 1 & 3: Over the years the reduction of the stunting among the SC population in India is just 2.5%. Uttar Pradesh and Gujarat are the only two states where marginal reductions are seen. In Punjab and Bihar, no such changes are there in the overall stunting rate. Haryana, Rajasthan, Maharashtra, Orissa and Karnataka are the states where the level of stunting, among the SC population, has significantly increased over the years.

Figure: 5.40



(ii) NFHS 1 & 2: In this period, the aggregate level of stunting for the SC is reduced by just 2.7%. Gujarat is the only state showing significant achievement in this period (10%). Maharashtra and Bihar are the two other important states where stunting have reduced. In Karnataka no improvements is noticed. Haryana, Orissa, Uttar Pradesh, Punjab and Rajasthan are the states, where rate of underweight children have increased.

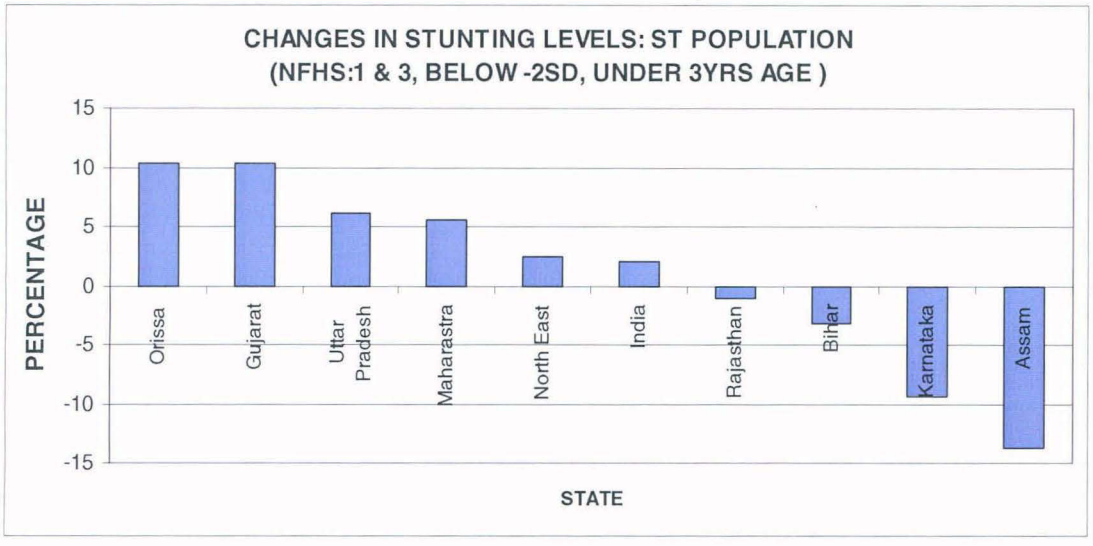
(iii) NFHS 2 & 3: During last NFHS survey no improvement was recorded at the national level stunting for the Scheduled Caste population. Rather, the situations become worse in many states. Only few states have performed well during this time period such Rajasthan, Uttar Pradesh and Punjab, although they are faced an increase during NFHS-2 time period. Due to this balancing effect, actually over the years no such improvements have happen in these states. Rest of the other states have experienced an increase in the rate of stunting for the SC population in this period.

(c) Scheduled Tribe Population:

(ii) NFHS 1 & 3: The overall stunting levels among the ST population have intensified over the years (increase by 2%). Assam and Karnataka are the two states where the levels have significantly gone down. In Bihar and Rajasthan no such

changes are there. In rest of the country the over all stunting level for the ST population has increased over the years.

Figure: 5.41



(ii) NFHS 1 & 2: From 1st to 2nd round of the NFHS survey, stunting among the STs has worsened. Karnataka and Assam are the only two states where the percentages of stunting reduced. In rest of the other states situation has worsened. In Uttar Pradesh and Rajasthan, the percentages of the stunted children are gone up respectively by 23 and 15 percentages.

(iii) NFHS 2 & 3: A slight improvement is noticed in the stunting rate. Uttar Pradesh, Rajasthan, Assam and Madhya Pradesh are the states showing impressive success in terms of reduction of stunted children among the ST. However at the same time couple of states have experienced an increase in the rate of stunting. In Gujarat, Orissa, Andhra Pradesh, Karnataka and North East stunting situation has intensified.

(d) Other Backward Caste Population: Among the children from OBC background, no positive change is found during the NFHS-2 & 3 time period. There are many states, which have experienced an increase in the stunting situation e.g. Gujarat, Karnataka, Kerala. On the other, in more number of states stunting rate has decreased.

Punjab, Haryana and Rajasthan have shown remarkable reductions in their stunting rate.

(e) Others: Among the others a slight improvement has been noticed over the years (NFHS-2 & 3). In Rajasthan, Assam, J & K, Himachal Pradesh and Haryana huge decrease in the stunting rate have been noticed. But in other parts of the country underweight rate has been gone up. In Delhi, Kerala and Maharashtra it has gone up respectively by 11, 6 and 5 percentages.

Table: 5.13B State level changes in the child stunting rate among the different social group: (Beloew3 Yrs, Below -2SD)

State	NFHS-1 & 2		NFHS-2 & 3				NFHS-1 & 3	
	SC	ST	SC	ST	OBC	OTHERS	SC	ST
Andhra Pradesh	NA	NA	0.4	6.2	NA	-4	NA	NA
Assam	NA	-2.4	2.4	-11.3	NA	-17	NA	-13.7
Bihar	-3.7	-0.8	2.7	-2.4	-5.6	-6.1	-1	-3.2
Delhi	NA	NA	-1.2	NA	NA	10.9	NA	NA
Gujarat	-9.8	-1	6.6	11.3	7.8	-2.5	-3.2	10.3
Haryana	2.4	NA	-1.5	NA	-11.3	-8.2	0.9	NA
Himachal Pradesh	NA	NA	NA	NA	NA	-10.6	NA	NA
J & K	NA	NA	NA	NA	NA	-13.6	NA	NA
Karnataka	-0.4	-15.2	NA	5.8	6.4	0.8	6.1	-9.4
Kerala	NA	NA	NA	NA	4.7	5.8	NA	NA
Madhya Pradesh	NA	NA	0.6	-9	-4.6	2.1	NA	NA
Maharashtra	-6.4	8.7	9.7	-3.2	-1.6	5.2	3.3	5.5
North East	NA	0.7		1.7	NA	-6.9	NA	2.4
Orissa	3.7	3.9	0.4	6.5	-2.8	-1.6	4.1	10.4
Punjab	5.1		-6.3		-19.5	0.3	-1.2	NA
Rajasthan	11.6	14.8	-10.1	-15.8	-11.1	-18.1	1.5	-1
Tamil Nadu	NA	NA	-3	NA	3.7	NA	NA	NA
Uttar Pradesh	3.9	22.6	-7.5	-16.5	-2	-6.6	-3.6	6.1
West Bengal	NA	NA	-3	-0.5	-4.2	0.5	NA	NA
India	-2.7	4.9	0.2	-2.9	1.5	-2.7	-2.5	2

Source: Calculated from NFHS datasets

(C) Wasting:

(a) Total Scheduled and Non-Scheduled Population:

(i) NFHS 1 & 3: The overall Wasting rates, both for the scheduled and non-scheduled children have risen between NFHS-1 to 3 surveys. Although during the 2nd NFHS round (1998-99), a decline was noticed, but during the 3rd survey (2005-06) it has severely gone up, leading to an overall increase in the rate of wasting. Punjab, Maharashtra, Kerala, Gujarat and Karnataka are the few states where wasting rate has

gone down among the total scheduled population. On the other hand, regarding the total Non-Scheduled population Punjab and Maharashtra are the only two states which showed reductions in it. In Orissa and Karnataka situation are remained unchanged. In rest of the country, wasting levels have risen over the years for both the scheduled and non-scheduled population.

Figure: 5.42

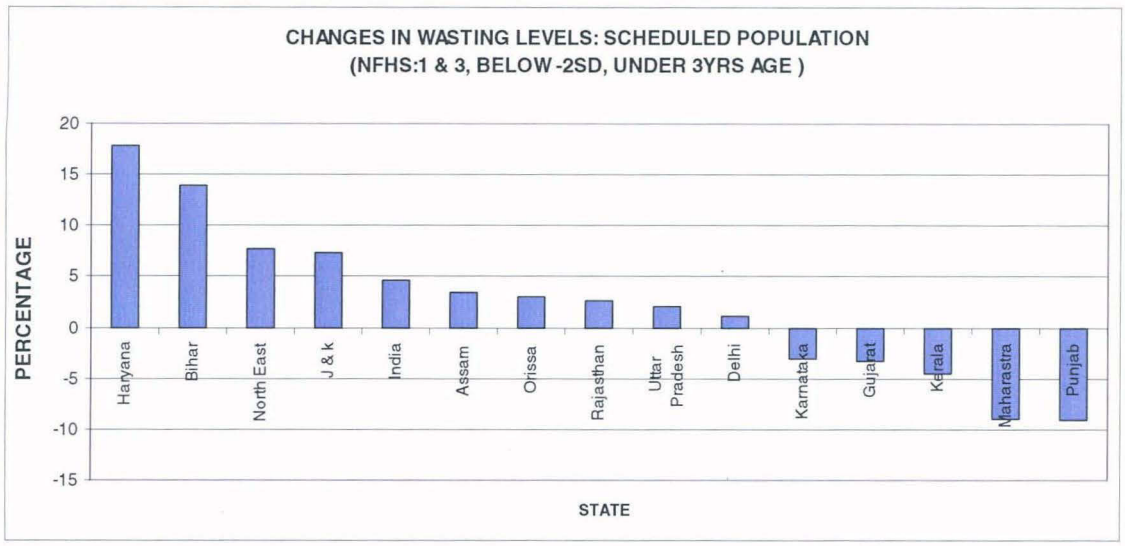
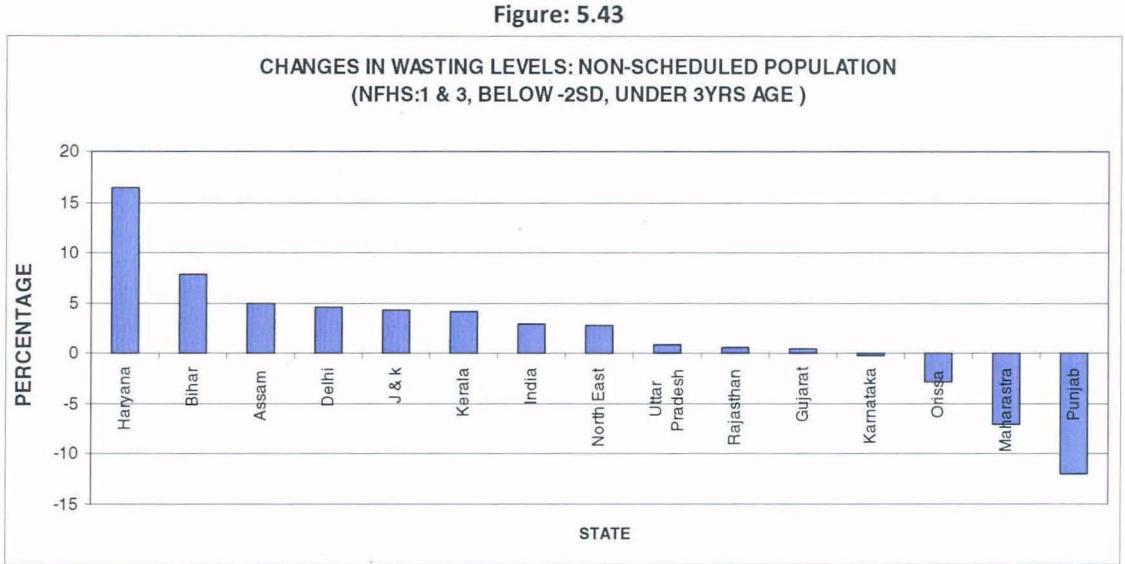


Figure: 5.43



(ii) NFHS 1 & 2: Between NFHS-1 & 2, wasting percentages are decreased by around 4% for the both scheduled and non-scheduled population. Gujarat, Punjab, Rajasthan Uttar Pradesh, Maharashtra and Kerala performed well in reducing its levels among the scheduled population. However in four states, (Bihar, J & K, Karnataka and Orissa) some negative growth is noticed. For the non-scheduled

population Punjab, Rajasthan, North-East and J & K have experienced decrease in it. In Punjab the decrease is recorded 15% On the other hand, Assam, Delhi, Haryana and Orissa are the states where wasting level increased during this time period.

Table: 5.14A State level changes in the child Wasting rate among the different Social Group: (3 Yrs, Below -2SD)

State	NFHS-1 & 2		NFHS-2 & 3		NFHS-1 & 3	
	SCHD	NSCHD	SCHD	NSCHD	SCHD	NSCHD
Andhra Pradesh	NA	NA	1.8	6.9	NA	NA
Assam	-0.5	3.5	4.1	1.3	3.5	4.9
Bihar	-0.4	-4	14.3	11.9	14	7.9
Delhi	-2.2	-0.1	3.3	4.6	1.1	4.5
Gujarat	-8.6	-2.6	5.4	3.1	-3.3	0.5
Haryana	-4.1	0.6	21.9	15.8	17.9	16.5
Himachal	NA	NA	-0.5	3.6	NA	NA
J & k	1.7	-5.1	5.6	9.4	7.3	4.3
Karnataka	5.1	-1.4	-8.1	1.2	-3	-0.3
Kerala	-6.6	-1.8	2.1	5.9	-4.5	4.1
Madhya Pradesh	NA	NA	17.2	14.5	NA	NA
Maharashtra	-9.8	-0.7	0.9	-6.4	-9	-7.1
North East	-1.1	-5.9	8.9	8.8	7.8	2.8
Orissa	0.7	0.5	2.3	-3.4	3	-2.9
Punjab	-12.3	-15.2	3.2	3.2	-9.1	-12
Rajasthan	-10.1	-8.7	12.9	9.3	2.7	0.6
Tamil Nadu	NA	NA	6.6	1.7	NA	NA
Uttar Pradesh	-8.2	-7	10.4	7.8	2.1	0.8
West Bengal	NA	NA	2.4	7.3	NA	NA
India	-3.8	-3.9	8.4	6.7	4.6	2.9

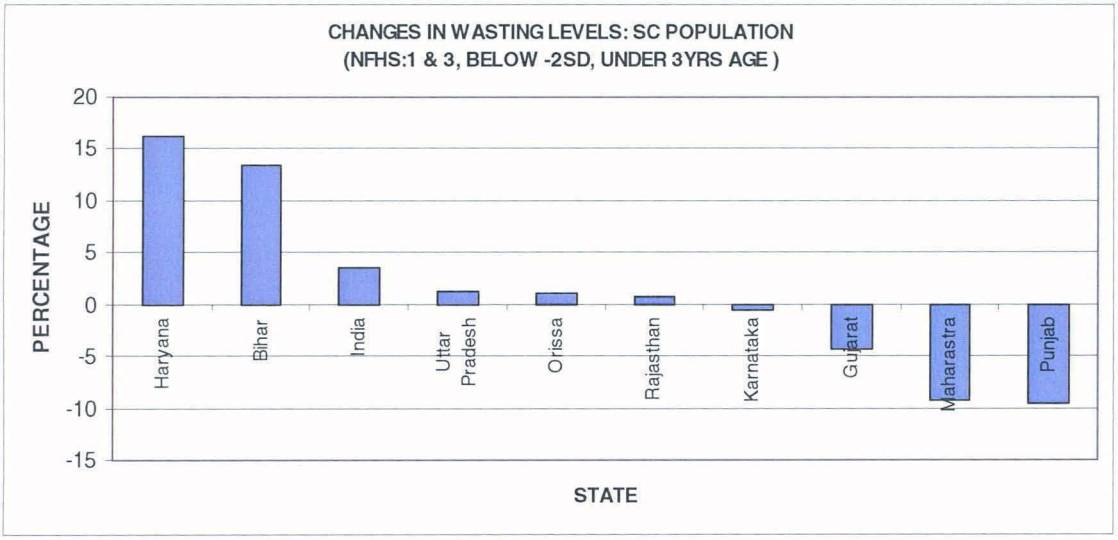
Source: Calculated from NFHS datasets

(ii) NFHS 2 & 3: During NFHS-2 & 3 survey almost all Indian states/regions have performed very poorly in terms of changes in the wasting rate. Karnataka is the only state where a reduction is observed. In rest of the country, there is an increase in the wasting rate have noticed. In Haryana the increase is scored as 23%. In Madhya Pradesh, Bihar, North-East, Rajasthan, Uttar Pradesh the rates of increase are tremendously very high. For the Non-Scheduled population, states like Bihar, Haryana, J & K, Madhya Pradesh, North-East (Rest) and Rajasthan have noticed very high increase in the wasting levels.

(b) Scheduled Caste Population:

(i) NFHS 1 & 3: For the SCs the situation of wasting has showed an improvement between NFHS-1 & 2 time period, although during the last survey (NFHS-3), the wasting levels have became severely worsen. From 1ST to 3rd round of the NFHS survey the wasting levels has increased by 3.6 %. Punjab, Maharashtra and Gujarat are the few states, where the levels of wasting among the SC population have decreased over the years. But in rest of the country it has severely accentuated.

Figure: 5.44



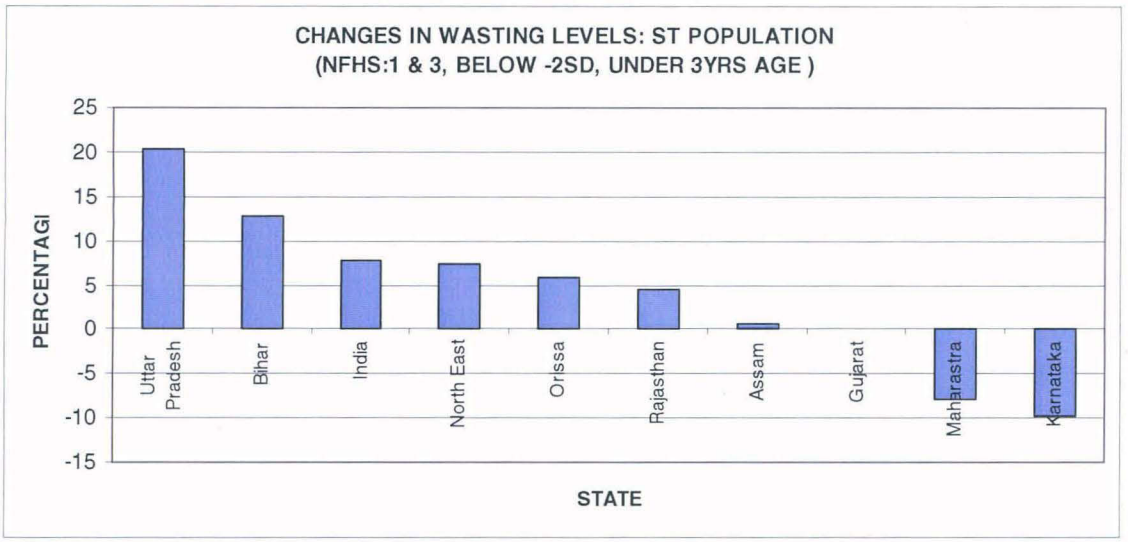
(ii) NFHS 1 & 2: During NFHS-1 & 2 survey, the overall reduction of wasting rate is 4.5%. The highest levels of reductions are noticed in Maharashtra, Punjab and Rajasthan. The only state which has experienced an increase this period is Karnataka.

(iii) NFHS-2 & 3: During the last NFHS survey, wasting level has increases by 8%. In most of the Indian states wasting rate are worsen up during this time period. The highest levels of increase have noticed in Bihar, Madhya Pradesh, Rajasthan, Assam, Uttar Pradesh and Maharashtra. Karnataka and North Eastern states have experiences improvements in wasting situation.

(c) Scheduled Tribe Population:

(i) NFHS-1 & 3: Wasting levels among the tribal children in India have severely worsened in the country, by close to 8%. Karnataka and Maharashtra are the two states where significant decline has been noticed. In the rest of the country the levels of wasting have increased. Highest increase is found in Uttar Pradesh (20%) and Bihar (13%).

Figure: 5.45



(ii) NFHS 1 & 2: For the Scheduled tribe population, a slight improvement is noticed at the national level during NFHS-1 & 2 time period. Rajasthan, Gujarat and Karnataka are the states, which have experienced moderate improvements during this period. Maharashtra and Assam are the states where no improvements are noticed. In Orissa, Andhra Pradesh and Bihar wasting rate among the STs as been intensified.

(iii) NFHS 2 & 3: During NFHS-2 & 3, wasting rate among the STs has increased by 10%. Maharashtra and Karnataka are the two states showing an improved in this period. In other parts of the country the situation has worsened. In Uttar Pradesh and Madhya Pradesh wasting levels have increased alarmingly by 25% and 18% respectively. The rates of increase are also found to be very high in West Bengal, Rajasthan, Andhra Pradesh and North-Eastern states.

(d) Other Backward Caste Population: For the OBC children, an over all increase is noticed. Andhra Pradesh and Maharashtra are the only two states where improvements are noticed. In Punjab and Kerala situation remains unchanged. In rest of the country the wasting rate has increased during this period. In Haryana it has gone up by 24 percentages.

Table: 5.14B State level changes in the child wasting rate among the different social group: (3 Yrs, Beloew -2SD)

State	NFHS-1 & 2		NFHS-2 & 3				NFHS-1 & 3	
	SC	ST	SC	ST	OBC	OTHERS	SC	ST
Andhra Pradesh	NA	NA	-0.1	10.4	-10.4	3.5	NA	NA
Assam	NA	NA	11.1	0.7		-1.5	NA	0.7
Bihar	-2.5	7.8	15.9	5	13.1	9.2	13.4	12.8
Delhi	NA	NA	4.6	0		8.7	NA	NA
Gujarat	-8.2	-6.3	3.9	6.3	0.2	5.3	-4.3	0
Haryana	-4.1	NA	NA	NA	24	13.1	16.3	NA
Himachal Pradesh	NA	NA	NA	NA	NA	6.2	NA	NA
J & K	NA	NA	NA	NA		11.9	NA	NA
Karnataka	8.7	-5	-9.3	-4.7	4.1	-2.3	-0.6	-9.7
Kerala	NA	NA	3		-0.9	10	NA	NA
Madhya Pradesh	NA	NA	14.8	18.1	13.9	17.3	NA	NA
Maharashtra	-18.6	-0.6	9.4	-7.2	-7.1	-7	-9.2	-7.8
North East		-2	-19.4	9.5		9.9	NA	7.5
Orissa	-1.3	3.8	2.4	2.1	-3.8	-2.2	1.1	5.9
Punjab	-12.2		2.6		-0.9	4	-9.6	
Rajasthan	-12	-7.5	12.7	12	5.9	14.6	0.7	4.5
Tamil Nadu	NA	NA	7		2.2		NA	NA
Uttar Pradesh	-8.5	-4.9	9.8	25.3	6.2	6.8	1.3	20.4
West Bengal	NA	NA	1	13.8	15.7	6	NA	NA
India	-4.5	-1.9	8.1	9.7	6.6	5.4	3.6	7.8

Source: Calculated from NFHS datasets

(e) Others: For the others an increase by 5% is noticed at the aggregate level wasting during NFHS-3 time period. Maharashtra was the only state where an important improvement was noticed. In Karnataka, Orissa and Assam a slight improvements were there. In rest of the other parts of the country situation has been worsened up. Highest increases were noticed in Madhya Pradesh, Rajasthan, Haryana, J & K, Kerala, North-East and Bihar.

5.8 Conclusion:

This chapter focuses on the issue of social inequalities of child undernourishment. The basic form of social inequality is rooted in caste based social hierarchies. The Indian society is highly stratified into the different social groups based on the caste structure. Within the broad social stratification, the SCs and STs are considered to be most vulnerable section of population in comparison to the other social groups (others and OBCs). There are ample evidences, which suggest that the disadvantaged social groups i.e. SCs and STs are suffering from mulitiple deprivation. The study focuses on both the aggregate and state level social inequalities of child undernourishment. It also focuses on the spatial patterns and temporal trends of child undernutrition across the different social groups. The major findings of the chapter can be discussed as follows-

- Throughout the discussions, we have shown that both at the aggregate and regional level stark social inequalities prevail in the levels of child undernutrition. The disadvantaged social groups especially the SCs and STs are carrying the immense burden of undernourishment in the country. At the aggregate level, all three forms of child undernourishment (stunting, wasting and underweight) are found to be much higher among SCs and STs as compared to the other social groups (others and OBC) . The levels of undernutrition among the non-scheduled and others are found to be minimal.

- Child undernutrition further got accentuated in the rural areas. Rural undernourishment levels are found to be higher across all social groups, in comparison to the urban place of residence. Within the rural areas, SCs and STs are found to be most vulnerable to the effect of undernourishment. The rural SC and ST children have highest levels of undernutrition then any other social groups in the country.

- The levels of social inequality are found higher in case of stunting and underweight levels as compared to the wasting. The aggregate level analysis on the trend change shows that, in urban areas the situations among the SCs and STs are relatively improving over the years; although in the rural areas their undernutrition levels remains persistently higher. It suggests that in rural

areas, they have remained perpetually underprivileged from the benefits different policies and programmes. Therefore, it also throws a light on the nature and functioning of different welfare programmes across the rural areas of the country and this issue can be important subject of further scrutiny. Several other studies have already suggested that, despite adequate safeguards in most of the rural and scheduled dominated areas of the country, the government sponsored programmes are poorly operational. For example, a recent study by Sengupta and Sarkar[7] suggests that caste dimension in different ethnic localities have an effect on the provisioning of public goods and services.

- The inter-state patterns have revealed that across all the states the scheduled population (SCs and STs) have relatively higher proportions undernourished children as compared to non-scheduled social groups. States where child undernourishment levels are found to be relatively higher among the SCs and STs are mainly- Uttar Pradesh, Bihar, Jharkhand, Madhya Pardesh, Orissa, Chhattisgarh, Gujarat and Maharashtra. States which have emerged with higher levels of social disparities, in terms of undernutritional gaps among the scheduled and non-scheduled populations, are namely- J&K, Orissa, Madhya Pradesh, Jharkhand, Chattisgarh, Uttaranchal, Maharasthra etc.

- The study also tries to understand the association between the proportions of scheduled population and their relative levels of undernutrition. It has observed that, across several states, where relatively larger proportions of scheduled population live, their undernutritional levels are significantly higher than the non-scheduled counter parts of the population. For example, in case of SC population in Punjab, Bihar, Orissa, Jharkhand and Maharashtra such situations prevail. For the ST population, similar situations have observed in Chhattisgarh, Jharkhand, Orissa, Madhya Pradesh, Gujarat, J&K, Maharashtra, Andhra Pradesh, West Bengal etc. These findings broadly suggest that in most of the scheduled preponderant states (even within few developed pockets like-Gujarat, Maharashtra, Punjab) the undernutritional levels for the

[7] Sengupta Jhumur and Sarkar Debnarayan (2007): "Discrimination in ethnically fragmented localities: a study of public good provision in West Bengal"; *Economic and Political Weekly.* vol.42 no.32 .pp. 3313-3321.

scheduled population are severely higher than the non-scheduled population group.

- The analysis on temporal changes at the state level have suggests that, over the years the level of underweight rate have been improved among the scheduled population, but stunting and wasting levels are found to be more or less persistent in nature. It implies that, wasting which is more severe form of undernourishment is not reducing among the scheduled population. Orissa, Bihar, Haryana, Gujarat, Maharashtra are some the states; where the undernutritional levels among the scheduled population have gone up over the years. The study has broadly suggested that in recent past there are no significant reductions take place in undernutritional levels among the scheduled population. Hence, in many pockets social inequalities of child undernutrition have not improved over the decade.

- The study also suggests that, during 1st to 2nd rounds of NFHS an overall improvements were noticed in the over all undernourishment situation in the country. But, during 3rd round of NFHS undernutrition level has severely worsened (except underweight levels).

The above findings have broadly revealed that, undernourishment is unrelenting among the children from scheduled background. It also suggests that in rural areas and most of scheduled dominated pockets the problems of child undernourishment are more persistent in nature. These preliminary findings thus provide an indication that, in those areas the different development programmes are not properly functioning. Now, in the upcoming chapter attempts have been made in order understand the reasons behind the social and regional inequalities of child undernourishment.

Chapter-6

Understanding the reasons behind Regional and Social Inequalities of child undernutrition in India

Discussions from the previous chapters have shown that widespread regional and social inequities prevail in the levels of child undernutrition in India. It has been largely observed that the scheduled population (SC & ST) and rural inhabitants are largely suffering from various degrees of undernourishment. On the other hand, in terms of regional inequalities, some of the poor states are carrying the immense burden of child undernutrition and in many of these states the problems are persistent in nature. In this chapter, focus has been laid on different factors, which are responsible for the social and regional inequalities in levels of child malnutrition in India. The present chapter has been divided into different sub sections, each of which addresses the aforesaid issue.

6.1 Socio-economic factors affecting child undernutrition - some correlates and determinants

Different several socio-economic factors affect child undernourishment in India at individual level (many of which have already been discussed in chapter-4). The socio-economic variables like residence, sex and age of the child, caste, child's birth weight and order, mother's BMI status, mother's education and wealth index have been considered. Table: 6.1 reveals that at the aggregate level, child undernutrition is low in urban areas compared to the rural place of residence. No such male-female gaps are visible. The scheduled population (SCs & STs) have relatively higher levels of all types of undernourishment compared to the non-scheduled (OBC & Others) population. Highest level of undernourished children is found among the ST population. Children with low birth weights have higher propensity of suffering from all the three forms of malnutrition. With the improvement of mother's nutritional status undernourishment seems to improve. Low birth order children have low chances of suffering from undernutrition; and with the rise in the birth order

undernutrition levels are also rises. Mothers with normal and higher nutritional levels (Obese) have relatively lower percentages of undernourished children.

Table: 6.1 Selected socio-economic variables affecting the child undernutrition : 2005-06 (5Yrs, Below-2SD)

Variables	Stunted	Underweight	Wasted
Type of place of residence			
Urban	39.9	32.8	16.8
Rural	50.7	45.7	20.8
Sex of the child			
Male	48.1	42	20.5
Female	48.0	43	19.1
Child Age			
Below or Equal To 2 Years	44.9	40.4	22.8
3 to 4 years	52.5	45.4	15.5
Castes or tribe			
SC	53.7	48	21.2
ST	53.7	55	27.8
OBC	48.9	43.2	20
Others	40.5	33.3	16.2
Birth weight of the children			
LBW	47.2	45.7	22.8
NON LBW	33.2	27.3	15.4
Mother's nutritional status			
Thin	53.5	51.9	25.1
Normal	46.2	38.6	17.3
Obese	31.5	20.2	9.2
Child's birth order			
2 or less	41.2	36.2	18.7
3 to 4	52	45.6	19.9
5 or above	59.3	53.7	22.6
Mother's educational level			
No education	57.1	51.9	22.7
Primary	48.6	42.5	19.8
Secondary and above	35.6	29.8	15.9
Wealth Indices			
Poor	57.3	53.3	23.7
Middle	48.8	41.5	18.9
Rich	34.2	27.5	14.8
India (Total)	48.0	42.5	19.8

Source: Calculated from NFHS-3 dataset

Mother's educational level has significant implications on undernutritional situation of the children. With the increase in their education, levels of undernutrition also tend

to recede. Wealth index measuring the household income shows that poorer the family greater is the percentage of children suffering from the malnutrition problem.

In order to know how the various socio-economic factors affect the level of child undernutrition in India at the individual level, binary logistic regression model has been applied. The formula for the multivariate logistic regression model is,

$$P = \frac{1}{1+ e^{-(b_0 + b_1 x_1 + b_2 x_2 + \ldots\ldots\ldots b_n x_n)}}$$

Where, b0 is 'intercept' and b_1, b_2, b_3, and so on, are the regression coefficients of x_1, x_2, x_3 respectively. Each of the regression coefficients describes the size of the contribution of the risk factor. A positive regression coefficient means that the explanatory variable increases the probability of the outcome, while a negative regression coefficient means that the variable decreases the probability of that outcome. A large regression coefficient means that the risk factor strongly influences the probability of that outcome, while a near-zero regression coefficient means that that risk factor has little influence on the probability of that outcome.

The dependent variables in the study are dichotomous and the independent variables are categorical in nature. The detailed recoding of the variables are followings:

A. Dependent variables:

Total three dependent variables have been used for three separate regression models. They are as follows:

(a)Stunted:

Yes =1, No= 0

(b) Underweight:

Yes =1, No= 0

(c) Wasted:

Yes =1, No= 0

B. Independent variables:

Total nine independent variables are selected for the regression models.

(a)Place of Residence:

Urban=0, Rural=1

(b)Sex of the child

Male=0, Female=1

(c) *Child Age*

2 years or below=0, 3 to 4 Years=1

(d) *Castes or tribes*

SC=0, ST=1, OBC=2, Other=3

(e) Birth Weight

Below 2500 gm=1, Above 2500 gm=1

(f) Mother's Nutritional status (BMI level)

Thin (<18.4) =0, Normal (18.5-24.9) =1, Obese (25.0>) =2

(g) Child's Birth Order:

2 or less=0, 3 to 4=1, 5 and above=2

(h) Mother's Educational level:

No Education=0, Primary=1, Secondary and above=2

(i) Wealth Indices:

Poor=0, Middle=1, Rich=2

Results: Logistic regressions for the stunting and underweight provide almost similar results with small variations in their expected beta (β) values. The results of logistic analysis both for the stunting and underweight suggest that place of residence, castes/ tribes, child's age, birth weight, mother's BMI and her education level, birth order

and income of the households have significant impacts on child undernutritional . All these variables were found to be statistically significant in the logistic model. The results show that rural children have 11% lesser chances of being stunted compared to their urban counterparts. Children of the age group 3 to 4 years have relatively higher chances of being stunting and underweight by 14%, 28% respectively, in comparison to the reference category i.e. below 2 years of age. Compared to the reference category (i.e. SCs) children from ST, OBC and Others have respectively14%, 20% and 23% lower chances of being stunted after having controlled for all other variables. In case of underweight, the OBC and Others respectively have 17 and 23 percentage lower chances of becoming undernourished in comparison to reference category i.e SC children. Children's weight at birth has been found to be highly significant. It appears that children with normal birth weight (above 2.5 kg) have respectively 40 and 52 percentages lower chances of not being stunted and underweight compared to the reference category i.e. low birth weight children. Children of mothers having normal and obese nutritional status have higher chances of not being stunted and underweight compared to the reference category mothers with lower BMI levels. Children with the birth order of '3 to 4' and '5 and above' categories are found to have respectively 31 and 62 percentage higher chances of being stunted compared to the reference category i.e. children with the birth order "2 or less". In case of underweight children, the chances are 13 and 57 percentage higher for these two categories to fall in the category of children having lesser weight than the reference category. In comparison to the uneducated mothers (as being the reference category), mothers with secondary education would have 22-25 percentages lesser chances to have stunted and underweight children. Compared to the poor income households, the middle and rich families have 27 and 49 percentages of lesser chances to have a stunted child. For the underweight, the chances are 19 and 48 percentages lesser in comparison to the reference category.

Table: 6.2 Results of logistic regression model

Independent Variables	Stunting Exp(β)	Underweight Exp(β)	Wasting Exp(β)
Place of residence			
Urban ®			
Rural	0.890**	0.933*	0.843***
Sex of the child			
Male ®			
Female	0.949	1.001	0.850***
Child Age			
2 years or below ®			
3 to 4 Years	1.129***	1.284***	0.755***
Castes or tribes			
SC ®			
ST	0.864*	1.081	1.210**
OBC	0.804***	0.829***	1.026
Others	0.773***	0.772***	0.888*
Birth Weight			
Below 2500 gm ®			
Above 2500 gm	0.601***	0.479***	0.668***
Mother's Nutritional statuses (BMI)			
Total Thin (<18.4) ®			
Normal (18.5-24.9)	0.754***	0.610***	0.660***
Obese (25.0>)	0.628***	0.388***	0.427***
Child's Birth Order			
2 or less ®			
3 To 4	1.310***	1.132***	1.058
5 and above	1.616***	1.567***	1.213**
Mother's Educational levels			
No Education ®			
Primary	0.939	0.975	0.972
Secondary and above	0.767***	0.785***	0.965
Wealth Indices			
Poor ®			
Middle	0.733***	0.807***	0.889*
Rich	0.507***	0.518***	0.670***
Constant	2.253	2.139	0.652

® Reference category, * Significant at 10 percent level, **Significant at 5 percent level, ***significant at 1 percent level of significance.
Dependent variable entered 1=undernourished (stunted, underweight and wasted), 0=Not undernourished

The logistic regression results for wasting shows that mother's education has little importance. It appears that children from rural areas have lesser chances of being wasted compared to the children from urban areas, controlling all other variables. Sex of the children has some implications on the wasting situation of the children. Female children have 15 percentages higher chances of being wasted compared to the

reference category i.e. male child. Children at the age group 3 to 4 years have 24% lesser chances to being wasted in comparison to the reference category i.e age group 2 years or less. As far as castes or tribes are concerned, ST children have 21% higher chances to become wasted in comparison to the reference category i.e. SC children. On the other hand, children from the other background have 17 percent less chances to be stunted in comparison to the SC children. It also appears that non-low birth weight children have 33 percentages of lower chances of being wasted compared to the reference category i.e. low birth weight children. Mothers of higher BMI levels reduce wasting levels significantly up to 57 percentages. Children having birth order of 5 and above has 21% higher chances of being wasted in comparison to the reference category i.e. birth order of 2 or less. As compared to the poor income households, the middle and rich families have significantly lesser chances to have wasted children (respectively 11 and 33 percentage lower).

6.2 Social inequities of child undernutrition: multiple deprivations

From the previous section it appeares that the child undernutrition in India are mainly governed by rural-urban place of residence, castes or tribe, maternal nutritional status, birth weight and birth order of the baby, mother's education level and income level(wealth index). The last section also precisely suggests that inequality in child undernutrition is mainly because of income inequality, educational inequality and other forms of socio-economic disparities. All these factors are interwoven with each other and they mostly tend to affect altogether. Now, the entire issue of social inequities can be addressed through the overarching social realities i.e. prevailing multidimensional inequities across the different social groups in India. In order to understand this we can take a glimpse of the tables (Table: 6.3,6.4 & 6.5).

Child undernutrition in the developing countries scenario starts at the very early age a baby. Undernourishment chances among the young children become very high, when the children are born with lower weights. In India 21 percent children are born with the birth weight below 2.5 kg. Among the SC and ST the rates are found to be more than 23 percentages. For the OBC and others it is below the national average. Mother's nutritional status is a determining factor for undernutrition among the young

children. Mothers with lower nutritional status (Thin, <18.5 BMI) have higher levels of undernourished children. In India around 40% of the mothers are found to be thin. Among the SCs & STs this levels are quite higher compared to OBC and others. In rural areas the situation is even worse for ST & SC population. Higher Birth order has serious implications on intra-household allocations of goods and services. Higher birth order also puts extra pressure on the family income. It has been found that relatively higher percentages of higher birth order children in India sre mainly from the weaker social groups. Due to less access to medical facilities and lacks of awareness vaccination rates are also very low among the scheduled children compared to the non-deprived category of population. Children from the Scheduled population have more percentages of anaemic children in India. Though ICDS have higher levels of population coverage in India but still nutrition supplementation is highly inaccessible for the backward communities. Only 24 and 35 percent of them have received food from the angwanari centres. Percentages of uneducated mothers are very higher among the backward communities in India, which also hinders access to many govt. health services provided to them. Most importantly the poverty levels among the scheduled population in India are much higher. It has also observed that scheduled population groups from rural place of residence are found to be far more vulnerable in terms all the above measures compared to that of the urban population.

Table: 6.3 Socio-economic background of different social groups in India: Total population (2005-06)

Selected Variables	SC	ST	OBC	Others	TOTAL
Percentage of LBW children	23.52	23.31	21.26	20.55	21.53
Mother's Nutritional Status					
Thin	43.58	46.30	38.22	33.78	39.00
Normal	52.05	52.21	55.14	54.77	54.09
Obese	4.38	1.50	6.63	11.45	6.91
Birth Order					
2 or less	44.97	38.76	47.16	58.47	48.88
3 to 4	32.63	34.90	32.72	27.19	31.44
5 or above	22.39	26.33	20.12	14.34	19.68
Children Vaccinated (<2 yrs)	29.8	23.5	30.0	40.9	32.3
Children Anaemic	72.47	77.14	70.20	64.05	69.74
Covered by ICDS	83.06	82.00	84.05	74.22	81.02
Received Nutrition	24.11	35.38	18.09	11.85	19.28
Mother's Educational level					
No Education	58.51	69.09	53.06	32.68	50.38
Primary	14.40	12.40	13.93	13.17	13.68
Secondary and above	27.08	18.52	33.02	54.15	35.94
Safe Water	81.66	62.87	78.74	84.18	79.25
Wealth Index					
Poor	59.09	77.16	46.88	28.98	47.72
Middle	18.52	12.79	22.61	19.11	19.83
Rich	22.40	10.06	30.51	51.91	32.45

Source: Calculated from NFHS-3 dataset

Table: 6.4 Socio-economic background of different social groups in India: Urban population (2005-06)

Selected Variables	SC	ST	OBC	Others	TOTAL
Percentage of LBW children	23.67	17.10	17.88	19.14	19.32
Mother's Nutritional Status					
Thin	33.47	33.04	29.35	24.06	28.30
Normal	56.45	60.65	54.31	54.72	55.10
Obese	10.08	6.30	16.34	21.22	16.60
Birth Order					
2 or less	53.99	54.82	58.64	67.57	61.01
3 to 4	32.31	31.73	27.51	23.01	26.87
5 or above	13.69	13.45	13.85	9.42	12.12
Children Vaccinated (<2 yrs)	38.8	35.7	40.9	47.8	43.0
Children Anaemic	67.07	68.18	65.28	58.48	63.24
Covered by ICDS	53.47	49.50	58.10	42.57	51.01
Received Nutrition	15.36	17.60	11.63	5.04	9.90
Mother's Educational level					
No Education	37.35	41.08	31.02	19.67	28.28
Primary	15.49	12.63	13.81	9.74	12.54
Secondary and above	47.16	46.29	55.18	70.58	59.18
Safe Water	87.91	83.94	87.28	89.69	88.20
Wealth Index					
Poor	18.96	27.91	16.19	5.68	13.15
Middle	20.67	17.47	19.05	11.91	16.59
Rich	60.37	54.62	64.76	82.41	70.26

Source: Calculated from NFHS-3 dataset

Table: 6.5 Socio-economic background of different social groups in India: Rural population (2005-06)

Selected Variables	SC	ST	OBC	Others	TOTAL
Percentage of LBW children	23.42	25.23	23.75	22.18	23.33
Mother's Nutritional Status					
Thin	46.48	47.58	40.94	39.03	42.53
Normal	50.78	51.39	55.40	54.79	53.75
Obese	2.74	1.03	3.66	6.18	3.72
Birth Order					
2 or less	42.31	37.14	43.54	53.24	44.70
3 to 4	32.72	35.22	34.36	29.59	33.01
5 or above	24.97	27.64	22.10	17.17	22.28
Children Vaccinated (<2 yrs)	27.2	22.2	26.5	36.8	28.5
Children Anaemic	74.04	77.98	71.72	66.90	71.85
Covered by ICDS	91.82	85.32	92.21	92.41	91.34
Received Nutrition	26.82	37.26	20.26	16.13	22.75
Mother's Educational level					
No Education	64.78	71.93	59.99	40.17	57.99
Primary	14.10	12.37	13.97	15.15	14.07
Secondary and above	21.13	15.70	26.04	44.68	27.94
Safe Water	79.81	60.72	76.05	81.01	76.17
Wealth Index					
Poor	70.96	82.13	56.54	42.37	59.61
Middle	17.88	12.33	23.73	23.26	20.95
Rich	11.16	5.54	19.73	34.37	19.44

Source: Calculated from NFHS-3 dataset

6.3 Understanding the factors affecting the regional inequalities of child undernutrition:

A. Correlation exercise: Understanding of regional inequities of child undernutrition is important both for policy formulation and evaluation points of view. The reasons for wide spread regional-social inequities in the level of child undernutrition in India are multiple. In order to capture different reasons affecting the social and regional inequities across the different states correlation matrices has been computed.

B. Selection and importance of some indicators:

Different types of socio-economic indicators have been considered for the correlation matrices. All these indicators can be broadly grouped into four categories:

a. Economic Indicators:

I. Per Capita Net State Domestic Product at the current prices for 2004-05 to 2006-07
II. Percentage of household, lived in the lowest two quintiles (poorest and poorer) of the Wealth Index in the N.F.H.S.-3 data set.
III. Per capita Expenditure in the Social Sector for 2000-05.
IV. Percentage of mothers engaged in manual work.

b. Indicators of health status and to its access:

I. Percentage low birth weight children (LBW).
II. Percentage of children who are anaemic.
III. Percentage of mother with low BMI (Thin i.e. BMI <18.5).
IV. Percentage of children (12-23 months) who received all the basic vaccination.
V. Percentage of the mothers who received full ante-natal care service.
VI. Number of population served by per Govt. hospital, including community health centre or CHC (2005-06).

c. ICDS Indicators:

I. ICDS coverage (percentage of PSU have an ICDS centre)
II. Percentage of children received nutrition supplementation from ICDS.
III. Per child expenditure in the ICDS in Supplementary Nutrition Programme (SNP) during 2005-06.
IV. Number of ICDS centre per 10000 child population.

At the state level per capita net state domestic product at the current prices (for the year 2004-5 to 2006-07) has been taken here in order to look whether state income has any relation with the undernutrition level. There are different studies which have tried to relate child malnutrition and undernutrition in general with per capita income.

Reasons behind Regional and Social Inequities of child undernutrition in India

Behrman and Rosenzweig[1] have reported that cross-country variation in GDP per capital is inversely related to the percentage of low birth weight children (LBW, <2.5 kg,) and is consistent with almost half of the variation in the percentage of births that are LBW across countries. Cross country analysis by Gabriele and Schettino[2] using homogeneous World Bank dataset shows that child malnutrition and mortality indicators are strong but very negatively correlated with the GDP per capita indicators. In Indian scenario, Deolalaikar[3] has observed that though the variation in undernutrition at the state level has an inverse relationship with per capita gross domestic product and this association is by no means perfect. Certain states, in spite of their high incomes have higher underweight children, suggesting that the socio-cultural factors affect the undernutrition level. Similarly Radhakrishna[4], has also argued that in India some of the middle income states have lower level of undernutrition compared to the high income group states. It can be explained by efficiency achieved in the field of basic health and child care services in those middle income states. Nandy et al.[5] has showed that the child malnutrition are highly correlated with mean standard of living, calculated from the NFHS-2 dataset. Nair[6] has found that for the state level variations of child undernutrition is highly correlated with percentage of population under the 'Below Poverty Line' (BPL- official data by GOI). For the present study, instead of BPL at the state level, percentage of population living within the lowest two quintiles of wealth index (poorest and poor) of the NFHS-3 dataset has been taken. Other than per capita income and indirect measures of economic wellbeing (wealth index), at the state level per capita social

---

[1] Behrman, J. and M. Rosenzweig (2004): "Returns to birthweight"; *The Review of Economics and Statistics*, vol. 86, no. 2, pp. 586–601.

[2] Gabriele A. and Schettino F. (2007): *Child malnutrition and mortality in developing countries: evidence from a cross-country analysis*; MPRA Paper No. 3132; Polytechnic University of Marche, University of Rome "la Sapienza" and UNCTAD-UN, Available at http://mpra.ub.uni-muenchen.de/3132/ .

[3] Deolalikar B Anil.(2005): *Attaining millennium development goals in India: rethinking infant mortality, child malnutrition, and hunger-poverty and increasing school enrolment and completion?* Oxford University Press, New Delhi.

[4] Radhakrishna R (2004): "Chronic poverty and malnutrition in 1990's"; Economic and Political Weekly; vol. 39, no. 28, pp 3121-3130.

[5] Nandy S. and M. Irving, Gordon D. et al. (2005): "Poverty, child under nutrition and morbidity: new evidence from India"; *Bulletin of the World Health Organization*, March, vol. 83, no. 3.

[6] Nair K R G (2007): "Malnourishment among children in india: a regional analysis"; *Economic and Political Weekly*, vol. 42, no. 37, pp 797-3803.

sector expenditure also has been considered here. According to Ramachandran[7], malnutrition in Indian scenario can also be explained with respect to workloads. Dasgupta[8] also holds similar argument in one of his paper. So, the percentages of mothers engaged in low paid manual work have been included in our study. According to NFHS-3 low paid manual work includes; agricultural employee, households and domestic workers, and those who engage in skilled and unskilled manual work. The low birth weight infants have the high chances of death and morbidity and at the same time throughout their early childhood and often through their entire life they remained malnourished, with low productivity[9] . But high level of LBW is the outcome of foetal malnutrition and pre-term birth, because in most of the developing countries pregnant mothers having low nutritional status are affected by low anaemia levels. Lower nutritional status among the women during the pregnancy having anaemia may lead to intrauterine or foetal growth retardation, pre-term birth and low birth weight[10]. So, nutritional status of mothers has been considered in our study. Children at the early age are more prone to different infectious diseases, which cause morbidity and lead to undernutrition among the children. Vaccination therefore is an important indicator for showing children's susceptibility to certain infections as well for access to vaccination or health care. Thus NFHS-3 percentage of children (12-23 months), who have received all the basic vaccinations, has been considered for the study. Child health is also largely the outcome of maternal health and nutritional status. For the safe motherhood and promotion health and nutritional status of the pregnant mothers the provision of antenatal care is considered as very much essential. In India promotion of antenatal care is adopted as the vital tool under Reproductive and Child Health Programme. The information of antenatal care for the study has

[7] Ramachandran P. (2007): "Poverty nutrition linkages"; *Indian Journal of Medical Research*, no.126; October, pp. 249-261.

[8] Dasgupta Partha (1997): "Nutritional status, the capacity for work and poverty traps"; *Journal of Econometrics*, vol-77, pp. 5-37.

[9] Gopalan C. (1994): *Low birth weights: significance and implications*; in H.P.S. Sachdev and Panna Chowdhary ed. *Nutrition in Children: Developing Country Concerns*; National update on Nutrition among Children, Department of Pediatrics. New Delhi.

[10] Allen L. H.(2001): "Biological mechanisms that might underlie iron's effects on fetal growth and preterm birth";, *The Journal of Nutrition*, vol. 131 no. 2, pp. 581S–589S.

been taken from RCH-II Report (2002-04). Shivkumar[11] argued that the state wise variation in the access to health is an important reason for the persistent regional disparities undernutritional problems in India. For understanding the role public health infrastructure, number of population served by per Govt. hospitals across the states also has been considered for the study. Information on it has gathered from Health Information of India. Almost every scholar has emphasized on ICDS to reduce undernutritional levels. Many indicators computed from different data sources for ICDS (Integrated Child Development Service) have been taken into consideration for the study. All these above mentioned indicators separately for the total population and scheduled population are computed for state level analysis (except per capita NSDP; expenditure on social sectors, ICDS; ICDS coverage, number of ICDS per 10000 child population of 0-5 years age).

C. Findings: The results of the correlation matrices for all three types of undernourishment's have shown the possible explanation for the regional inequities of child undernutrition in India, both for the overall and the scheduled populations. The regional variations of the stunting and underweight rates for the total and scheduled population are found to be highly correlated with the socio-economic factors like mother's lower nutritional level, incidence of anaemia among the children, full vaccination coverage for the children, antenatal care services, access to the public health care, mothers engagements into the low paid manual works, incidence of poverty, per capita NSDP and availability of the ICDS centres per 10,000 children. Mothers lower BMI levels and children's anaemia and mother's engagement in low paid manual works have shown high positive correlation with the stunting and underweight levels. Vaccination rate among the children, antenatal and access to public health care services, per capita NSDP, per capita social sector expenditure and availability of the ICDS centres- are found to be negatively correlated with the stunting and underweight level. Incidences of poverty have shown a very high correlation with the level of stunting and underweight rate. It appears that state wise per capita income has low correlation values as compared to the incidence of poverty.

[11] Shiva Kumar A. K. (2007): "Why are levels of child malnutrition not improving?"; *Economic and Political Weekly*, vol. 42, no. 15, pp. 1337-1345.

It is because of the fact that the inequality component has not been captured by per capita NSDP, secondly there is a direct linkage between undernourishment and poverty, which has been captured by the state-wise percentages of the poor population. Poverty therefore forms one of the basic underlying factors for explaining the regional inequalities. Strong correlations with the social sector expenditure suggest the importance of more public investments in the public sectors like education, health etc. which have indirect linkages with the undernourishment level. The numbers of ICDS centre per 10000 child population suggest the actual availability of the angwanwari services across the states. It is observed that numbers of ICDS centre are also correlated with the levels of state-wise variations in the stunting and underweight rates. But interestingly, it appears that all other ICDS indicators have no correlation with the rates of underweight and stunting in India and neither there is any correlation among four types of ICDS indicators (geographical coverage, actual population based coverage, functioning or nutrition supplementation and per capita expenditure in it). The issue of ICDS would be dealt elaborately in the next section of the chapter.

Wasting represents very prolonged and acute undernourishment among the children. The state wise variation of wasting in India is captured through poor maternal nutritional status, poverty and mother's lower working status. Therefore it can be said that wasting is originated mainly because of the poverty related factors. Additionally it has been observed that the current expenditure on social and health facilities are insufficient in terms of meeting this problem; furthermore whatever facilities are available are beyond the reach of certain group of population who are remain perpetually poor.

6.4 ICDS and its role in reduction of child undernourishment:

Integrated Child Development Services (ICDS), is a major project for addressing and alleviating the problem of maternal and child health in India. ICDS was launched three decades earlier and is still serving as the major programme in rural areas to deliver supplementary nutrition and basic vaccination to the younger children. Recently many studies have laid emphasis on the re-strengthening of the ICDS

programme to tackle child health and undernutrition problems. There are also studies which have found massive irregularities in the proper functioning of the ICDS centres[12]. This section tries to see the present situation of the ICDS programme and its problems in India.

In India about 80% of the settlements (PSUs) are reported to have been covered by the ICDS centre, suggesting a fairly large geographical coverage of the programme. Tamil Nadu and Karnataka are the only two Indian states which are close to achieving 100 percent coverage of the ICDS. Kerala, Jharkhand have also shows good geographical coverage of the ICDS. However, states such as Orissa, Himachal Pradesh, Rajasthan and Punjab have poor coverage of ICDS, whuch is below the national average. However, the geographical coverage of ICDS does not ensure its availability. Considering the availability of ICDS centre per 10,000 children in the country, it has been observed that the deficiency in the number of ICDS is such that numerically not a single ICDS is available for each 10000 of population.It actually indicates that the problems in achieving universalisation in terms of geographical coverage have some serious problems.

The expenditure on ICDS in terms of per capita children on an average is Rs/-154 (INR) for providing supplementary nutrition. Jharkhand, Chhattisgarh, Himachal Pradesh, Karnataka are the leading states in terms of expenditure incurred on such heads. In most of the other states the expenditures are below the national averages. It also important to know the actual utilization of the ICDS services in terms of receiving the supplementary nutrition in India. Only 18.5 percent of the overall child population and 25 percent of the scheduled population actually receive any type of supplementary nutritional food from the ICDS centre. This suggests that it is not utilised by most of the children from poor households. Tamil Nadu and Chhattisgarh are the leading states in India where a large percentage of children receive nutritional supplementation from *anganwari* centres. It has been found that in Bihar hardly any child is receiving any food from the ICDS centres (less than 1% of the children). In J & K, UP and Punjab also the utilization of the ICDS centres are very poor. Therefore the benefit of the ICDS is not accessible to the majority of the children from the poor households.

[12] *Focus on Children Under Six (*2004): was the survey conducted in the six states in India, for more information of focus survey www.righttofoodindia.

Table 6.6 Situations ICDS programme in India: 2005-06

States	ICDS coverage	Per capita exp SNDP	No of ICDS per 10000 children	Supplementary Nutrition Received from ICDS		Poverty rate (% below lowest two quintiles of Wealth index	
				Total Population	Scheduled Population	Total Population	Scheduled Population
J & K	84.4	163	1.2	5.8	9.2	19.8	42.6
Himachal Pradesh	63.5	215	1.1	35.0	33.3	9.6	17.1
Punjab	64.8	89	0.6	8.1	16.2	10.0	17.6
Uttarakhand	75.1	125	0.6	16.6	19.7	24.9	38.3
Haryana	74.9	141	0.6	9.2	11.2	20.5	30.5
Rajasthan	65.9	139	0.5	13.4	17.4	48.2	66.5
Uttar Pradesh	76.4	162	0.5	8.4	11.8	55.2	71.8
Bihar	88.1	142	0.4	.8	1.3	64.9	86.0
Assam	88.9	146	0.7	14.1	14.8	62.7	65.2
West Bengal	88.7	132	0.7	21.9	30.2	61.1	70.8
Jharkhand	91.7	326	0.6	32.8	47.1	73.4	85.9
Orissa	81.0	175	0.9	39.7	50.1	65.1	84.6
Chhattisgarh	78.4	231	0.9	53.1	66.3	71.1	83.2
Madhya Pradesh	79.6	98	0.6	28.6	31.0	66.8	83.0
Gujarat	84.4	127	0.6	18.6	26.7	27.6	44.9
Maharashtra	75.4	176	0.6	21.4	33.7	27.5	47.8
Andhra Pradesh	86.5	104	0.7	23.4	35.7	31.5	44.3
Karnataka	92.8	212	0.9	35.9	42.6	34.9	54.9
Kerala	89.8	150	0.9	18.7	31.5	5.2	25.6
Tamil Nadu	97.1	93	0.7	50.5	68.4	26.6	39.1
India	81.3	154	0.6	19.2	27.8	47.9	64.8

Source: Calculated from NFHS-3 dataset

6.5 Conclusion:

The chapter tries to understand the factors responsible for persistent social and regional inequalities of child undernourishment. In the technical parts few statistical techniques have been used for meeting that purpose. They major findings of the chapter are follows.

- Child undernutrition is determined by several socio-economic factors. High incidences of poverty and income inequality are the basic factors causing undernourishment to the children. Mothers nutritional status (low BMI), LBW, higher levels of anaemia among infants etc, are also constitutes important background for undernourishment. These background factors are affected by several underlying reasons such as less education, lesser access to health care facilities etc (6.1).

- The result of logistic regressions have suggests that undernourishment levels are significantly higher among scheduled groups (SCs and STs) as compared to the non-scheduled component of the population. It has observed that mother's education level and her nutritional status, child's age, birth weight and birth order significantly affect the levels of child undernourishment. It appears that with the progress of education, better nutritional status among the mothers, adaptation of small family norms etc. can significantly reduce the levels of undernourishment. At the apex of all these factors poverty level is found to be the prime determinants of child undernutrition, though the above mentioned factors are also responsible for it (6.1).

- Considering the above mentioned findings as the important guidelines, the study has further focused on understanding the origin of social inequalities of child undernourishment. It has been largely observed from this part (6.2) of the discussion that, in terms of some selected socio-economic indicators (such percentages of low birth weight children, mothers nutritional status, birth order, vaccination coverage, mothers educational level and wealth indices) the situation of the SCs and STs were found to be worse than other social groups of the country. It is observed that, with respect to the other social group, the percentages of LBW children, mothers with lower nutritional status (low

BMI), proportions of higher birth order children and percentages of anaemic children, are much higher among SCs and STs. Further, the other indicators like proportions of educated mothers, children with full vaccinations etc. are very low among the Scheduled population as compared to the others and total non-scheduled population group. Such findings broadly imply that overall deprivations among the disadvantaged social groups are causing higher levels of undernutrition for them. Besides, it also throws a light on the question of lacks of availability and accessibility of goods and services in the most of rural and scheduled dominated areas of the country which causes deprivation among the socially disadvantaged communities like SCs and STs.

- Thus, the study has been directed towards understanding those critical factors which are responsible for unequal levels of undernourishment (6.3). The state level variations in the levels of undernourishment, for the both total and scheduled population have been discussed in the lights of the results of correlation matrices. In order to carry out the correlation matrices several indicators were selected. The results suggest that state level income is very much correlated with the levels of stunting, underweight and wasting rate. However, the incidence poverty has relatively sound correlation values as compared to the state level per capita NSDP. Analysis also suggests the importance social sectors expenditure across the different states in the country. As far as the access to health is concerned, it has been observed that availability of govt. run hospitals, antenatal care services and full vaccination coverage among the young children are associated to the state wise variation in the levels undernourishment. Thus the study suggests that availability and access to different health facilities may bring down levels of child undernourishment. Different indicators of ICDS were also selected for the correlation exercise, however they does not hold good relationship with the levels of undernourishment.

- In the last section of the chapter (6.4) special focus has been laid on ICDS services in order to evaluate its role and functionability across the different states. Despite paucity of necessary database, this section has broadly suggested the ineffectiveness of ICDS, especially the SNPs (Supplementary

Nutrition Programmes) for the young children. It has observed that in most of the states SNP were hardly operational. For example, in Bihar less than 1% of children were reported to get SNP services. In many other states the performance of the ICDS were found to be very poor. Thus the study suggests the importance of immediate effectiveness of this programme. This section also has shown the huge mismatches between availability and coverage ICDS services and relative benefits from it. The geographical coverage of the ICDS across the different states in the country is found to be fairly large. Likewise, in many states per capita expenditure in SNPs are also found very higher. However, in terms of utilization, ICDS services are found to be very poor in most of the states and relatively lower proportions of the children are getting benefits from it. This observation thus puts an essential question that- why ICDS services are still beyond the reach of a majority of undernourished young children in India?

From the above discussions, many important issues are also coming up. We need to address these in a more critical manner. The study indicates the lack of availabilities and accessibilities of public health care services in many parts of the country. Likewise, study largely identifies the problems of functionability in case of ICDS. Therefore critical question would be to understand why despite every possible effort these services are still inaccessible across different pockets of the country. Therefore, as far as policy point of view is concerned, the essential tasks would be to ensure the availabilities of those services for disadvantaged section of the population especially among scheduled and rural inhabitants.

Chapter-7

A summary of conclusions

India, the second largest populated country of the world is also the homeland for millions of malnourished men, women and children. According to NFHS-3, 48%, 42% and 20% of the children below 5 years of age are stunted, underweight and wasted respectively. The estimated numbers of children suffering from moderate levels of stunting, underweight and wasting were 5.94, 6.70 and 2.79 crores. According to UNICEF[1], it contributes the highest proportion of undernourished and LBW children among the developing worlds. In terms of child undernutrition, its situation is similar to some of the least developing countries of Sub-Saharan Africa. Even in the recent past, though the country is experiencing a higher level of economic growth, but the substantial improvement in child undernutrition situation has been minimal. The levels of child undernutrition situations in India are not only high, but at the same time widespread social and regional inequalities are there. In terms of social inequalities, prevalent gaps are found among the various social groups in the country. The disadvantaged section of the population, especially the SCs and STs are bearing the brunt of undernourishment. Likewise, in of the some states undernutrition problems are found to be severe.

This dissertation comprises of seven chapters and is mainly based on the analysis of different rounds of NFHS. In the preceding chapters the study explores the nature of social and regional inequalities of child undernutrition. It also tries to explain the factors responsible for these inequalities. The study also explores the rural-urban and slum and non-slum inequalities undernourishment. Special focus also has been laid on ICDS services, which is the main flag ship programme for lowering undernutrition levels among young children. The background, methodology, framework and approach of study have emerged through a wide literature review. There are 4 main analytical chapters (chapter-3 to 6), each focuses on a special theme. In the upcoming sections, some of major findings of these chapters will be discussed and its conclusions.

[1] UNICEF (2009): *Tracking Progress on Child and Maternal Nutrition*; New York, USA, pp. 12-23.

A summary of conclusions

The third chapter of the study provides an overview of child undernutritional situation in India. The purpose of this chapter is to understand the magnitude and nature of undernourishment at the aggregate level. It broadly identifies the major socio-economic (castes) and locational (rural-urban) contours through which social differentiation in undernutrition took place. The main observations of this chapter are follows-

- At the aggregate level, huge disparities have observed in the undernourishment situations among different sets of population. The rural and scheduled population have the highest percentages of undernourished children, as compared to the urban and non-scheduled components of the population. Among STs, the levels of stunted, underweight and wasted children were respectively 54, 55 and 28 percentages. In comparison the above figure, 44%, 335 and 16% children from others social groups are found to be undernourished in respective categories. As par as gender point of, no such gaps have been observed between the male and female children in their levels of undernourishment.

- The undernutrition problems in the country are found to be more or less persistent. The moderate underweight rate has improved over the decades (12%), though stunting rate has not changed much (merely 2 % reduction) and moderate levels wasting has gone up by few percentage points (3.5 %).

- Furthermore, during the 1st and 3rd round of the NFHS, the reductions of severe underweight and stunting rates were respectively 3 and 5 percentages. Contrary to these changes, over the year's severe types of the wasting levels has increased from 2.8 to 7.9 percentage points.

- As far as socio-economic and demographic characteristics are concerned, wide disparities in undernutritional levels are found across mother's educational status, mother's age and BMI levels, birth order and birth weight of children, living standards and income of the family.

Thus this chapter broadly indicates the existing social-economic and locational divides through which some sections of the population (SCs, STs and rural inhabitants) are perpetually bearing the brunt of undernourishment. It also observed

that over the years, undernourishment problems are not reducing at the expected levels among these disadvantaged groups. The above findings are also needed to address at the state level. Therefore in the subsequent chapters attempts have been made to examine the spatial/inter-state variations in the levels of child under nutrition.

The 4th chapter focuses on the nature and patterns of regional inequalities of India's child undernutrition. State level investigations have been largely carried out for that purpose. The chapter also focuses on urban undernutrition situation, across the 7 metroploitan cities in the country and especially in terms of disparities between the slum and non-slum place of residence. The major findings of this section of study are followings-

- In terms of share, some of the most populated states having highest proportions of undernourished children in India. Like-Uttar Pradesh, Bihar, Madhya Pradesh, Maharashtra and Rajasthan. Uttar Pradesh is the home of 20% stunted, 24% underweight and 15% wasted children.

- Inter-state pattern reveals wide spatial variations in the distribution of child undernourishment. Geographically the higher levels of undernourishment are found in few northern and middle Indian states- like UP, Madhya Pradesh, Jharkhand, Chattisgarh, Bihar etc. Relatively lower levels of undernutrition are found in the south and north-eastern states like- Kerala, Tamil Nadu, Assam etc.

- Rural undernourishments are found to be higher across every state in the country in comparison with the urban areas. States with relatively higher levels of rural undernourishment are Uttar Pradesh, Bihar, Jharkhand, Chhattisgarh, Madhya Pradesh etc. Even in few developed states, like Gujarat (in case of underweight and stunting) rural undernourishment levels are found to be higher.

- Urban undernourishment is found to be relatively lower as compared to rural areas. Uttar Pradesh, Bihar, Jharkhand, Madhya Pradesh are the states where urban undernourishment are relatively higher than the rest of the country.

Lower levels of undernourishment have observed in Kerala, J&K, Himachal Pradesh and Uttaranchal.

- Across the different states widespread rural and urban inequalities in the levels of undernutrition has observed. The highest levels of rural urban gaps are found in the following states, like- Uttaranchal, West Bengal, Jharkhand, Chhattisgarh, Delhi, Assam, Orissa and Rajasthan. Even in few developed states like Maharashtra and Gujarat the gaps are found to be higher.

- Analyses have shown wide disparities in city-wise levels of child undernourishment. Though a definite pattern has not been found but across them wide gaps have been observed between the slum and non-slum levels of undernourishment.

- State wise trend suggests that over the years underweight levels have been improving across most of the states in India (except Haryana). However, levels of stunting and wasting have gone up in different parts of the country. For example-in Maharashtra, Gujarat, Karnataka stunting levels have increased.

- It has been observed that the reductions of undernourishment in the rural areas are much sluggish in comparison to urban areas. Trends have shown that in many states significant changes have not been taking place in terms of reduction of rural undernourishment. States like Haryana, Orissa, Madhya Pradesh, Gujarat etc rural undernutrition have increased. Therefore critical understanding is further required on this issue. In case of urban undernourishment (stunting) have been increased in few developed pockets like- Maharashtra, Punjab. The effect migration may be a possible explanation to this problem.

The entire 5th chapter focuses on the issue of social inequalities of child undernourishment. The basic form of social inequality is rooted in caste based social hierarchies, which causes multiple deprivations among the scheduled population (SCs and STs). The major findings of the chapter are-

- Both at the aggregate and regional level the disadvantaged social groups especially the SCs and STs are having the higher levels of undernourishment in the country. The levels of undernutrition among the non-scheduled and others are found to be minimal.

- In rural areas, the levels of undernourishment are found to be higher among the all social groups, in comparison to the urban place of residence. However, in both cases SCs and STs are found to be the most vulnerable social groups. The rural SC and ST children have highest levels of undernutrition then any other social groups in the country.

- The aggregate level changes have shown that, in urban areas the situations among the SCs and STs are relatively improving over the years. However, in the rural areas their undernutrition levels remains persistently high. It suggests that in rural areas they are remained perpetually deprived from the benefits different policies and programmes.

- The inter-state patterns have revealed that across all the states the scheduled population (SCs and STs) have relatively higher proportions undernourished children as compared to non-scheduled social groups. States where child undernourishment levels are found to be relatively higher for the SCs and STs are mainly- Uttar Pradesh, Bihar, Jharkhand, Madhya Pardesh, Orissa, Chhattisgarh, Gujarat and Maharashtra. In terms of undernutritional gaps among the scheduled and non-scheduled populations, states which have emerged with higher levels of social disparities are namely- J&K, Orissa, Madhya Pradesh, Jharkhand, Chattisgarh, Uttaranchal, Maharasthra etc.

- Study also tries to understand to association between the proportions of scheduled population and their relative levels of undernutrition. It has observed that, across several states, where relatively larger proportions of scheduled population live, their undernutritional levels are significantly higher than the non-scheduled counter parts of the population. For example- in case of SCs, in Punjab, Bihar, Orissa, Jharkhand and Maharashtra such situations prevail. The findings thus broadly suggest that, in most of the scheduled predominant states (even in some of the developed pockets like-Gujarat,

Maharashtra, Punjab) the undernutritional gaps among the better off and disadvantaged sections are relatively higher.

- Analysis of temporal changes of undernourishment suggests that, over the years the level of underweight rate have been improving among the scheduled population, but stunting and wasting levels are found more or less persistent in nature. Such observation was found across the state level. It implies that, wasting which is more severe form of undernourishment is not reducing among the scheduled population. Orissa, Bihar, Haryana, Gujarat, Maharashtra are some the states, where the undernutritional levels among the scheduled population have gone up over the years.

- Study also suggests that, during 1st and 2nd rounds of NFHS overall improvements were noticed in the undernourishment situation in the country. But, during 3rd round of NFHS undernutrition level has severely worsened (except underweight levels).

The preliminary findings of the chapter suggest that in rural areas and most of the scheduled dominated areas the problems of child undernourishment are more severe in nature. This provides an indication that, in those pockets the benefits from the different development programmes are minimal. Therefore it suggests that in those areas the different policies and programmes may not be functioning properly.

Chapter Six tries to explore the reasons for persistent social and regional inequalities of child undernourishment. In order to understand that few statistical techniques have been used. They major findings of the chapter are follows.

- Child undernutrition is determined by several socio-economic factors like high incidences of poverty and income inequality, which forms the basic background for it. Mothers nutritional status (low BMI), LBW, higher levels of anaemia among infants etc, are also constitutes important background for undernourishment. The analysis from logistic regressions suggests that undernourishment level is significantly higher among scheduled groups (SCs and STs) as compared to the non-scheduled component of the population. It

has observed that mothers education level and her nutritional status, child's age, birth weight and birth order, all have significant effect the levels of child undernourishment. It appears that with progress of education, better nutritional status among the mothers, adaptation of small family norms etc can significantly reduce the levels of undernourishment.

- At the root of social inequality, high levels of poverty and overall deprivations among the Scheduled population in India (SC and ST) are inevitably responsible. These form the basic and underlying background for the higher levels of child undernutrtion among the scheduled population. It is observed that, with respect to the other social group, the percentages of LBW children, mothers with lower nutritional status (low BMI), proportions of higher birth order children and percentages of anaemic children, are much higher among SCs and STs. Further, other indicators like proportions of educated mothers, children with full vaccinations etc. are very lower among the Scheduled population as compared to the others and total non-scheduled population group. Such findings also throws a light on the question of lacks of availability and accessibility of goods and services in the most of rural and scheduled dominated areas of the country and how different government programmes are functioning across the different parts of the country.

- The correlation co-efficient has been used in order to understand the factors responsible for the state level variations of undernourishment. The results suggest that state level income is very much correlated with the levels of stunting, underweight and wasting rate. However, the correlation results are stronger in case of incidence of poverty as compared to the state level per capita NSDP. Analysis also suggests the importance social sectors expenditure across the different states in the country. As far as the access to health is concerned, it has observed that availability of govt. run hospitals, antenatal care services and full vaccination coverage among the young children are associated to the state wise variation in the levels undernourishment. Thus, the study suggests that availability and access to different health facilities may bring down levels of child undernourishment. Different indicators of ICDS

were also selected for the correlation exercise, however they does not hold good relationship with the levels of undernourishment.

- In the last section of this chapter special focus has been laid on ICDS services, which is the major flagship programme for the overall improvements of health and nutritional status of the mothers and children in India. This section has broadly suggested the ineffectiveness of ICDS, especially the SNP (Supplementary Nutrition Programmes) for the young children[2]. It has observed that in most of the states SNP was hardly operational. For example in Bihar less than 1% of children were reported to get SNP services. In many other states the performance of the ICDS were found to be very poor. Thus the study recommends immediate effectiveness of this programme.

  This section also has shown the huge mismatches between availability and coverage, and costs and the benefits of the ICDS services. As per Supreme courts order in 2001[3]every settlement in India should have an *anganwari* centre and every child, mother and adolescent girl should be covered by it, but such universalisation yet not possible in actual scenario. Analysis shows that, ICDS has fairly large geographical coverage in the country (around 80% of the PSU having an ICDS centre). Tamil Nadu and Karnataka are the only two states which are close to achieve 100% universalisation of the ICDS. Kerala, Jharkhand also have good ICDS coverage. On the other hand in Punjab, Himachal Pradesh, Haryana, Uttar Pradesh and Rajasthan are states where geographical coverage are below the national level. However, it has found that the geographical coverage of ICDS does not ensure its availability. Considering the availability, it has observed that not a single ICDS (less than 1%) centre is there for per 10,000 children in the country. It suggests that actual coverage of the ICDS both in terms of geographical and population base are yet far way from the universal achievement target. In terms of utilization of ICDS, across the different states large differences are also found. Analysis shows that in many parts of the country, still overwhelming percentages of the

[2] FOCUSsurvey (2004) also suggested that in most of the backward states ICDS and especially the supplementary nutrition programme are functioning very poorly. for more information of focus survey www.righttofoodindia.

[3] In a Public Interest Litigation (WP No. 196/2001) filed by PUCL the Supreme Court has given the following directions by order dated 28-11-2001 with regard to the ICDS Scheme: ordered that every settlement must have a disbursement centre and that every child aged 0-6, every pregnant and nursing mother and every adolescent girl be covered under the ICDS.

children (both overall and the scheduled background) are not receiving nutritional food from the ICDS centre. In Bihar, UP, Haryana, Punjab and J&K the access to supplementary nutritional food among the children is very much low. In Bihar where poverty rate is one of the highest in the country (among the total and scheduled population respectively 65% and 86% are live below lowest two quintiles of wealth indices) only 0.6% of the total and 1.3 % of the total scheduled children received supplementary nutritional food from the ICDS centre. Additionally in many states per capita expenditure in SNPs are also found very higher. However, in terms of utilization of ICDS services which is poor in most of the states very lower proportions of the children are getting benefits from it. This observation puts an essential question that, why ICDS services are still beyond the reach of a majority of undernourished young children in the country?

India is a major signatory country of the United Nations Million Development Goals (MDG). Therefore, reduction of child undernourishment by one-half is a major challenge for the govt. and policy makers. The past trend shows that country is far behind the fulfilment of the target. Reduction of social and regional inequalities of child undernutrition in India can be seen as the parts of larger development goals. The study have largely suggests the implementation of poverty reduction programmes and restrengthening of basic heath care services across the different parts of the country, for the improvement of undernutrition situation. Study has shown the inadequacy of present state of ICDS in the country. Therefore, restrengthening ICDS would be a crucial attempt in order to reduce the adversity of undernutritonal problems. There is also urgent efficacy has been observed, in terms of access to public health facilities across the different states.

These preliminary conclusions of the study must obviously be refined with much more rigorous empirical analysis. Therefore this study also points to some of the areas for future research. The most important future task involves exploring as to how in different ethnic or scheduled dominated areas provision for public goods and services are being implemented in the country. Because the main reasons for persistent regional and social inequalities in the country is the operational failure of different policies and programmes in the rural and remote areas. The question of

governance and implementation of the government programmes holds vital keys towards understanding and rectifying the problem of child malnutrition in India, which will be addressed in the doctoral research.

APPENDIX

Appendix-6.1: Description of indicators for the raw data for correlation matrix

ABBREVIATION	INDEX
TOT	Total population
SCH	Total scheduled population
LBW	Percentage low birth weight children
ICDS COVER	ICDS coverage (percentage of PSU have an ICDS centre)
NUTRITION ICDS	Percentage of children received nutrition supplementation from ICDS centre
MOTHER THIN	Percentage of mother with low BMI (Thin i.e. BMI <18.5).
CHILDREN ANAEMIA	Percentage of children who are anaemic.
VACCINATION	Percentage of children (12-23 months) who received all the basic vaccination
MANUAL WORK MOTHER	Percentage of mothers engaged in manual work
WEALTH INDEX	Percentage of household, lived in the lowest two quintiles (poorest and poorer) of the Wealth Index in the N.F.H.S.-3 data set
NSDP	Per Capita Net State Domestic Product at the current prices for 2004-05 to 2006-07.
ICDS EXP.	Per capita child expenditure in the ICDS in Supplementary Nutrition Programme (2005-06).
SOCIAL EXP	Per capita Expenditure in the Social Sector for 2000-05.
ICDS NO	Number of ICDS centre per 10000 child population.
ANTE NATAL CARE	Percentage of the mothers who received full ante-natal care service.
POP PER GOVT HOSPITAL	Number of population served by per Govt. hospital, including community health centre or CHC (2005-06).

Appendix-6.2: **CORRELATION MATRIX: STUNTING**

INDICATORS		STUNTING		L.B.W.		ICDS COVER	NUTRITION ICDS		MOTHER THIN		CHILDREN ANAEMIA		VACCINATION		MANUAL WORK MOTHER		WEALTH INDEX		NSDP	ICDS EXP.	SOCIAL EXP	ICDS NO.	ANTE NATAL CARE	POP/ HOSPITAL
		TOT	SCH	TOT	SCH		TOT	SCH	TOT	SCH	TOT	SCH	TOT	SCH	TOT	SCH	TOT	SCH						
STUNTING	TOT	1																						
	SCH	.901**	1																					
L.B.W.	TOT	.304	.367	1																				
	SCH	-.062	.155	.553**	1																			
ICDS COVERAGE		-.083	-.094	-.640**	-.251	1																		
NUTRITION ICDS	TOT	-.095	-.234	-.583**	-.617**	.242	1																	
	SCH	-.156	-.275	-.649**	-.650**	.328	.969**	1																
MOTHER THIN	TOT	.801**	.658**	.077	-.086	.107	.205	.135	1															
	SCH	.637**	.652**	.120	.159	-.028	.117	.060	.816**	1														
CHILDREN ANAEMIA	TOT	.814**	.694**	.356	.028	.018	-.091	-.124	.628**	.379	1													
	SCH	.742**	.612**	.314	-.068	.142	-.067	-.096	.581**	.310	.928**	1												
VACCINA-TION	TOT	-.768**	-.642**	-.176	-.003	.017	.279	.300	-.600**	-.353	-.755**	-.678**	1											
	SCH	-.755**	-.665**	-.212	-.008	.085	.245	.273	-.562**	-.374	-.792**	-.719**	.969**	1										
MANUAL WORK MOTHER	TOT	.574**	.446*	-.146	-.268	-.015	.411	.374	.643**	.506*	.507*	.435*	-.457*	-.498*	1									
	SCH	.634**	.554**	-.173	-.145	.131	.363	.347	.699**	.563**	.550**	.466*	-.573**	-.587**	.906**	1								
WEALTH INDEX	TOT	.714**	.538*	-.099	-.222	.268	.206	.170	.807**	.548*	.616**	.637**	-.719**	-.699**	.594**	.739**	1							
	SCH	.705**	.595**	-.133	-.167	.303	.171	.151	.779**	.603**	.596**	.598**	-.720**	-.711**	.617**	.779**	.972**	1						
NSDP		-.522*	-.477*	.136	.003	-.210	.055	.104	-.479*	-.396	-.430	-.412	.712**	.740**	-.463*	-.608**	-.794**	-.828**	1					
ICDS EXP.		.246	.177	-.278	-.459*	.099	.354	.326	.364	.223	.004	.012	-.200	-.166	.395	.352	.324	.328	-.211	1				
SOCIAL EXP.		-.508*	-.381	-.121	.042	-.304	.097	.062	-.350	-.133	-.647**	-.704**	.605**	.594**	-.224	-.433*	-.701**	-.690**	.583**	.157	1			
ICDS NO.		-.517*	-.510*	-.507*	-.176	.056	.378	.312	-.261	-.104	-.601**	-.578**	.516*	.499*	-.122	-.295	-.322	-.303	.173	.286	.575**	1		
ANTE NATAL CARE		-.711**	-.562*	-.508*	-.011	.242	.027	.106	-.616**	-.408	-.718*	-.784**	.567**	.613**	-.441*	-.446*	-.653	-.573*	.399	-.041	.514**	.606	1	
POP/HOSPITAL		.513*	601**	.203	.140	.234	-.370	-.350	2.45	1.36	.453	.436	-.550*	-.554*	.106	.370	.475*	.490*	-631**	.219	-515*	-.530*	.358	1

** CORRELATION SIGNIFICANT AT 1 % LEVEL, * CORRELATION SIGNIFICANT AT 5 % LEVEL

Appendix-6.3: **CORRELATION MATRIX: UNDERWEIGHT**

INDICATORS		UNDERWEIGHT		L.B.W.		ICDS COVER	NUTRITION ICDS		MOTHER THIN		CHILDREN ANAEMIA		VACCINATION		MANUAL WORK MOTHER		WEALTH INDEX		NSDP	ICDS EXP.	SOCIAL EXP	ICDS NO.	ANTE NATAL CARE	POP/ HOSPITAL
		TOT	SCH	TOT	SCH		TOT	SCH	TOT	SCH	TOT	SCH	TOT	SCH	TOT	SCH	TOT	SCH						
UNDERWEIGHT	TOT	1																						
	SCH	.901**	1																					
L.B.W.	TOT	.194	.209	1																				
	SCH	-.005	.167	.553**	1																			
ICDS COVERAGE		.069	.101	-.640**	-.251	1																		
NUTRITION ICDS	TOT	.123	.016	-.583**	-.617**	.242	1																	
	SCH	.045	-.009	-.649**	-.650**	.328	.969**	1																
MOTHER THIN	TOT	.785**	.588**	.077	-.086	.107	.205	.135	1															
	SCH	.609**	.596**	.120	.159	-.028	.117	.060	.816**	1														
CHILDREN ANAEMIA	TOT	.677**	.530*	.356	.028	.018	-.091	-.124	.628**	.379	1													
	SCH	.655**	.503*	.314	-.068	.142	-.067	-.096	.581**	.310	.928**	1												
VACCINATION	TOT	-.607**	-.421	-.176	-.003	.017	.279	.300	-.600**	-.353	-.755**	-.678**	1											
	SCH	-.612**	-.462*	-.212	-.008	.085	.245	.273	-.562**	-.374	-.792**	-.719**	.969**	1										
MANUAL WORK MOTHER	TOT	.678**	.580**	-.146	-.268	-.015	.411	.374	.643**	.506*	.507*	.435*	-.457*	-.498*	1									
	SCH	.795**	.713**	-.173	-.145	.131	.363	.347	.699**	.563**	.550**	.466*	-.573**	-.587**	.906**	1								
WEALTH INDEX	TOT	.766**	.584**	-.099	-.222	.268	.206	.170	.807**	.548*	.616**	.637**	-.719**	-.699**	.594**	.739**	1							
	SCH	.767**	.658**	-.133	-.167	.303	.171	.151	.779**	.603**	.596**	.598**	-.720**	-.711**	.617**	.779**	.972**	1						
NSDP		-.568**	-.498*	.136	.003	-.210	.055	.104	-.479*	-.396	-.430	-.412	.712**	.740**	-.463*	-.608**	-.794**	-.828**	1					
ICDS EXP.		.345	.241	-.278	-.459*	.099	.354	.326	.364	.223	.004	.012	-.200	-.166	.395	.352	.324	.328	-.211	1				
SOCIAL EXP.		-.497*	-.436*	-.121	.042	-.304	.097	.062	-.350	-.133	-.647**	-.704**	.605**	.594**	-.224	-.433*	-.701**	-.690**	.583**	.157	1			
ICDS NUMBER		-.459*	-.425	-.507*	-.176	.056	.378	.312	-.261	-.104	-.601**	-.578**	.516*	.499*	-.122	-.295	-.322	-.303	.173	.286	.575**	1		
ANTE NATAL CARE		-.671**	-.479*	-.508*	-.011	.242	.027	.106	-.616**	-.408	-.718*	-.784**	.567**	.613**	-.441*	-.446*	-.653	-.573*	.399	-.041	.514**	.606	1	
POP/HOSPTIAL		.528*	.564**	.203	.140	.234	-.370	-.350	2.45	1.36	.453	.436	-.550*	-.554*	.106	.370	.475*	.490*	-.631**	.219	-515*	-.530*	.358	1

** CORRELATION SIGNIFICANT AT 1 % LEVEL, * CORRELATION SIGNIFICANT AT 5 % LEVEL

Appendix-6.4: **CORRELATION MATRIX: WASTING**

INDICATORS		WASTING		L.B.W.		ICDS COVER	NUTRITION ICDS		MOTHER THIN		CHILDREN ANAEMIA		VACCINATION		MANUAL WORK MOTHER		WEALTH INDEX		NSDP	ICDS EXP.	SOCIAL EXP	ICDS NO.	ANTE NATAL CARE	POP/ HOSPITAL
		TOT	SCH	TOT	SCH	TOT	TOT	SCH	TOT	SCH	TOT	SCH	TOT	SCH	TOT	SCH	TOT	SCH						
WASTING	TOT	1																						
	SCH	.933**	1																					
L.B.W.	TOT	.033	.084	1																				
	SCH	.019	.113	.553**	1																			
ICDS COVERAGE		.203	.149	-.640**	-.251	1																		
NUTRITION ICDS	TOT	.271	.180	-.583**	-.617**	.242	1																	
	SCH	.209	.156	-.649**	-.650**	.328	.969**	1																
MOTHER THIN	TOT	.473*	.384	.077	-.086	.107	.205	.135	1															
	SCH	.361	.409	.120	.159	-.028	.117	.060	.816**	1														
CHILDREN ANAEMIA	TOT	.341	.321	.356	.028	.018	-.091	-.124	.628**	.379	1													
	SCH	.377	.369	.314	-.068	.142	-.067	-.096	.581**	.310	.928**	1												
VACCINA-TION	TOT	-.237	-.178	-.176	-.003	.017	.279	.300	-.600**	-.353	-.755**	-.678**	1											
	SCH	-.276	-.254	-.212	-.008	.085	.245	.273	-.562**	-.374	-.792**	-.719**	.969**	1										
MANUAL WORK MOTHER	TOT	.574**	.566**	-.146	-.268	-.015	.411	.374	.643**	.506*	.507*	.435*	-.457*	-.498*	1									
	SCH	.664**	.613**	-.173	-.145	.131	.363	.347	.699**	.563**	.550**	.466*	-.573**	-.587**	.906**	1								
WEALTH INDEX	TOT	.534*	.451*	-.099	-.222	.268	.206	.170	.807**	.548*	.616**	.637**	-.719**	-.699**	.594**	.739**	1							
	SCH	.564**	.521*	-.133	-.167	.303	.171	.151	.779**	.603**	.596**	.598**	-.720**	-.711**	.617**	.779**	.972**	1						
NSDP		-.429	-.400	.136	.003	-.210	.055	.104	-.479*	-.396	-.430	-.412	.712**	.740**	-.463*	-.608**	-.794**	-.828**	1					
ICDS EXP.		.314	.250	-.278	-.459*	.099	.354	.326	.364	.223	.004	.012	-.200	-.166	.395	.352	.324	.328	-.211	1				
SOCIAL EXP.		-.302	-.271	-.121	.042	-.304	.097	.062	-.350	-.133	-.647**	-.704**	.605**	.594**	-.224	-.433*	-.701**	-.690**	.583**	.157	1			
ICDS NO.		-.259	-.244	-.507*	-.176	.056	.378	.312	-.261	-.104	-.601**	-.578**	.516*	.499*	-.122	-.295	-.322	-.303	.173	.286	.575**	1		
ANTE NATAL CARE		-.427	-.418	-.508*	-.011	.242	.027	.106	-.616**	-.408	-.718*	-.784**	.567**	.613**	-.441*	-.446*	-.653	-.573*	.399	-.041	.514**	.606	1	
POP/HOSPITAL		.344	.390	.203	.140	.234	-.370	-.350	2.45	1.36	.453	.436	-.550*	-.554*	.106	.370	.475*	.490*	-.631**	.219	-515*	-.530*	.358	1

** CORRELATION SIGNIFICANT AT 1 % LEVEL, * CORRELATION SIGNIFICANT AT 5 % LEVEL

Bibliography

Acharya S. Sanghmitra (2010): *Access to health care and patterns of discrimination: a study of dalit children in selected villages of Gujarat and Rajasthan;* Working Paper, Indian Institute of Dalit Studies and UNICEF.

Agarwal K. N. et al. (2006): "Prevalence of anaemia in pregnant & lactating women in India"; *Indian J Med Res;* 124, August, pp 173-184

Agnihotri B. Satish (1999): "Eliminating severe malnutrition in Orissa: profile of a campaign"; *Economic and Political Weekly*; vol. 34, no. 51, pp 3616-3621.

Alderman H. (2005): "Linkages between poverty reduction strategies and child nutrition: an Asian perspective"; *Economic and Political Weekly*, vol. 40, no. 46. pp.4837-4842.

_____et al. (2004): "Reducing child malnutrition: how far does income growth take us ?"; World Bank Economic Review, vol. 17, no. 1.

Allen Jonathan (2008): India tries new ways to reach its underfed children; Reuters, 18 March.

Allen L.H. (1994): *Maternal micronutrient malnutrition: effects on breast milk and infant nutrition, and priorities for intervention*; SCN News; 11, pp. 21–24.

_____ (2001): "Biological mechanisms that might underlie iron's effects on fetal growth and preterm birth"; *American Society for Nutritional Sciences.*

Alsendro Tarrozzi (2007): "Child nutrition in India in the nineties"; *Economic Development and cultural change,* vol. 55, no. 3.

Angèle Petros-Barvazian and M. Béhar (1978): "Low birth weight: a major global problem"; *Ambio*, vol. 7, no. 4. pp. 157-163.

Archer Sujata (2007): "Staying focused on the undernourished child—India"; *Journal of the American Dietetic Association,* November Issue, pp. 1879-1881.

Arnold Fred, Nangia Praven and Kapil Umesh (2004): "Indicators of nutrition for women and children current status and recommendations"; *Economic and Political Weekly,* vol. 39, no. 7, pp 664-670.

Bibliography

Bairagi Radheshyam (1986): "Food crisis, nutrition, and female children in rural Bangladesh"; *Population and Development Review*, vol. 12, no. 2 . pp. 307-315.

Baraik K. Vijay and Kulkarni P.M (2006): *Health status and access to health care services – disparities among social groups in India;* Working Paper, Indian Institute of Dalit Studies, vol-1, no-4.

Baru Rama et. al.(2010): "Inequities in access to health services in India: caste, class and region"; *Economic and Political Weekly*, vol. 45, no. 38.pp. 49-58.

Basu Malwade Alaka (1989): "Is discrimination in food really necessary for explaining sex differentials in childhood mortality?"; *Population Studies,* vol. 43, no. 2 , pp. 193-210.

Behrman R. Jere , Deolalikar B. Anil, Barbara L. Wolfe (1988): "Nutrients: impacts and determinants"; *The World Bank Economic Review,* vol. 2, no. 3. pp. 299-320.

_____,Alderman Harold and Hoddinott John (2004): *Hunger and malnutrition: copenhagen consensus – challenges and opportunities*; challenger Paper.

_____and M. Rosenzweig (2004): "Returns to birthweight"*; Review of Economics and Statistics*.vol.86, no.2. pp.586-601.

Benjamin Senauer and Marito Garcia (1991): "Determinants of the nutrition and health status of preschool children: an analysis with longitudinal data"; *Economic Development and Cultural Change,* vol. 39, no. 2. pp. 371-389.

Bentley M.E. and Griffiths P.L. (2003): "The burden of anemia among women in India"; *European Journal of Clinical Nutrition,* vol. 57, pp.52–60.

Bern C, Nathanail L, (1995): "Is mid-upper arm circumference a useful tool for screening in emergency settings?": *Lancet* , 345, pp. 631-633.

Bernard J. Brabin , Mohammad Hakimi and David Pelletier (2001): "An analysis of anemia and pregnancy-related maternal mortality"; *American Society for Nutritional Sciences*.pp. 604s-615s.

Beverly Winikoff (1978): "Nutrition, population, and health: some implications for policy"; *Science, New Series*, vol. 200, no. 4344, Health Maintenance Issue. pp. 895-902.

Bibliography

Bharati Premananda et al. (2006): "Nutritional status of preschool children of Raj Gond – a tribal population in Madhya Pradesh, India", *Mal J Nutr,* vol. 12, no.2, pp.147-155,

Bicego, T.G. and J.T. Boerma (1993): "Maternal education and child survival: a comparative study of survey data from 17 countries"; *Social Science and medicine*, vol- 36, no-9: pp-1207-1227.

Black E. Robert (1984): "Malnutrition is a determining factor in diarrheal duration, but not incidence, among young children in a longitudinal study in rural Bangladesh"; *American Journal of Clinical Nutrition,* no. 37.

Allen H. L., De Onis Mercedes et al. (2008): "Maternal and child under-nutrition: global and regional exposures and health consequences"; *Lancet*, January 17.

Blaise Genton,Fadwa Al-Yaman et al. (1998): "Relation of anthropometry to malaria morbidity and immunity in Papua New Guinean children"; *The* American Journal of Clinical Nutrition; no. 68, pp.734–741.

Bobak Martin (2000): "Outdoor air pollution, low birth weight, and prematurity"; *Environmental Health Perspectives,* vol 108, no. 2.pp.173-176.

Borooah, V. (2002): *The role of maternal literacy in reducing the risk of child malnutrition in India;* Draft Paper, UK, University of Ulster, http://www.icer.it/docs/wp2002/borooah31-02.pdf

Bose Ashis (2006): *Falling fertility and rising anaemia ?*; Economic and Political Weekly, vol. 41, no. 37. September 16. pp.3923-3926.

Bose Kaushik, Bisai Samiran et al (2008): "Extreme levels of underweight and stunting among pre-adolescent children of low socioeconomic class from Madhyamgram and Barasat, West Bengal; India"; *Coll. Antropol,* vol. 32, no. 1, pp. 73–77.

Brooke O. G. (1972): "Influence of malnutrition on the body temperature of children"; *The British Medical Journal,* vol. 1, no. 5796, pp. 331-333.

Caldwell, J.C. (1979): "Education as a factor in mortality decline"; *Popualtion Studies,* vol-33, no-9.pp.395-413.

_____and P. Mcdonald (1982): "The influence of maternal education on infant and child mortality: levels and causes"; *Health Policy and education*, vol 2, pp. 251-267.

_____(1990): "Cultural and social factors of mortality decline"; *Annals of the American Academy of Political and Social science,* no. 510, pp. 44-59.

Carlos Larreaa, Ichiro Kawachi(2005): "Does economic inequality affect child malnutrition? The case of Ecuador"; *Social Science & Medicine*; no. 60, pp. 165–178.

Caroline Harper, Rachel Marcus and Karen Moore (2003): "Enduring poverty and the conditions of childhood: life course and intergenerational poverty transmissions"; *World Development*, vol. 31, no.3, pp. 535–554.

Chandrashekhar C.P. and Ghosh Jayati (2005): The unfulfilled potential of the ICDS; MacroScan, 21 March.

Chatterjee Mirai (2006): "Decentralised childcare service"; *Economic and Political Weekly*, vol. 41, no. 34. August 26.

Chen Lincoln C., Huq Emdadul, D'Souza Stan (1981): "Sex bias in the family allocation of food and health care in rural Bangladesh"; Population and Development Review, vol. 7, no. 1 , pp. 55-70

Chen Zhuo, Eastwood B. David, YEN T. Steven (2007): "A decade's story of childhood malnutrition inequality in China: Where you live does matter"; *China Economic Review,* vol. 18, pp. 139–154.

Cogill Bruce (2001): *Anthropometric Indicators Measurement Guide; Food and Nutrition Technical Assistance Project;* (E-book), Academy for Educational Development, Washington D.C.,Website: www.fantaproject.org

Cora M. Kai Sun et al (2007): "Parental tobacco use is associated with increased risk of child Malnutrition in Bangladesh"; *Nutrition,* vol. 23, pp. 731–738.

Crittenden Robert and Baines Janis (1986): "The seasonal factors influencing child malnutrition on the Nembi Plateau, Papua New Guinea"; *Human Ecology*, vol. 14, no. 2. pp. 191-223.

Cutberto Garza and De Onis Mercedes (1997): "Time for a new growth reference"; *Pediatrics*; vol.100, no. E8. pp.1-2.

_____and De Onis Mercedes (1999): "A new international growth reference for young children"; *American Journal of Clinical Nutrition;* vol. 70, pp. 169S–72S.

Das Lipi (2000): "Anthropometric parameters for assessment of nutritional status of 0-6 years children of Varanshi"; *Man in India,* vol. 80, no. 34.

Dasgupta Partha (1993). *An inquiry into Wellbeing and its Destitution*; Oxford University Press,

_____(1997): "Nutritional status, the capacity for work, and poverty traps"; *Journal of Econometrics*, vol. 77; pp. 5-37.

_____(1998): "The economics of poverty in poor countries"; *The Scandinavian Journal of Economics,* vol. 100, no. 1.pp. 41-68.

_____(2007): *Poverty traps: exploring the complexity of causation: 2020 focus brief on the world's poor and hungry people*"; Washington, DC: IFPRI

David Suzan & L. Lobo Marie (1995): "Childhood diarrhea and malnutrition in Pakistan, Part I: Incidence and Prevalence"; *Journal of Pediatric Nursing*, vol 10, no 2.

Davidson R. Gwatkin, Shea Rutstein, Kiersten Johnson et. al. (2007): *Socio-economic differences in health, nutrition, and population within developing countries;* World Bank

De Onis Mercedes, Blössner Monika et al. (2004): "Methodology for estimating regional and global trends of child malnutrition"*; International Journal of Epidemiology,* vol. 33, no. 6. pp. 1260-1270.

Deolalikar B. Anil (2005): *Attaining millennium development goals in India: rethinking infant mortality, child malnutrition, and hunger-poverty and increasing school enrolment and completion?* Oxford University Press, New Delhi.

Dibley J. Michael et al. (1987): "Interpretation of Z-score anthropometric indicators from the international growth reference"; *American Journal of Clinical Nutrition*; vol. 46, pp. 749.

Donald W. MacCorquodale and Haydee Rondon de Nova (1974): "Family size and malnutrition in santo domingo"; *Public Health Reports*; vol. 92, no. 5 , pp. 453-457.

Dorin Bruno (1999): "Food policy and nutrition security"; *Economic and Political Weekly*, vol. 34, no. 26. pp. 1709-1717.

Bibliography

Doris Howes Calloway (1982): "Functional consequences of malnutrition"; *Reviews of Infectious Diseases*, vol. 4, no. 4.

Dreze Jean and Sen Amartya (1989) :*Hunger and public action;* Oxford University Press,

_____and Sen Amartya ed. (1995):*The political economy of hunger;* Oxford University Press

_____(2006): Children under six - out of the spotlight, The Hindu, 20 October 2006)

_____(2006): "Universalisation with quality: ICDS in a rights perspective"; *Economic and Political Weekly,* vol. 41, no. 34, pp. 3706-3715.

Dyson T. ,& Moore M.(1983): "On kinship structure, female autonomy ,and demographic behaviour in India"; *Population and Development Review;* vol 9, no. 1,pp. 35–54.

Economic Research Foundation (2006): *Government health expenditure in india: a benchmark study;* New Delhi. Undertaken for the MacArthur Foundation, India. Available at http://www.macroscan.org.

Ellen Van de Poel et al. (2008): "Socioeconomic inequality in malnutrition in developing countries"; *Bulletin of the World Health Organization*, April, vol. 86, no. 4.pp-282-291.

_____and Niko Speybroeck (2009): "Decomposing malnutrition inequalities between scheduled castes and tribes and the remaining Indian population"*; Ethnicity & Health*, vol.14, no.3, pp. 271-287.

Engle, P., P. Menon, and L. Haddad (1999): "Care and nutrition: concepts and measurement"; *World Development, vol.* 27, no. 8, pp. 1309–1337.

Esrey S.A. , Potash J.B., Roberts L. and Shiff C. (1991*): "*Effects of improved water supply and sanitation on ascariasis, diarrhoea, dracunculiasis, hookworm infection, schistosomiasis, and trachoma"*; Bulletin of the World Health Organization*, vol 69, no. 5.pp. 609-621.

_____Eyob Zere and Diane McIntyre(2003): "Inequities in under-five child malnutrition in South Africa"*; International Journal for Equity in Health.*

Fay Marianne, leipzigeret danny et al. (2005): "Achieving child-health-related millennium development goals: the role of infrastructure"; *World development,* vol. 33, no. 8, pp. 1267–1284.

Fishman SM, Caulfield L, de Onis M, et al. (2004): "Childhood and maternal underweight; In *Comparative quantification of health risks: global and regional burden of disease attributable to selected major risk factors (edited).* Geneva: World Health Organization, pp. 39–161.

Friedman Jenifer, Kwena M. Arthur et al. (2005): "Malaria and nutritional status among pre-school children: results from cross-sectional surveys in western Kenya"; *American Journal of Tropical Medicine and Hygiene*, vol. 73, no. 4, pp. 698–704.

G. VenkateshIyengar and Padmanabhan P. Nair (2000): "Global outlook on nutrition and the environment: meeting the challenges of the next millennium"; *The Science of the Total Environment* , vol 249, pp. 331-346

Gabriele, Alberto and Schettino, Francesco(2007): *child malnutrition and mortality in developing countries: evidence from a cross-country analysis*; Polytechnic University of Marche, University of Rome "la Sapienza" and UNCTAD-UN: Online at http://mpra.ub.uni-muenchen.de/3132/ .MPRA Paper No. 3132.

Ge Ke-you chang su-ying (2001): "Definition and measurement of child malnutrition"; Biomedical and environmental sciences, vol.40, no. 4.

Ghosh Jayati (2005): The unsung heroines of India; Frontline, 17 June.

Ghosh Shanti (2004): "Child malnutrition"; *Economic and Political Weekly,* vol. 39, no. 40, October 2.

(2006): "Food dole or health: Nutrition and development programme?"; *Economic and Political Weekly,* vol. 41, no. 34. August 26.

Glewwe Paul (1999): "Why does mother's schooling raise child health in developing countries? evidence from Morocco"; *The Journal of Human Resources,* vol. 34, no. 1, pp. 124-159

Gomez, F. et al. (1956): "Mortality in second and third degree malnutrition"; *Journal of tropical pediatrics and African child health*, vol-2, no- 77.

Gopalan C. (1985a): "The mother and child in India"; *Economic and Political Weekly*, vol. 20, no. 4. pp. 159-166.

_____and M, Chaterjee (1985b): *Use of growth charts for promoting child nutrition: a review of global experiences*; special publication series 2, Nutrition foundation of India.

_____ (1994): Low birth weights: significance and implications; in. Sachdev H.P.S and Chowdhary Panna edited N*utrition in Children: developing Country Concerns,* Dept. of Pediatrics, Maulana Azad Medical College, New Delhi.

_____ (1995): *"Towards food and nutrition security"* : *Economic and Political Weekly*, vol. 30, no. 52.

_____and Tamber Aeri Bani (2001): "Strategies to combat under-nutrition"; *Economic and Political Weekly*, vol. 36, no. 33. August 18.

Gopaldas Tara (2006): "Hidden hunger: the problem and possible interventions"; *Economic and Political Weekly,* vol. 41, no. 34.

Gorstein J.J. et al. (1994): "Issues in the assessment of nutritional status using anthropometry"; *Bulletin of the World Health Organization;* vol. 72, no.2, pp 273-283.

Gragnolati Michele, Bredenkamp Caryn et all (2006): "ICDS and persistent undernutrition strategies to enhance the impact"; *Economic and Political Weekly*, vol. 41, no. 12. March 25.

_____, Shekar Meera, Das Gupta Monica et al. (2005): *India's undernourished children: a call for reform and action;* Health, Nutrition and Population discussion paper, World Bank Publication.

Griffiths Paula, Zoe Matthews Andrew Hinde (2002): "Gender, family, and the nutritional status of children in three culturally contrasting states of India"; *Social Science & Medicine,* vol 55, pp. 775–790.

Gross Rainer, Patrick Webb (2006): "Wasting time for wasted children: severe child undernutrition must be resolved in non-emergency settings*";Lancet*, 367, pp 1209–11.

Gujrati N Damodar and Sangeetha (2009): *Basic Econometrics;* 4th Edition, pp-627-628, Tata Mcgraw Hill Education Private Limited, New Delhi.

Gupta Arun and Rhode E John (2004): "Infant and young child undernutrition: where lie the solution?"; *Economic and Political Weekly,* vol. 39, no. 49.

_____ (2006): "Infant and young child feeding an 'optimal' approach"; *Economic and Political Weekly*, vol. 41, no. 34. August 26.

Patnaik Biraj, Drèze Jean et al. (2007): *Strategies for children under six: a framework for the 11th Plan*; Planning Commission

Hack Maureen et. al. (1993): "Health of very low birth weight children during their first eight years"; *Journal of Pediatrics*, vol.122, pp. 887-892.

_____et al. (2002): "Outcomes in young adulthood for very-low-birth-weight infants"; *The New England Journal of Medicine*, vol. 346, no. 3.

Haddad L., Alderman H. et al. (2003): "Reducing child malnutrition: how far does income growth take us ?"; *The world bank economic review,* vol.17, no. 1, pp 107-131.

Harper Caroline, Marcus Rachel and Moore Karen (2003): "Enduring poverty and the conditions of childhood: life course and intergenerational poverty transmissions"; World Development, vol. 31, no. 3, pp. 535–554,

Hatekar Neeraj, Rode Sanjay (2003): "Truth about hunger and disease in Mumbai: malnourishment among slum children"; *Economic and Political Weekly*, vol. 38, no. 43. October 25.

Henri L. Vis, Michel Bossuyt et al. (1975): "The health of mother and child in rural central Africa"; *Studies in Family Planning, vol.* 6, no. 12. pp. 437-441.

Govt. of India (2005): *Health Information of India-2005;* Central Bureau of Health

Inequalities, Higgins Paul and Alderman Harold (1997): "Labor and women's nutrition: the impact of work effort and fertility on nutritional status in Ghana"; *The Journal of Human Resources,* vol. 32, no. 3. pp. 577-595.

Hill Kenneth and Upchurch M. Dawn (1995): "Gender differences in child health: evidence from the demographic and health surveys"; *Population and Development Review*; vol. 21, no.1 , pp. 127-151.

Hong Rathavuth and Mishra Vinod (2006): "Effect of wealth inequality on chronic under-nutrition in Cambodian children"; *J Health Popul Nutr* , Mar; vol. 24, no. 1, pp. 89-99.

_____, Banta E. James and Betancourt A. Jose (2006): "Relationship between household wealth inequality and chronic childhood under-nutrition in Bangladesh"; *International Journal for Equity in Health.*

Horton Susan (1988): "Birth order and child nutritional status: evidence from the Philippines"; *Economic Development and Cultural Change*, vol. 36, No. 2 ,pp. 341-354

Hulshof Karin (2009): *Child malnutrition in India is a human right issue*; The Hindu, Dec 10.

Bibliography

ICDS Scheme: Presenting Innovative Panaroma [28 November] available from: http://www.righttofoodindiorg

Indian Institute of Population Studies (2000): nfhs bulletin: women's education can improve child nutrition in India; available from: http://www.righttofoodindiorg

Indrakant S (2004): "Nutrition programmes and children"; *Economic and Political Weekly*, vol. 39, no. 4.

J Gorstein et al. (1994): "Issues in the assessment of nutritional status using anthropometry" ; Bulletin of the World Health Organization, vol. 72, no. 2, pp.273-283.

Jain Sonu (2008*):* An undernourished programme, Indian Express, 24 January.

James E. Austin and F. James Levinson (1974): "Population and nutrition: a case for integration"; *The Milbank Memorial Fund Quarterly;* Health and Society, vol. 52, no. 2. pp. 169-184.

Jelllife, D.B. (1966): *The assessment of the nutritional status of the community*; WHO Monograph, Series No.53, pp. 8.

_____ (1969): "The arm circumference as a public health index of protein calorie malnutrition of early childhood"; J Trop Pediatr , vol. 15, pp.179-189.

Jere D. Haas and Gail G. Harrison (1977): "Nutritional anthropology and biological adaptation", *Annual Review of Anthropology*, vol. 6, pp. 69-101.

Jha Raghbendra,Imai S. Katsushi and Ghaia Raghav (2009): *Poverty, undernutrition and vulnerability in rural India: public works versus food subsidy;* Working paper, Chronic Poverty Research Centre, no. 135.

Jo C. Phelan, Bruce G Link et al. (2004): "Fundamental causes of social inequalities in mortality: a test of the theory*"; Journal of Health and Social Behavior* , vol. 45 (September): pp. 265-285.

Johnston F. Bruce and Meyer J. Anthony (1977): "Nutrition, health, and population in strategies for rural development"*;* Economic *Development and Cultural Change,* vol. 26, no. 1.

Jood Sudesh, Bishnoi Saroj et. al.(2000): "Nutritional status of rural pre-school children of Haryana state"; *Indian Journal of Pediatrics;* vol. 67, no. 3. pp. 189-196.

Jose Sunny and Navaneetham K. (2008): "A factsheet on women's malnutrition in India"; *Economic & Political Weekly,* vol. 43, no. 33, August 16.

Kacker Loveleen (2006a): *"Breastfeeding for child survival, health and development"*; available from :http://www.righttofoodindiorg

_____ (2006b):"Child budgeting in India"; available from :http://www.righttofoodindiorg, Supplementarysource:http://wcd.nic.in/statewsd/Statesecreteries Meeting, 24-25 April 2006/child-budgeting LK.ppt

_____ (2006c): "Grading of anganwadi centres – experience sharing by Himachal Pradesh"; available from :http://www.righttofoodindiorg

Karkal Malini (1987): "Differentials in mortality by Sex"; *Economic and Political Weekly*, vol. 22, no. 32, pp. 1343-1347.

Kent George (2006): "ICDS and right to food"; *Economic and Political Weekly*, vol. 41, no. 45. November 11.

Khorshed Alam Mozumder A.B.M. et. al. (2000): "The effect of birth interval on malnutrition in Bangladeshi infants and young children"; *Journal of biosocial Science*; vol. 32, pp. 289–300.

Khullar Vandana (1998): "Integrated child development services: a critique of evaluation techniques"; *Economic and Political Weekly,* vol. 33, no. 10. pp. 537-545.

Klasen Stephan (2006): *Poverty, undernutrition, and child mortality: some inter-regional puzzles and their implications for research and policy;* Discussion Paper No. 2509, University of Göttingen and IZA Bonn.

Kramer M.S (1987): "Determinants of low birth weight: methodological assessment and meta-analysis"; *Bulletin of World Health Organization*, vol. 65, no. 5.

_____, Victoria C. (2001): Low birth weight and peri natal mortality; in Semba RD, Bloem MW edited *Nutrition and Health in Developing countries*, Human Press.

Kumar Rajesh, Aggarwal Arun K. and Iyengar Sharad D. (1996): "Nutritional status of children: validity of mid-upper arm circumference for screening undernutrition"; Indian Pediatrics; volume 33

Kumar Rajesh, Aggarwal K. Arun and Iyengar D. Sharad (1996): "Nutritional status of children: validity of mid-upper arm circumference for screening under-nutrition"; *Indian Pediatrics*; vol. 33.

Bibliography

L. S. Stephenson, D. W. T Crompton et al (1980): "Relationships between Ascaris infection and growth of malnourished preschool children in Kenya"; *The American Journal of Clinical Nutrition,* no. 33, pp.1165-1172.

Lakshman Nirmala (2006):The entitlement of every Indian child , Hindu, 17 August.

Lennart Freiji et al.(1979*):* "Ascariasis and malnutrition : a study in urban Ethiopian children"*; The American Journal of Clinical Nutrition*; vol 32,pp.1545-1553.

LeVine Robert A., LeVine Sarah E. et al.(1991): "Women's schooling and child care in the demographic transition: a Mexican case study"*; Population and Development Review*, vol. 17, no. 3. pp. 459-496.

Long S. (1997): *Regression Models for Categorical and Limited Dependent Variables*, pp-83, Thousand Oaks, CA, Sage Publications.

Malwade Basu Alaka (1989): "Is discrimination in food really necessary for explaining sex differentials in childhood mortality?"; *Population Studies,* vol. 43, no. 2.

Marcoux Alain (2002): "Sex differentials in undernutrition: a look at survey evidence"; *Population and Development Review,* vol. 28, no. 2. pp. 275-328.

Mari Bhat P N and Zavier Francis (1999): "Findings of National Family Health Survey regional analysis"; *Economic and Political Weekly*, vol. 34, no. 42/42. October 16-23.

Martin Bobak (2000): "Outdoor air pollution, low birth weight, and prematurity"*; Environmental Health Perspectives,* vol 108, Number 2,

Martorell Reynaldo and Teresa J. (1984): "Malnutrition, morbidity, and mortality"*; Population and Development Review,* Vol. 10, Supplement: Child Survival: Strategies for Research, pp. 49.

_____ (1999): "The nature of child malnutrition and its long-term implications"*; Food and Nutrition Bulletin,* vol.20, no. 3, pp 288-293.

Massimo Livi-Bacci (1983): "*The nutrition-mortality link in past times: a comment*"; *Journal of Interdisciplinary History*, vol. 14, no. 2.

Maureen Hack, Daniel J. Flannery, Mark Schluchter et al. (2002): "Outcomes in young adulthood for very-low-birth-weight infants"; *The New England Journal of Medicine,* vol. 346, no. 3.

McCormick. M.C.(1985): "The contribution of low birth weight to infant and childhood morbidity"*; New England Journal of Medicine*, 312, pp. 82-90

Mehrotra Santosh (2006): "Child malnutrition and gender discrimination in South Asia"; *Economic and Political Weekly*, vol. 41, no. 10, March 11.

Michael GM Rowland et. al. (1988): "Impact of infection on the growth of children from 0 to 2 Years in an urban West African community"; American Journal of Clinical Nutrition, vol 47, pp. 134-8.

Miller D. Barbara (1977): "Social class, gender and intra household food allocations to children in South Asia"; *Social Science Medicine*; vol.44, no. 11, pp. 1685-1695.

Ministry of Health and Family Welfare (2006): *Reproductive and child health, District level household survey,2002-04;* IIPS.

Ministry of Minority Affairs (2006): *Social, Economic and Educational Status of the Muslim Community of India: A Report*; Govt. of India.

Mishra Narayan Rudra (2006): *Dynamics of caste-based deprivation in child undernutrition in India*; Working paper, Centre for development studies, India (available at www.cds.edu).

Mishra Vinod, Roy T. K. and Retherford D. Robert (2004): "Sex differentials in childhood feeding, health care, and nutritional status in India"; *Population and Development Review*, vol. 30, no. 2, pp. 269-295.

Mondal Swati (2006): *Child malnutrition in India: A comparative study between Tamil Nadu and Madhya Pradesh on the basis of NFHS-2*; unpublished thesis; Centre for the study of regional development, Jawaharlal Nehru University, New Delhi.

Morales Rolando, Aguilar AnaMaria and Calzadilla Alvaro (2000): "Geography and culture matter for malnutrition in Bolivia"; *Economics and Human Biology*, vol. 2, pp. 373–389.

Moseley and Chen (1984): "An analytical framework for the study of child survival in developing countries"; *Population and Development Review,* vol. 10.

Mosley W. Henry (1984): "Child survival: research and policy"; *Population and Development Review,* vol. 10.

Muhuri Pradip K. (1995): "Health programs, maternal education, and differential child mortality in matlab, Bangladesh"; *Population and Development Review*, vol. 21, no. 4 (Dec), pp. 813-834

Murthi Mamta, Guio Anne-Catherine and Drèze Jean (1995): "Mortality, fertility, and gender bias in India: a district-level analysis"; *Population and Development Review*, vol. 21, no. 4. pp. 745-782.

Nandy Shailen, Michelle Irving, David Gordon et al. (2005): "Poverty, child under-nutrition and morbidity: new evidence from India"; *Bulletin of the World Health Organization*, March, vol. 83, no. 3.

National Family and Health Survey: 1992-93; IIPS.

National Family and Health Survey: 1998-99; IIPS.

National Family and Health Survey: 2005-06; IIPS.

Nelson Michael (2005): "Childhood nutrition and poverty"; *Proceedings of the Nutrition Society*, vol. 59, pp. 307–315.

Nyakeriga AM, Troye-Blomberg M et al. (2004): "Malaria and nutritional status in children living on the coast of Kenya", *American Journal of Clinical Nutrition*, no. 80, pp. 1604–1610.

Osmani, S.R. (2001a): "Hunger in South Asia: a study in contradiction"; *The Little Magazine,* vol. 2, pp. 35-40.

_____. ed. (2001b): *Nutrition and Poverty*; Clarendon Press . Oxford

Park K. (2005): *Park's textbook of preventive and social medicine*; M/s Banarashidas Bhanoot Publishers, Jabalpur, India, 18th edition.

Pathak Piyali, Kapil Umesh, Kapoor K. Suresh et al. (2004): "Prevalence of multiple micronutrient deficiencies amongst pregnant women in a rural area of Haryana"; *Indian Journal of Pediatrics*, vol. 71, November.

Prasad Vandana and Sinha Dipa (2008): Childhood on hold ; The Hindu, 21 September.

Qader Imrana, Pridarshi Anju (2006): "Nutrition policy: shifts and logical fallacies"; *Economic and Political Weekly*, vol. 41, no. 34, pp-358-364.

Radakrishna R and Ravi C. (2004): "Malnutrition in India: trend and determinants"; *Economic and Political Weekly,* vol. 39, no. 7, pp. 671-976.

_____, Rao Hanumantha et al. (2004b): "Chronic poverty and malnutrition in 1990s"; *Economic and Political Weekly*, vol. 39, no. 28, pp 3121-3130.

_____ (2005): "Food and nutrition security of the poor: emerging perspectives and policy issues"; *Economic & Political Weekly*, vol. 40, no. 18, pp. 1817-1821.

Rajivan K Anuradha (2006): "Tamil Nadu: ICDS with a difference"; *Economic and Political Weekly*, vol. 41, no. 34. August 26.

Ramachandran P. (2007): "Poverty nutrition linkages"; *Indian Journal of Medical Research* 126; October, pp. 249-261.

Ramakrishna U. et al(2003): *The importance of women's status for child nutrition in developing countries*; International Food Policy Research Institute, Washington,Dc, Department Of International Health, Emory University.

Ramalingaswami, V, Johnson U and Rohde J. (1997): *'The Asian enigma' in progress of nations*; UNICEF, New York.

Rao V. G., Yadav Rajeev et al. (2005): "Under-nutrition & childhood morbidities among tribal preschool Children"; *Indian J Med Res*, no.122 (July), pp. 43-47

Ravallion Martin (1990): *Income effects on under-nutrition;* Economic Development and Cultural Change, Vol. 38, No. 3, pp. 489-515.

Resolution of the National Convention on Regularisation of ICDS (New Delhi, April 26 2005) available from: http://www.righttofoodindiorg.

Govt. of India (2010): State *Finances: A Study of Budgets of 2009-10,* Reserve bank of India

Roy T.K, Kulkarni S. and Vaidehi Y. (2004): "Social inequalities in health and nutrition in selected states"; *Economic and political weekly,* vol. 39, no. 7. Feb 14, pp. 667-683.

S. Sudha and S. Irudaya Rajan(2003): "Persistent daughter disadvantage: what do estimated sex ratios at birth and sex ratios of child mortality risk reveal?"; *Economic and Political Weekly*, vol. 38, no. 41 , pp. 4361-4369

Sain Ruby (1994): "Nutritional status of tribal children in Birbhum"; *Economic and Political Weekly*, vol. 29, no. 25, pp. 1513

Bibliography

Saugstad, L.F. (1981): "Weight of all births and infant mortality"; *Journal of epidemiology and community health,* vol.35, pp.185-191.

Scott Susan and Duncan C. J. (1999): "Malnutrition, pregnancy, and infant mortality: a biometric model"; *Journal of Interdisciplinary History,* vol. 30, no. 1. pp.37.

Sen Amartya and Sengupta Sunil (1983): "Malnutrition of rural children and the sex bias"; *Economic and Political Weekly,* vol. 18, no. 19/21, Annual Number , pp. 855-864.

_____ (2002): "Hunger: Old torments and new blunders"; *Little magazine*, vol. 2, no. 6

Sen Pranab (2005): "Of calories and things: reflections on nutritional norms, poverty lines and consumption behaviour in India"; *Economic and Political Weekly,* vol. 40, no. 43, pp. 4601-4610.

Sengupta Jhumur and Sarkar Debnarayan (2007): "Discrimination in ethnically fragmented localities: a study of public good provision in West Bengal"; *Economic and Political Weekly*. vol.42 no.32 .pp. 3313-3321.

Shariff Abusaleh and Mallick C Ananta (1999): "Dynamics of food intake and nutrition by expenditure class in India"; *Economic and Political Weekly,* vol. 34, no.27. July 3.

Shiva Kumar A. K. and Nayak Mukherjee V. (1993): "Health as development: implications for research, policy and action"; *Economic and Political Weekly*, vol. 28, no. 16, pp. 769-774.

_____ (2002): "Child malnutrition: myths and realities"; *Little Magazine*, vol. 2, no. 6; can be accessed from the website http://www.littlemag.com.

_____ (2007): "Why are levels of child malnutrition not improving?" ; *Economic and Political Weekly*, vol. 42, no. 15, pp. 1337-1345.

Sinha Dipa (2006): "Rethinking ICDS: a rights based perspective"; *Economic and Political Weekly*, vol. 41, no. 34. August 26.

Sinha Sachidanand (2005): "Reaching out to undernourished children: social inequities and policy perspectives"; *Journal of Health and Development,* vol.1, no.4. pp. 71-90.

Smith L. C. and Haddad L. (2000): *Explaining child malnutrition in developing countries: a cross- country analysis*; International Food Policy Research In statute, Washington, D.C.

_____et al. (2005): "Why is child malnutrition lower in urban than rural areas? evidence from 36 developing countries"; *World Development,* vol. 33, no.8, pp. 1285-1305.

Snow R., C Molyneux C. ,E Njeru et al. (1997): "The effects of malaria control on nutritional status in infancy"; *Acta Tropica*, no. 65, pp. 1–10.

Somini Sengupte (2008): *As Indian growth soars, child hunger persists*; The New York Times, 12 March.

Sommerfelt A.E. (1991): *Comparative analysis of the determinants of children's nutritional status;* Paper presented at the Demographic and Health Surveys World Conference, Washington, DC, August5–7.

Steketee W. Richard (2003): "Pregnancy, nutrition and parasitic diseases"; *American Society for Nutritional Sciences,* pp. 1661-1667.

Stephenson L.S., Crompton D. W. T et al (1980): "Relationships between ascaris infection and growth of malnourished preschool children in Kenya"; *The American Journal of Clinical Nutrition*, no. 33, pp.1165-1172.

Subdararaman T. (2006): "Universalisation of ICDS and community health worker programmes lessons from Chhattisgarh"; *Economic and Political Weekly*, vol. 41, no. 34. August 26.

Sudha S. and Irudaya Rajan S. (2003): "Persistent daughter disadvantage: what do estimated sex ratios at birth and sex ratios of child mortality risk reveal?"; *Economic and Political Weekly*, vol. 38, no. 41 , pp. 4361-4369

Sukhatme P. V. (1974): "The protein problem, its size and nature"; *Journal of the Royal Statistical Society*. Series A (General), vol. 137, no. 2, pp. 166-199.

_____(1980): "Nutrition policy: need for reorientation"; *Economic and Political Weekly,* Vol. 15, No. 26, Jun. 28, pp. 1101-1105.

_____ (1981): "Measuring the incidence of undernutrition: a comment": *Economic and Political Weekly,* vol. 16, no. 23, Jun. 6, pp. 1034-1036.

_____Susan C. and M. Scrimshaw (1978): "Infant mortality and behavior in the regulation of family size"; *Population and Development Review,* vol. 4, no. 3. pp. 383-403.

Svedberg Peter (2000): *Poverty and undernutrition*; Oxford University Press, New Delhi.

Swain Chandra Sukanta (2008): "Nutritional deprivation of children in Orissa"; *Economic & Political Weekly*, vol. 43, no. 37. September 13.

Thapar Nikhil and Sandersin Ian R (2004): "Diarrhoea in children: an interface between developing and developed countries"; *The Lancet*, vol. 363

Thorat Sukhadeo and Joel Lee (2005): "Caste discrimination and food security programmes"; *Economic and Political Weekly*, vol. 40, no. 39. 24 September.

_____and Joel Lee (2006): *Dalits and the right to food–discrimination and exclusion in food-related government programms;* Working Paper, Indian Institute of Dalit Studies, vol-1, no-3.

UNICEF (2009): *Tracking progress on child and maternal nutrition*; New York, USA, pp. *12-23.*

Venkatachalam P. S. (1962): "Maternal nutritional status and its effect on the newborn"; *Bulletin of World health organization*, vol. 26, pp. 193-201.

Venkatesh Iyengar G. and Nair P. Padmanabhan (2000): "Global outlook on nutrition and the environment: meeting the challenges of the next millennium"; *The Science of the Total Environment*, vol 249, pp. 331-346.

Verhoef H, West CE, Veenemans J, Beguin Y, Kok FJ(2002): "Stunting may determine the severity of malaria-associated anemia"; *African children. Pediatrics*, vol. 110, no. 48.

Vishwanathan Brinda (2003): Household food security and integrated child development services in India; available from: http://www.righttofoodindiorg

_____(2006): "Access to nutritious meal programmes: evidence from 1999-2000 NSS data"; *Economic and Political Weekly*, vol. 41, no. 6, February 11.

Wagstaff A. (2000): "Socioeconomic inequalities in child mortality: Comparisons across nine developing countries"; *Bulletin of the World Health Organization*, vol. 78, no. 1, pp. 19-29.

Bibliography

Walter P. John (1974): "Two poverties equal many hungry Indians: an economic and social study of nutrition"; *American Journal of Economics and Sociology*, vol. 33, no. 1. pp. 33-44.

Working Group on the Child Development for the Eleventh Five Year Plan (2007-2012): *Final Report of the Sub-Group on "ICDS & Nutrition";* Ministry Women & Child Development of Government of India, New Delhi August 24, 2006

World Health Organization (1986): "Use and interpretation of anthropometric indicators of nutritional status"*;* Bulletin of the World Health Organization, vol. 64, pp. 929-941.

_____ (1992): *The prevalence of anaemia in women: a tabulation of available information.* Maternal Health and Safe Motherhood Programme; Geneva, Switzerland.

_____ (1995a): *An evaluation of infant growth: the use and interpretation of anthropometry in infants;* vol.73, no. 2, pp. 167.

_____ (1995b): Maternal anthropometry and pregnancy outcomes; A WHO collaborative study; *Bulletin of World Health Organization*; 73: pp. 32–37

_____ (2006): Child growth standards and the identification of severe acute malnutrition in infants and children.

_____ (2008): *Worldwide prevalence of anaemia 1993–2005;* WHO global database on anaemia.

Zbigniew Konczacki (1972): "Infant malnutrition in Sub-Saharan Africa: A problem in Socio-Economic Development"; *Canadian Journal of African Studies,* vol. 6, no. 3, pp 433-449.

Ziauddin Hyder S.M., Persson Lars-AÊ ke, Chowdhury AMR et al (2000): "*Anaemia among non-pregnant women in rural Bangladesh";* Public Health Nutrition, vol. 4, no. 1, pp. 79-83.