LEVELS, DETERMINANTS AND INEQUALITIES IN CHILDREN WITH NO ANTHROPOMETRIC FAILURE IN EAG STATES OF INDIA

Dissertation submitted to Jawaharlal Nehru University

in partial fulfillment of the requirement

for the award of the degree of

MASTER OF PHILOSOPHY

RITESH RANJAN PUSHKAR

CENTRE FOR THE STUDY OF REGIONAL DEVELOPMENT

SCHOOL OF SOCIAL SCIENCE

JAWAHARLAL NEHRU UNIVERSITY

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26 July 2012

Declaration

I, Ritesh Ranjan Pushkar, certify that the dissertation entitled **"Levels, Determinants and Inequalities in Children with No Anthropometric Failure in EAG States of India"** for the degree of Master of Philosophy is my bonafide work and may be placed for evaluation.

Ritesh Ranjan Pushkar

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DEDICATED

TO

MY FAMILY

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This research work would not have been possible without the help of those influential people associated with me, with their intellect, support, belief, innovation and motivation.

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Dated 26.07.2012

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INTRODUCTION

"Nutrition refers to the availability of energy and nutrients to the body's cells in relation to the body's requirement. Thus it has major effect on health. Malnutrition refers to any imbalances in satisfying nutrition requirements" (Mishra et al., 1999, p.5). Children are the prime victims of malnutrition. Nutritional status of a child is usually determined by combination of dietary intake and infection and results in the anthropometric failure i.e., growth retardation. Child undernutrition is a major threat to child's survival, growth and full development potential.

Freedom from hunger and malnutrition was declared a basic child right long back in 1924 through the Declaration of the Rights of Children and as a human right in the 1948 in Universal Declaration of Human Rights. But yet a large proportion of world population lacks the access to adequate food. The extent of this problem can be estimated as it is recognised as first among of all the Millennium Development Goals to eradicate extreme poverty and hunger. The target was to halve the proportion of people who suffer from hunger between 1990 and 2015. According to the state of food insecurity report in the world, 2011, by Food and Agriculture Organisation, 13 percent of the world population is suffering from undernourishment in 2006-08. At global level 26 percent of children under five years of age are underweight in 2008 (UNICEF, 2010).

Nutritional status of child has serious and pervasive repercussions on the development of both mental and physical health of the child and ultimately on the productivity of economy and society. It has tremendous effect on developmental outcomes. A child's physical and intellectual potential is shaped during first three years. So, nutritional status of children in these years and mothers too has paramount influence on the child's later physical, mental and social development (UNICEF, 1998). Children under two years are most vulnerable to stunting, the effects of which are then largely irreversible. This is the period of life when suboptimal breastfeeding and inappropriate complementary feeding practices put children at high risk of undernutrition and its associated outcomes (UNICEF, 2010).

Children who are undernourished have substantially lower chances of survival. They are prone to suffer from serious infections and are more likely to die from common childhood illness, such as diarrhoea, pneumonia, and measles. Malnutrition is a prime cause of slow

physical and cognitive growth, impairs the immune system and increases the risk morbidity and mortality among children (Pelletier, 1998). According to Menon et al., (2009), hunger is most directly manifested in inadequate food intake and a poor diet, especially in combination with low birth weights and high rates of infections, can result in stunted and underweight children and the most extreme manifestation of continued hunger and malnutrition is mortality. Even if the child survives, the loss of social capital is tremendous (Gupta and Rhohde, 2004). According to WHO (1995), children who are underweight or stunted are at greater risk for childhood morbidity and mortality, poor physical and mental development, inferior school performance and reduced adult size and capacity for work. Some studies have shown that risk of non-communicable disease in adult life is higher in children who were stunted and underweight in early childhood and had rapid increase in body mass index in childhood and adolescence (Dietz and Bellizi, 1999; Victora et al., 2008). Undernutrition is also associated with poor educational outcomes and reduced adult earnings. Malnourished children tend to enter school later, repeat grades more often, and have higher dropout rates, resulting in fewer completed years of schooling compared to healthy children (Behrman et al., 2004).

Scenario of nutritional status of children

The nutritional status of children in developing world is very far from satisfactory levels. In developing countries approximately 195 million children under five years of age are stunted in 2008. Africa and Asia have the highest prevalence of stunting, 40 percent and 36 percent respectively, contributing more than 90 percent of the world's stunted children. Around 26 million children (13 percent of total children) and 129 million children under five years of age in developing countries are wasted and underweight respectively in 2008. The prevalence of underweight is 27 percent and 21 percent in Asia and Africa respectively (UNICEF, 2009). South Asia has the largest percentage of underweight children in the world and reduction rates are also very slow. The proportion of underweight children has declined from 31 percent to 26 percent between 1990 and 2008 at global level. But, the proportion of underweight children was 54 percent, 49 percent and 48 percent in 1990, 2000 and 2008 respectively in south Asia (UNICEF Global databases, 2010). There is no substantial decline in the prevalence of underweight children in south Asia.

"Although, India is one of the fastest growing economies in the world, improvement in child nutrition is stagnant. In the last five decades, mortality rate has come down by 50 percent and the fertility rate by 40 percent but reduction in undernutrition is only 20 percent" (Ramachandran, 2010, p.301). According to the state of food insecurity report in the world, 2011 by Food and Agriculture Organisation, in 2006-08, 19 percent of Indian population is undernourished, while it was 20 percent during 1990-92. It shows that there is no significant improvement in nutritional status of Indian population during this period. India alone contributes 42 percent and 31.2 percent of underweight and stunted children respectively in developing countries. Anaemia levels are also very high in India, 70 percent among pre-school age children and 82 percent in children below age two are suffering from any type of anaemia. Table 1.1 shows the trends in nutritional status child of child below three years in India in NFHS rounds. It shows that malnutrition is declining at a very slow rate. In India, 52 percent of children under age three were stunted in 1992-93 (NFHS-I) which is decreased by only 1 percent in 1998-99 (NFHS-II) and 6 percent in 2004-06 (NFHS-III). The similar trend is observed in underweight children under age three, 53 percent children were underweight in NFHS-I, which is decreased by 10 percent in NFHS-II and reached up to 40 percent in NFHS-III. Unfortunately the percentage of wasted is increased. In NFHS-I, 18 percent children under age three were wasted. It was increased by 2 percent in NFHS-II and again 3 percent children in NFHS-III.

Table 1.1 Trends in nutritional status of children under age three years in India

	Stunted (in percent)	**Wasted** (in percent)	**Underweight** (in percent)
NFHS-I	52	18	53
NFHS-II	51	20	43
NFHS-III	45	23	40

Source: NFHS – III, 2005-06

According to NFHS-III (2005-06), 48 percent of children under age five years are stunted and 23.7 percent are severely stunted. The prevalence of wasting and severe wasting is 19.8 percent and 6.4 percent respectively. The proportion of underweight children is also very high, 42.5 percent are underweight and 15.8 percent are severely underweight.

Objectives

1. To show the nutritional status of children by disaggregated sub groups of anthropometric failure in EAG states of India.
2. To examine the impact of various demographic, socioeconomic, maternal and other determinants of the nutritional status of children in EAG states of India.
3. To assess and analyse inequalities in nutritional status of children by socioeconomic characteristics in EAG states of India.

Database

1. National Family & Health Survey-III, 2005-06

Methodology

1. Crosstabs
2. Binary Logistic Regression
3. Concentration Curve and associated Concentration Index
4. Decomposition of Concentration Index

Summary and Conclusion

Despite of remarkable economic growth in the last two decades, the nutritional status of Indian population is among the worst in the world. Improvement in nutritional status is much slower than the expected international experience (Radhakrishna and Ravi, 2004; Deaton and Dreze, 2009). Nutritional status of India is worse than most of sub-Saharan countries, even though those countries are poorer than India and have higher infant and child mortality rates (Deaton and Dreze, 2009). A large proportion of the children in India still lack of most basic needs, i.e., sufficient food and adequate health care. According to NFHS-III, 48 percent of Indian children are stunted, 19.8 percent are wasted and 42.5 percent are underweight. These rates are much higher than the sub-Saharan Africa (22 percent of children are underweight). The consequences of the poor nutrition are not just limited to the physical and mental health of the populations, but also for the economy as a whole. The economic loss associated with malnutrition is estimated to be 3 percent of India's GDP annually (Susan, 1999).

In this study nutritional status of children in EAG states has been studied through the new anthropometric measure, no anthropometric failure i.e., free from any type of anthropometric failure. Results of the study inflict serious concerns on the nutritional status of children. In all EAG states, the proportion of children with no anthropometric failure is very low, only one-third of children are in state of no anthropometric failure. In Bihar, Jharkhand and Madhya Pradesh, it is even less than 30 percent.

The prevalence of no anthropometric failure among children is highest in the age group less than one year. It decreases in the age group of 1 to 2 years and 2 to 3 years because in this age child is prone to infectious diseases. After the age of three years there is sign of improvement in nutritional status measured by no anthropometric failure, but it does not reach even up to level of less than one year age group. There is no clear evidence of low level of no anthropometric failure among girl child.

Prevalence of no anthropometric failure is higher in the urban areas in comparison to rural areas and there also exist wide gaps between them. Type of caste or tribe has significant impact on the nutritional status of children. Children belonging to general caste have much better nutritional status than ST, SC and OBC. There are small differences in the level of no anthropometric failure in ST, SC and OBC, but the gap between OBC and general caste children is much wider. Among religious groups, Hindu children are better in terms of no anthropometric failure, but the difference from other religious group is not very large. In some states Muslims and other religious group have better nutritional levels. Education level of mother emerges as a remarkable indictor in determining the nutritional status of child. Levels of no anthropometric failure among children with the rise in the education level of mother have correlated positively. Highly educated mothers have almost two to three times higher level of children with no anthropometric failure than illiterate mothers. There is large gap between the secondary educated mothers and highly educated mothers in terms of no anthropometric failure among children.

Among the maternal factors, BMI of mother do plays a pivotal role for the prevalence of no anthropometric failure among children as its impact on child growth during pregnancy. It is interesting to see that overweight or obese mothers posses high percentages of children with no anthropometric failure. Anaemia levels of mother have also influence on the level of

children with no anthropometric failure, but here the wide differences are seldom. Children with lower birth order say one or two are better in terms of nutritional status than higher birth order children. Again shorter birth interval is associated with the deprived nutritional status of children.

Mother's work status shows negative impact on the levels of no anthropometric failure among children. Standard of living of the household has strong impact on the nutritional status of child as it affects nutrient intake and health care. With increase in the standard of living of household measured by wealth index in this study, it is observed that there is sharp increase in the nutritional status of children in terms of no anthropometric failure. It is shocking to see that even in the economically better off groups the level of no anthropometric failure among children is not satisfactory. In the richest wealth quintile only 61 percent of children are in no anthropometric failure and rest 39 percent are suffering from any type of anthropometric failure. Poor environmental condition may have impact on the overall low nutritional status of children in EAG states (Radhakrishna and Ravi, 2004).

Mass media is a major source of information in the modern world. Its impact is also observed on the nutritional status of children. With increase in the exposure to mass media, the proportion of children with no anthropometric failure is increasing. But the magnitude of improvement is small.

It also observed that when the other variables are controlled, different demographic and socioeconomic variables like age of the child, education level of mother, BMI of mother and standard of living bears strong influence on the nutritional status of child.

Age of the child has significant impact on the nutritional status of children. The likelihood of no anthropometric failure among children decreases in 1 to 2 year and 2 to 3 year age group in comparison to less than 1 year age group. After the three years the likelihood of no anthropometric failure increases slightly but it does not reach up to level of less than one year.

Type of caste or tribe is also an important determinant of nutritional status of child. In all EAG states, the likelihood of no anthropometric failure is lower in the SC, ST and OBC children. In this analysis, it is observed that SC children have the least likelihood to be in no anthropometric failure.

Education level of mother has strong bearing on the nutritional status of children. In all EAG states combined the likelihood of no anthropometric failure among children is reduced to almost half in comparison to highly educated mothers.

BMI level of mother have a strong relationship with the children nutritional status. It is interesting to note that likelihood of no anthropometric failure children of thin mothers is significantly reduced to less than half in comparison to overweight or obese mothers.

There is a very strong relation of wealth index with nutritional status of child and for the substantial poor-rich gap it was found that rich have a disproportionate advantage of no anthropometric failure. There are large differences in likelihood of no anthropometric failure among children in richest and richer group and small differences in likelihood are observed among other wealth quintiles.

In general inequality in no anthropometric failure among children is low in all EAG states. The values of concentration indices are not much higher in any of the state or for all EAG state. But there are evidences of unequal distribution of nutritional status of children. It is observed from the analysis that no anthropometric children is concentrated in the better off groups defined by type of caste or tribe, education level of mother, wealth index and exposure to mass media. Standard of living measured by wealth index has the largest role in the unequal distribution of the nutritional status of children. Education level of mother and exposure to mass media is the second and third largest factor respectively. The type of caste or tribe of children is the least affecting factor in unequal distribution of nutritional status of children among these four variables. Inequality in terms of wealth index in Odisha, Uttarakhand, Bihar and Jharkhand is higher in comparison to Rajasthan, Chhattisgarh and Madhya Pradesh, while in terms of type of caste or tribe it is higher in Odisha, Madhya Pradesh, Bihar and Jharkhand in comparison to Rajasthan, Chhattisgarh, Uttarakhand and Uttar Pradesh.

It was also observed that Madhya Pradesh which has the lowest percentage of no anthropometric failure among children but inequality is lowest among the studied

socioeconomic variables namely, education level of mother, wealth index and exposure to mass media. But in Bihar and Jharkhand, the percentage of no anthropometric failure children is low, however there is high inequality in terms of the type of caste or tribe and wealth index. While in Uttarakhand and Odisha there are high percentage of no anthropometric failure children, but inequality is also higher in terms of wealth index, education level of mother, exposure to mass media and type of caste or tribe (only for Odisha). Rajasthan also has higher percentage of no anthropometric failure among children but the inequalities are lower in terms of type of caste or tribe, exposure to mass media, education level of mother and wealth index.

This study also shows the contribution of various factors in unequal distribution of no anthropometric failure among children in all EAG states. Wealth index (45 percent) emerges as the largest contributor to the unequal distribution of nutritional status of children. Education level of mother as a factor accounts one-fifth for the distribution. Exposure to mass media and BMI of mother also has significant contribution 12.33 percent and 12 percent respectively. Type of caste or tribe has 8.43 percent contribution in the unequal distribution of no anthropometric failure among children.

From this study, the some important features regarding child nutritional status in EAG states emerges that have potential implication. The percentage of no anthropometric failure children is very low in each of the EAG state, but there are evidences of unequal distribution of no anthropometric failure across the various demographic and socioeconomic variables. So improvement in income of the poor, education and health status of women, eradication of caste based discriminations, spreading the awareness about nutrition provide a long term solutions to establish equality in terms of nutritional status among children. It is also important to target children at a very early age to avoid irreversible disorders in later stages. Reduction in poverty levels assumes prime significance as it has emerged as the largest contributor of the inequality in nutritional status. However, in the short run, direct nutrition intervention for all and improvement in environmental conditions should be the priority, because even in the better off groups the level of nutritional status of children is far from the optimal.

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CHAPTER - I

INTRODUCTION

"Nutrition refers to the availability of energy and nutrients to the body's cells in relation to the body's requirement. Thus it has major effect on health. Malnutrition refers to any imbalances in satisfying nutrition requirements" (Mishra et al., 1999, p.5). Children are the prime victims of malnutrition. Nutritional status of a child is usually determined by combination of dietary intake and infection and results in the anthropometric failure i.e., growth retardation. Child undernutrition is a major threat to child's survival, growth and full development potential.

Freedom from hunger and malnutrition was declared a basic child right long back in 1924 through the Declaration of the Rights of Children and as a human right in the 1948 in Universal Declaration of Human Rights. But yet a large proportion of world population lacks the access to adequate food. The extent of this problem can be estimated as it is recognised as first among of all the Millennium Development Goals to eradicate extreme poverty and hunger. The target was to halve the proportion of people who suffer from hunger between 1990 and 2015. According to the state of food insecurity report in the world, 2011, by Food and Agriculture Organisation, 13 percent of the world population is suffering from undernourishment in 2006-08. At global level 26 percent of children under five years of age are underweight in 2008 (UNICEF, 2010).

Nutritional status of child has serious and pervasive repercussions on the development of both mental and physical health of the child and ultimately on the productivity of economy and society. It has tremendous effect on developmental outcomes. A child's physical and intellectual potential is shaped during first three years. So, nutritional status of children in these years and mothers too has paramount influence on the child's later physical, mental and social development (UNICEF, 1998). Children under two years are most vulnerable to stunting, the effects of which are then largely irreversible. This is the period of life when suboptimal breastfeeding and inappropriate complementary feeding practices put children at high risk of undernutrition and its associated outcomes (UNICEF, 2010).

Children who are undernourished have substantially lower chances of survival. They are prone to suffer from serious infections and are more likely to die from common childhood

illness, such as diarrhoea, pneumonia, and measles. Malnutrition is a prime cause of slow physical and cognitive growth, impairs the immune system and increases the risk morbidity and mortality among children (Pelletier, 1998). According to Menon et al., (2009), hunger is most directly manifested in inadequate food intake and a poor diet, especially in combination with low birth weights and high rates of infections, can result in stunted and underweight children and the most extreme manifestation of continued hunger and malnutrition is mortality. Even if the child survives, the loss of social capital is tremendous (Gupta and Rhohde, 2004). According to WHO (1995), children who are underweight or stunted are at greater risk for childhood morbidity and mortality, poor physical and mental development, inferior school performance and reduced adult size and capacity for work. Some studies have shown that risk of non-communicable disease in adult life is higher in children who were stunted and underweight in early childhood and had rapid increase in body mass index in childhood and adolescence (Dietz and Bellizi, 1999; Victora et al., 2008). Undernutrition is also associated with poor educational outcomes and reduced adult earnings. Malnourished children tend to enter school later, repeat grades more often, and have higher dropout rates, resulting in fewer completed years of schooling compared to healthy children (Behrman et al., 2004).

1.1 Scenario of nutritional status of children

The nutritional status of children in developing world is very far from satisfactory levels. In developing countries approximately 195 million children under five years of age are stunted in 2008. Africa and Asia have the highest prevalence of stunting, 40 percent and 36 percent respectively, contributing more than 90 percent of the world's stunted children. Around 26 million children (13 percent of total children) and 129 million children under five years of age in developing countries are wasted and underweight respectively in 2008. The prevalence of underweight is 27 percent and 21 percent in Asia and Africa respectively (UNICEF, 2009). South Asia has the largest percentage of underweight children in the world and reduction rates are also very slow. The proportion of underweight children has declined from 31 percent to 26 percent between 1990 and 2008 at global level. But, the proportion of underweight children was 54 percent, 49 percent and 48 percent in 1990, 2000 and 2008 respectively in south Asia

(UNICEF Global databases, 2010). There is no substantial decline in the prevalence of underweight children in south Asia.

"Although, India is one of the fastest growing economies in the world, improvement in child nutrition is stagnant. In the last five decades, mortality rate has come down by 50 percent and the fertility rate by 40 percent but reduction in undernutrition is only 20 percent" (Ramachandran, 2010, p.301). According to the state of food insecurity report in the world, 2011 by Food and Agriculture Organisation, in 2006-08, 19 percent of Indian population is undernourished, while it was 20 percent during 1990-92. It shows that there is no significant improvement in nutritional status of Indian population during this period. India alone contributes 42 percent and 31.2 percent of underweight and stunted children respectively in developing countries. Anaemia levels are also very high in India, 70 percent among pre-school age children and 82 percent in children below age two are suffering from any type of anaemia. Table 1.1 shows the trends in nutritional status child of child below three years in India in NFHS rounds. It shows that malnutrition is declining at a very slow rate. In India, 52 percent of children under age three were stunted in 1992-93 (NFHS-I) which is decreased by only 1 percent in 1998-99 (NFHS-II) and 6 percent in 2004-06 (NFHS-III). The similar trend is observed in underweight children under age three, 53 percent children were underweight in NFHS-I, which is decreased by 10 percent in NFHS-II and reached up to 40 percent in NFHS-III. Unfortunately the percentage of wasted is increased. In NFHS-I, 18 percent children under age three were wasted. It was increased by 2 percent in NFHS-II and again 3 percent children in NFHS-III.

Table 1.1 Trends in nutritional status of children under age three years in India

	Stunted (in percent)	**Wasted** (in percent)	**Underweight** (in percent)
NFHS-I	52	18	53
NFHS-II	51	20	43
NFHS-III	45	23	40

Source: NFHS – III, 2005-06

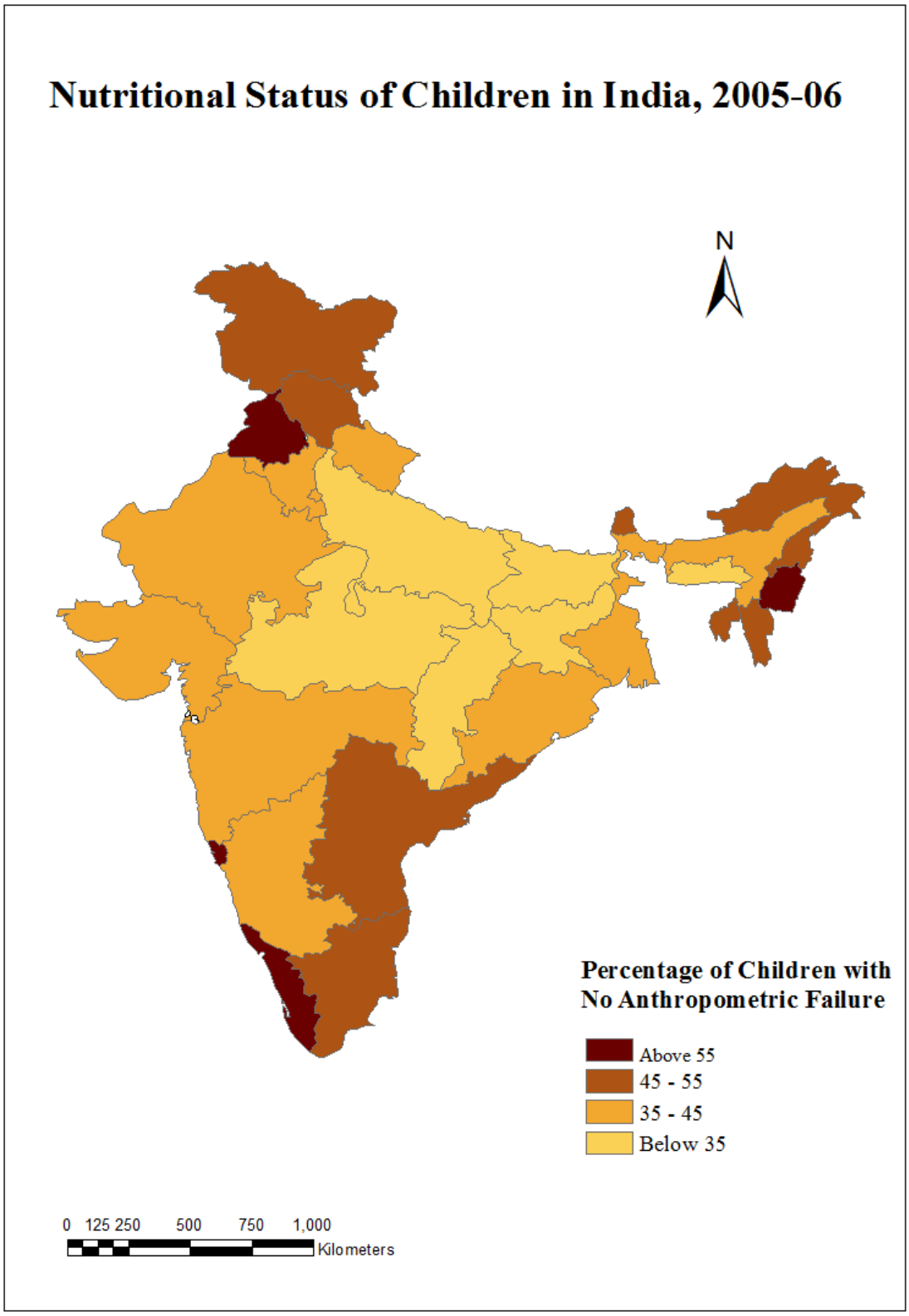
Table 1.2 Nutritional status of children in India by state, 2005-06

State	Stunting	Underweight	Wasting	CIAF	No Anthropometric Failure
Jammu and Kashmir	35.6	25.7	14.5	47.2	52.8
Himachal Pradesh	38.2	36.3	19.3	52.4	47.6
Punjab	36.5	24.6	8.9	42.9	57.1
Uttaranchal	44.7	38.1	18.9	57.2	42.8
Haryana	45.4	39.7	19.5	57.6	42.4
Delhi	42.6	26.9	16.1	55.1	44.9
Rajasthan	44.1	40.4	20.5	58.4	41.6
Uttar Pradesh	56.5	42.3	14.9	66.7	33.3
Bihar	55.7	56.1	27.3	71.1	28.9
Sikkim	36.8	21.1	10.5	47.4	52.6
Arunachal Pradesh	42.6	31.5	14.8	53.7	46.3
Nagaland	39.0	25.6	13.0	49.4	50.6
Manipur	35.3	22.5	8.9	44.1	55.9
Mizoram	40.0	20.5	9.1	47.7	52.3
Tripura	36.2	39.1	24.8	53.3	46.7
Meghalaya	55.4	49.5	31.2	72.1	27.9
Assam	46.1	36.4	13.6	56.6	43.4
West Bengal	44.3	38.6	16.8	56.7	43.3
Jharkhand	49.8	57.0	32.6	70.3	29.7
Odisha	45.1	40.9	19.6	59.4	40.6
Chhattisgarh	53.8	47.7	20.0	65.6	34.4
Madhya Pradesh	49.8	59.9	35.3	72.6	27.4
Gujarat	51.5	44.7	18.6	64.4	35.6
Maharashtra	46.3	36.8	16.3	58.3	41.7
Andhra Pradesh	42.7	32.7	12.3	53.1	46.9
Karnataka	43.6	37.6	17.8	56.7	43.3
Goa	25.6	25.6	14.0	37.2	62.8
Kerala	24.6	22.7	15.8	39.5	60.5
Tamil Nadu	31.4	30.0	21.8	49.7	50.3
India	**48.0**	**42.5**	**19.8**	**61.4**	**38.6**

Source: Computed from NFHS-III, 2005-06

Note: figures are shown in percentage.

Map 1.1 Nutritional status of children in India, 2005-06



Source: based on NFHS – III, 2005-06

According to NFHS-III (2005-06), 48 percent of children under age five years are stunted and 23.7 percent are severely stunted. The prevalence of wasting and severe wasting is 19.8 percent and 6.4 percent respectively. The proportion of underweight children is also very high, 42.5 percent are underweight and 15.8 percent are severely underweight. Table 1.2 shows prevalence of stunting, wasting, underweight, Composite Index of Anthropometric Failure (CIAF) and no anthropometric failure among children under age five in states of India. No anthropometric failure stands for children who are free from any type of anthropometric failure i.e., stunting, wasting and underweight. As shown in map 1.1, prevalence of no anthropometric failure among children is lowest in the states of Uttar Pradesh, Bihar, Jharkhand, Chhattisgarh, Madhya Pradesh and Meghalaya. In Uttarakhand, Haryana, Delhi, Rajasthan, Gujarat, Maharashtra, Karnataka, Odisha, West Bengal and Assam levels of no anthropometric failure is slightly higher than the Uttar Pradesh, Bihar, Jharkhand, Chhattisgarh and Madhya Pradesh. The percentage of no anthropometric failure is highest in Punjab, Goa, Kerala and Manipur. Jammu & Kashmir, Tamil Nadu, Andhra Pradesh, Sikkim, Arunachal Pradesh, Nagaland, Mizoram and Tripura have also better percentage of no anthropometric failure among children under age five. But overall even in the better states levels of no anthropometric failure among children is far from satisfactory. The percentage of no anthropometric failure is highest in Goa, where it is only 62.8 percent and rest 37.2 percent of children are suffering from at least one type of anthropometric failure.

1.2 Disparities in nutritional status of children in India

The burden of malnutrition is unequally distributed among various socioeconomic groups in India. Table 1.3 shows the prevalence of three indicators of undernutrition among children namely, stunting, underweight and wasting across gender. The percentage of female children is 1 percent higher in underweight, while in stunting and wasting, male children are slightly more undernourished. The ratio of male to female is around unity for all these indicators. Table 1.4 shows that in India, overall 42.5 percent of children are underweight. In rural areas 46 percent children are underweight, whereas it is around 33 percent in urban areas. The ratio of urban to rural underweight children is 0.7. There are also significant differences in stunting and wasting between urban and rural children.

Table 1.3 Percentage of undernutrition in children under five years according to gender in India, 2005-06

	Male	Female	Ratio to male to female
Stunting	48	48	1.0
Underweight	42	43	1.0
Wasting	21	19	1.1

Source: NFHS – III, 2005-06

Table 1.4 Percentage of undernutrition in children under five years according to place of residence in India, 2005-06

	Urban	Rural	Ratio to urban to rural
Stunting	40	51	0.8
Underweight	33	46	0.7
Wasting	17	21	0.8

Source: NFHS – III, 2005-06

Table 1.5 shows disparities in undernutrition of children across wealth quintiles. There are substantial differences between poorest and richest wealth groups. In poorest wealth quintile the proportion of underweight children is 57 percent while in richest wealth quintile it is only 20 percent. The ratio of richest to poorest is 0.4. The similar level of ratio of richest to poorest is observed in stunting and wasting (UNICEF, 2010).

Table 1.5 Percentage of undernutrition in children under five years across wealth quintile in India, 2005-06

	Poorest	Poorer	Middle	Richer	Richest	Ratio to richest to poorest
Stunting	60	54	49	25	25	0.4
Underweight	57	49	41	20	20	0.4
Wasting	25	22	19	13	13	0.5

Source: NFHS – III, 2005-06

1.3 Area of study

Nutritional status of population is closely linked with the level of socioeconomic development. Empowered Action Group of states lagged behind in the development process, which India experienced in last few decades. Improving nutritional status of population in backward societies is critical to break the vicious cycle of malnutrition and poverty.

Table 1.6 Demographic, socioeconomic and heath indicators of study area

Characteristics	India	Uttarakhand	Rajasthan	Uttar Pradesh	Bihar	Jharkhand	Odisha	Chhattisgarh	Madhya Pradesh
Demographic Indicator									
Population	1,02,86,10,328	84,89,349	5,65,07,188	16,61,97,921	8,29,98,509	2,69,45,829	3,68,04,660	2,08,33,803	6,03,48,023
% to total population of India		0.83	5.5	16.17	8.07	2.62	3.57	2.03	5.88
Density (Sq. /km.)	325	159	165	690	881	338	903	154	196
Decadal pop. Growth Rate (%)	21.52	19.34	28.4	25.91	28.26	23.36	16.25	18.27	24.26
Total Fertility Rate ®	2.7	N.A.	3.4	3.9	3.9	3.2	2.4	3.1	3.4
Sex Ratio (female per 1000 male)	933	916	921	898	919	941	972	989	919
Social Indicator									
Literacy Rate (%)	64.8	71.6	60.4	56.3	47	53.6	63.1	64.7	63.7
Female literacy rate (%)	53.7	59.6	43.9	42.2	33.1	38.6	50.5	51.9	50.3
Mean age at Marriage ®	20.6	N.A.	19.8	20.2	19.5	20.5	20.5	20.2	21.4
Economic Indicator									
Female work participation rate (%)	25.7	27.1	35.5	16.3	18.8	26.4	24.6	40.0	30
Proportion of BPL population ©	27.5	39.6	22.1	32.8	41.4	40.3	46.4	40.9	38.3
Health Indicator									
Infant Mortality Rate*	57	41.5	65.3	72.7	61.7	68.7	64.7	70.8	69.5
Child mortality Rate*	18.4	15.5	21	25.6	24.7	26.1	27.6	21	26.5
Neonatal mortality rate*	39	27	43.9	47.6	39.8	48.6	45.4	51.1	44.9
Maternal mortality Ratio+	301	517	445	517	371	379	358	379	379
Prevalence of anaemia among Children*	69.5	61.4	69.7	73.9	78.0	70.3	65.0	71.2	74.1

Sources: * NFHS-III, 2005-06, + SRS, RGI, 2001-03, ® Statistical Report, RGI, 2007, © Planning commission, India, Census of India, 2001, ORGI

Note: N.A. Not Available

In National Population Policy 2000, goals are set to achieve populating stabilization by 2045. But some states have poor performance in social and demographic development and further reducing population growth rates. Therefore, an Empowered Action Group (EAG) was constituted by the Ministry of Health and Family Welfare with the prime objective of giving specific attention to these states in order to achieve national goals. It includes Uttarakhand, Rajasthan, Uttar Pradesh, Bihar, Jharkhand, Odisha, Chhattisgarh and Madhya Pradesh. They together constitute 45 percent of total population of India.

The characteristics of the EAG states are shown in table 1.6. Decadal population growth rate in EAG states is very high. In Rajasthan, Uttar Pradesh, Bihar, Jharkhand and Madhya Pradesh, it is higher than national average. Total fertility rate except Odisha, in all EAG states stands above national average. Literacy rates of these states are also lower than the national average, whereas female literacy rates are much lower comparing to national average, showing low level of social development and lower status of women in society. Proportion of below poverty line population, is also much higher than national average except in Rajasthan. In Bihar, Jharkhand, Odisha and Chhattisgarh, more than 40 percent of the population lies below poverty line. Infant, child, neo-natal and maternal mortality rates are also higher, reflecting the low level of socioeconomic development in EAG states. Nutritional status of children under five in EAG states is also in critical situation. More than half of the children in Uttar Pradesh, Bihar, Chhattisgarh and Madhya Pradesh are stunted. The proportion of wasting is higher than national average in Rajasthan, Bihar, Jharkhand and Madhya Pradesh. In Jharkhand and Madhya Pradesh, it is more than 30 percent. The proportion of underweight children is very high in Bihar (55.9 percent), Jharkhand (56.5 percent) and Madhya Pradesh (60 percent), while the national average is 42.5 percent. The percentage of no anthropometric failure among children under age five is also very low in EAG states. It is only 27.4 percent, 28.9 percent, 29.7 percent, 33.3 percent and 34.4 percent in Madhya Pradesh, Bihar, Jharkhand, Uttar Pradesh and Chhattisgarh respectively. This is slightly higher in Odisha (40.6 percent), Rajasthan (41.6 percent) and Uttarakhand (42.8 percent). The aforementioned demographic, social, economic and nutritional indicators are evident of the fact that EAG states are lying in the bottom of all of these indicators. Therefore, Empowered Action Group of states is selected for the analysis of nutritional status of children.

1.4 Objectives

1. To show the nutritional status of children by disaggregated sub groups of anthropometric failure in EAG states of India.
2. To examine the impact of various demographic, socioeconomic, maternal and other determinants of the nutritional status of children in EAG states of India.
3. To assess and analyse inequalities in nutritional status of children by socioeconomic characteristics in EAG states of India.

1.5 Organisation of the study

This study is divided into five chapters. First chapter of the study introduces to nutrition, its importance and scenario as well as area of the study. A review of literature is presented in the second chapter. Chapter three discusses conceptual framework for the analysis of nutritional status of child, database, methodology and variables selected for the study. In the fourth chapter, a detailed analysis of levels, determinants and inequalities in nutritional status of children in EAG states of India is presented and discussed. Last chapter contains summary and conclusion of the study.

CHAPTER - II

A REVIEW OF LITERATURE

Adequate nutrition is essential for the physical, mental and other development of children since the very early phase of life. Its inclusion in Millennium Development Goals shows its importance in human development. Nutritional status of a child is controlled by various demographic, socioeconomic, maternal and other factors. Mosley and Chen (1984) provided a comprehensive framework to study relationship between nutritional status of child and various socioeconomic and biological variables. They identified maternal factors, environmental contamination leading to infections, nutrient availability to the child as well as to mother during pregnancy, lactation and socio-cultural factors as the determinants of nutritional status of child.

In this chapter we discuss the available literature about different factors which influence the nutritional status of children. These factors are categorized into demographic, social, economic, maternal and other factors. The demographic factors include age and sex of the child. In the social factors place of residence, type of caste or tribe, religion and education level of mother are included. Economic factors which influence child nutritional status are standard of living and mother's work status. Maternal factors which have considerable impact on the child nutritional status are birth order, birth interval, BMI of mother and anaemia level of mother. Besides these factors other factor which has significant impact on the child nutritional status is exposure to mass media.

2.1 Demographic factors

2.1.1 Age of the child

The nutritional intake in initial years of a human being is important for their physical and mental growth. Different organs, tissues, bones and brain are formed during the period of conception to age of three years. In this initial three years human physical and intellectual development proceeds at a rapid rate, so nutritional status of child in these years have significant impact on the child's physical, mental and social development (UNICEF, 1998).

The variation in nutritional status of children according to age is observed. In India, a study based on NFHS-II reveals that underweight and stunting are very low for the children less than six months of age but it almost double for the children of six to eleven months of age. And for the children one to two year it further increases and more than half of the children are underweight and stunted. If a child reaches up to age three malnutrition and other related disorders becomes a serious problem and it is difficult to reverse these disorders (Arnold et al., 2004). The prevalence of wasting is the highest among children between 12 and 24 months of age, while the prevalence of stunting increases over time up to age of 24 and 36 months and then shows a tendency to level off (Sachdev, 1994). The prevalence of stunting increased with age of the child. The prevalence was considerably less in the first six months, when children are more likely to be fully breastfed. The prevalence increases rapidly up to 12 to 23 months of age, after which it increased more slowly (Hong and Mishra, 2006). An increasing pattern of stunting by age is consistent with the typical pattern of increasing prevalence of childhood diseases by age such as diarrhoea and acute respiratory infections in many developing countries (Casa, 2001; Mishra, 2003). This may partly be due to the beginning of feeding solid foods to a child around 6 months of age, which increases the likelihood of consuming contaminated foods and removes the protection provided by breast milk. Additionally, children begin crawling around this age and are more likely to be carried outdoors, which exposes them to additional infections (Hong et al., 2006)

Good nutrition is a prerequisite when mothers are pregnant and during children's first two years of life, after which the opportunity for child's development potential is lost forever. Malnutrition is highly correlated with the high level of mortality. If a child survives with the deprived nutritional status due to inadequate food in the first five years of life are susceptible to permanent stunting (Bender and Smith, 1997). The children of deprived sections of the society who survive on the inadequate food experiences transit from normalcy to full-fledged clinically manifest malnutrition which generally supervenes before the third year of life (Gopalan, 1989).

2.1.2 Sex of the child

Discrimination against women is a major underlying cause of malnutrition (UNICEF, 1998). In developing countries discrimination against girl child in feeding and healthcare are

considered as cause of lower nutritional status and higher mortality among the girls (Basu, 1989; Hill and Upchurch, 1995; Pande, 2003).

In India male children are valued higher than female children and there is evidence of discrimination in respect of food and healthcare. Where there is a strong preference for sons, boys will receive preferential treatment in feeding and medical treatment (Williamson, 1976). Hence the prevalence of malnutrition is often found higher among girls than boys (Geetha and Swaminathan, 1996; Gopalan, 1995; and Pande, 2003). The effects of child's sex and mother's number of living sons on feeding, healthcare, and nutritional status will be greater in north India than in south India, because son preference is stronger in the North (Arnold et al., 2002).

However, many studies based on anthropometric data do not find a higher prevalence of malnutrition in girls in India, as well in other developing countries (Marcoux, 2002; Sommerfelt and Arnold, 1998; Haddad et al., 1996). Despite the strong prevalence of son preference in India, there is no evidence that girls are much more malnourished than boys (Arnold et al., 2004; Radhakrishna and Ravi, 2004). Studies also reveal that stunting and wasting was more among the male children than among the female children of Malto tribes of Bihar (Rajaratnam, 1997). There is no evidence of any gender bias in nutrition against girls in Vietnam (Haughton and Haughton, 1997) and Bangladesh (Hong et al., 2006). In India, too there is no gender bias against girl child in stunting, and underweight in first and second rounds of NFHS, while male children were more likely to be wasted than female in first round of NFHS, but this differential is not observed in the second round. But evidences of gender discrimination are observed with increasing birth order of child and sex composition of the older living children (Mishra et al., 2004).

2.2 Social Factors

2.2.1 Place of residence

According to Bender and Smith (1997), rural children are more likely to be underweight because they are more likely to be poor. Although urban poverty is a growing phenomenon in the developing world because of rapid urbanization and other factors up to 80 percent of

extreme poverty is concentrated in rural areas. Prevalence of child undernutrition in rural areas is much higher than in urban areas of India. But even urban areas are not in satisfactory situation, around one-third of children are stunted and underweight (Arnold et al., 2004). NFHS data for 1998-99 shows that in rural areas 50.5 percent of children are undernourished (weight-for-age), while in urban areas it is only 39 percent (Radhakrishna and Ravi, 2004). Other evidence shows that urban children generally have a better nutritional status than their rural counterparts (Ruel et al., 1999).

2.2.2 Type of Caste or tribe and Religion

Malnutrition is not only affected by income, education level and access to public health services, social identity has significant impact on the nutritional status of children. According to NFHS-III, SC and ST children have lower nutritional levels than general caste in similar levels of wealth and mother's education. SC and ST children and mothers also have relatively lower access to public health services than other social groups. Children belonging to the socially deprived groups i.e., scheduled caste, tribes and other backward classes, have relatively high level of anthropometric failure and among them tribal children suffer from the highest level of undernutrition (Kanungo and Mohanta, 2004; Thorat and Sabharwal, 2011) and it is also found to be a leading cause of mortality among children (Rajaratnam et al., 1997). Many studies found that undernutrition is widely prevalent in tribal children in India (Sharma et al., 2006; Rao and Rao, 1994; Rao et al., 2005; Iqbal et al., 1999: Mitra et al., 2004). Various socio-cultural and environmental factors are associated with the low nutritional status of tribal children (Sharma et al., 2006). Brahmin preschool children have better nutritional status than tribal and other caste groups (Ghosh et al., 2001).

Across religious groups, Christian and Sikh children have relatively better nutritional status than Hindu and Muslim children (Thorat and Sabharwal, 2011; Sabharwal, 2011). According to a study by Haughton (1997) of Vietnamese children, it is seen that children born into the ethnic minorities are more likely to be stunted.

2.2.3 Mother's education

According to Gopalan (1989), the level of female literacy in the household is often a major determinant of child rearing practice and therefore of the level of child malnutrition in poor

households. Education of parents especially mother is an important socio-cultural factor, which determines the nutritional status of children. Studies have found that literate and educated mothers have fewer malnourished children than illiterate mothers (Sommerfelt and Sewart, 1984; Pena, 2000). A study by Arnold et al., (2004) based on NFHS-II shows that the education level of mother has significant impact on the nutrition level of children. Children of illiterate mothers are more than twice likely to be stunted and underweight and one and a half times likely to be wasted in comparison to children whose mothers have completed at least high school level education. Another study based on NFHS-III, reveals that the education level of mothers show considerable impact on the nutritional status of children. The children of illiterate mothers are likely to be two times malnourished than that of children of mothers with secondary or higher education (Sabharwal, 2011). A study by Haughton and Haughton (1997) on Vietnamese children shows that when parents are more educated, their children are likely to be less malnourished. Boyle et al., (2006) identified that the correlation between child health and maternal education increases in strength at higher levels of education.

Food, health and care are three component of nutrition and they are influenced by family environment particularly women. Countries where nutrition improvement has lagged behind economic growth, social discrimination against women is common. It further causes lower education level of women and is it an underlying factor in determining nutritional status of child (UNICEF, 1998). Women's education has significant impact in improving child health through more effective care at the home and enhanced use of treatment and prevention services from the health care system (Caldwell, 1979, 1994). He has argued that three factors are of importance in this regard. These are i) a reduction in fatalism in the face of children's ill health; ii) a greater capability in manipulating the world (e.g., in knowing where facilities are, and in securing the attention of doctors and nurses); and iii) a change in the traditional balance of family relationship that shifts the focus of power away from the patriarch and mother-in-law and ensures that greater share of available resource to children. The importance of maternal education can be understood that it is noted by Boyle et al., (2006) that independent influence of maternal education on child health is stronger than the independent influence of within-country distributions of household wealth. However, a study by Desai and Alva (1998) shows little empirical evidence for impact of maternal education on child nutritional status. Maternal education is associated with improved socioeconomic status,

geographic residence, attitudes towards health care and reproductive behaviors. Maternal education has independent influence on child nutritional status. But socioeconomic status remains the primary pathway linking maternal education and child nutritional status (Frost et al., 2005). Some other studies also show little effect of maternal education on the stunting particularly in less educated societies (Hong and Mishra, 2006; Hong et al., 2006; Hong, 2006). In South Asia, gender-based rules restrict opportunities in decision making which may be related with high level of child malnutrition regardless the education level of mothers (Shroff et al., 2011). There are evidences that mothers with more education are also more likely to have children with better anthropometric growth (Basu & Stephenson, 2005; Cleland, 2010; Miller & Rodgers, 2009), but this relation is not universal (Agee, 2010; Moestue & Huttly, 2008; Thang and Popkin, 2003).

2.3 Maternal Factors

2.3.1 BMI of mother

The Body Mass Index (BMI) is an indicator used to assess both thinness and obesity. It is defined as weight in kilograms divided by height in meter square (kg/m^2). Usually BMI of less than 18.5 kg/m^2 is considered as indicator of chronic energy deficiency. According to NFHS-III, 36 percent of women aged between 15 to 49 years have a BMI below 18.5 kg/m^2 in India. According to UNICEF (1998), the infants of malnourished and underweight women are likely to be small at birth. During pregnancy, growth of a foetal depends on how much weight a woman gains while she is pregnant as gains in weight are essential for the development of foetal tissues. Mothers with normal stature had normal newborns more than those with present and past forms of malnutrition. The risk of malnutrition is higher among children whose mothers suffer from chronic energy deficiency (Radhakrishna and Ravi, 2004).

Mothers with short stature and low BMI show very high relative risk of abnormalities because stunted women are more likely to experience obstructed labour and are therefore at greater risk of dying while giving birth. There is also a positive relationship between stunting of the mothers and the occurrence of low birth weights in their offspring. With respect to both height and weight, it is observed that infants who start with the initial handicap of low birth weight

apparently never fully recover from their initial handicap. As per Gopalan (1989) low birth weights in infants make a permanent contribution to stunting of the child. Brennam et al., (2003) stated in their study that mother's BMI also plays a very significant role in the wasting of the child. The prevalence of stunting was also strongly negatively associated with BMI of mother (Hong and Mishra, 2006).

2.3.2 Anemia in mother

Prevalence of anemia during pregnancy not only affects the health and quality of life of the mother, but also of the newborn. It is the one of the most important of all micronutrient deficiencies during pregnancy. Since the foetus depends entirely on the mother for nutrients, pregnant women not only need to gain weight but also must maintain an optimal intake of essential nutrients such as iron. The consequence of anaemia for pregnant women and their new born children are often disastrous and put women at higher risk of deaths because of the greater likelihood of haemorrhage in childbirth and their newborns face a high risk of poor growth and development (UNICEF, 1998). As per Kanungo and Mohanta (2004) the provision of iron and folic acid tablets to pregnant women prevents nutritional anaemia. According to UNICEF (1998) many countries especially developing countries have adopted policies to ensure that women who seek antenatal care have access to daily iron supplements to help them meet the very needs of pregnancy and childbirth. Sachdev and Choudhary (1994) indicated that the National Anaemia Prophylaxis Programme of Iron and Folic acid tablets distribution to pregnant women and young anaemia children was initiated to reduce the prevalence of anaemia as a part of National Plan of Action for children on the basis of National Nutritional Policy of 1993 for preventing malnutrition.

2.3.3 Birth order and birth interval of the child

An important maternal factor namely birth order of the child has significant influence on the nutritional status of children. It is usually said that the oldest child is least malnourished and the subsequent children are increasingly poorer nutritional status. There are a number of acceptable explanations. Pandey et al., (1998) pointed out that births of very high order may have mothers who are physically depleted at the time of conception and during pregnancy, thus newborn suffer from foetal growth retardation and low birth weight. As well as parents

may have less time per child for care once their families become large. Additional children may also stretch the household budget too far and reflect a more intense competition faced by higher birth-order children for the resources. Thus it negatively affects the nutritional status of children. Mothers become older and may become more physically depleted as they have more children and thus cannot without difficulty recover the energy to devote as much attention to late-arriving children. Some other studies also identified that prevalence of undernutrition is higher among children of higher birth order, because birth order itself correlated with age of mother and competition for food is greater in households with more children (Hong and Mishra, 2006; Hong et al., 2006). Haughton and Haughton (1997) analyzed in their study that to the some extent there is a quantity-quality trade-off between having a few children and lavishing attention on them and having a lot of children but letting a few children and lavishing attention on them and having a lot children but letting them fend more themselves. They also pointed out that higher parity children are more malnourished, being more stunted and wasted than lower parity children in Vietnam. Studies by Sommerfelt and Stewart (1984) have found that malnutrition (Frost et al., 2005) and infant child mortality is lower among children of lower birth orders than that of higher birth orders children.

Mosley and Chen (1984) consider the demographic characteristics such as the age of mother at childbirth and birth interval as the important maternal factors influencing the nutritional status of children. Many studies have found that infant and child mortality, and malnutrition, is higher among children born with a short birth interval of less than 24 months (Sommerfelt and Stewart, 1984; Frost et al., 2005).

2.4 Economic factors

2.4.1 Mother's work status

The work status of the mothers also has strong bearing on nutritional status of children. In South Asia, very high level of child malnutrition is correlated with the women's low level of employment. But, if women have to work to meet the needs of the family the nutritional status of children is negatively affected. Proper nutrition and rest during pregnancy are essential elements in determining child nutritional status (UNICEF, 1998). A study by Radhakrishna and Ravi (2004) shows that probability of malnutrition among children increases with the working status of mother in India.

Poor mothers who must work are particularly vulnerable and employment conditions often do not allow infants to accompany their mothers and misconception about bottle-feeding results in child malnutrition (Gupta and Rhode, 2004). Ukwuani et al., (2003) identified that not all types of mother's work have a negative effect on child health during infancy and positive effects on child health during childhood. Mother's work did not have a negative effect on stunting during infancy and wasting was only higher for children of mothers who did not earn cash from work and never went to work with their children.

2.4.2 Wealth index

Mosley and Chen (1984) in their framework for child survival have identified that standard of living has substantial impact on the nutritional status of children. It affects availability of food, water and clothing, housing condition, sanitation, personal hygiene, information and sickness care. Income level of household directly affects consumption pattern, which further determines the nutritional status of children. Arnold et al., (2004) in their study based on NFHS-II show that among Indian children from households with a low standard of living more than the one-quarter of the children are stunted and underweight.

The type and amount of food people eat are largely determined by economic factors, especially the price of food relative to income. As income rise, people tend to demand larger quantities of food and more variety in their diets, the share of inexpensive starches in the diet falls and the share of animal products, oils, sweeteners, fruits and vegetables rises which increases the nutritional status (Bender and Smith, 1997).

Wealth status had a strong negative effect on stunting. Children from the poorer households are at a much greater risk of being chronically undernourished than children in the better off households. Children in the poorest wealth quintiles are at more than twice the risk of being stunted than children in the richest wealth quintiles, controlling the other factors (Hong and Mishra, 2006; Hong, 2006). Some other studies also show that children in poorer households tend to be more undernourished than children in better off households (Thang and Popkin, 2003; Larrea and Freire 2002; Wang et al., 2002; Doak, 2002). Wealth status of household provide opportunity for improving child health within countries in much the same way that

economic development level can improve child health nationally. It provides an opportunity to improve the material circumstances of the family and to buy goods and services that have positive influence on health. It is well established at the low end of the wealth quintile that poverty is an important determinant of mortality and poor health in all countries (WHO, 1999).

In countries where economic growth has resulted in increased household income and resource access for the poor, the nutritional pay-off has been large. For example, in Indonesia, economic growth from 1976 to 1986 was accompanied by improvements in nutrition (UNICEF, 1998). Economic well-being of the household operates mainly through better food availability, more hygienic living conditions and better access to health services in affecting the health and nutritional status of children (Hong, 2006).

Radhakrishna and Ravi (2004) estimated that 10 percent reduction in poverty reduces undernutrition by 3 percent and severe malnutrition by 7 percent. They also identify that undernutrition declines with standard of living but it persist even among the top wealth quintiles in India. The prevalence of malnutrition in top quintiles could be attributed to factors such as environmental hygiene, health, etc. According to Ramachandarn (2010), poverty is no longer a major determinant of undernutrition. Improved health and nutrition infrastructure can provide coverage quality services to improve nutritional status of children.

There are evidences that economic inequality is strongly correlated with the child undernutrition (Hong, 2006). But, the relationship between economic inequality and children's nutritional status is not conclusive. A recent study in Mexico found that household poverty is not a necessary condition for children to be undernourished (Reyes, 2004). Another recent study in Ecuador found inconsistent evidence of a relationship between economic inequality and childhood undernutrition (Larrea and Kawachi, 2005).

2.5 Other factors

2.5.1 Exposure to mass media

Mass media is generally identified with print media, film, radio and television are capable of changing the attitudes and behavioural patterns of the people and have assumed a powerful role in modern society. According to Schramn (1964), mass media acts as 'mobility

multiplier', spreading favourable attitude for social change. Mother's exposure to mass media such as radio, television, film and newspaper plays significant role in reducing child mortality. Women, exposed to mass media are likely to have access to information on health-care services and ways of enhancing maternal and child health (Pandey et al., 1998). Information, education, and communications promote changes in attitudes and practices among women about health care services and motivate them to use the services appropriately. Thus, these activities can help prevent mortality and enhance nutritional status of the child (Tinker and Koblinsky, 1993).

To sum up, since the intellectual and physical development of children that takes place during the first five years of life is entirely dependent on the nutrition provided during these crucial years, it is necessary to study the nutritional status of children during these five years. The different demographic, socioeconomic, maternal and other variables discussed in this chapter to explain their importance in determining the child nutritional status. The review of literature presented above is used for framing the conceptual framework in the next chapter, which helps in subsequent analysis of the effects of demographic and socioeconomic factors on child nutrition in EAG states of India.

CHAPTER-III

CONCEPTUAL FRAMEWORK, SOURCES OF DATA AND METHODOLOGY

On the basis of literature review in second chapter, a conceptual framework is developed in this chapter to analyse effects of various demographic and socioeconomic factors on the child nutritional status. It is a useful tool for analysis of relationship between the various concepts. This chapter is divided into four sections. The plan of the chapter is as follows. In first section, we present and discuss the conceptual framework for empirical analysis of the impact of different demographic, socioeconomic, maternal and other factors on the child nutritional status. Second section presents method for the assessment and classification of child nutritional status. Third section outlines sources of data and selection of dependent and independent variables. And in fourth and last section, methodologies are discussed which are used for the analysis in the following chapter.

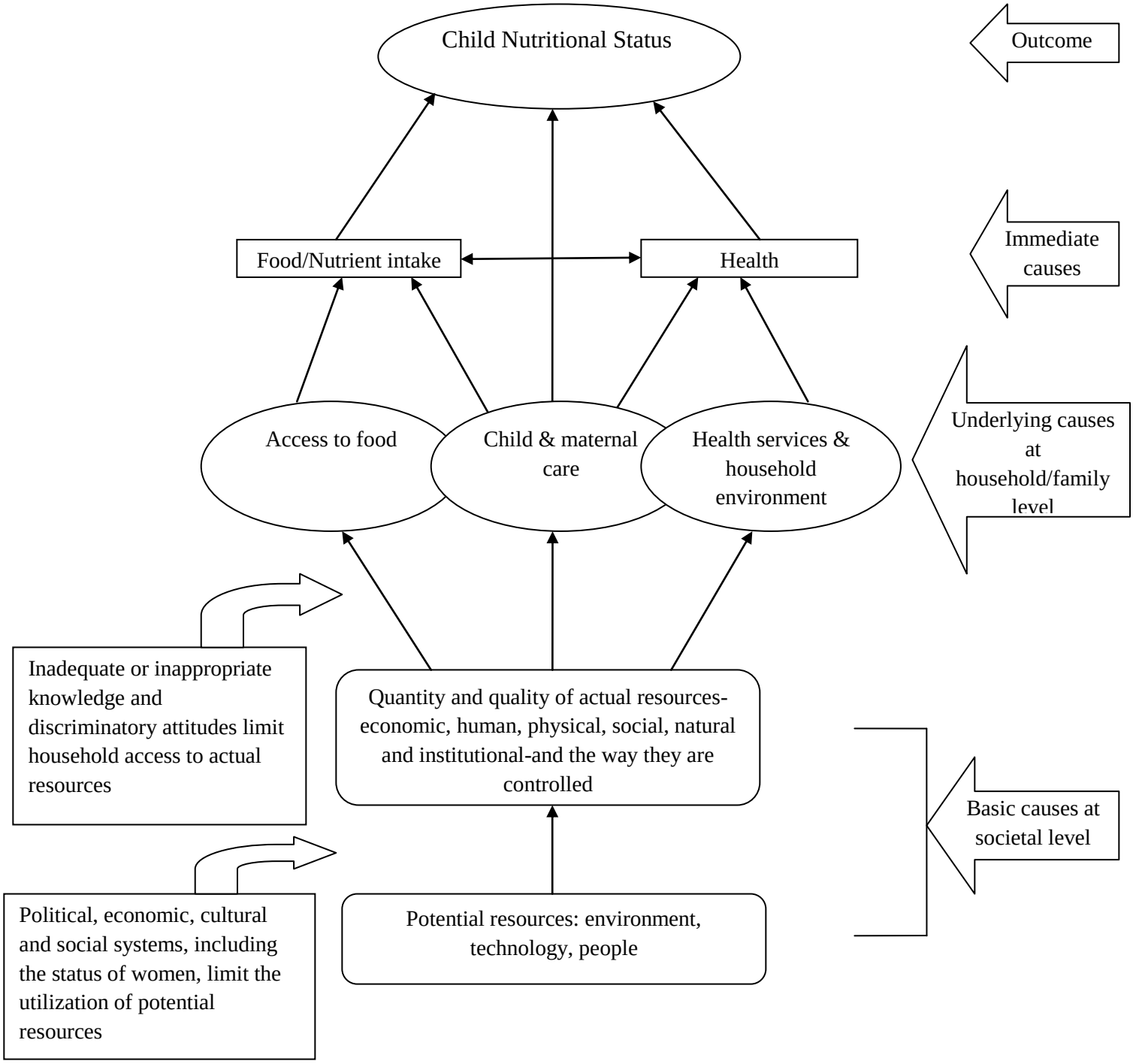
3.1 Conceptual framework

Determinants of child nutritional status at the individual, household and societal level are well known. The conceptual framework shown in figure 3.1 for the determinants of child nutritional status is adapted from framework developed in 1990 as a part of UNICEF Nutrition Strategy, Black et al., (2008) and Kadilya et al., (2012). The framework shows that causes of malnutrition are multisectoral, embracing food, health and caring practices. They are also classified as immediate (individual level), underlying (household or family level) and basic (societal level), whereby factors at one level influence other levels (UNICEF, 1998).

As per shown in the framework, the two immediate causes that affect the nutritional status of child are food/nutrient intake and health. The interplay between these two factors determines nutritional status of children. The food/nutrient intake of children affects the health condition of a child and reduces the chances of falling ill and if a child falls ill it increases the nutrient requirements of body.

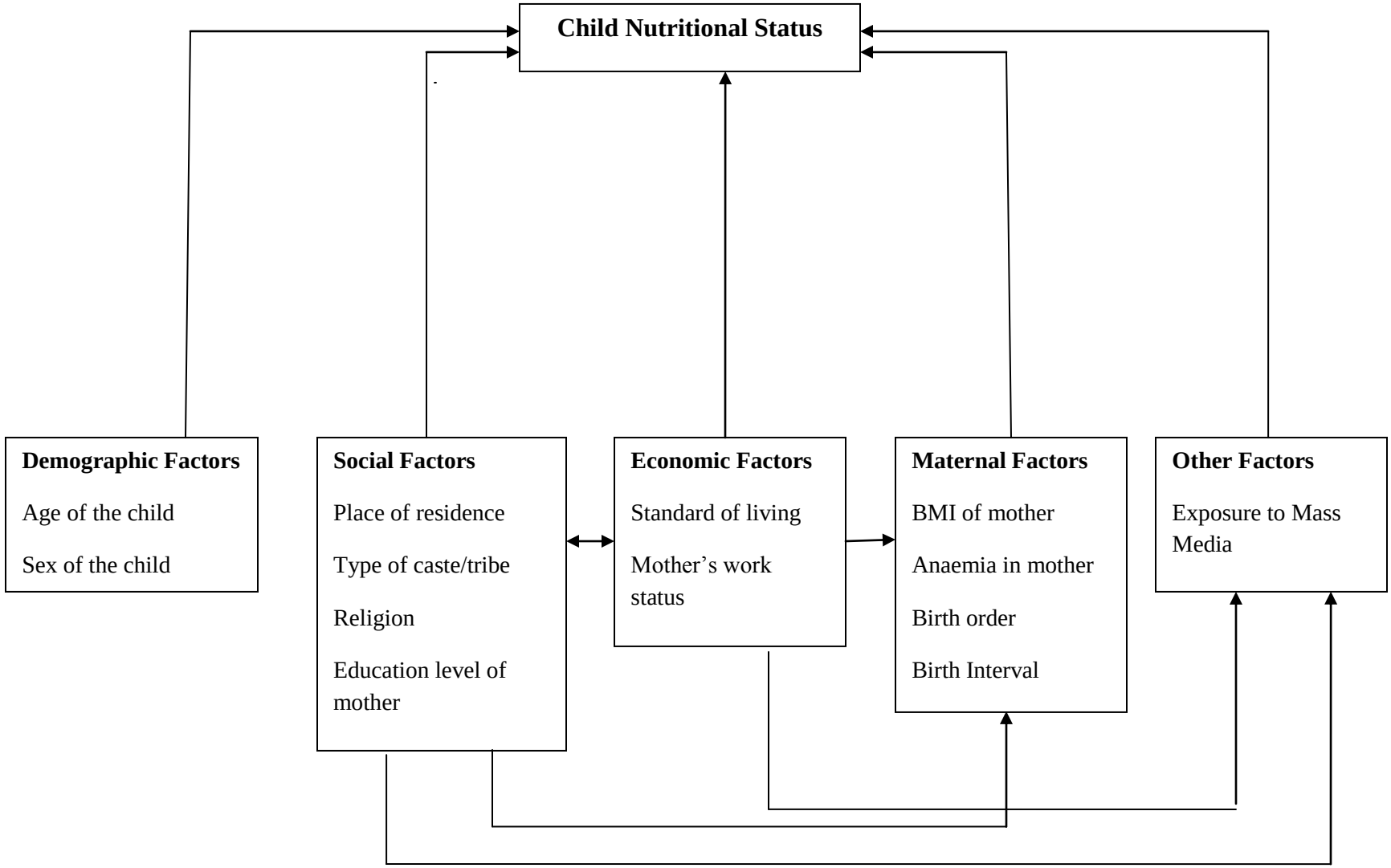
Three underlying causes namely, access to food, maternal and child care and household environment and health services are recognized that lead to immediate causes. Access to food is defined as physical, economic and social access to nutritious food in sufficient quantity and

Figure 3.1 Conceptual framework of the determination of child nutrition



Source: Adapted from UNICEF (1990), Black et al., (2008) & Kadilya et al., (2012)

Figure 3.2 Conceptual framework for the analysis of child nutritional status



quality to ensure adequate food intake. Household environment and health services are determined by the accessibility of safe water, sanitation and health services. Affordable and quality health care services are essential elements of the good health of population. Healthy household environment refers to the access to safe water, proper sanitation and hygienic manner of food handling as well as hygienic conditions around the house for prevention of infectious diseases. Caring practices of child and mother also have significant impact on the nutritional status of children. Care of the children includes the ways a child is fed, nurtured, taught and guided i.e., proper breastfeeding, complementary food, immunization, emotional support and cognitive stimulation. Maternal care includes health care and proper rest particularly during the pregnancy and lactation.

The basic determinants of child nutritional status are the economic, social, political and other institutional set up that determine how resources are distributed. Economic growth is not a sole factor which affects the nutritional status of children. In many regions of the world economic growth has not resulted in the rise of the nutritional status. Along with income poverty, discrimination, status of women and social sector spending has significant impact on the nutritional level of children (UNICEF, 1998). These basic determinants are responsible for the causing inequality in the nutritional status of children. This study has taken these basic determinants for the analysis of inequality in nutritional status of children.

On the basis of the above mentioned conceptual framework, a framework, shown in figure 3.2, is developed to analyse the determinants and inequalities in child nutrition in EAG states. The determinants of child nutritional status are classified into five types of factors namely, demographic, social, economic, maternal and other factors. Demographic factors include: age and sex of the child. Place of residence, type of caste/tribe, religion and education level of mother are social factors included in the analysis. Standard of living and mother's work status are considered to be important economic factors responsible for child nutritional status. Maternal factors include BMI of mother, anaemia level of mother, birth order and birth interval of child. Other factors include exposure to mass media. It is observed that all factors directly and in relation with each other influence the nutritional status of child.

It is evident from the framework that beside the direct influences, some factors have indirect impact on child nutrition. Economic factors like standard of living and work status of mother

influence maternal factors like BMI of mother, anaemia level of mother, birth order and birth interval. Economic factors also affect social factors like education level of mother and exposure to mass media. Social factors have substantial impact on the maternal factors like birth order and birth interval of children, and economic factors like standard of living and mother's work status. Social factors also affect the mother's exposure to mass media. So, many indirect influences of the above discussed factors are on the child nutritional status.

After discussing the conceptual framework, now we describe the methods of assessment of nutritional status of children.

3.2 Assessment of nutritional status

The nutritional status of an individual is a result of many interrelated factors. It is influenced by factors like food intake (quantity & quality), illness and infections. Nutritional status can be evaluated by four methods, namely Anthropometric, Biochemical, Clinical and Dietary Evaluation. Anthropometric method utilises physical dimensions and composition of body to assess the nutritional status. In Biochemical method, body fluids and parts are tested to assess nutritional level. Estimation of hemoglobin level is the most important biochemical test and useful indicator of the overall state of nutrition. Clinical method assesses nutritional status on the basis of physical signs that are supposed to be associated with protein energy malnutrition and deficiency of vitamins & micronutrients. But, there are limitations associated with this method. It cannot detect early cases of deficiencies of nutrients because the physical signs did not appear till they become severe in nature. The last method is Dietary Evaluation, it uses dietary pattern of an individual to assess the nutritional status. Dietary history since early life, dietary habits, recent dietary intakes, food frequency, and observed food consumption are used to evaluate the nutritional status.

Anthropometric and biochemical methods are based on the rational assessment of the nutritional level. They are also suitable for the assessment of nutritional level of population. Inadequate food and infections have negative effect on the growth and composition of human body. Anthropometric method is supposed to be most reliable and suitable way to assess nutritional status of population. Biochemical method also provides useful information about the nutritional level. Hemoglobin level alone provides general picture of the nutritional status.

These methods provide value free and unit based level of nutrition. Clinical method requires careful examination by experts and it is not suitable for assessment of early cases of nutritional deficiency. Dietary Evaluation method needs careful coverage and it is very difficult to assess the dietary history. So, anthropometric and biochemical methods are practically most suitable methods.

3.2.1 Nutritional anthropometry

There are various variables of nutritional significance e.g. height, weight, arm circumference, skin fold thickness, chest circumference, head circumference, head/chest ratio, hip/waist ratio, that are widely used to assess the nutritional status of population. Weight is one of the most useful measures of the physical examination for the assessment of nutritional status. It is a measure of overall nutritional status with age, sex, and height required for optimal interpretation. Height is also an important measure of nutritional status for monitoring long-term nutritional status (Maqbool et al., 2008). Proportions of weight and height with age are widely used to evaluate the nutritional status. The following anthropometric indices are used in this study for assessment of nutritional status of children:

Height-for-Age

The height for age represents the height of a child with that of a median reference population. Deficits in height for age are signs of stunting. It reflects failure to receive adequate nutrition over a long period. This index is an indicator of chronic undernutrition.

Weight-for-Height

The weight for height compares the weight with height of a child with that of a median reference population. Weight below the expected weight of a child of the same height reflects wasting. It represents the failure to receive adequate nutrition in recent period. This index is an indicator of acute undernutrition.

Weight-for-Age

The weight for height represents the weight of a child with that of a median reference population. A deficit in weight below the expected weight of a child is an indicator of

underweight. It is a composite indicator of stunting and wasting, which takes account of both acute and chronic undernutrition.

There are three different systems by which a child can be compared to the reference population: z-scores (standard deviation scores), percentiles, and percent of median. For population-based assessment, z-score is recognized as the best system for analysis and presentation of anthropometric data because of its advantages compared to the other methods (WHO, 1995). Use of a reference population facilitates comparison in the nutritional status. The z-score system expresses the anthropometric value as a number of standard deviations or z-scores below or above the reference mean or median value. These scores are also sex independent, thus permitting the evaluation of children's growth status by combining sex and age groups (WHO, 1997). So, each of three indices is expressed in standard deviation scores from the median of the reference population.

The reference population is based on the empirical findings derived from field testing from various countries and different part of the world and applicable to all ethnic groups. This study uses estimates of nutritional status based on new international reference population recommended by WHO Multicenter Growth Reference Study Group in 2006. Before this recommendation the U.S. National Center for Health Statistics (NCHS) standard was used as reference population. The new WHO growth standard, 2006 is based on samples of children around the world (Brazil, Ghana, India, Norway, Oman, and the United States) who are raised in healthy environment. It considers breastfed child as the normative model for growth and development standards, depicts normal early childhood growth under optimal environmental conditions, and applicable to children from different ethnicity, socioeconomic status and type of feeding. The new WHO standard of international reference population provides a better tool to assess the nutritional status of children than the earlier NCHS standard (Onis et al., 2006).

3.2.2 Classification of nutritional status

The population lying between specific cutoff points evaluates the level of nutrition status. The nutritional status of children is classified based on distribution of standard deviation scores for three indices namely, height-for-age, weight-for-height and weight-for-age. According to

WHO classification, Children having z-scores falling below minus two standard deviation (-2SD) from the median of the reference population are considered as undernourished and below minus three standard deviation (-3SD) are categorized as severely undernourished for these three anthropometric indices.

- **Height-for-Age**

Percentage distribution from International Reference Population Median	Nutritional Status
Below -2SD	Stunted
Below -3SD	Severely Stunted

- **Weight -for-Height**

Percentage distribution from International Reference Population Median	Nutritional Status
Below -2SD	Wasted
Below -3SD	Severely Wasted

- **Weight-for-Age**

Percentage distribution from International Reference Population Median	Nutritional Status
Below -2SD	Underweight
Below -3SD	Severely Underweight

Composite index of anthropometric failure (CIAF)

The above three anthropometric indices namely, Height-for-Age, Weight-for-Height and Weight-for-Age show particular type of nutrition, so none of them provide a comprehensive estimate of level of undernourished children in a population. Some children who are stunted also may have wasting and/or be underweight, some children who are underweight also may have wasting and/or stunted, and some children who have wasting also may be stunted and/or underweight (Nandy et al., 2005). Weight-for-Age (the intention behind using this indicator is

to capture both stunted and wasted) is generally used as a composite measure of undernourishment. But, it does not identify the sum of those who are stunted and/or wasted. The Weight-for-Age indicator in fact misses some of the children who are undernourished in terms of two latter indices. Therefore, the Weight-for-Age indicator can underestimate the total prevalence of anthropometric failure (Svedberg, 2000).

Table 3.1 Classification of children with anthropometric failure

Group	Description	Wasting	Stunting	Underweight
A	No Failure	No	No	No
B	Wasting Only	Yes	No	No
C	Wasting and Underweight	Yes	No	Yes
D	Wasting, Stunting and Underweight	Yes	Yes	Yes
E	Stunting and Underweight	No	Yes	Yes
F	Stunting Only	No	Yes	No
Y	Underweight Only	No	No	Yes

Source: Svedberg (2000) and Nandy et al., (2005)

A new measure named "Composite Index of Anthropometric Failure" is developed by Svedberg to estimate the level of undernourishment in children. It uses various combinations of the above mentioned three anthropometric indices and provides six possible combinations of these indices. Nandy et al., (2005) proposed inclusion of one more category 'underweight only' in the Svedberg model. Children free from any type of anthropometric failure are categorised as 'No Failure' or 'No Anthropometric Failure' category. Children suffering from any type of anthropometric failure (i.e., from B to Y combined or 1 - A) are classified as a single category namely Composite Index of Anthropometric Failure (CIAF). The disaggregated sub groups of anthropometric failure of this classification are shown in table 3.1.

3.3 Research questions

Based on literature survey in the last chapter, the following research questions have been formulated to understand the impact of demographic and socioeconomic variables on child nutritional status.

1. Children in the age group of 1-2 years have lower nutritional status than children in the age group of less than 1 year.
2. Sex of the child, does not have any impact on the nutritional status of the children.
3. Mother's education plays an important role in determining the nutritional status of their children i.e., higher levels of education of mothers may be easily reflected in the higher nutrition level of their children as compared to those illiterate mothers whose springs are devoid of nutrition at basic level thereby resulting in undernourishment.
4. The higher standard of living of household enhances the nutritional status of children.

3.4 Sources of data

This study will utilise secondary data from the National Family Health Survey (NFHS - III 2005-06) for the EAG states namely, Uttarakhand, Rajasthan, Uttar Pradesh, Bihar, Jharkhand, Odisha, Chhattisgarh and Madhya Pradesh. It is conducted by International Institute for Population Sciences (IIPS), Mumbai, under the directives of the Ministry of Health and Family Welfare and financially supported by United States Agency for International Development (USAID), ORC Macro and UNICEF. NFHS-III collected information from a nationally representative sample of 109,041 households. Its sample covers 99% of India's population living in all 29 states. Fieldwork for NFHS-III was conducted in two phases from November 2005 to August 2006. It provides nutritional information for the children born in the five years preceding the survey who are listed in the household questionnaire, in earlier rounds it was restricted to the children listed in the women questionnaire. In this study, data from kids file are taken for the analysis. NFHS-III has information about the 51,555 children at the national level but covered only 20,668 children in EAG states. The sample size varies across states from 1,228 children in Uttarakhand to 7,051 in Uttar Pradesh. The sample sizes of the other states in study area are 2,023 in

Rajasthan, 2,310 in Bihar, 1,657 in Jharkhand, 1,781 in Odisha, 1,592 in Chhattisgarh, and 3,016 in Madhya Pradesh.

3.5 Selection of variables

The following set of dependent and independent variables are selected to analyse the nutritional status of children in this study.

3.5.1 Dependent variable

NFHS-III (2005-06) provides three anthropometric measures of child nutrition namely, Height-for-Age, Weight-for-Height and Weight-for-Age in standard deviation units as recommended by WHO new growth reference of 2006. However, these indices are found to underestimate the actual prevalence of malnutrition and the indices of Composite Index of Anthropometric Failure are considered to be better in assessment the nutritional status of children (Nandy et al., 2005; Seetharam et al., 2007; Mandal and Bose, 2009). Children falling below the -2 Standard Deviation units are categorized as Stunted, Wasted and Underweight for the Height-for-Age, Weight-for-Height and Weight-for-Age respectively. Then, they are converted in the disaggregated sub groups of anthropometric failure, shown in table 3.1, to assess the nutritional status of children. In this study children free from any type of anthropometric failure classified in group A named 'No Failure' or 'No Anthropometric Failure' is selected as dependent variable.

3.5.2 Independent variables

Independent variables are those variables which affect the dependent variable or nutritional status of children in this study. The demographic, social, economic, maternal, and other variables, shown in table 3.2, are selected and categorized as independent variables to suit the requirements of this study.

Demographic variables

1. **Age of the child** – Current age of the child is taken for the analysis and classified into five groups shown in table 3.2.
2. **Sex of the child –** It is classified into two categories male and female.

Social variables

3. **Place of residence** – Urban and rural are taken as place of residence.
4. **Type of caste/tribe** - Children are categorised into four categories namely, Schedule Caste (SC), Schedule Tribe (ST), Other Backward Caste (OBC) and General (who do not belong to any of the former three categories).
5. **Religion** –It is classified into three categories: i) Hindu, ii) Muslim and iii) Others. There are few household belonging to religions except Hindu and Muslim in the dataset used for this study, so they are clubbed into the category of 'Other's'. It includes Christian, Sikh, Buddhist/Neo-buddhist, Jain, no religion and others.
6. **Education level of mother** – Highest education level attended by the mother is classified into no education, primary, secondary and higher levels.

Maternal variables

7. **Body mass index (BMI) of mother** – Body Mass Index is an index of weight for height that is used to assess nutritional status of adults. It is defined as a body weight divided by the square of the height (kg/m^2). It is an indicator of body composition, which is directly related to nutritional status. A low BMI indicates the chronic energy deficiency and can hamper physical performance. BMI of women less than 18.5 is classified as thin, from 18.5 to 24.9 as normal and above 25 as overweight/obese.
8. **Anaemia level of mother** - Anaemia is characterized by low hemoglobin concentration in the blood. The level of hemoglobin in blood is widely used biochemical method to assess the nutritional status. It is classified in only two categories: i) Any anaemia (hemoglobin < 12.0 g/dl) and ii) No anaemia (hemoglobin ≥ 12.0 g/dl).
9. **Birth order** – Birth order is classified into '1 to 2' and '3 & above' for this study.
10. **Birth interval** - It is classified into two categories: i) less than 36 months and ii) 36 and above months.

Economic variables

11. **Mother's work status** – Working status of mother is classified into either she is working or not.

Table 3.2 Classification of independent variables

Serial No.	Name of independent variable	Categories of the independent variable
1	Age of the child	1. less than 1 year
		2. 1-2 year
		3. 2-3 year
		4. 3-4 year
		5. 4-5 year
2	Sex of the child	1. Male
		2. Female
3	Place of residence	1. Urban
		2. Rural
4	Type of caste/tribe	1. Scheduled caste (SC)
		2. Scheduled tribe (ST)
		3. Other backward caste (OBC)
		4. General
5	Religion	1. Hindu
		2. Muslim
		3. Others
6	Education level of mother	1. No education
		2. Primary
		3. Secondary
		4. Higher
7	BMI of mother	1. Thin
		2. Normal
		3. Overweight/Obese
8	Anaemia level of mother	1. No anaemia
		2. Any anaemia
9	Birth order	1. 1 to 2
		2. 3 & above
10	Birth interval	1. Less than 36 months
		2. 36 months
11	Mother's work status	1. Not working
		2. Working
12	Wealth index	1. Poorest
		2. Poorer
		3. Middle
		4. Richer
		5. Richest
13	Exposure to mass media	1. No exposure
		2. Low
		3. Partial
		4. High

12. **Wealth index** – It is a proxy indicator of economic status of household. Each household asset is assigned a weight (factor score) generated through principal components analysis, and the resulting asset scores are standardized in relation to a normal distribution with a mean of zero and standard deviation of one. Each household is then assigned a score for each asset, and the scores were summed for each household; individuals are ranked according to the score of the household in which they reside. The sample is then divided into quintiles namely, i) Poorest, ii) Poorer, iii) Middle, iv) Richer and v) Richest (NFHS 2005-06, India Report).

Other variable

13. **Exposure to mass media** – It is divided into four categories i) No exposure: women does not at all either listen to radio or see television or read newspaper, ii) Low: either listen to radio or see television or read newspaper less than once a week, iii) Partial: either listen to radio or see television or read newspaper at least once a week and iv) High: either listen to radio or see television or read newspaper almost everyday.

3.6 Methodology

In order to fulfill the requirements of the study, crosstabs, binary logistic regression, concentration curves, associated concentration index and decomposition of concentration index are used.

3.6.1 Cross tabulation

It is used to access the nutritional status of children by showing percentage of children in different sub groups of anthropometric failure across different background characteristics.

3.6.2. Binary logistic regression

Binary logistic regression is used when the dependent variable is in dichotomous (binary) form. It determines the effect of a set of variables on the probability as well as the effect of the individual variables. In this study, dependent variable is in dichotomous form, either child is in state of no anthropometric failure or suffering from any type of anthropometric failure, thus binary logistic regression is used.

The dependent variable in binary logistic regression is dichotomous, i.e. the dependent variable can take the value 1 with probability of success Pi or the value 0 with probability of failure (1-P_i). The basic form of logistic function is:

$$P = \frac{1}{1 + e^{-z}} \quad (1)$$

Where, P is the estimated probability (here the probability of no anthropometric failure), z is the explanatory variable and e is the base of the natural logarithm (e = 2.7183).

The explanatory variable has the largest effect on P when P = 0.5 and P becomes smaller in absolute magnitude as P approaches 0 or 1. The quantity $\frac{p}{1-p}$ is called the odds and the quantity of $\log(\frac{p}{1-p})$ is called the logit of P. simplifying the equation (1) we get:

$$\text{Odd} = \frac{P}{1 - P} = \frac{\text{Probability of Presence of Characteristics}}{\text{Probability of Absence of Characteristics}} \quad (2)$$

$$\text{Logit (P)} = \ln [\frac{P}{1-P}]$$

The Multivariate logistic function involving K predictor variables $x_1, x_2, x_3 \ldots\ldots x_n$ is given by:

$$\text{Logit (P)} = b_0 + b_1x_1 + b_2x_2 + b_3x_3 + \ldots\ldots b_nx_n$$

$$\text{Odds} = \frac{P}{1-P} = e^{b0} \times e^{b_1x_1} \times e^{b_2x_2} \times e^{b_3x_3} \times \ldots\ldots e^{b_nx_n}$$

The coefficient b_1 represents the additive effect of one unit change in explanatory variable x_i on the log odds of the dependent variable i.e., no anthropometric failure.

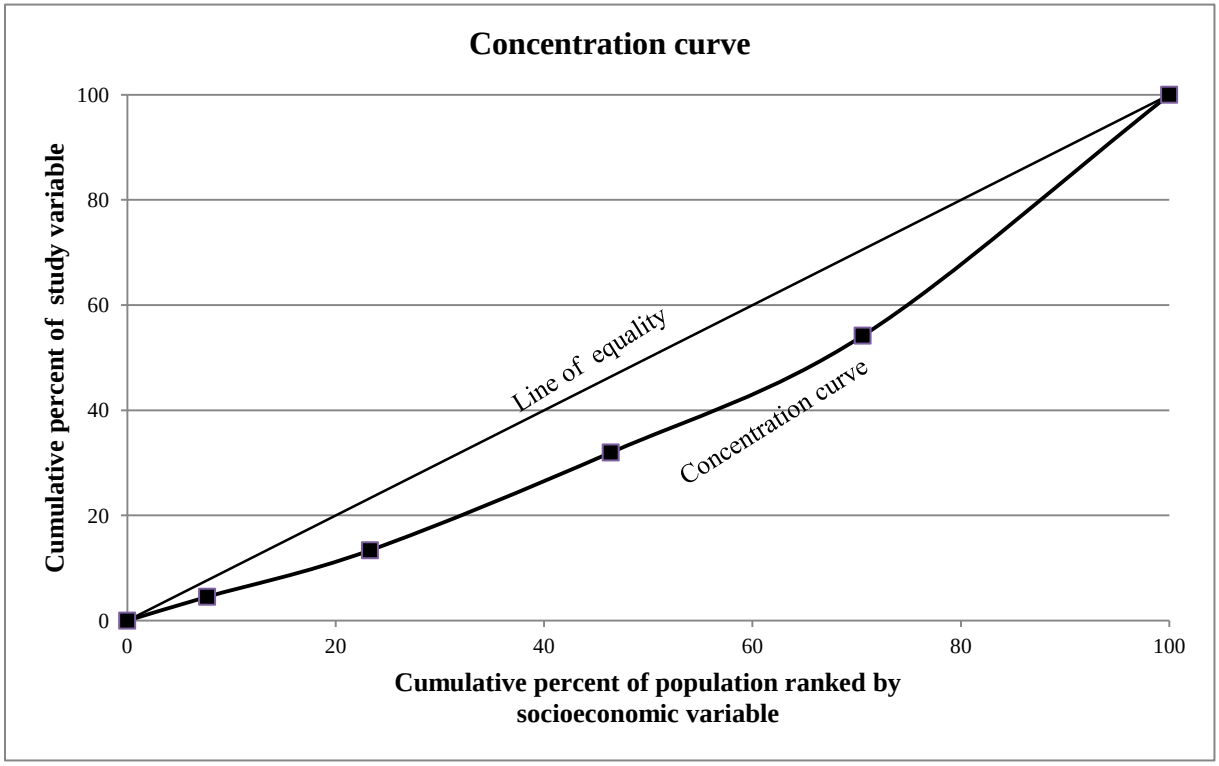
The quantity e^{bi} is called the odds ratio, which represents the multiplicative effect on one unit change in the explanatory variable on the odds of dependent variable (Retherford and Choe, 1993).

3.6.3 Concentration curve and concentration index

The concentration curve and concentration index are widely used methods to study socioeconomic inequalities. Concentration curve is graphical representation of inequality by

plotting the cumulative percentage of the study variable on y-axis against the cumulative percentage of population starting with most disadvantaged and ending with least disadvantaged socioeconomic group on the x-axis. If the cumulative proportions of the study variable under study equals with the cumulative population shares, then there will be complete equality and in that case the concentration curve will overlap line of equality. But, if the study variable is disproportionally distributed across the socioeconomic groups the curve will either lie below or above the line of equality.

Figure 3.3 Concentration curve



When the concentration curve is above the line of equality, the study variable is concentrated among the most disadvantaged socioeconomic groups and when it is below the line of equality, the study variable is concentrated among least disadvantaged socioeconomic groups. In figure 3.3 concentration curve is lying below the line of equality, so study variable is concentrated towards least disadvantaged socioeconomic group. With increasing distance from line of equality, concentration curve indicates about the higher degree of inequality across socioeconomic groups.

Concentration curve does not provide magnitude of inequality. So, concentration index is developed to quantify the degree of socioeconomic inequalities which is associated with the concentration curve. Concentration index is defined as twice the area between the concentration curve and the line of equality. It is calculated from a grouped data by using formula (Fuller and Lury, 1997):

$$\mathbf{CI = (P_1*L_2-P_2*L_1) + (P_2*L_3-P_3*L_2) + ...+ (P_{t-1}*L_t-P_t*L_{t-1})}$$

Where, CI = Concentration Index,

P = Cumulative percentage of the sample ranked by socioeconomic variable beginning form most disadvantaged to least disadvantaged.

L = Corresponding cumulative percentage of health variable

t = Total number of socioeconomic groups

The value of concentration index lies between -1 to +1. If it is nearer to zero means there is less inequality. Negative value of the index indicates concentration of study variable in most disadvantaged socioeconomic groups and positive value shows concentration in the least disadvantaged groups of the population (Kakwani et al., 1997).

In this study, plotting of the concentration curve and the calculation of the concentration index have been done by taking the total number of children in each socioeconomic group, beginning with most disadvantaged group and ending with least disadvantaged socioeconomic group, and the number of children in state of no anthropometric failure corresponding to that socioeconomic group.

3.6.4 Decomposition of concentration index

A decomposition analysis allows quantifying proportional contribution of each determinant to inequality in any study variable, which is 'children with no anthropometric failure' in this study. The method proposed by Wagstaff et al., (2003) is used to decompose the socioeconomic inequality nutritional status of children into its determinants. They showed

that for any liner regression model taking the study variable of interest y to a set of k determinants, x_k:

$$y_i = \alpha + \sum_k \beta_k x_{ki} + \varepsilon_i \qquad (1)$$

Where $\mathcal{E}$ is an error term, given the relationship between y and x_k in equation (1), the concentration index for $y(C)$ can be written as:

$$C = \sum_k \left(\frac{\beta_k \bar{x}_k}{\mu}\right) C_k + \frac{GC_\varepsilon}{\mu} \qquad (2)$$

Where μ is the mean of y, $\bar{x}_k$ is the mean of x_k, C_k is the concentration index for x_k (defined analogously to C. In the last term (which can be computed as a residual), $GC\varepsilon$ is the generalized concentration index for ε, where C = concentration index defined as:

$$C = \frac{2}{\mu} cov(hi, ri) \qquad (3)$$

Where h_i and r_i are respectively the nutritional status of the individual and the fractional rank of the i^{th} individual (weighted data) in terms of the index of the household economic status, μ is the (weighted mean of the health of the sample and cov is the weighted covariance. (Yiengprugsawan et al., 2007)

In the decomposition analysis, the dependent variable is no anthropometric failure children and the independent variables are age of the child, sex of the child, type of caste or tribe, religion, education level of mother, BMI of mother, anaemia level of mother, birth order, birth interval, mothers work status, wealth index and exposure to mass media.

Table 3.3 Definition of variables used in decomposition analysis

Nutrition variable (no failure = 1, any failure = 0)	Predictor variables (Yes=1, Otherwise=0)
No anthropometric failure	Age of the child: less than 1 year
	Sex of the child: Male
	Place of residence: Urban
	Type of caste or tribe: No SC/ST
	Religion: Hindu
	Educational level of Mother: Literate
	BMI of Mother: above 18.5
	Anaemia Level of Mother: No anaemia
	Birth Order: 1 to 2
	Birth Interval: 36 months and above
	Mother's Work Status: Not working
	Wealth index: Middle or richer or richest
	Exposure to Mass Media: Partial or high

Methodological steps for decomposition of socioeconomic inequalities in no anthropometric failure among children

1. Regress the nutrition variable against its determinants and get the coefficients of explanatory variable.
2. Calculate the mean of the nutrition variable and each of its determinants.
3. Calculate the concentration indices for the nutrition variable and for determinants using equation (3). At this stage, the values of all the variables included in equation (2) are known. Finally the contribution of each factor are quantified through the following steps:
4. Calculate the absolute contribution of each determinant by multiplying the nutrition variable elasticity with respect to that determinant and its concentration index

$$\left(\frac{\beta_k \bar{x}_k}{\mu}\right) C_k$$

5. Calculate the percentage contribution of each determinant simply by dividing its absolute contribution by the concentration index of the nutrition variable

$$(\frac{\beta_k \bar{x}_k}{\mu}) C_k / C$$

CHAPTER – IV

LEVELS, DETERMINANTS AND INEQUALITIES IN NUTRITIONAL STATUS OF CHILDREN IN EAG STATES OF INDIA

This chapter presents analysis of the levels, determinants and inequalities in nutritional status of children in EAG states. It is divided into four sections. The first section presents general overview of the prevalence of undernutrition by different indices of anthropometric failure in EAG states. In the second the distribution of children with no anthropometric failure (children free from any type of anthropometric failure) by background characteristics is given. The third section deals with the effect of demographic, socioeconomic, maternal and other variables on the nutritional status of children through binary logistic regression analysis. The fourth section of this chapter analyses the inequalities in nutritional status of children in terms of no anthropometric failure using concentration curve and index.

4.1 Levels of undernutrition in children by disaggregated sub groups of anthropometric failure in EAG states

In this section the study nutritional status of children is presented in the disaggregated sub groups of anthropometric failure. Table 4.1 shows the status of nutrition in each sub group of anthropometric failure in EAG states of India. No anthropometric failure stands for children free from any type of anthropometric failure. Composite Index of Anthropometric Failure (CIAF) is simply the sum of B to Y sub groups and provides children suffering from any type of anthropometric failure.

In EAG states combined only 33.6 percent of children are in no anthropometric failure (Group A), rest 66.4 percent of children are suffering from at least one type of anthropometric failure. And 10.9 percent of total children are suffering from stunting, wasting and underweight simultaneously. In EAG states, 27.2 percent of total children are suffering from stunting and underweight simultaneously. These figures show the severity of undernutrition in EAG states. The proportion of children in no anthropometric failure category is highest (42.8 percent) in Uttarakhand followed by Rajasthan (41.6 percent) and Odisha (40.6 percent). Madhya Pradesh has the lowest proportion of children 27.4 percent in the no anthropometric failure category followed by Bihar (28.9 percent) and Jharkhand (29.7 percent). The proportion of

children in sub group C (Wasting & Underweight) is very high in Madhya Pradesh (13.6 percent) and Jharkhand (11.2 percent) in comparison to other states, again the proportion of children in sub group D (Stunting, Wasting & Underweight) is very high in Madhya Pradesh (16.7 percent), Jharkhand (16.1 percent) and Bihar (15 percent). In sub group F (Stunting only) Madhya Pradesh (7 percent) and Jharkhand (7.1 percent) have the least proportion indicating that in these states stunting is associated with other types of failures. In sub group Y (Underweight only) again these two states have the highest proportion. CIAF category includes any type of

Table 4.1 Percentage distribution of children in disaggregated sub groups of anthropometric failure in each state of EAG, 2005-06

	A	B	C	D	E	F	Y	1- A
States	**No Failure**	**Wasting Only**	**Wasting & Underweight**	**Stunting, Wasting & Underweight**	**Stunting & Underweight**	**Stunting Only**	**Underweight Only**	**CIAF**
Uttarakhand	42.8	3.8	6.2	9.0	21.0	15.1	1.9	57.2
Rajasthan	41.6	5.0	7.4	8.2	23.2	12.7	1.8	58.4
Uttar Pradesh	33.3	3.3	4.9	6.9	29.3	20.5	1.7	66.7
Bihar	28.9	4.4	8.2	15.0	30.8	10.2	2.6	71.1
Jharkhand	29.7	5.8	11.2	16.1	26.7	7.1	3.4	70.3
Odisha	40.6	5.0	6.5	8.5	23.4	13.4	2.8	59.4
Chhattisgarh	34.4	3.4	6.4	10.5	29.2	14.3	1.7	65.6
Madhya Pradesh	27.4	5.4	13.6	16.7	26.4	7.0	3.6	72.6
EAG	33.6	4.3	7.8	10.9	27.2	13.8	2.4	66.4

Source: Computed from NFHS-III, 2005-06

anthropometric failure i.e., single failure or multiple failures. It is just an opposite indicator of no anthropometric failure category. So, the results of the CIAF are just opposite of the results of No anthropometric failure. In Madhya Pradesh the proportion of children in CIAF is 72.6 percent, in Bihar it is 71.1 percent and in Jharkhand it is 70.3 percent. It is lowest in Uttarakhand (57.2 percent), followed by Rajasthan (58.4 percent) and Odisha (59.4 percent).

4.2 Levels of no anthropometric failure in children by background characteristics in EAG states

Table 4.2 and 4.3 shows percentage of children with no anthropometric failure by their background characteristics. No anthropometric failure category includes those children whose are free from any type of anthropometric failure. There are wide variations in the level of no anthropometric failure by background characteristic.

As shown in the table 4.2 and figure 4.1, in EAG states the highest level of no anthropometric failure is observed among children less than 1 year age group (43.3 percent). The lowest level of no anthropometric failure children is 29.8 percent in the age groups of 1 to 2 years. In age groups of 2 to 3 years, 3 to 4 years and 4 to 5 years the proportion of children in no anthropometric failure is 30.4 percent, 30.9 percent and 34 percent respectively. In each of the EAG states, the proportion of children in no anthropometric failure is highest in the age group less than 1 year except Chhattisgarh, while it is lower in the age groups of 1 to 2 year and 2 to 3 year. There are some signs of improvement of nutritional status of children after three years, but not enough to reach up to even the level of age less than 1 year except in Uttarakhand, where in age group of 4 to 5 years proportion of children in no anthropometric failure is 35.4 percent which is lower than the age groups of less than 1 to 2 year (41.5 percent), 2 to 3 year (45.9 percent) and 3 to 4 year (40 percent).

The general trend is initial decrease and later on little increase in the percentage of no anthropometric failure children with age in all EAG states. But later increase is not sufficient to even reach up to the level of no anthropometric failure in less than 1 year age group (Figure 4.1). As discussed in the review of literature, initial three years of life is most important for the brain development and anthropometric failure in these ages have disastrous results in later years of life causing great loss productivity of individual and society (UNICEF, 1998). This study in accordance with the other studies which note better nutritional status during less than 1 year of age, decreasing nutritional status in 1 to 2 year and 2 to 3 year and slight improvement after 3 years (Arnold et al., 2004; Sachdev, 1994). The decrease in the nutritional status of children in later ages is caused by initiation of supplementary food introduced to child in later ages, which further enhances chance of infections (Casa, 2001; Mishra, 2003).

Table 4.2 Percentage of children with no anthropometric failure in all EAG states by background characteristics, 2005-06

Background Characteristic		Percent in no failure
Age of the child	Less than 1 Year	43.3
	1 - 2 Year	29.8
	2 - 3 Year	30.4
	3 - 4 Year	30.9
	4 - 5 Year	34.0
Sex of the child	Male	34.3
	Female	32.9
Place of residence	Urban	43.2
	Rural	31.4
Type of caste or tribe	SC	28.9
	ST	26.3
	OBC	32.8
	General	44.4
Religion	Hindu	34.1
	Muslim	30.8
	Others	33.3
Educational level of Mother	No education	27.4
	Primary	34.3
	Secondary	43.9
	Higher	68.7
BMI of Mother	Thin	27.1
	Normal	36.5
	Overweight/Obese	58.4
Anaemia Level of Mother	No Anaemia	37.5
	Any Anaemia	31.2
Birth Order	1 to 2	38.3
	3 & above	29.2
Birth Interval	Less than 36 months	30.3
	36 & above	33.3
Mother's Work Status	Not Working	36.8
	Working	29.4
Wealth index	Poorest	24.4
	Poorer	30.2
	Middle	34.1
	Richer	41.7
	Richest	61.3
Exposure to Mass Media	No Exposure	27.3
	Low	30.3
	Partial	33.1
	High	44.4

Source: Computed from NFHS-III, 2005-06

Table 4.3 Percentage of children with no anthropometric failure in each state of EAG by background characteristics, 2005-06

Background Characteristic		Uttarakhand	Rajasthan	Uttar Pradesh	Bihar
Age of the child	Less than 1 Year	50.7	55.0	46.3	39.5
	1 - 2 Year	41.5	38.7	28.1	28.5
	2 - 3 Year	45.9	39.2	29.1	23.4
	3 - 4 Year	40.0	35.9	31.5	24.9
	4 - 5 Year	35.4	39.6	32.7	27.2
Sex of the child	Male	41.5	41.1	34.6	30.4
	Female	44.3	42.2	31.9	27.1
Place of residence	Urban	61.3	49.3	40.3	35.6
	Rural	37.1	39.6	31.7	28.0
Type of caste or tribe	SC	35.8	37.3	29.1	18.5
	ST	41.9	35.5	17.4	42.9
	OBC	35.0	44.6	31.5	29.1
	General	47.6	44.3	42.9	37.8
Religion	Hindu	43.2	42.6	33.6	29.7
	Muslim	39.0	33.0	31.8	25.1
	Others	44.3	52.9	80.0	N.A.
Educational level of Mother	No education	31.1	35.9	27.7	24.0
	Primary	40.7	50.2	35.9	36.0
	Secondary	44.8	52.5	43.1	39.8
	Higher	78.0	75.8	66.4	59.5
BMI of Mother	Thin	29.5	38.6	26.9	23.4
	Normal	44.4	42.6	35.4	32.2
	Overweight/Obese	73.3	56.2	50.6	58.2
Anaemia Level of Mother	No Anaemia	45.9	43.8	37.0	33.2
	Any Anaemia	40.7	40.1	30.5	27.1
Birth Order	1 to 2	48.0	46.3	36.7	33.8
	3 & above	35.0	37.2	30.7	24.9
Birth Interval	Less than 36 months	35.2	39.3	30.9	26.6
	36 & above	43.6	38.7	34.0	27.5
Mother's Work Status	Not Working	47.7	42.7	35.4	30.9
	Working	34.7	40.7	28.6	25.0
Wealth index	Poorest	25.3	32.2	23.9	19.9
	Poorer	24.2	38.1	30.4	26.2
	Middle	34.5	40.8	31.9	30.9
	Richer	39.4	46.5	40.5	41.5
	Richest	66.7	59.3	59.1	59.8
Exposure to Mass Media	No Exposure	28.2	34.8	27.7	23.9
	Low	24.4	43.0	29.5	30.2
	Partial	38.7	47.1	33.0	30.2
	High	53.2	52.8	43.9	38.7

Source: Computed from NFHS-III, 2005-06, Note: N.A. - Not Available

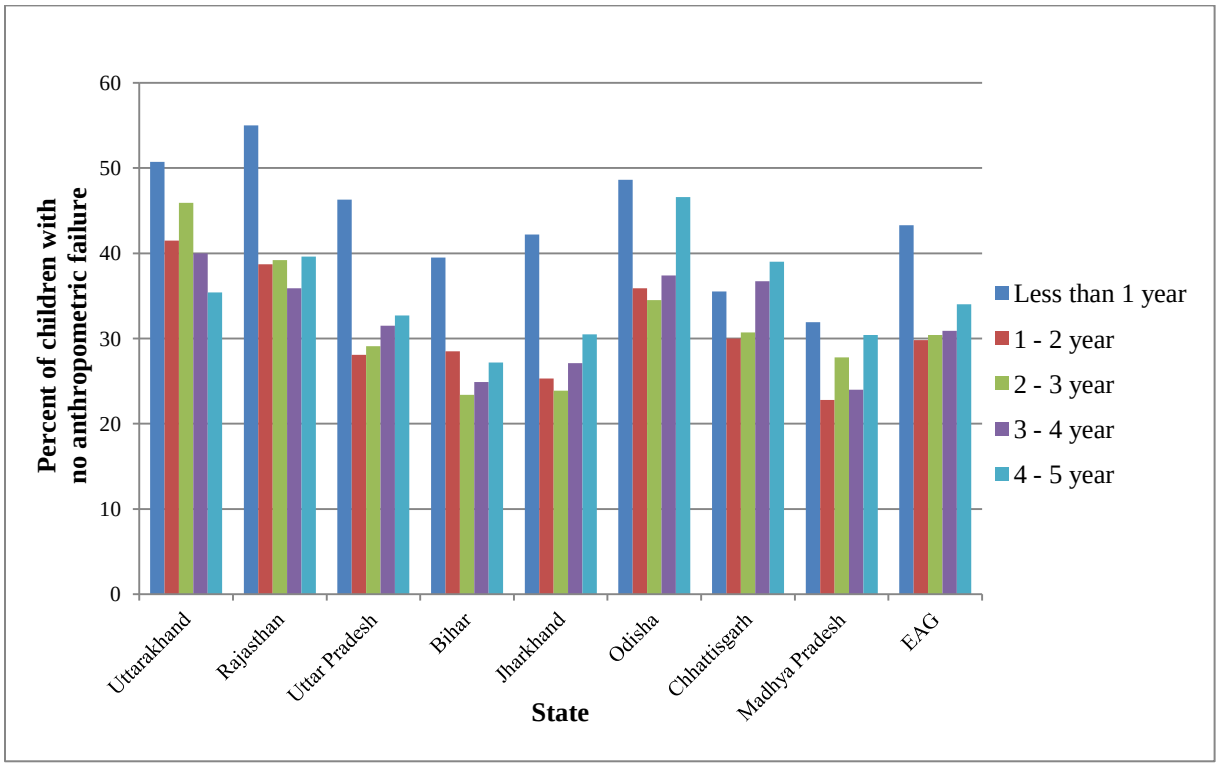
continued…

Table 4.3 continued…

Background Characteristic		Jharkhand	Odisha	Chhattisgarh	Madhya Pradesh
Age of the child	Less than 1 Year	42.2	48.6	35.5	31.9
	1 - 2 Year	25.3	35.9	30.0	22.8
	2 - 3 Year	23.9	34.5	30.7	27.8
	3 - 4 Year	27.1	37.4	36.7	24.0
	4 - 5 Year	30.5	46.6	39.0	30.4
Sex of the child	Male	29.7	41.3	33.4	28.4
	Female	29.8	39.8	35.5	26.4
Place of residence	Urban	44.9	54.8	47.9	34.8
	Rural	26.1	38.3	31.7	25.1
Type of caste or tribe	SC	27.6	34.8	32.9	23.4
	ST	23.6	26.6	32.2	20.2
	OBC	29.6	45.2	33.5	29.0
	General	45.5	54.4	53.0	39.2
Religion	Hindu	30.3	40.8	34.1	27.4
	Muslim	34.0	31.2	36.8	26.0
	Others	22.1	36.4	66.7	37.5
Educational level of Mother	No education	24.5	29.2	28.7	23.0
	Primary	31.7	35.8	28.5	26.3
	Secondary	39.0	56.3	45.7	35.5
	Higher	80.6	76.5	72.4	51.5
BMI of Mother	Thin	25.0	32.3	28.7	20.7
	Normal	32.1	45.0	38.5	31.3
	Overweight/Obese	65.7	82.2	58.1	57.1
Anaemia Level of Mother	No Anaemia	37.1	44.3	34.2	32.0
	Any Anaemia	27.4	38.4	34.4	24.5
Birth Order	1 to 2	31.8	46.4	40.3	31.5
	3 & above	27.7	31.3	28.3	23.2
Birth Interval	Less than 36 months	27.8	34.0	30.3	24.6
	36 & above	30.8	38.2	33.8	27.1
Mother's Work Status	Not Working	36.3	44.8	41.5	31.2
	Working	25.3	31.6	31.5	24.1
Wealth index	Poorest	23.8	25.2	29.0	22.0
	Poorer	27.1	42.8	32.2	25.8
	Middle	32.1	46.7	35.2	29.0
	Richer	38.5	62.0	40.9	33.1
	Richest	70.3	80.4	68.0	47.7
Exposure to Mass Media	No Exposure	22.5	30.6	30.8	24.5
	Low	28.1	34.3	30.1	26.8
	Partial	42.8	30.2	32.6	24.0
	High	43.0	53.3	42.1	33.3

Source: Computed from NFHS-III, 2005-06

Figure 4.1 Percentage of children with no anthropometric failure according to age of the child in EAG states, 2005-06



Source: Computed from NFHS-III, 2005-06

In case of sex of the child, there is no clear evidence of deprived status of female children. In EAG states, 34.3 percent and 32.9 percent of male and female children are in no anthropometric failure respectively. In Uttar Pradesh, Bihar, Odisha and Madhya Pradesh the female children are in disadvantaged position, but in Uttarakhand, Rajasthan and Chhattisgarh they are not in disadvantageous position, but the differences in no failure between male and female children is very little. In Jharkhand, the level of no anthropometric failure is almost equal for the male and female children. Despite of strong son preference there is no difference between the nutritional status of male and female children (Marcourx, 2002; Hong et al., 2006; Radhakrishna and Ravi, 2004).

Large differences between nutritional status of urban and rural children is observed in EAG states. In urban areas, 43.2 percent of children are in no anthropometric failure, while it is only 31.4 percent in rural areas. The highest level of no anthropometric failure in urban areas is observed in Uttarakhand (61.3 percent) followed by Odisha (54.8 percent) and Rajasthan (49.3 percent) and lowest in Madhya Pradesh (34.8 percent) followed by Bihar (35.6 percent).

In rural areas, the highest level of no anthropometric failure in Rajasthan (39.6 percent) followed by Odisha (38.3 percent) and lowest in Madhya Pradesh (25.1 percent) followed by Jharkhand (26.1 percent) and Bihar (28 percent). The highest difference between urban and rural children in no failure is observed in Uttarakhand (24.2 percent) followed by Odisha (16.5 percent) and Chhattisgarh (16.2 percent). This differential is lower in Bihar (7.6 percent), Uttar Pradesh (8.6 percent), Madhya Pradesh (9.7 percent) and Rajasthan (9.7 percent).

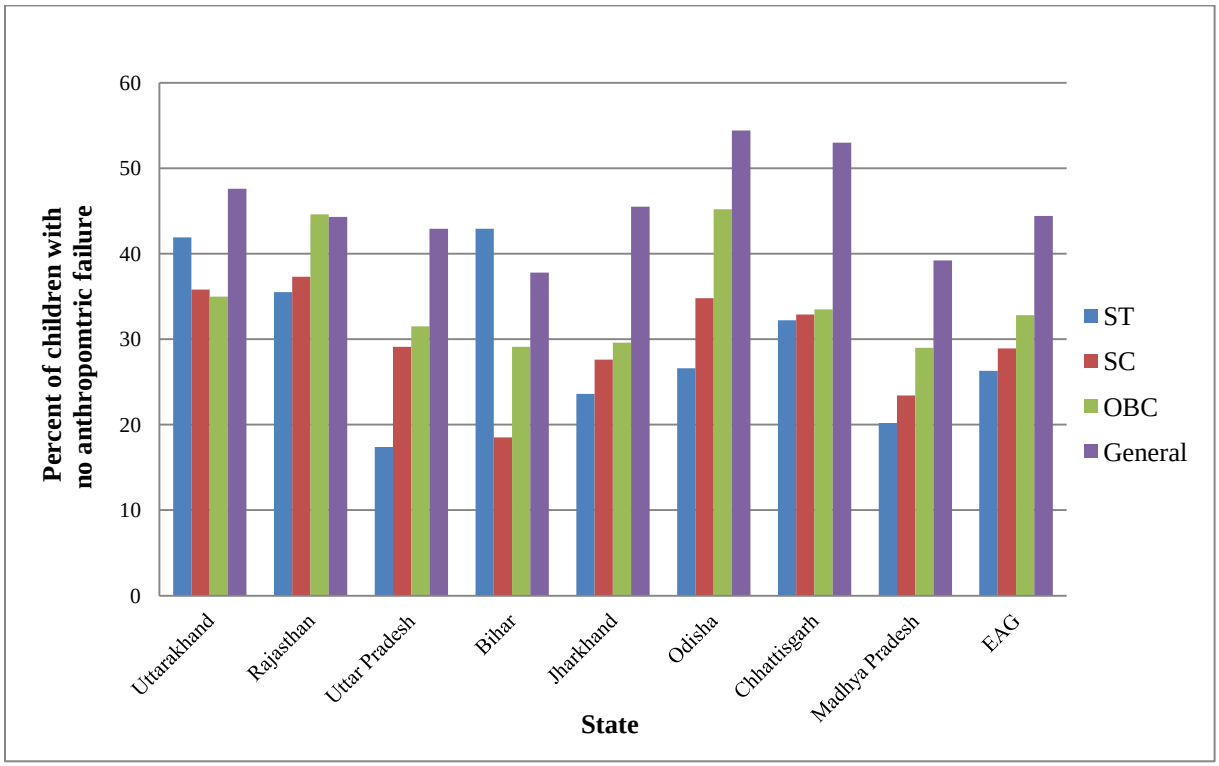
Place of residence has a significant impact on the nutritional status of children. The children from urban background have a high level of no anthropometric failure than rural counterparts. There are also wide gaps in levels of no anthropometric failure between urban and rural children.

Table 4.2, 4.3 and figure 4.2 shows the percentage of no anthropometric failure children in different caste groups in EAG states. Among caste groups, the general caste children (44.4 percent) have very high level of no anthropometric failure than SC (28.9 percent), ST (26.3 percent) and OBC (32.8 percent) children. The levels of no anthropometric failure are lowest for STs in all states except Uttarakhand and Bihar. In Uttarakhand, Uttar Pradesh and Bihar the sample sizes for ST children are very small. So, the levels of no anthropometric failure in ST children in these three states are not reliable. The lowest level of no anthropometric failure among ST children is observed in Madhya Pradesh (20.2 percent) followed by Jharkhand (23.6 percent) and Odisha (26.6 percent). ST children of Rajasthan (35.5 percent) and Chhattisgarh (32.2 percent) are better off in terms of no anthropometric failure in comparison to the other EAG states. Various socio-cultural and environmental factors are responsible for the low nutritional status of tribal children (Sharma et al., 2006).

Nutritional status of SC children is slightly better than the ST children. The lowest level of no anthropometric failure in SC children is observed in Bihar (18.5 percent) followed by Madhya Pradesh (23.4 percent), Jharkhand (27.6 percent) and Uttar Pradesh (29.1 percent). The highest level of no anthropometric failure in SC children is observed in the Rajasthan (37.3 percent) followed by Uttarakhand (35.8 percent), Odisha (34.8 percent) and Chhattisgarh (32.9 percent).

The level of no anthropometric failure of OBC children (32.8 percent) is above SC (28.9 percent) but much lower than general caste (44.4 percent) in EAG states. The highest level of

Figure 4.2 Percentage of children with no anthropometric failure according to type of caste/tribe groups in EAG states, 2005-06



Source: Computed from NFHS-III, 2005-06

no anthropometric failure in OBC children is observed in Odisha (45.2 percent) followed by Rajasthan (44.6 percent), while it is lowest in Madhya Pradesh (29 percent) followed by Bihar (29.1 percent) and Jharkhand (29.6 percent). In Uttarakhand and Chhattisgarh, the level of no anthropometric failure of OBC children is almost similar to the SC children. In states of Uttar Pradesh (2.4 percent) and Jharkhand (2 percent) the gap between SC and OBC children is smaller, while in Bihar (10.6 percent), Odisha (10.4 percent), Rajasthan (7.3 percent), and Madhya Pradesh (5.6 percent) the gap is higher.

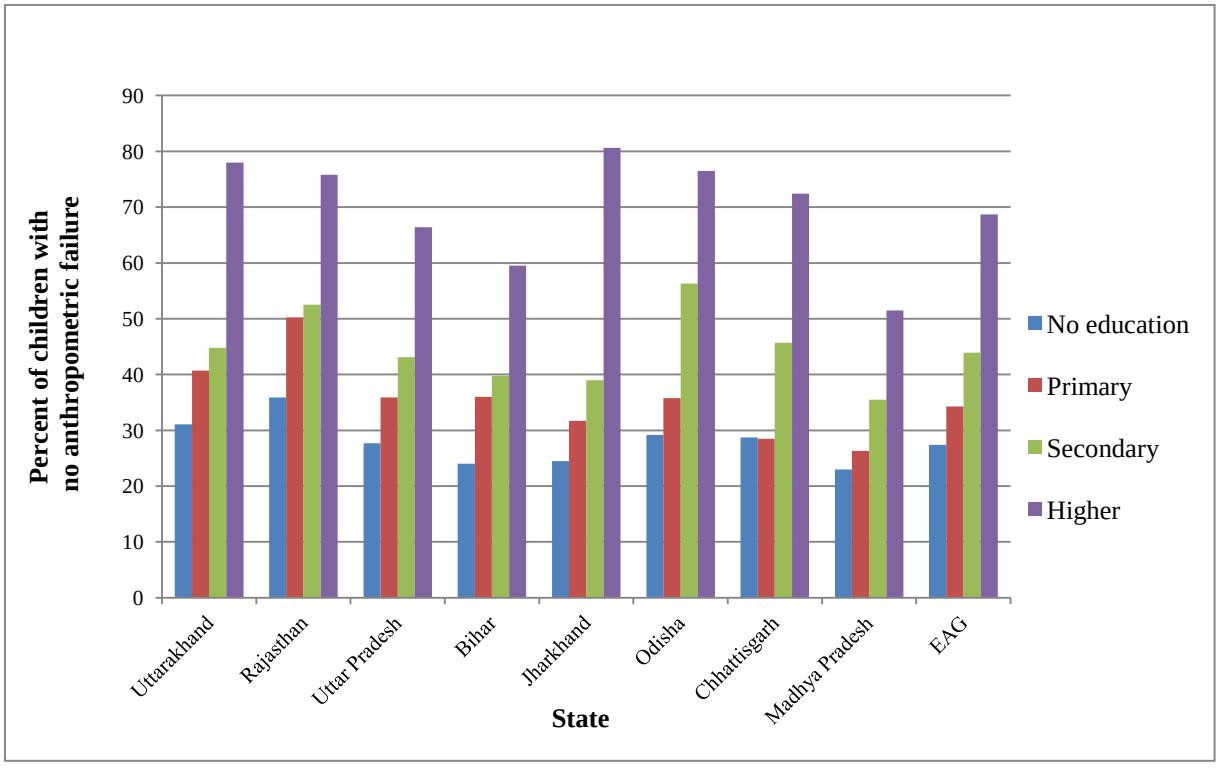
The general caste children have the highest level of no anthropometric failure in each of EAG states, except Rajasthan where it is highest in OBC children. The level of no anthropometric failure in general caste children is highest in the Odisha (54.4 percent) followed by Chhattisgarh (53 percent) and lowest in the Bihar (37.8 percent) followed by Madhya Pradesh (39.2 percent). There are wide gaps in levels of no anthropometric failure between OBC and general Caste children. There is 11.6 percent difference between the general caste and OBC children in EAG states. This gap is wider in Chhattisgarh, Jharkhand, Uttarakhand, Uttar

Pradesh and Madhya Pradesh, 19.5 percent, 15.9 percent, 12.6 percent, 11.4 percent and 10.2 percent.

Overall, Scheduled Tribes are the most deprived group in terms of nutritional status of child. SC children are the second largest disadvantaged group. Differentials between these two are small. Nutritional status of OBC children is better than SC and ST children, but much poorer than general caste children.

The level of no anthropometric failure among children is 34.1 percent in Hindu children, 30.8 percent in Muslim children and 33.3 percent in other religious group in EAG states. In all the EAG states except Jharkhand and Odisha, the level of no anthropometric failure is higher among children of other religious group. In Jharkhand the highest level of no anthropometric failure is observed among Muslim children (34 percent) and in Odisha among Hindu children (40.8 percent). In general the low level of no anthropometric failure is observed among Muslim children.

Figure 4.3 Percentage of children with no anthropometric failure according to education level of mother in EAG states, 2005-06



Source: Computed from NFHS-III, 2005-06

Hindu children show highest level of no anthropometric failure in Uttarakhand (43.2 percent) followed by Rajasthan (42.6 percent) and lowest in Madhya Pradesh (27.4 percent) followed by Bihar (29.7 percent) and Jharkhand (30.3 percent). The highest level of no anthropometric failure among Muslim children is observed in Uttarakhand (39 percent) followed by Chhattisgarh (36.8 percent), while it is lowest in Bihar (25.1 percent) followed by Madhya Pradesh (26 percent). Nutritional status of Hindu and other children is better than the Muslim children. According to Haughton and Haughton (1997), children born to ethnic minorities are more likely to be undernourished but in this study it is true for the Muslim children but not for other religious groups.

Education level of mother is one of the most important factors which affect the nutritional status of children. In EAG states, 68.7 percent of Children of highly educated mothers are in state of no anthropometric failure, while it is only 27.4 percent in illiterate mothers, 34.4 percent in primary educated mothers and 43.9 percent in secondary educated mothers. Among children of illiterate mothers Madhya Pradesh, Bihar, Jharkhand, Uttar Pradesh and Chhattisgarh have the lowest level of no anthropometric failure, 23 percent, 24 percent, 24.5 percent, 27.7 percent and 28.7 percent respectively. In the children of highly educated mothers of Jharkhand, Uttarakhand, Odisha, Rajasthan and Chhattisgarh the level of no anthropometric failure is 80.6 percent, 78 percent, 76.5 percent, 75.8 percent and 72.4 percent respectively and in states of Madhya Pradesh, Bihar and Uttar Pradesh it is only 51.5 percent, 59.5 percent and 66.4 percent. There is marked increase in the percentage of no anthropometric failure in children of secondary educated mothers to higher educated mothers. In EAG states, this increase is 24.8 percent. This differential is higher in Jharkhand (41.6 percent), Uttarakhand (33.2 percent), and Chhattisgarh (26.7 percent) and lower in Madhya Pradesh (16 percent), Bihar (19.7 percent) and Odisha (20.2 percent).

The highest level of no anthropometric failure is observed among those children whose mothers are highly educated and lowest in those children whose mothers have no education. In all EAG states the level of no anthropometric failure increases sharply with the increase in the level of education of mother. The maternal education level of is a major determinant of child rearing practice which further affects nutritional status of child (Gopalan, 1989). The increase in the level of no anthropometric failure is almost two to three times from mothers having no education to higher educated mothers. The major increase in level of no

anthropometric failure is observed between children of secondary and higher educated mothers. Boyle et al., (2006) also identified that relationship between child health and mother's education is stronger in the higher level of education.

Nutritional status of mother has substantial impact on the nutritional status of children. In EAG states, only 27.1 percent of children of mothers with low BMI are in no anthropometric failure. In normal and overweight or obese BMI of mother category, it is 36.5 percent and 58.4 percent respectively. In each of the EAG states similar trend is observed. Mothers having low body mass index have low percentage of no anthropometric failure children and it is higher among children whose mothers are in overweight or obese category. There is a two to three times increase in the level of no anthropometric failure children from low BMI to overweight or obese BMI category. Malnourished and thin women are more likely to have infant of small size. During pregnancy, growth of foetal tissue depends on how much weight a woman gains (UNICEF, 1998). Similarly, the anaemia level of mother also has a strong impact on the health of child. In all the EAG states it is observed that the percentage of no anthropometric failure is low among those children whose mothers are anaemic.

Maternal factors like birth order and birth interval also have the impact on the nutritional status of children. Children of birth order 1 to 2 have higher percentage (38.3 percent) of no anthropometric failure in comparison to children of birth order 3 and above (29.2 percent) in EAG states. In each of the EAG state same pattern is observed. With the increase in the birth order the level of no anthropometric failure in children decreases. Birth of higher order may be associated with the women who are physically depleted at the time of conception and during pregnancy thus child suffer from growth retardation (Pandey et al., 1998). Age of mother and competition for food in household are also identified as associated reasons for the low nutritional status of higher birth order children (Hong and Mishra, 2006; Ukwuani et al., 2003). Birth interval between two children has a significant effect on the child health. The children with short birth interval (below 36 months) have a low level of no anthropometric failure (30.3 percent) compared to children with birth interval more than 36 months (33.3 percent). In each of EAG state, the similar pattern is observed except in Rajasthan.

As discussed in literature review it is widely recognized that work status of mother has the significant impact on the nutritional status of children. It argued that the working mothers have more resources to nourish the children while it is also said that they have less time to

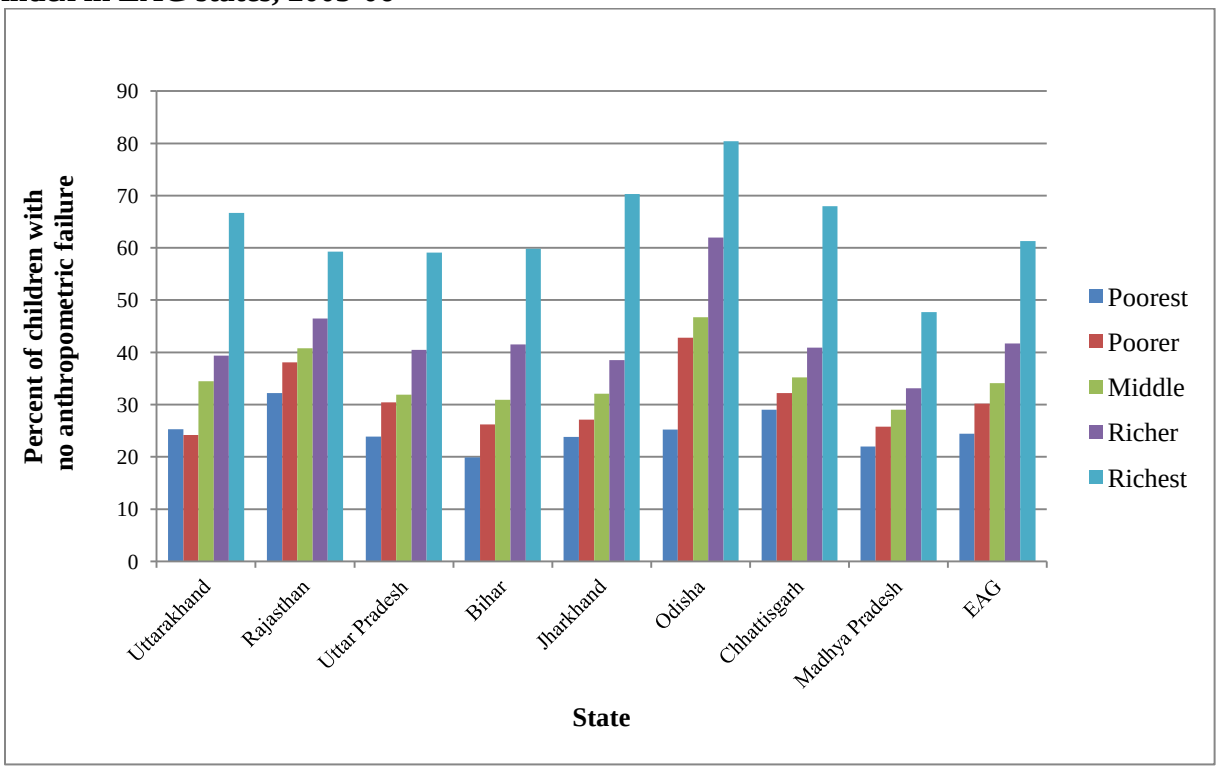
spend on the children so there may be negative impact on the nutritional status of children. But not all type of work has negative impact on the nutritional status of child (Ukwuani et al., 2003). The nature of work of mother also affects the nutritional status of children. Here, mothers are classified into only working and not working category and observed that not working mothers (36.8 percent) have better level of no anthropometric failure in children than working mothers (29.4 percent) in EAG states. The similar pattern is observed in each of the EAG states.

Economic status of a household is supposed to have largest influence on the nutritional status of children. It directly affects the availability of nutritious food, sanitation and access to health care, which are essential for the better nutritional status of children. Here wealth index is taken as a proxy indicator of economic status of household. Figure 4.4 shows the levels of no anthropometric failure children in EAG states. In poorest quintile only 24.4 percent of children are in no anthropometric failure, in poorer (30.2 percent), middle quintile (34.1 percent), richer quintile (41.7 percent) and in richest quintile, it is 61.3 percent. There is more than twice increase in the percentage of no anthropometric failure children from poorest to richest wealth quintile. The quantity and quality of food are largely determined by economic factors. As the income level rise, households tend to demand adequate and wider variety of food which increases the nutritional status (Bender and Smith, 1997). Improvement in standard of living results in access to better food, hygienic conditions and better access to health care facilities which affect nutritional status of child (Hong, 2006). Largest increase in level of no anthropometric failure from poorest to richest wealth quintile is recognized in Odisha (55.2 percent) followed by Jharkhand (46.5 percent). In Madhya Pradesh and Rajasthan minimum increase is observed for the similar wealth quintiles. Besides that, there are wide gaps in levels of no anthropometric failure children in same wealth quintile in different states. In poorest wealth quintile, in Bihar only 19.9 percent of children are in state of no anthropometric failure, while it is 32.2 percent in Rajasthan. In richest wealth quintile, in Odisha 80.4 percent of children are in state of no anthropometric failure, while it is only 47.7 percent in Madhya Pradesh. Large variations in levels of no anthropometric failure in same wealth quintile indicate that factors other than wealth also have significant impact on the nutritional status of children. Among the wealth quintiles, the largest increase in the percentage of no anthropometric failure among children is observed between richer to richest

wealth quintile. In these wealth quintiles there is a 19.6 percent increase in the no failure in EAG states. This gap is higher in Jharkhand (31.8 percent), Uttarakhand (27.3 percent) and Chhattisgarh (27.1 percent) and lower in Rajasthan (12.8 percent) and Madhya Pradesh (14.6 percent).

It is also important to note that even in the richest wealth quintile only 61.3 percent of children are in no anthropometric failure in all EAG states, rest 38.7 percent are in Composite Index of Anthropometric Failure (CIAF) category i.e., suffering from at least one type of anthropometric failure. In richest wealth quintile, approximately 50 percent children in Madhya Pradesh and approximately 40 percent children in Rajasthan, Uttar Pradesh and Bihar are in CIAF category. In Odisha, Jharkhand, Chhattisgarh and Uttarakhand approximately 20 percent, 30 percent, 32 percent and 33 percent children in richest wealth quintile are in CIAF category respectively. According to Radhakrishna and Ravi (2004), lower nutritional status in top quintiles could be attributed to factors such as environmental hygiene, health etc. Therefore, in low developed societies even the richest quintiles have lower level of no anthropometric failure.

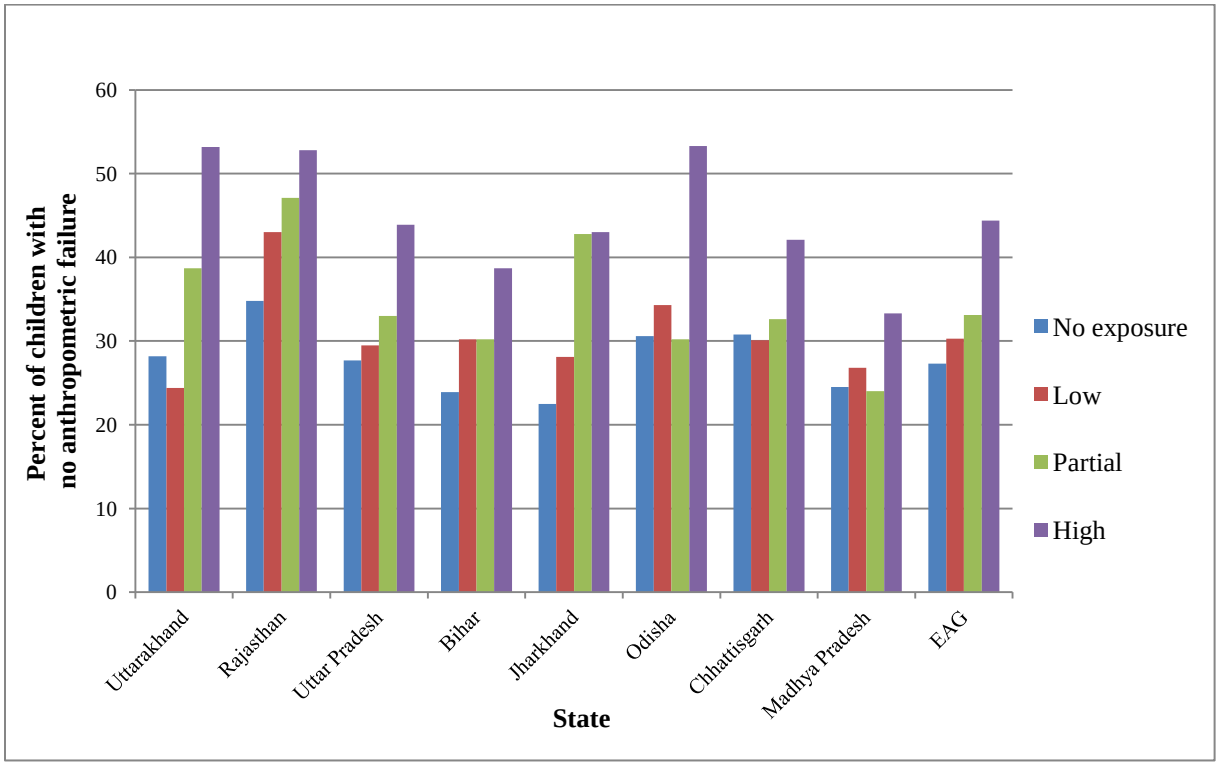
Figure 4.4 Percentage of children with no anthropometric failure according to wealth index in EAG states, 2005-06



Source: Computed from NFHS-III, 2005-06

In all the EAG states, with increasing wealth index level of no anthropometric failure is sharply increasing. There are two to three times increase in the level of no anthropometric failure children from the poorest to richest wealth quintile and in some states it is larger than three times. Differentials in percentage of children with no anthropometric failure are highest between the richer to richest wealth quintiles. But even in the richest wealth quintile level of no anthropometric failure among children is far from optimal.

Figure 4.5 Percentage of children with no anthropometric failure according to level of exposure to mass media in EAG states, 2005-06



Source: Computed from NFHS-III, 2005-06

Exposure to mass media also plays an important role in the nutritional status of children. It provides crucial information, which is essential to raise nutritional status of children. Figure 4.5 shows the levels of no anthropometric failure children in different levels of exposure to mass media in EAG states. The lowest level of no anthropometric failure is 27.3 percent among children of household with no exposure to mass media. It increases with the increase in level of exposure of mass media. Percentage of children with no anthropometric failure is 30.3 percent, 33.1 percent and 44.4 percent in low exposure, partial exposure and high exposure. From no exposure to high exposure group there is a significant increase in the

percentages of no anthropometric failure children. The highest increase is observed in Uttarakhand, where it is increased by 25 percent followed by Odisha (22.7 percent) and Jharkhand (20.5 percent), while lowest increase is observed in Madhya Pradesh 8.8 percent followed by Chhattisgarh (11.3 percent) and Bihar (14.8 percent).

In General, there is an increase in the percentage of no anthropometric failure among children with the increase in the level of exposure to mass media. From no exposure to high exposure group there is a considerable increase in the percentages of children with no anthropometric failure.

In this section of the chapter we have seen the prevalence of no anthropometric failure among children by various background characteristics. This analysis through cross tabulation shows gross effects of various demographic, socioeconomic, maternal and other variables on the nutritional status of children. In order to assess the net effects of these variables on nutritional status of children we present binary logistic regression analysis in the next section.

4.3 Determinants of nutritional status of children in EAG states

In this section of the chapter, effect of the demographic and socioeconomic variables on nutritional status of children is studied through the binary logistic regression analysis. Logistic regression shows impact of a predictor variable on the dependent variable when impact of other predictor variables is controlled. In this analysis, dependent variable no anthropometric failure assumes one and zero if any failure. The tables 4.4 and 4.5 show the effect of demographic and socioeconomic variables on the nutritional status of children in EAG states.

Initial three years of human life is very important for the later physical and mental development. Nutritional deficiency in these years is irreversible. So, assessment of nutritional status of children in initial years is essential to estimate nutritional deprivation and to plan for possible interventions. With increasing age of the child the likelihood of no anthropometric failure is decreasing. In EAG states, likelihood of no anthropometric failure in the age group 1 to 2 year and 2 to 3 year is 0.554 and 0.509 respectively. It is much less likely in comparison to less than 1 year age group. In age groups 3 to 4 year and 4 to 5 year, increase

Table 4.4 Odds ratio of no anthropometric failure children by background characteristic in EAG states, 2005-06

Background characteristic		Exp (B)
Age of the child	Less than 1 Year [#]	
	1 to 2 year	0.554***
	2 to 3 year	0.509***
	3 to 4 year	0.552***
	4 to 5 year	0.660***
Sex of the child	Male [#]	
	Female	0.935*
Place of residence	Urban [#]	
	Rural	1.097
Type of caste or tribe	General [#]	
	OBC	0.896**
	SC	0.786***
	ST	0.826**
Religion	Hindu [#]	
	Muslim	0.869**
	Others	0.768*
Education level of mother	Higher [#]	
	Secondary	0.566***
	Primary	0.548***
	No Education	0.478***
BMI of mother	Overweight/Obese [#]	
	Normal	0.693***
	Thin	0.488***
Anaemia level of mother	No Anaemia [#]	
	Anaemia	0.857***
Birth order	1 to 2 [#]	
	3 & above	0.935
Birth Interval	36 months & above [#]	
	Less than 36 months	0.895***
Mother's work status	Not Working [#]	
	Working	1.008
Wealth index	Richest [#]	
	Richer	0.681***
	Middle	0.582***
	Poorer	0.542***
	Poorest	0.422***
Exposure to mass media	High [#]	
	Partial	0.956
	Low	0.917
	No Exposure	0.925
State	Uttar Pradesh [#]	
	Bihar	0.876*
	Rajasthan	1.395***
	Odisha	1.312***
	Madhya Pradesh	0.769***
	Chhattisgarh	1.111
	Jharkhand	1.120
	Uttarakhand	0.966

Source: Computed from NFHS-III, 2005-06, **Note -** [#] reference category, *** P < 0.01, ** P < 0.05, * P < 0.1

Table 4.5 Odds ratio of no anthropometric failure in each of EAG states, 2005-06

Background characteristic		Uttarakhand	Rajasthan	Uttar Pradesh	Bihar
Age of the child	Less than 1 Year #				
	1 to 2 year	0.761	0.447***	0.453***	0.641**
	2 to 3 year	0.707	0.549***	0.464***	0.362***
	3 to 4 year	0.571**	0.419***	0.460***	0.441***
	4 to 5 year	0.488***	0.549***	0.584***	0.518***
Sex of the child	Male #				
	Female	1.094	1.082	0.849**	0.950
Place of residence	Urban #				
	Rural	0.789	1.236	1.240**	0.983
Type of caste or tribe	General #				
	OBC	0.649*	1.332	0.785***	0.737*
	SC	0.952	1.114	0.804*	0.468***
	ST	1.500	1.167	0.574	1.937
Religion	Hindu #				
	Muslim	0.670	0.616**	0.963	0.826
	Others	0.857	0.378	2.051	N.A.
Education level of mother	Higher #				
	Secondary	0.443**	0.293**	0.633**	0.753
	Primary	0.749	0.291**	0.567***	0.898
	No Education	0.538	0.205***	0.506***	0.756
BMI of mother	Overweight/Obese #				
	Normal	0.487**	0.668	0.856	0.605
	Thin	0.304***	0.560*	0.574***	0.384***
Anaemia level of mother	No Anaemia #				
	Anaemia	1.018	1.056	0.728***	0.670***
Birth order	1 to 2 #				
	3 & above	0.912	1.023	1.023	0.816
Birth Interval	36 months & above #				
	Less than 36 months	0.831	1.001	0.863**	0.912
Mother's work status	Not Working #				
	Working	0.705*	1.048	0.963	1.281*
Wealth index	Richest #				
	Richer	0.790	0.625*	0.751**	0.565**
	Middle	0.609	0.609*	0.572***	0.476**
	Poorer	0.393***	0.606*	0.566***	0.425***
	Poorest	0.429**	0.526**	0.410***	0.292***
Exposure to mass media	High #				
	Partial	0.954	0.903	0.901	1.184
	Low	0.500**	1.112	0.876	1.196
	No Exposure	0.962	0.788	0.927	0.889

Note: N.A. – Not Available

Continued…

Table 4.5 Continued…

Background characteristic		Jharkhand	Odisha	Chhattisgarh	Madhya Pradesh
Age of the child	Less than 1 Year #				
	1 to 2 year	0.431***	0.473***	0.729	0.733*
	2 to 3 year	0.305***	0.491***	0.682*	0.603***
	3 to 4 year	0.508***	0.677*	1.111	0.691**
	4 to 5 year	0.575**	0.831	1.160	0.845
Sex of the child	Male #				
	Female	1.004	0.894	0.868	1.003
Place of residence	Urban #				
	Rural	1.206	1.070	0.743	0.817
Type of caste or tribe	General #				
	OBC	0.767	1.005	0.989	0.972
	SC	0.557*	0.719	1.029	0.598***
	ST	0.611	0.587**	0.962	0.791
Religion	Hindu #				
	Muslim	0.999	0.319	0.453	0.657*
	Others	0.782	0.754	4.068	0.684
Education level of mother	Higher #				
	Secondary	0.215**	0.654	0.702	0.561**
	Primary	0.276*	0.644	0.380**	0.544**
	No Education	0.192**	0.641	0.406*	0.493**
BMI of mother	Overweight/Obese #				
	Normal	0.900	0.476*	0.911	0.480***
	Thin	0.686	0.444*	0.628	0.307***
Anaemia level of mother	No Anaemia #				
	Anaemia	0.706**	1.035	1.354**	0.788**
Birth order	1 to 2 #				
	3 & above	1.020	0.925	0.708**	0.896
Birth Interval	36 months & above #				
	Less than 36 months	0.952	0.869	0.839	0.976
Mother's work status	Not Working #				
	Working	1.216	1.172	1.437*	0.906
Wealth index	Richest #				
	Richer	0.379**	0.533	0.490*	0.859
	Middle	0.308***	0.334***	0.564	1.050
	Poorer	0.266***	0.309***	0.585	0.849
	Poorest	0.250***	0.177***	0.538	0.734
Exposure to mass media	High #				
	Partial	1.509	0.747	1.037	0.877
	Low	0.729	0.924	0.957	1.088
	No Exposure	0.828	0.991	1.081	1.095

Source: Computed from NFHS-III, 2005-06

Note - # reference category, *** P < 0.01, ** P < 0.05, * P < 0.1

in likelihood of no anthropometric failure is observed. In Uttarakhand the likelihood of no anthropometric failure is constantly decreasing with the increase in the age of child, but results are not significant for the 1 to 2 year and 2 to 3 year age groups. While in Odisha the likelihood of no anthropometric failure declines for 1 to 2 year age group and after that it is increasing. In Rajasthan likelihood of no anthropometric failure declined for 1 to 2 year age group, then increased for 2 to 3 year age group, again decreased to lowest level in 3 to 4 year and for 4 to 5 year age group it again increases. The similar trend is observed for Uttar Pradesh. In Bihar, Jharkhand, Chhattisgarh and Madhya Pradesh the likelihood of no anthropometric failure of children declines for 1 to 2 year, reaches to minimum level in 2 to 3 year age group and then it increases in 3 to 4 year and 4 to 5 year age groups.

The nutritional status of children in initial years of life is significantly low in the EAG states of India. The nutritional status of children in age less than 1 year is better than any other age group. In general, the likelihood of no anthropometric failure is decreasing in the age groups of 1 to 2 year and 2 to 3 year and then increases in the 3 to 4 year and 4 to 5 year age group. But the later catch up is not sufficient to reach up to level of age less than 1 year.

Sex of child is an important factor in the nutritional status of children due to differential treatment in terms of food intake and health care due to prevalence of gender discrimination (Basu, 1989; Pande, 2003). Arnold et al., (2002) argues that son preference is stronger in north India, which form the EAG states, so nutritional status of female children lower. But, in all EAG states female children are slightly less likely (0.935) to be in no anthropometric failure than male children. Among states likelihood of no anthropometric failure is significant only in Uttar Pradesh, where female children are less likely (0.849) to be in no anthropometric failure in comparison to male children. This study has not found any clear evidence of lower nutritional status of female children than males.

In case of place of residence, many studies suggest that nutritional status of urban children is better than that of rural children (Radhakrishna and Ravi, 2004; Ruel et al., 1999; Arnold et al., 2004). But in this study, surprisingly the likelihood of no anthropometric failure is higher for the rural children (1.240) than urban children in Uttar Pradesh.

Social identity plays an important role in access of food, health care and information. It further affects the nutritional status of children. In EAG states likelihood of no anthropometric failure is lowest for the SC children (0.786) followed by ST (0.826) and OBC children (0.896) in comparison to general caste children. The likelihood of OBC children is 0.649, 0.785, and 0.737 in Uttarakhand, Uttar Pradesh and Bihar respectively. The likelihood of no anthropometric failure among SC children (0.468) is lowest in Bihar. It is 0.557, 0.598 and 0.804 in Jharkhand, Madhya Pradesh and Uttar Pradesh respectively. ST children (0.587) in Odisha are less likely to be in no anthropometric failure in comparison to general caste children. Deprived caste groups have much less likelihood of no anthropometric failure among children in comparison to general caste children. In some states these likelihood is much lower than the general caste.

Religious identity of the children is also included in the social identity. In EAG states likelihood of no anthropometric failure among children from Muslim (0.869) and others (0.768) religious group are less than the Hindu children. In Rajasthan, likelihood of no anthropometric failure is 0.616 for Muslim children, much less comparison to Hindu children, while in Madhya Pradesh, it is 0.657. In EAG states minority religious groups have less likelihood of no anthropometric failure in comparison to the Hindu children, which constitutes majority of the population. Haughton and Haughton (1997) also conclude with the similar result in a study of Vietnamese children.

Education level of mother has significant influence on the nutritional status of children as it affects knowledge and practices of feeding and care. With decreasing education level of mother the likelihood of no anthropometric failure among children is decreasing. In EAG states children of mothers educated up to secondary (0.566), primary (0.548) and illiterate (0.478) are significantly less likely to be in no anthropometric failure in comparison to higher educated mothers. In Rajasthan, likelihood of no anthropometric failure among children is very low, 0.293, 0.291 and 0.205 for secondary, primary and illiterate mothers respectively in comparison to higher educated mothers. In Jharkhand too very low likelihood is observed in children of secondary, primary and illiterate mothers. In Uttar Pradesh and Madhya Pradesh, there is a marked decline in likelihood of no anthropometric failure among children with decreasing level of mother's education but declines are not as low as Rajasthan and

Jharkhand. In EAG states the likelihood of no anthropometric failure among children is low among the less educated children in comparison to higher educated children. But in different states the impact of education level of mother has differential impact on the likelihood of no anthropometric failure. This study strongly supports the evidence that the relationship between mother's education and nutritional status of children is strong in the higher level of education (Boyle et al., 2006) as the likelihood is much lower in lower levels of maternal education.

Mother's nutritional status is a major determinant of the nutritional status of children. In EAG states, likelihood of no anthropometric failure among children of mother in normal and thin BMI category is 0.693 and 0.488 respectively in comparison to overweight or obese BMI category. The likelihood of no anthropometric failure is very less for the thin BMI category mothers. In Uttarakhand, Madhya Pradesh and Bihar the likelihood of no failure among children of mothers in thin BMI category is very less 0.304, 0.307 and 0.384 respectively. In Odisha, Rajasthan and Uttar Pradesh it is 0.444, 0.560 and 0.574 in thin BMI category. Even in the normal BMI category it is 0.487, 0.480 and 0.476 in Uttarakhand, Madhya Pradesh and Odisha respectively. With decreasing BMI of mother the likelihood of no anthropometric failure is significantly less in the EAG states. In Uttarakhand, Madhya Pradesh and Bihar likelihood of no anthropometric failure among children of mothers in thin BMI category is very less in comparison to overweight or obese mothers. There are no wide differences in likelihood of no anthropometric failure among children of mothers in normal and thin BMI category in comparison to overweight or obese mothers.

Anaemia level is taken as another indicator of nutritional status of mother. In this analysis of Mother's having any anaemia (0.857) is less likely to have children in no anthropometric failure in comparison to mothers having no anaemia in EAG states. In Uttar Pradesh (0.728), Bihar (0.670), Jharkhand (0.706) and Madhya Pradesh (0.788) have less likelihood of no anthropometric failure of children of anaemic mothers in comparison to not anaemic mothers. Contrary to these results in Chhattisgarh, the likelihood of no failure among children is more for anaemic mothers in comparison to not anaemic mothers.

Birth Order is another maternal factor is taken for the study. But the results are not significant. It is significant only in Chhattisgarh where the 3 & above birth order children (0.708) are less likely to be in no anthropometric failure in comparison to 1 to 2 birth order.

Birth interval is also an influencing factor of nutritional status of children. In EAG states the likelihood of children having birth interval of less than 36 months (0.895) are less likely to be in no anthropometric failure than children of birth interval more than 36 months & above. In Uttar Pradesh too similar pattern is observed.

The impact of working status of mother on nutritional status of children is debatable. Nature of mother's work has significant influence on the nutritional status of children, but in this study we have taken only two classifications of working or not working mothers. Results are significant only in Uttarakhand, Bihar and Chhattisgarh. In Uttarakhand children of working mothers are less likely to be in no anthropometric failure in comparison to not working mothers. While in Bihar and Chhattisgarh, the likelihood of no anthropometric failure among children of working mothers is more than not working mothers.

Wealth index is taken as proxy of the economic status in this analysis which is an important influencing factor of nutritional status of children. The likelihood of poorest, poorer, middle and richer wealth quintile is 0.422, 0.542, 0.582 and 0.681 respectively taking richest as the reference category in EAG states. In individual states too similar pattern is observed. In Jharkhand, the likelihood of no failure is very less in poorest (0.250), poorer (0.266), middle (0.308) and richer (0.379) wealth quintile in comparison to richest wealth quintile. In Odisha likelihood of no failure is very less, only 0.177 in the poorest in comparison to richest wealth quintile. In Rajasthan and Uttar Pradesh decline in likelihood according to wealth status is slightly low in comparison to other states of EAG.

With decreasing economic status the likelihood of no anthropometric failure is decreasing in all of the EAG states. In EAG states the decrease in likelihood of no anthropometric failure is small in richer to poorest wealth quintile, but in richest to richer quintile the decrease is huge. The similar trend is observed in all of the EAG states. But in Bihar, Jharkhand and Chhattisgarh the decrease in likelihood of no anthropometric failure in richest to richer wealth quintile is very high.

Table 4.6 Summary table of determinants of no anthropometric failure children in each of EAG states of India, 2005-06

Background characteristic		UK	RJ	UP	BR	JH	OR	CH	MP	EAG
Age of the child	Less than 1 Year #	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
	1 to 2 year		Sig.	Sig.	Sig.	Sig.	Sig.		Sig.	Sig.
	2 to 3 year		Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
	3 to 4 year	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.		Sig.	Sig.
	4 to 5 year	Sig.	Sig.	Sig.	Sig.	Sig.				Sig.
Sex of the child	Male #									
	Female			Sig.						Sig.
Place of residence	Urban #									
	Rural			Sig.						
Type of caste or tribe	General #			Sig.	Sig.		Sig.		Sig.	Sig.
	OBC	Sig.		Sig.	Sig.					Sig.
	SC			Sig.	Sig.	Sig.			Sig.	Sig.
	ST						Sig.			Sig.
Religion	Hindu #		Sig.							Sig.
	Muslim		Sig.						Sig.	Sig.
	Others									Sig.
Education level of mother	Higher #	Sig.	Sig.	Sig.		Sig.		Sig.		Sig.
	Secondary	Sig.	Sig.	Sig.		Sig.			Sig.	Sig.
	Primary		Sig.	Sig.		Sig.		Sig.	Sig.	Sig.
	No Education		Sig.	Sig.		Sig.		Sig.	Sig.	Sig.
BMI of mother	Overweight/Obese #	Sig.		Sig.	Sig.			Sig.	Sig.	Sig.
	Normal	Sig.					Sig.		Sig.	Sig.
	Thin	Sig.	Sig.	Sig.	Sig.		Sig.		Sig.	Sig.
Anaemia level of mother	No Anaemia #									
	Anaemia			Sig.	Sig.	Sig.		Sig.	Sig.	Sig.
Birth order	1 to 2 #									
	3 & above							Sig.		
Birth Interval	36 months & above #									
	Less than 36 months			Sig.						Sig.
Mother's work status	Not Working #									
	Working	Sig.			Sig.			Sig.		
Wealth index	Richest #	Sig.		Sig.	Sig.	Sig.	Sig.			Sig.
	Richer		Sig.	Sig.	Sig.	Sig.		Sig.		Sig.
	Middle		Sig.	Sig.	Sig.	Sig.	Sig.			Sig.
	Poorer	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.			Sig.
	Poorest	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.			Sig.
Exposure to mass media	High #					Sig.				
	Partial									
	Low	Sig.								
	No Exposure									

Source: Based on table 4.4 and 4.5 **Note -** # reference category, UK - Uttarakhand, RJ - Rajasthan, UP – Uttar Pradesh, BR - Bihar, JH - Jharkhand, OR - Odisha, CH - Chhattisgarh, MP – Madhya Pradesh, EAG – Empowered Action Group of states

Results are not significant for the exposure to mass media.

Coming to the state level variations of the no anthropometric failure shown in table 4.4, considering the Uttar Pradesh as the reference group, children of Rajasthan and Odisha are more likely to be in no anthropometric failure, while children of Bihar and Madhya Pradesh are less likelihood to be no anthropometric failure. Results are not significant for Chhattisgarh, Jharkhand and Uttarakhand.

Table 4.6 shows the summary of the binary logistic regression results in this section of the study. It is observed in this table that age of the child, type of caste or tribe, education level of mother, body mass index of mother, anaemia level of mother and wealth index are emerges as the significant determinants of the nutritional status of children in EAG states. Nutritional status in initial years of life is must for the physical and mental development of child. But in EAG states the nutritional status in initial years are far from satisfactory. Social identity of children is also emerges as major determinant of nutritional status of children. Education level and nutritional status of mother has strong positive relationship with the nutritional status of children. Economic status of household emerges as the one of the significant determinant of nutritional status of children as it directly affects availability of nutrients and healthcare.

4.4 Inequalities in nutritional status of children by concentration curve and concentration index in EAG states

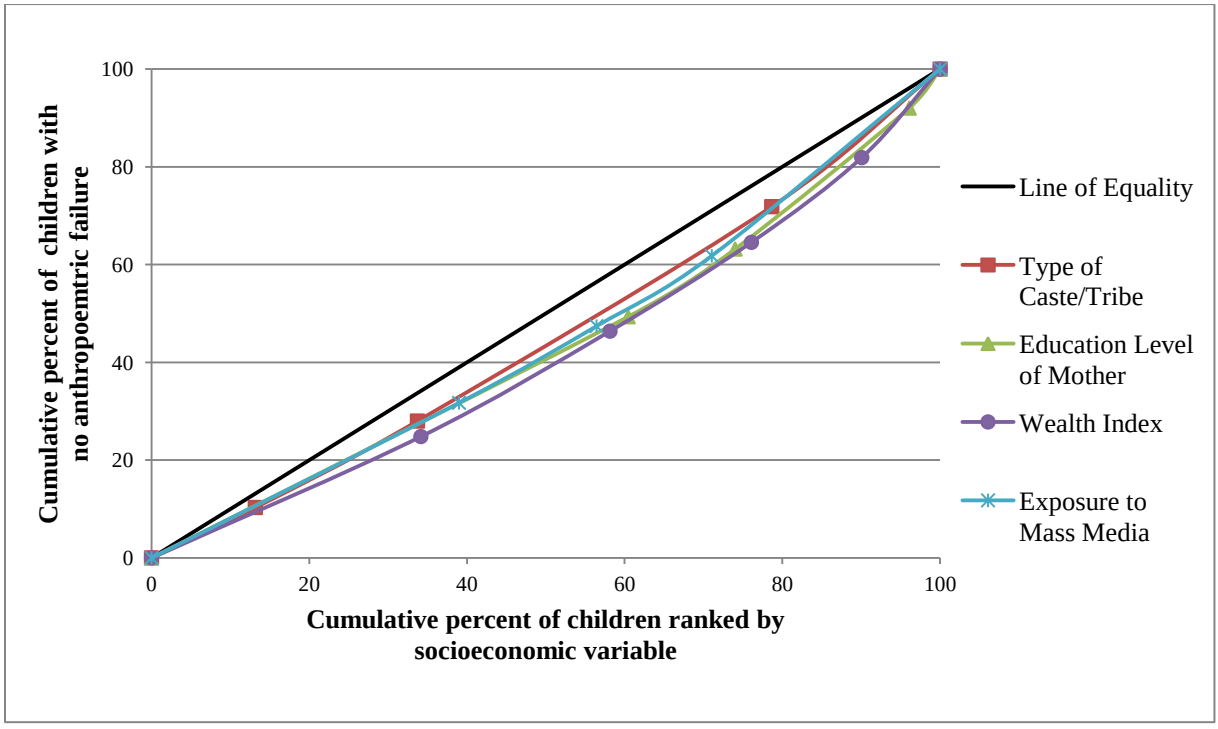
In this section of the chapter socioeconomic inequalities in nutrition status of children is studied by concentration curve and concentration index. Only four socioeconomic variables namely type of caste or tribe, education level of mother, wealth index and exposure to mass media are taken for this analysis because of the methodological suitability of these indicators in construction of concentration curve and concentration index.

Concentration curves are drawn to show the situation of the inequality in EAG states shown in figure 4.6. All the curves are above the below of equality which shows the concentration of no anthropometric failure children in upper strata of socioeconomic variables. Concentration curve of wealth index predominate other curves and line of equality, indicating larger

inequality in no anthropometric failure children across the wealth quintile in EAG states. The second important variable in unequal distribution of no anthropometric failure children is education level of mother. Exposure to mass media is the third largest factor across which of no anthropometric failure children are unequally distributed. Type of caste or tribe is the least affecting factor across which inequality in no anthropometric failure among children occurs among these four factors.

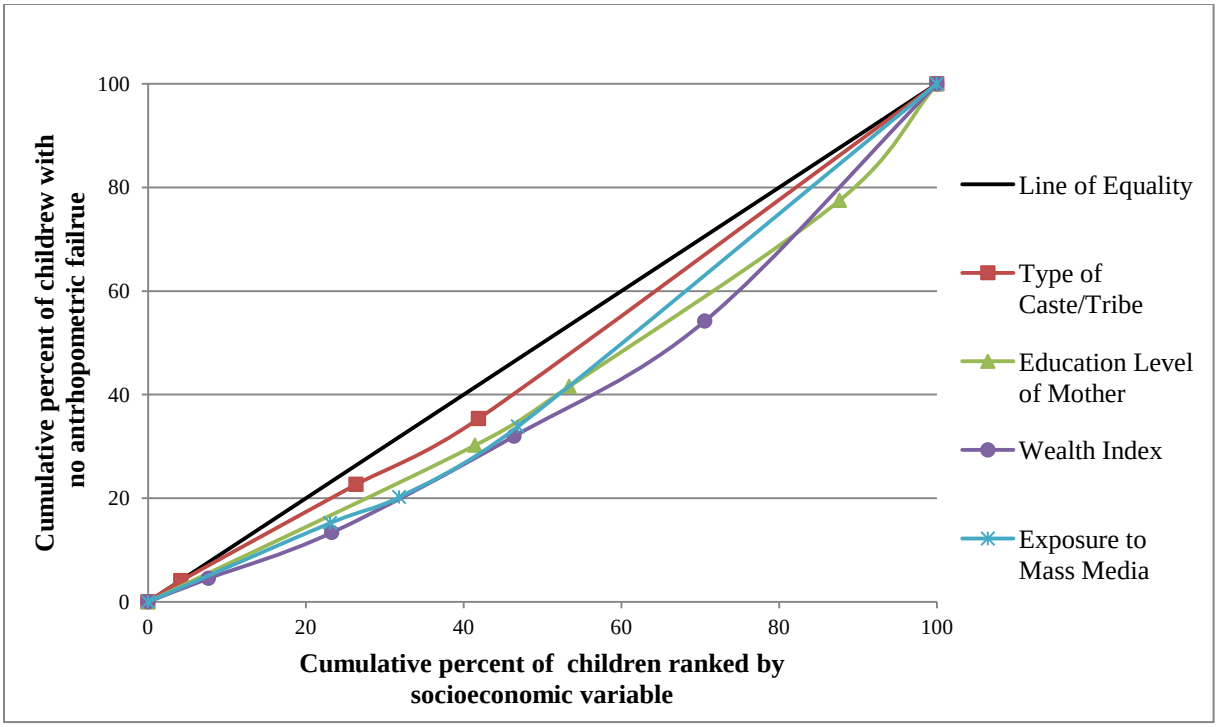
In each of the EAG states, concentration curve of wealth index predominate other curves, Chhattisgarh where education level of mother dominates all other curves as shown in figures 4.7 to 4.14. In Jharkhand curve of exposure to mass media dominates same of wealth index in lower strata of socioeconomic variables, but in upper strata wealth index dominates all other curves (figure 4.11). In Rajasthan curves of wealth index, education level of mother and exposure to mass media seem to be overlapping each other indicating similar levels of inequality in distribution of no anthropometric failure across these variables as shown in figure 4.8.

Figure 4.6 Concentration curves showing inequality in EAG states, 2005-06



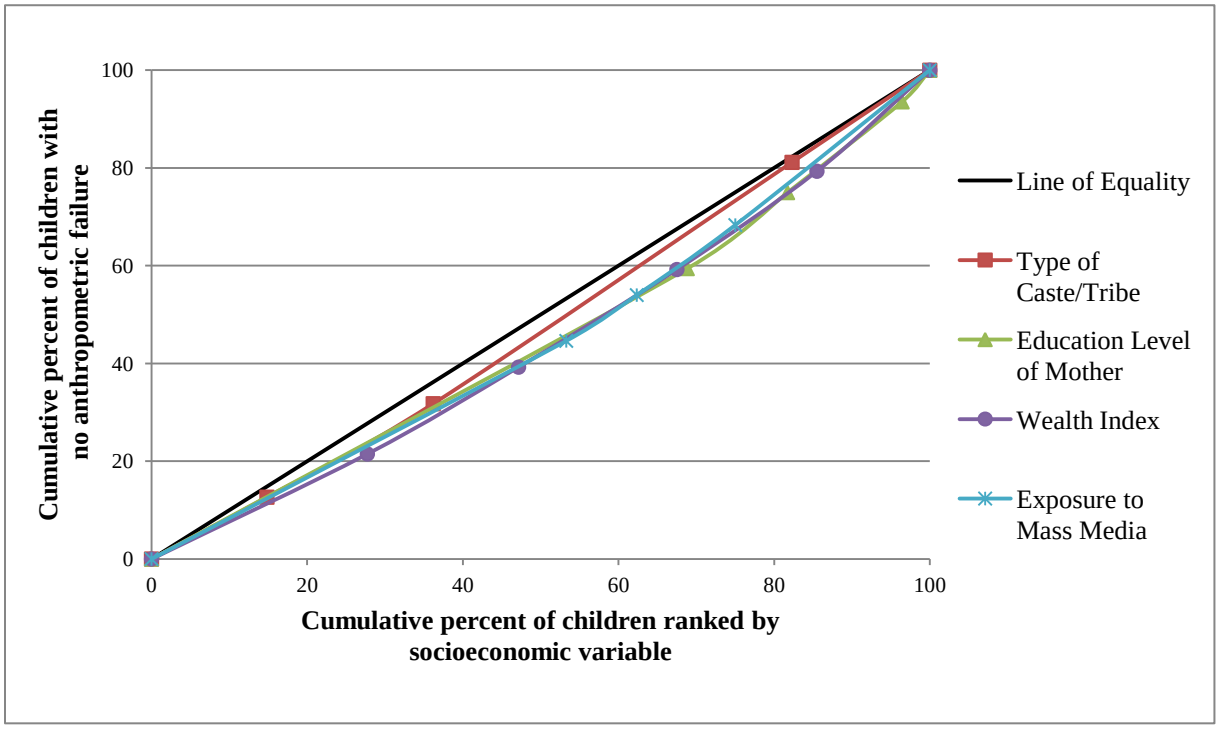
Source: Computed from NFHS-III, 2005-06

Figure 4.7 Concentration curves showing inequality in Uttarakhand, 2005-06



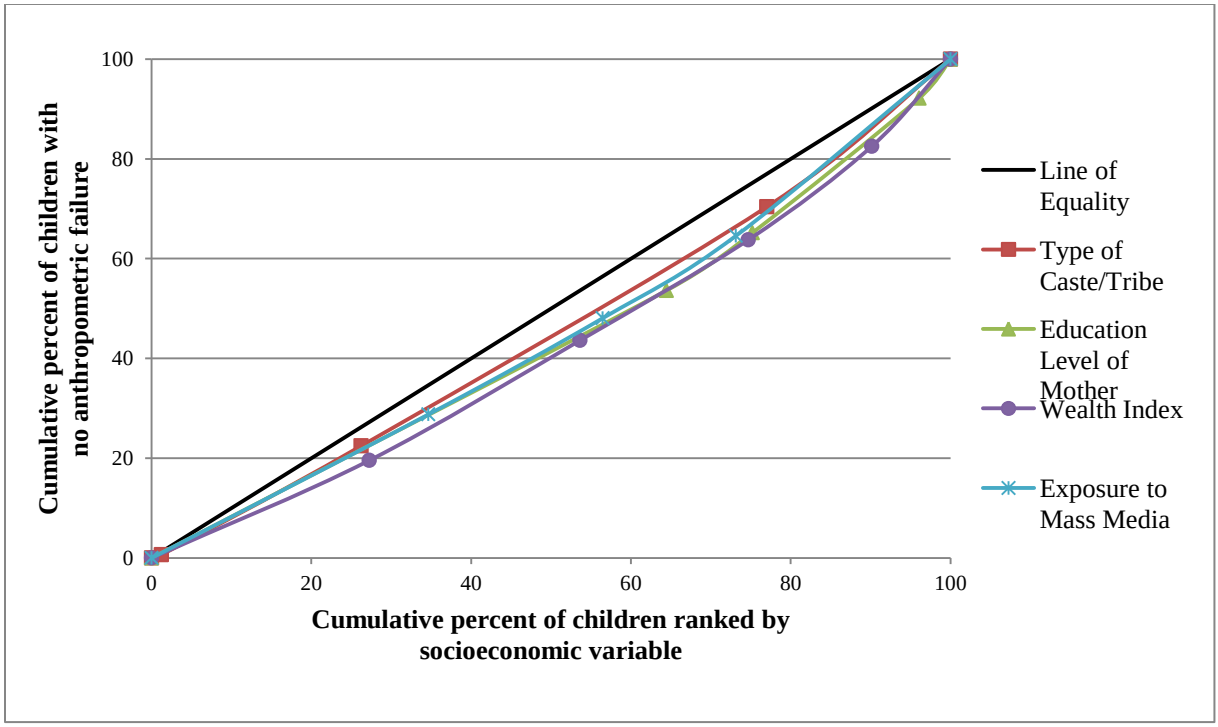
Source: Computed from NFHS-III, 2005-06

Figure 4.8 Concentration curves showing inequality in Rajasthan, 2005-06



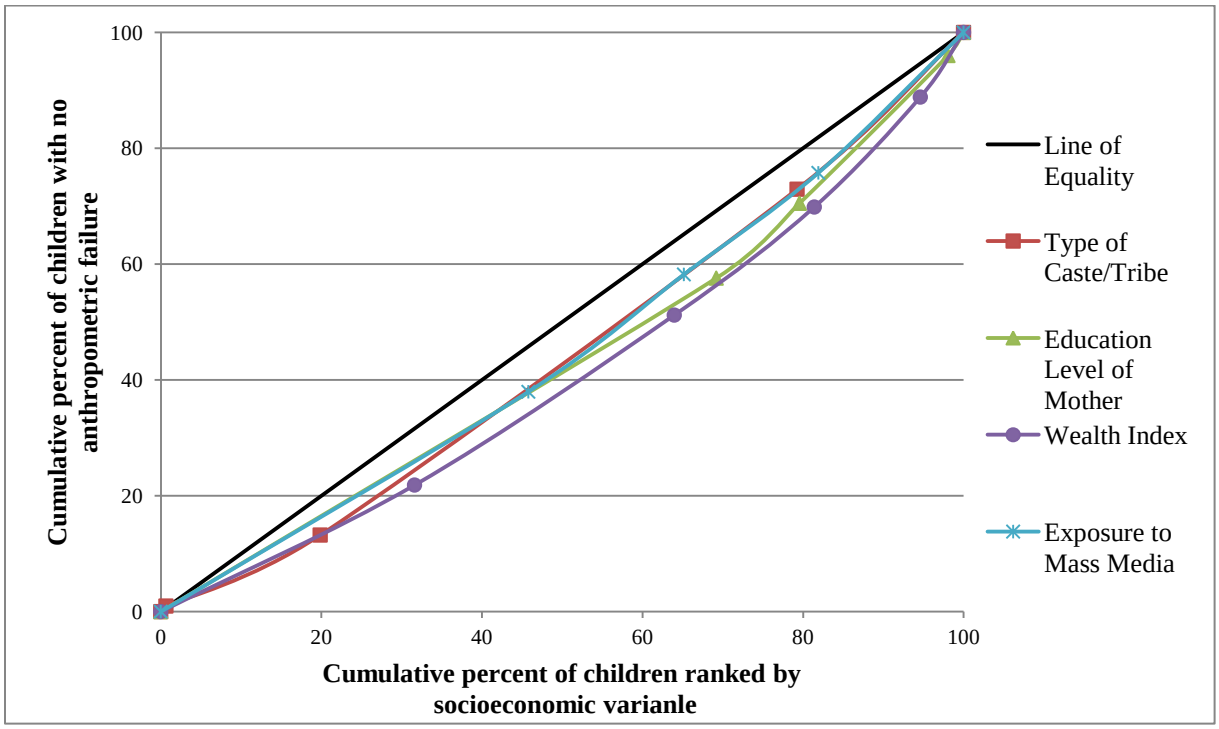
Source: Computed from NFHS-III, 2005-06

Figure 4.9 Concentration curves showing inequality in Uttar Pradesh, 2005-06



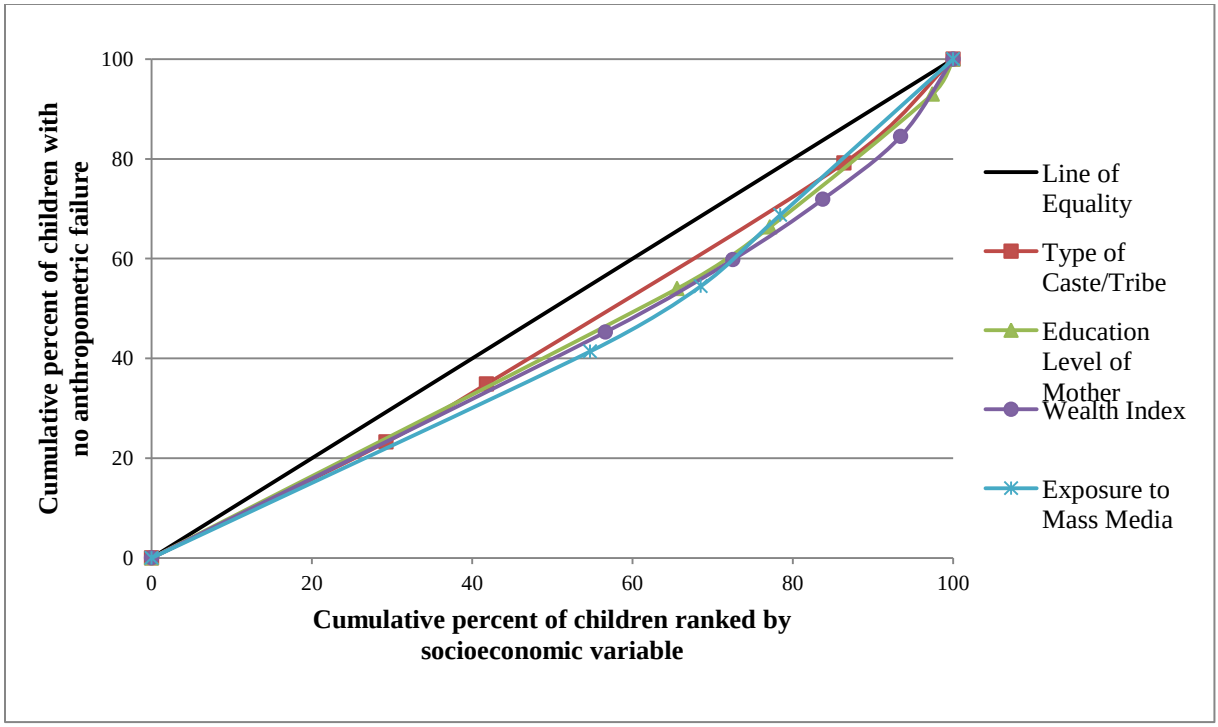
Source: Computed from NFHS-III, 2005-06

Figure 4.10 Concentration curves showing inequality in Bihar, 2005-06



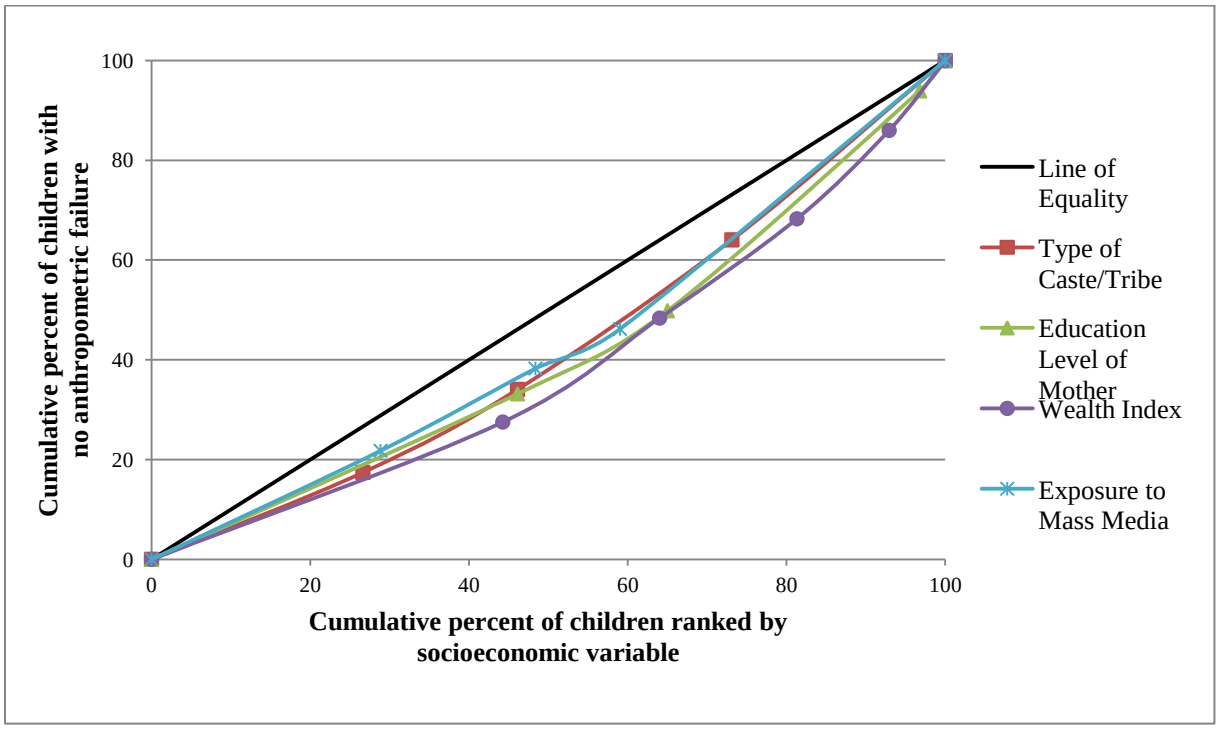
Source: Computed from NFHS-III, 2005-06

Figure 4.11 Concentration curves showing inequality in Jharkhand, 2005-06



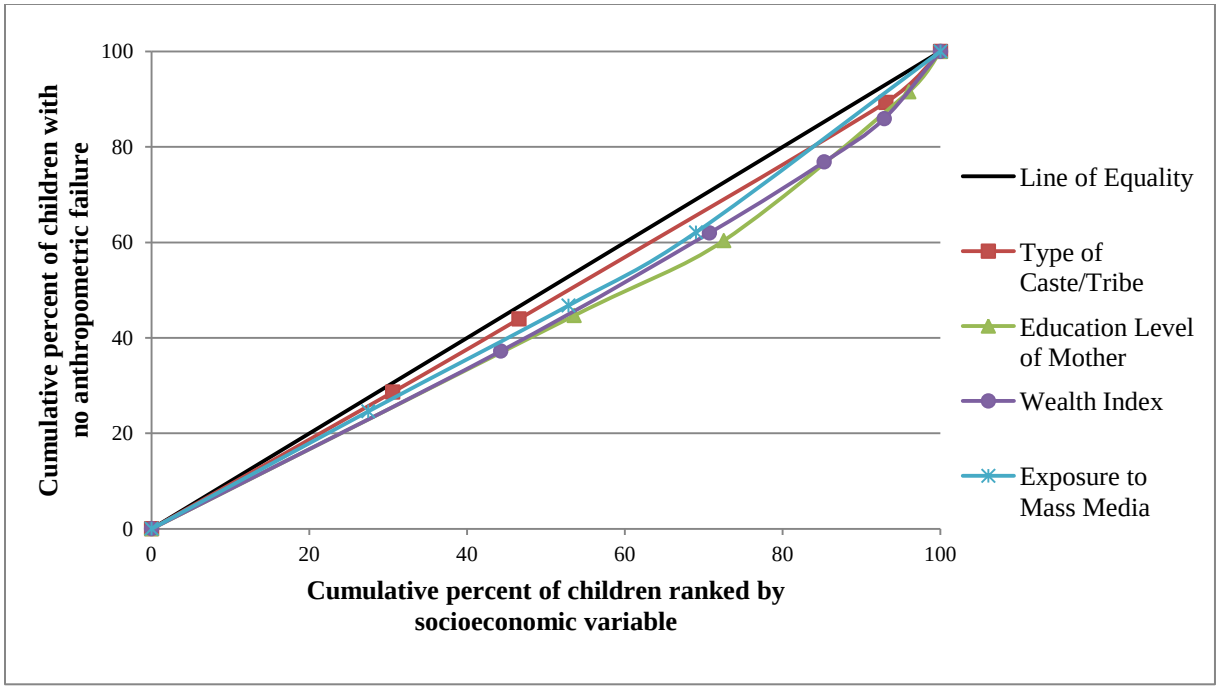
Source: Computed from NFHS-III, 2005-06

Figure 4.12 Concentration curves showing inequality in Odisha, 2005-06



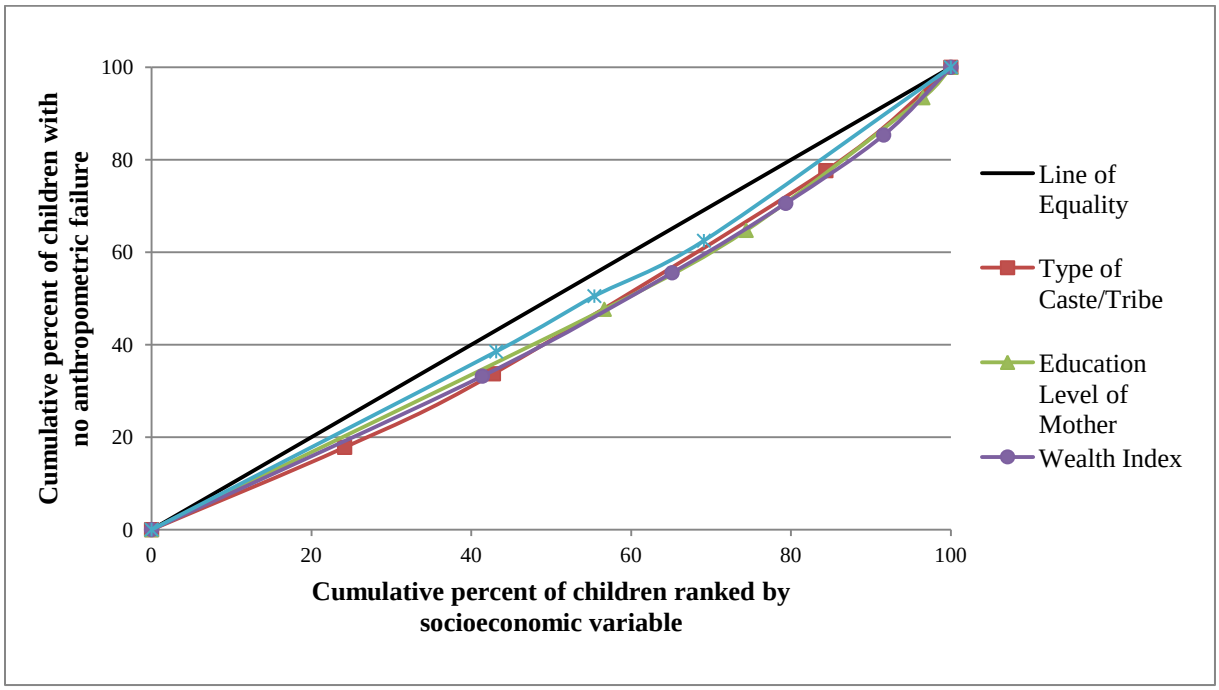
Source: Computed from NFHS-III, 2005-06

Figure 4.13 Concentration curves showing inequality in Chhattisgarh, 2005-06



Source: Computed from NFHS-III, 2005-06

Figure 4.14 Concentration curves showing inequality in Madhya Pradesh, 2005-06



Source: Computed from NFHS-III, 2005-06

In Madhya Pradesh all concentration curves except exposure to mass media looks to be overlapping each other showing similar level of inequality across wealth index, type of caste or tribe and education level of mothers (figure 4.14). In Uttarakhand, Jharkhand and Odisha the concentration curves are farther from the line of equality, shown in figures 4.7, 4.11 and 4.12 respectively, showing high inequality in these states across the studied socioeconomic variables.

Overall, no anthropometric failure children are most inequitably distributed across the wealth quintiles and then slightly less across the education level of mother, then much less across the exposure to mass media. Type of caste or tribe is least affecting factor in inequitable distribution among these four socioeconomic variables.

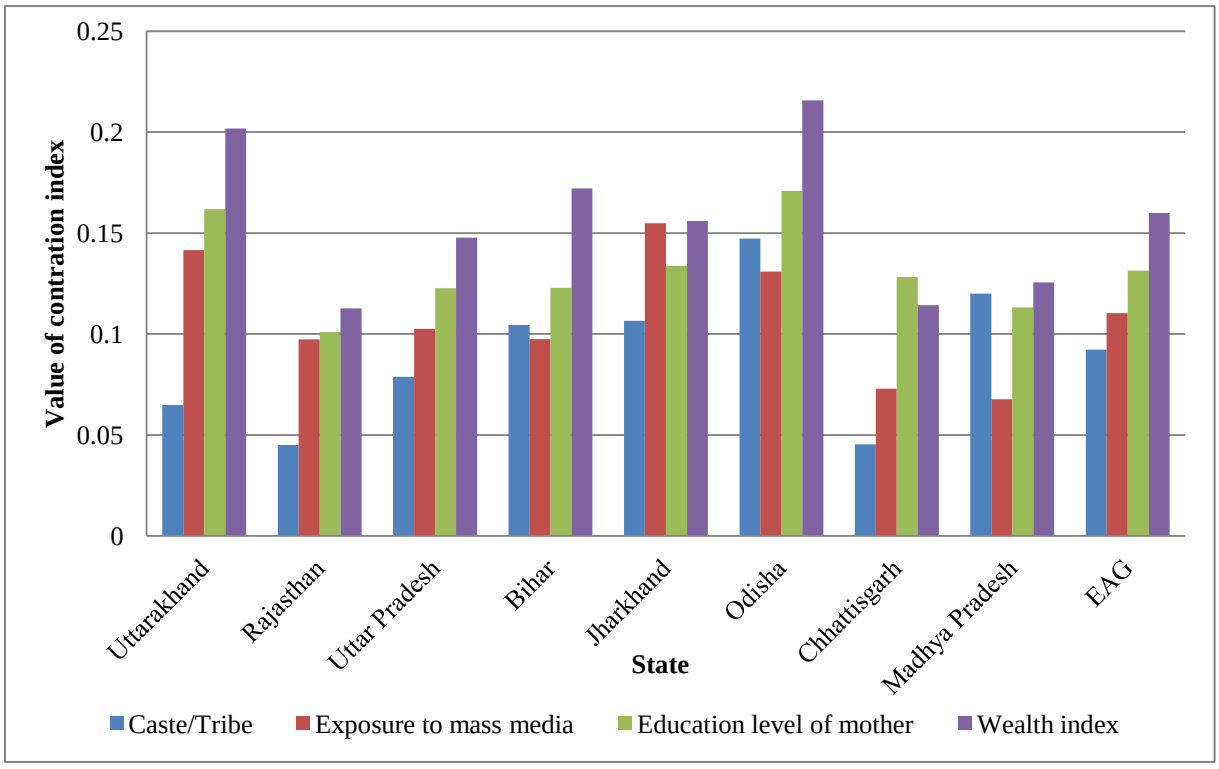
In order to clarify the status of inequality across the socioeconomic variables concentration index is also calculated. Table 4.4 shows concentration indices for the nutritional status of children across the socioeconomic variables in EAG states. The positive value of concentration index indicates that children with no anthropometric failure are concentrated

Table 4.7 Concentration index for nutritional status of children in EAG states

State	Caste/Tribe	Exposure to Mass Media	Education Level of Mother	Wealth Index
Uttarakhand	0.0622	0.1415	0.1619	0.2018
Rajasthan	0.0450	0.0973	0.1009	0.1126
Uttar Pradesh	0.0787	0.1026	0.1226	0.1477
Bihar	0.1023	0.0975	0.1228	0.1722
Jharkhand	0.1065	0.1548	0.1337	0.1560
Odisha	0.1472	0.1310	0.1708	0.2157
Chhattisgarh	0.0454	0.0729	0.1283	0.1143
Madhya Pradesh	0.1200	0.0676	0.1132	0.1256
EAG	0.0922	0.1103	0.1314	0.1599

Source: Computed from NFHS-III, 2005-06

Figure 4.15 Concentration index for inequalities in nutritional status of children in EAG states, 2005-06



Source: Computed from NFHS-III, 2005-06

among the least disadvantaged socioeconomic groups. The value of concentration index is positive for all socioeconomic groups and in each of EAG states. Figure 4.15 shows the concentration index for each socioeconomic group in the each of EAG states. It is highest for the wealth index, indicating that the economic condition has the largest impact on the unequal distribution of no anthropometric failure children except in Chhattisgarh, where the value of concentration index is highest for education level of mother.

The inequality across wealth quintile is highest in Odisha (0.2157) followed by Uttarakhand (0.2018), Bihar (0.1722) and Jharkhand (0.1560) and lowest in Rajasthan (0.1126) followed by Chhattisgarh (0.1143) and Madhya Pradesh (0.1256).

Education level of mother is the second largest factor (among these four variables) across which children with no anthropometric failure are unequally distributed of in the each of EAG states except Madhya Pradesh. Inequalities across education level of mother are higher in

Odisha (0.1708) and Uttarakhand (0.1619) and lower in Rajasthan (0.1009), Madhya Pradesh (0.1132), Uttar Pradesh (0.1226) and Bihar (0.1228).

In terms of exposure to mass media, inequality in no anthropometric failure among children is highest in Jharkhand (0.1548) followed by Uttarakhand (0.1415) and Odisha (0.1310) and lowest in Madhya Pradesh (0.0676) followed by Chhattisgarh (0.0729), Rajasthan (0.0973) and Bihar (0.0975).

The unequal distribution of children with no anthropometric failure is higher across the type of caste or tribe in Odisha (0.1472), Madhya Pradesh (0.1200), Jharkhand (0.1065) and Bihar (0.1044) and lower in Rajasthan (0.0450), Chhattisgarh (0.0454) and Uttar Pradesh (0.0787).

Inequality in level of no anthropometric failure among children is highest in Odisha in terms of wealth index, type of caste or tribe and education level of mother. Rajasthan has the least inequality in terms of wealth index, education level of mother and type of caste or tribe. The unequal distribution of children with no anthropometric failure is least across the type of caste or tribe of children except Madhya Pradesh, Bihar and Odisha. In general Rajasthan, Madhya Pradesh and Chhattisgarh have the lower inequality, while Uttarakhand, Odisha and Jharkhand have the higher inequality in level of no anthropometric failure of children.

4.5 Decomposition of concentration index for nutritional status of children in EAG states

Concentration curves and concentration index do not provide the proportional contribution of each factor in inequality. A decomposition analysis is performed to estimate contribution of each factor in unequal distribution of children with no anthropometric failure. Table 4.8 shows that the wealth index alone contributes 44.46 percent in inequality in no anthropometric failure among children. Education level of mother (21.12 percent) emerges as the second largest contributing factor in inequality. Exposure to mass media and BMI of mother has 12.33 percent and 12.06 percent contribution in unequal distribution of no anthropometric failure children respectively. Type of caste or tribe has 8.43 percent contribution. The other factors having considerable contribution in inequality are birth order

(6.34 percent) and place of residence (4.48 percent). Sex of the child has a very small contribution (0.14 percent).

Table 4.8 Decomposition of concentration index showing contribution of different factors in inequality in EAG states, 2005-06

Background characteristic	Concentration index	Absolute contribution	Relative contribution
Age of the child	-0.0333	-0.0020	-2.15
Sex of the child	0.0059	0.0001	0.14
Place of residence	0.4982	0.0041	4.48
Type of caste or tribe	0.1092	0.0078	8.43
Religion	-0.0103	-0.0007	-0.82
Educational level of mother	0.2883	0.0196	21.12
BMI of Mother	0.0718	0.0112	12.06
Anaemia level of mother	0.0723	-0.0058	-6.24
Birth order	0.1395	0.0059	6.34
Birth interval	-0.0048	-0.0001	-0.18
Mother's work status	0.1582	0.0000	0.00
Wealth index	0.4636	0.0413	44.46
Exposure to mass media	0.2928	0.0114	12.33
No anthropometric failure		0.0930	100.00
Residual		0.0669	
Total CI		0.1599	

Source: Computed from NFHS-III, 2005-06

To sum up, it can be said from the above analysis that wealth index has a prominent contribution in inequality in no anthropometric failure children in EAG states. Education level of mother also has significant contribution in this inequality. The other important factors which have considerable contribution in inequality in no anthropometric failure children are exposure to mass media, BMI of mother, type of caste or tribe, birth order and place of residence.

CHAPTER – V

SUMMARY AND CONCLUSION

Despite of remarkable economic growth in the last two decades, the nutritional status of Indian population is among the worst in the world. Improvement in nutritional status is much slower than the expected international experience (Radhakrishna and Ravi, 2004; Deaton and Dreze, 2009). Nutritional status of India is worse than most of sub-Saharan countries, even though those countries are poorer than India and have higher infant and child mortality rates (Deaton and Dreze, 2009). A large proportion of the children in India still lack of most basic needs, i.e., sufficient food and adequate health care. According to NFHS-III, 48 percent of Indian children are stunted, 19.8 percent are wasted and 42.5 percent are underweight. These rates are much higher than the sub-Saharan Africa (22 percent of children are underweight). The recent Hunger and Malnutrition (HUNGaMA) survey report, 2011 shows some positive change for child nutrition, but it is still unacceptably high. In 100 focus districts of selected states (Bihar, Jharkhand, Madhya Pradesh, Odisha, Rajasthan and Uttar Pradesh), 58.8 percent children are stunted, 42.3 percent are underweight and 11.4 percent are wasted. The consequences of the poor nutrition are not just limited to the physical and mental health of the populations, but also for the economy as a whole. The economic loss associated with malnutrition is estimated to be 3 percent of India's GDP annually (Susan, 1999).

In this study nutritional status of children in EAG states has been studied through the new anthropometric measure, no anthropometric failure i.e., free from any type of anthropometric failure. Results of the study inflict serious concerns on the nutritional status of children. In all EAG states, the proportion of children with no anthropometric failure is very low, only one-third of children are in state of no anthropometric failure. In Bihar, Jharkhand and Madhya Pradesh, it is even less than 30 percent.

The prevalence of no anthropometric failure among children is highest in the age group less than one year. It decreases in the age group of 1 to 2 years and 2 to 3 years because in this age child is prone to infectious diseases. After the age of three years there is sign of improvement in nutritional status measured by no anthropometric failure, but it does not reach even up to level of less than one year age group. There is no clear evidence of low level of no anthropometric failure among girl child.

Prevalence of no anthropometric failure is higher in the urban areas in comparison to rural areas and there also exist wide gaps between them. Type of caste or tribe has significant impact on the nutritional status of children. Children belonging to general caste have much better nutritional status than ST, SC and OBC. There are small differences in the level of no anthropometric failure in ST, SC and OBC, but the gap between OBC and general caste children is much wider. Among religious groups, Hindu children are better in terms of no anthropometric failure, but the difference from other religious group is not very large. In some states Muslims and other religious group have better nutritional levels. Education level of mother emerges as a remarkable indictor in determining the nutritional status of child. Levels of no anthropometric failure among children with the rise in the education level of mother have correlated positively. Highly educated mothers have almost two to three times higher level of children with no anthropometric failure than illiterate mothers. There is large gap between the secondary educated mothers and highly educated mothers in terms of no anthropometric failure among children.

Among the maternal factors, BMI of mother do plays a pivotal role for the prevalence of no anthropometric failure among children as its impact on child growth during pregnancy. It is interesting to see that overweight or obese mothers posses high percentages of children with no anthropometric failure. Anaemia levels of mother have also influence on the level of children with no anthropometric failure, but here the wide differences are seldom. Children with lower birth order say one or two are better in terms of nutritional status than higher birth order children. Again shorter birth interval is associated with the deprived nutritional status of children.

Mother's work status shows negative impact on the levels of no anthropometric failure among children. Standard of living of the household has strong impact on the nutritional status of child as it affects nutrient intake and health care. With increase in the standard of living of household measured by wealth index in this study, it is observed that there is sharp increase in the nutritional status of children in terms of no anthropometric failure. It is shocking to see that even in the economically better off groups the level of no anthropometric failure among children is not satisfactory. In the richest wealth quintile only 61 percent of children are in no anthropometric failure and rest 39 percent are suffering from any type of anthropometric

failure. Poor environmental condition may have impact on the overall low nutritional status of children in EAG states (Radhakrishna and Ravi, 2004).

Mass media is a major source of information in the modern world. Its impact is also observed on the nutritional status of children. With increase in the exposure to mass media, the proportion of children with no anthropometric failure is increasing. But the magnitude of improvement is small.

It also observed that when the other variables are controlled, different demographic and socioeconomic variables like age of the child, education level of mother, BMI of mother and standard of living bears strong influence on the nutritional status of child.

Age of the child has significant impact on the nutritional status of children. The likelihood of no anthropometric failure among children decreases in 1 to 2 year and 2 to 3 year age group in comparison to less than 1 year age group. After the three years the likelihood of no anthropometric failure increases slightly but it does not reach up to level of less than one year. It indicates that the nutritional status of the children in EAG states is lagging behind in initial years of life which is irreversible and resulted in the lower nutritional status of adult population.

Type of caste or tribe is also an important determinant of nutritional status of child. In all EAG states, the likelihood of no anthropometric failure is lower in the SC, ST and OBC children. In this analysis, it is observed that SC children have the least likelihood to be in no anthropometric failure.

Education level of mother has strong bearing on the nutritional status of children. In all EAG states combined the likelihood of no anthropometric failure among children is reduced to almost half in comparison to highly educated mothers.

BMI level of mother have a strong relationship with the children nutritional status. It is interesting to note that likelihood of no anthropometric failure children of thin mothers is significantly reduced to less than half in comparison to overweight or obese mothers.

There is a very strong relation of wealth index with nutritional status of child and for the substantial poor-rich gap it was found that rich have a disproportionate advantage of no anthropometric failure. There are large differences in likelihood of no anthropometric failure among children in richest and richer group and small differences in likelihood are observed among other wealth quintiles.

In general inequality in no anthropometric failure among children is low in all EAG states. The values of concentration indices are not much higher in any of the state or for all EAG state. But there are evidences of unequal distribution of nutritional status of children. It is observed from the analysis that no anthropometric children is concentrated in the better off groups defined by type of caste or tribe, education level of mother, wealth index and exposure to mass media. Standard of living measured by wealth index has the largest role in the unequal distribution of the nutritional status of children. Education level of mother and exposure to mass media is the second and third largest factor respectively. The type of caste or tribe of children is the least affecting factor in unequal distribution of nutritional status of children among these four variables. Inequality in terms of wealth index in Odisha, Uttarakhand, Bihar and Jharkhand is higher in comparison to Rajasthan, Chhattisgarh and Madhya Pradesh, while in terms of type of caste or tribe it is higher in Odisha, Madhya Pradesh, Bihar and Jharkhand in comparison to Rajasthan, Chhattisgarh, Uttarakhand and Uttar Pradesh.

It was also found that Madhya Pradesh which has the lowest percentage of no anthropometric failure among children but inequality is lowest among the studied socioeconomic variables namely, education level of mother, wealth index and exposure to mass media. But in Bihar and Jharkhand, the percentage of no anthropometric failure children is low, however there is high inequality in terms of the type of caste or tribe and wealth index. While in Uttarakhand and Odisha there are high percentage of no anthropometric failure children, but inequality is also higher in terms of wealth index, education level of mother, exposure to mass media and type of caste or tribe (only for Odisha). Rajasthan also has higher percentage of no

anthropometric failure among children but the inequalities are lower in terms of type of caste or tribe, exposure to mass media, education level of mother and wealth index.

This study also shows the contribution of various factors in unequal distribution of no anthropometric failure among children in all EAG states. Wealth index (45 percent) emerges as the largest contributor to the unequal distribution of nutritional status of children. Education level of mother as a factor accounts one-fifth for the distribution. Exposure to mass media and BMI of mother also has significant contribution 12.33 percent and 12 percent respectively. Type of caste or tribe has 8.43 percent contribution in the unequal distribution of no anthropometric failure among children.

From this study, the some important features regarding child nutritional status in EAG states emerges that have potential implication. The percentage of no anthropometric failure children is very low in each of the EAG state, but there are evidences of unequal distribution of no anthropometric failure across the various demographic and socioeconomic variables. So improvement in income of the poor, education and health status of women, eradication of caste based discriminations, spreading the awareness about nutrition provide a long term solutions to establish equality in terms of nutritional status among children. It is also important to target children at a very early age to avoid irreversible disorders in later stages. Reduction in poverty levels assumes prime significance as it has emerged as the largest contributor of the inequality in nutritional status. However, in the short run, direct nutrition intervention for all and improvement in environmental conditions should be the priority, because even in the better off groups the level of nutritional status of children is far from the optimal.

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Table: 1 Percentage distribution of no anthropometric failure and total number of children in Uttarakhand and Rajasthan

		Uttarakhand (1,030)		Rajasthan (1,746)	
		Percent of no failure	N	Percent of no failure	N
Age of the Child	Less than 1 Year	50.7	221	55.0	347
	1 - 2 Year	41.5	193	38.7	354
	2 - 3 Year	45.9	207	39.2	332
	3 - 4 Year	40.0	200	35.9	357
	4 - 5 Year	35.4	209	39.6	356
Sex of the Child	Male	41.5	542	41.1	932
	Female	44.3	488	42.2	813
Place of residence	Urban	61.3	243	49.3	361
	Rural	37.1	788	39.6	1385
Type of caste or tribe	SC	35.8	229	37.3	373
	ST	41.9	43	35.5	259
	OBC	35.0	160	44.6	805
	General	47.6	599	44.3	309
Religion	Hindu	43.2	864	42.6	1529
	Muslim	39.0	105	33.0	200
	Others	44.3	61	52.9	17
Education level of mother	No Education	31.1	427	35.9	1202
	Primary	40.7	123	50.2	225
	Secondary	44.8	353	52.5	257
	Higher	78.0	127	75.8	62
BMI of Mother	Thin	29.5	308	38.6	686
	Normal	44.4	619	42.6	989
	Overweight/Obese	73.3	101	56.2	64
Anaemia Level of Mother	No Anaemia	45.9	401	43.8	713
	Anaemia	40.7	610	40.1	1023
Birth Order	1 to 2	48.0	621	46.3	848
	3 & above	35.0	409	37.2	898
Birth Interval	Less than 36 months	35.2	421	39.3	822
	36 & above	43.6	291	38.7	465
Mother's work status	Not Working	47.7	635	42.7	779
	Working	34.7	395	40.7	967
Wealth index	Poorest	25.3	79	32.2	484
	Poorer	24.2	161	38.1	339
	Middle	34.5	238	40.8	355
	Richer	39.4	249	46.5	314
	Richest	66.7	303	59.3	253
Exposure to Mass Media	No Exposure	28.2	238	34.8	930
	Low	24.4	90	43.0	158
	Partial	38.7	155	47.1	221
	High	53.2	547	52.8	436

Source: NFHS- III, 2005-06

Table: 2 Percentage distribution of no failure and total number of children in Uttar Pradesh and Bihar

		Uttar Pradesh (5,597)		Bihar (2,173)	
		Percent of no failure	N	Percent of no failure	N
Age of the Child	Less than 1 Year	46.3	1056	39.5	443
	1 - 2 Year	28.1	1128	28.5	449
	2 - 3 Year	29.1	1177	23.4	406
	3 - 4 Year	31.5	1124	24.9	421
	4 - 5 Year	32.7	1112	27.2	453
Sex of the Child	Male	34.6	2907	30.4	1158
	Female	31.9	2690	27.1	1014
Place of residence	Urban	40.3	1076	35.6	250
	Rural	31.7	4521	28.0	1923
Type of caste or tribe	SC	29.1	1399	18.5	417
	ST	17.4	69	42.9	14
	OBC	31.5	2842	29.1	1289
	General	42.9	1287	37.8	450
Religion	Hindu	33.6	4442	29.7	1749
	Muslim	31.8	1132	25.1	422
	Others	80.0	15	N.A.	N.A.
Education level of mother	No Education	27.7	3606	24.0	1503
	Primary	35.9	602	36.0	225
	Secondary	43.1	1168	39.8	402
	Higher	66.4	220	59.5	42
BMI of Mother	Thin	26.9	2001	23.4	972
	Normal	35.4	3186	32.2	1138
	Overweight/Obese	50.6	328	58.2	55
Anaemia Level of Mother	No Anaemia	37.0	2381	33.2	620
	Anaemia	30.5	3007	27.1	1512
Birth Order	1 to 2	36.7	2438	33.8	962
	3 & above	30.7	3158	24.9	1211
Birth Interval	Less than 36 months	30.9	2745	26.6	1040
	36 & above	34.0	1651	27.5	629
Mother's work status	Not Working	35.4	3918	30.9	1428
	Working	28.6	1679	25.0	744
Wealth index	Poorest	23.9	1525	19.9	687
	Poorer	30.4	1476	26.2	703
	Middle	31.9	1179	30.9	379
	Richer	40.5	865	41.5	287
	Richest	59.1	552	59.8	117
Exposure to Mass Media	No Exposure	27.7	1939	23.9	995
	Low	29.5	1221	30.2	421
	Partial	33.0	933	30.2	364
	High	43.9	1504	38.7	393

Source: NFHS- III, 2005-06 , Note: N.A. – Not Available

Table: 3 Percentage distribution of no anthropometric failure and total number of children in Jharkhand and Odisha

		Jharkhand (1,390)		Odisha (1,584)	
		Percent of no failure	N	Percent of no failure	N
Age of the Child	Less than 1 Year	42.2	263	48.6	313
	1 - 2 Year	25.3	269	35.9	323
	2 - 3 Year	23.9	255	34.5	310
	3 - 4 Year	27.1	321	37.4	318
	4 - 5 Year	30.5	282	46.6	320
Sex of the Child	Male	29.7	664	41.3	811
	Female	29.8	726	39.8	772
Place of residence	Urban	44.9	265	54.8	219
	Rural	26.1	1125	38.3	1366
Type of caste or tribe	SC	27.6	174	34.8	305
	ST	23.6	406	26.6	417
	OBC	29.6	619	45.2	423
	General	45.5	189	54.4	421
Religion	Hindu	30.3	936	40.8	1525
	Muslim	34.0	241	31.2	16
	Others	22.1	208	36.4	33
Education level of mother	No Education	24.5	912	29.2	730
	Primary	31.7	161	35.8	299
	Secondary	39.0	282	56.3	503
	Higher	80.6	36	76.5	51
BMI of Mother	Thin	25.0	640	32.3	678
	Normal	32.1	707	45.0	854
	Overweight/Obese	65.7	35	82.2	45
Anaemia Level of Mother	No Anaemia	37.1	348	44.3	557
	Anaemia	27.4	1012	38.4	997
Birth Order	1 to 2	31.8	676	46.4	974
	3 & above	27.7	715	31.3	610
Birth Interval	Less than 36 months	27.8	604	34.0	583
	36 & above	30.8	429	38.2	469
Mother's work status	Not Working	36.3	559	44.8	1074
	Working	25.3	831	31.6	510
Wealth index	Poorest	23.8	787	25.2	701
	Poorer	27.1	221	42.8	313
	Middle	32.1	156	46.7	274
	Richer	38.5	135	62.0	184
	Richest	70.3	91	80.4	112
Exposure to Mass Media	No Exposure	22.5	761	30.6	457
	Low	28.1	192	34.3	309
	Partial	42.8	138	30.2	169
	High	43.0	300	53.3	649

Source: NFHS- III, 2005-06

Table: 4 Percentage distribution of no anthropometric failure and total number of children in Chhattisgarh and Madhya Pradesh

		Chhattisgarh (1,446)		Madhya Pradesh (2,890)	
		Percent of no failure	N	Percent of no failure	N
Age of the Child	Less than 1 Year	35.5	296	31.9	558
	1 - 2 Year	30.0	270	22.8	552
	2 - 3 Year	30.7	287	27.8	533
	3 - 4 Year	36.7	311	24.0	628
	4 - 5 Year	39.0	282	30.4	619
Sex of the Child	Male	33.4	725	28.4	1464
	Female	35.5	721	26.4	1426
Place of residence	Urban	47.9	238	34.8	676
	Rural	31.7	1207	25.1	2213
Type of caste or tribe	SC	32.9	231	23.4	538
	ST	32.2	441	20.2	698
	OBC	33.5	671	29.0	1202
	General	53.0	100	39.2	452
Religion	Hindu	34.1	1395	27.4	2636
	Muslim	36.8	38	26.0	223
	Others	66.7	12	37.5	32
Education level of mother	No Education	28.7	774	23.0	1637
	Primary	28.5	274	26.3	513
	Secondary	45.7	339	35.5	639
	Higher	72.4	58	51.5	101
BMI of Mother	Thin	28.7	672	20.7	1230
	Normal	38.5	738	31.3	1593
	Overweight/Obese	58.1	31	57.1	63
Anaemia Level of Mother	No Anaemia	34.2	602	32.0	1093
	Anaemia	34.4	835	24.5	1794
Birth Order	1 to 2	40.3	734	31.5	1436
	3 & above	28.3	710	23.2	1454
Birth Interval	Less than 36 months	30.3	600	24.6	1425
	36 & above	33.8	474	27.1	743
Mother's work status	Not Working	41.5	419	31.2	1346
	Working	31.5	1027	24.1	1544
Wealth index	Poorest	29.0	639	22.0	1196
	Poorer	32.2	382	25.8	686
	Middle	35.2	210	29.0	411
	Richer	40.9	110	33.1	354
	Richest	68.0	103	47.7	243
Exposure to Mass Media	No Exposure	30.8	396	24.5	1246
	Low	30.1	366	26.8	355
	Partial	32.6	233	24.0	396
	High	42.1	447	33.3	893

Source: NFHS- III, 2005-06

Table: 5 Percentage distribution of no anthropometric failure and total number of children in EAG States

		EAG Sates (17,855)	
		Percent of no failure	**N**
Age of the Child	Less than 1 Year	43.3	3497
	1 - 2 Year	29.8	3538
	2 - 3 Year	30.4	3507
	3 - 4 Year	30.9	3680
	4 - 5 Year	34.0	3633
Sex of the Child	Male	34.3	9203
	Female	32.9	8650
Place of residence	Urban	43.2	3328
	Rural	31.4	14528
Type of caste or tribe	SC	28.9	3666
	ST	26.3	2347
	OBC	32.8	8011
	General	44.4	3807
Religion	Hindu	34.1	15076
	Muslim	30.8	2377
	Others	33.3	378
Education level of mother	No Education	27.4	10791
	Primary	34.3	2422
	Secondary	43.9	3943
	Higher	68.7	697
BMI of Mother	Thin	27.1	7187
	Normal	36.5	9824
	Overweight/Obese	58.4	722
Anaemia Level of Mother	No Anaemia	37.5	6715
	Anaemia	31.2	10790
Birth Order	1 to 2	38.3	8689
	3 & above	29.2	9165
Birth Interval	Less than 36 months	30.3	8240
	36 & above	33.3	5151
Mother's work status	Not Working	36.8	10158
	Working	29.4	7697
Wealth index	Poorest	24.4	6098
	Poorer	30.2	4281
	Middle	34.1	3202
	Richer	41.7	2498
	Richest	61.3	1774
Exposure to Mass Media	No Exposure	27.3	6962
	Low	30.3	3112
	Partial	33.1	2609
	High	44.4	5169

Source: NFHS- III, 2005-06

Table: 6 Odds ratio of no anthropometric failure in EAG states, 2005-06

		B	S.E.	Wald	Sig.	Exp(B)
Age of the child	Less than 1 Year			147.650	0	
	1 to 2 year	-0.590	0.064	84.117	0	0.554
	2 to 3 year	-0.675	0.064	110.384	0	0.509
	3 to 4 year	-0.594	0.063	89.089	0	0.552
	4 to 5 year	-0.415	0.062	44.470	0	0.66
Sex of the child	Male					
	Female	-0.067	0.040	2.779	0.095	0.935
Place of residence	Urban					
	Rural	0.093	0.057	2.624	0.105	1.097
Type of caste or tribe	General			13.143	0.004	
	OBC	-0.110	0.056	3.839	0.05	0.896
	SC	-0.241	0.068	12.465	0	0.786
	ST	-0.191	0.085	5.047	0.025	0.826
Religion	Hindu			7.922	0.019	
	Muslim	-0.141	0.062	5.143	0.023	0.869
	Others	-0.264	0.149	3.155	0.076	0.768
Education level of mother	Higher			36.404	0	
	Secondary	-0.569	0.116	24.057	0	0.566
	Primary	-0.602	0.128	22.109	0	0.548
	No Education	-0.738	0.124	35.332	0	0.478
BMI of mother	Overweight/Obese			94.075	0	
	Normal	-0.366	0.090	16.696	0	0.693
	Thin	-0.718	0.094	58.607	0	0.488
Anaemia level of mother	No Anaemia					
	Anaemia	-0.155	0.042	13.55	0	0.857
Birth order	1 to 2					
	3 & above	-0.067	0.045	2.190	0.139	0.935
Birth Interval	36 months & above	-0.111	0.042			
	Less than 36 months	0.008	0.046	7.141	0.008	0.895
Mother's work status	Not Working					
	Working	-0.385	0.082	0.032	0.859	1.008
Wealth index	Richest			72.116	0	
	Richer	-0.541	0.091	21.913	0	0.681
	Middle	-0.613	0.096	35.756	0	0.582
	Poorer	-0.862	0.103	40.364	0	0.542
	Poorest	-0.045	0.068	70.416	0	0.422
Exposure to mass media	High			2.015	0.569	
	Partial	-0.087	0.068	0.437	0.509	0.956
	Low	-0.078	0.063	1.614	0.204	0.917
	No Exposure	-0.132	0.070	1.503	0.22	0.925
State	Uttar Pradesh			75.189	0	
	Bihar	0.333	0.072	3.588	0.058	0.876
	Rajasthan	0.271	0.083	21.154	0	1.395
	Orissa	-0.263	0.068	10.771	0.001	1.312
	Madhya Pradesh	0.105	0.083	14.913	0	0.769
	Chhattisgarh	0.113	0.087	1.592	0.207	1.111
	Jharkhand	-0.035	0.093	1.710	0.191	1.120
	Uttarakhand	1.778	0.134	0.141	0.707	0.966
	N= 12064, Nagelkerke R^2= 0.103, Cox & Snell R^2= 0.074					

Source: *Computed from NFHS-III, 2005-06*

Table: 7 Odds ratio of no anthropometric failure in Uttarakhand, 2005-06

		B	S.E.	Wald	Sig.	Exp(B)
Age of the child	Less than 1 Year			8.58	0.072	
	1 to 2 year	-0.273	0.266	1.055	0.304	0.761
	2 to 3 year	-0.346	0.258	1.8	0.18	0.707
	3 to 4 year	-0.561	0.262	4.583	0.032	0.571
	4 to 5 year	-0.718	0.268	7.205	0.007	0.488
Sex of the child	Male					
	Female	0.09	0.174	0.267	0.605	1.094
Place of residence	Urban					
	Rural	-0.237	0.246	0.925	0.336	0.789
Type of caste or tribe	General			4.49	0.213	
	OBC	-0.432	0.263	2.703	0.1	0.649
	SC	-0.049	0.216	0.052	0.819	0.952
	ST	0.405	0.392	1.07	0.301	1.5
Religion	Hindu			1.636	0.441	
	Muslim	-0.401	0.319	1.581	0.209	0.67
	Others	-0.154	0.385	0.159	0.69	0.857
Education level of mother	Higher			7.127	0.068	
	Secondary	-0.814	0.378	4.641	0.031	0.443
	Primary	-0.289	0.446	0.419	0.517	0.749
	No Education	-0.62	0.424	2.133	0.144	0.538
BMI of mother	Overweight/Obese			11.796	0.003	
	Normal	-0.719	0.329	4.789	0.029	0.487
	Thin	-1.191	0.363	10.788	0.001	0.304
Anaemia level of mother	No Anaemia					
	Anaemia	0.018	0.178	0.01	0.919	1.018
Birth order	1 to 2					
	3 & above	-0.092	0.189	0.239	0.625	0.912
Birth Interval	36 months & above					
	Less than 36 months	-0.185	0.178	1.074	0.3	0.831
Mother's work status	Not Working					
	Working	-0.35	0.192	3.318	0.069	0.705
Wealth index	Richest			7.811	0.099	
	Richer	-0.236	0.27	0.76	0.383	0.79
	Middle	-0.496	0.306	2.628	0.105	0.609
	Poorer	-0.934	0.363	6.624	0.01	0.393
	Poorest	-0.847	0.426	3.947	0.047	0.429
Exposure to mass media	High			4.128	0.248	
	Partial	-0.047	0.256	0.034	0.855	0.954
	Low	-0.694	0.349	3.96	0.047	0.5
	No Exposure	-0.038	0.262	0.021	0.884	0.962
	N= 692, Nagelkerke R^2= 0.190, Cox & Snell R^2=0.140					

Source: *Computed from NFHS-III, 2005-06*

Table: 8 Odds ratio of no anthropometric failure in Rajasthan, 2005-06

		B	S.E.	Wald	Sig.	Exp(B)
Age of the child	Less than 1 Year			25.019	0	
	1 to 2 year	-0.805	0.198	16.61	0	0.447
	2 to 3 year	-0.601	0.194	9.632	0.002	0.549
	3 to 4 year	-0.87	0.194	20.17	0	0.419
	4 to 5 year	-0.6	0.189	10.048	0.002	0.549
Sex of the child	Male					
	Female	0.079	0.122	0.418	0.518	1.082
Place of residence	Urban					
	Rural	0.211	0.198	1.146	0.284	1.236
Type of caste or tribe	General			2.895	0.408	
	OBC	0.287	0.19	2.288	0.13	1.332
	SC	0.108	0.225	0.23	0.632	1.114
	ST	0.155	0.247	0.392	0.531	1.167
Religion	Hindu			7.049	0.029	
	Muslim	-0.484	0.214	5.11	0.024	0.616
	Others	-0.973	0.662	2.162	0.141	0.378
Education level of mother	Higher			10.348	0.016	
	Secondary	-1.226	0.525	5.458	0.019	0.293
	Primary	-1.235	0.559	4.884	0.027	0.291
	No Education	-1.584	0.55	8.308	0.004	0.205
BMI of mother	Overweight/Obese			4.003	0.135	
	Normal	-0.403	0.324	1.551	0.213	0.668
	Thin	-0.579	0.331	3.064	0.08	0.56
Anaemia level of mother	No Anaemia					
	Anaemia	0.054	0.127	0.184	0.668	1.056
Birth order	1 to 2					
	3 & above	0.023	0.14	0.026	0.871	1.023
Birth Interval	36 months & above					
	Less than 36 months	0.001	0.128	0	0.992	1.001
Mother's work status	Not Working					
	Working	0.047	0.136	0.122	0.727	1.048
Wealth index	Richest			4.969	0.291	
	Richer	-0.47	0.251	3.509	0.061	0.625
	Middle	-0.496	0.276	3.238	0.072	0.609
	Poorer	-0.5	0.3	2.78	0.095	0.606
	Poorest	-0.642	0.302	4.504	0.034	0.526
Exposure to mass media	High			2.693	0.441	
	Partial	-0.102	0.229	0.198	0.656	0.903
	Low	0.106	0.252	0.178	0.673	1.112
	No Exposure	-0.238	0.208	1.31	0.252	0.788
	N= 1239, Nagelkerke R^2= 0.196, Cox & Snell R^2 = 0.071					

Source: *Computed from NFHS-III, 2005-06*

Table: 9 Odds ratio of no anthropometric failure in Uttar Pradesh, 2005-06

		B	S.E.	Wald	Sig.	Exp(B)
Age of the child	Less than 1 Year			73.103	0	
	1 to 2 year	-0.791	0.114	48.305	0	0.453
	2 to 3 year	-0.769	0.111	48.008	0	0.464
	3 to 4 year	-0.776	0.113	47.14	0	0.46
	4 to 5 year	-0.539	0.11	23.761	0	0.584
Sex of the child	Male					
	Female	-0.164	0.071	5.311	0.021	0.849
Place of residence	Urban					
	Rural	0.215	0.101	4.523	0.033	1.24
Type of caste or tribe	General			7.865	0.049	
	OBC	-0.242	0.092	6.886	0.009	0.785
	SC	-0.218	0.113	3.694	0.055	0.804
	ST	-0.555	0.391	2.01	0.156	0.574
Religion	Hindu			1.47	0.48	
	Muslim	-0.037	0.093	0.16	0.69	0.963
	Others	0.718	0.634	1.283	0.257	2.051
Education level of mother	Higher			12.563	0.006	
	Secondary	-0.458	0.188	5.893	0.015	0.633
	Primary	-0.567	0.213	7.109	0.008	0.567
	No Education	-0.682	0.2	11.672	0.001	0.506
BMI of mother	Overweight/Obese			29.337	0	
	Normal	-0.155	0.13	1.419	0.234	0.856
	Thin	-0.555	0.141	15.552	0	0.574
Anaemia level of mother	No Anaemia					
	Anaemia	-0.318	0.072	19.623	0	0.728
Birth order	1 to 2					
	3 & above	0.023	0.081	0.079	0.778	1.023
Birth Interval	36 months & above					
	Less than 36 months	-0.148	0.074	4.011	0.045	0.863
Mother's work status	Not Working					
	Working	-0.038	0.083	0.211	0.646	0.963
Wealth index	Richest			27.834	0	
	Richer	-0.286	0.14	4.185	0.041	0.751
	Middle	-0.558	0.157	12.681	0	0.572
	Poorer	-0.569	0.169	11.324	0.001	0.566
	Poorest	-0.892	0.18	24.447	0	0.41
Exposure to mass media	High			1.536	0.674	
	Partial	-0.104	0.115	0.812	0.368	0.901
	Low	-0.133	0.115	1.336	0.248	0.876
	No Exposure	-0.076	0.111	0.475	0.491	0.927
	N= 3899, Nagelkerke R^2 = 0.110, Cox & Snell R^2 = 0.080					

Source: *Computed from NFHS-III, 2005-06*

Table: 10 Odds ratio of no anthropometric failure in Bihar, 2005-06

		B	S.E.	Wald	Sig.	Exp(B)
Age of the child	Less than 1 Year			32.556	0	
	1 to 2 year	-0.444	0.183	5.883	0.015	0.641
	2 to 3 year	-1.016	0.198	26.203	0	0.362
	3 to 4 year	-0.818	0.192	18.158	0	0.441
	4 to 5 year	-0.657	0.184	12.801	0	0.518
Sex of the child	Male					
	Female	-0.051	0.121	0.179	0.672	0.95
Place of residence	Urban					
	Rural	-0.017	0.15	0.014	0.907	0.983
Type of caste or tribe	General			10.898	0.012	
	OBC	-0.305	0.175	3.03	0.082	0.737
	SC	-0.759	0.246	9.523	0.002	0.468
	ST	0.661	0.888	0.555	0.456	1.937
Religion	Hindu			1.237	0.539	
	Muslim	-0.192	0.172	1.237	0.266	0.826
	Others	19.555				
Education level of mother	Higher			1.132	0.769	
	Secondary	-0.284	0.434	0.43	0.512	0.753
	Primary	-0.108	0.474	0.052	0.82	0.898
	No Education	-0.28	0.459	0.373	0.541	0.756
BMI of mother	Overweight/Obese			17.045	0	
	Normal	-0.503	0.328	2.356	0.125	0.605
	Thin	-0.956	0.333	8.233	0.004	0.384
Anaemia level of mother	No Anaemia					
	Anaemia	-0.401	0.133	9.141	0.002	0.67
Birth order	1 to 2					
	3 & above	-0.203	0.136	2.238	0.135	0.816
Birth Interval	36 months & above					
	Less than 36 months	-0.092	0.127	0.525	0.469	0.912
Mother's work status	Not Working					
	Working	0.248	0.148	2.802	0.094	1.281
Wealth index	Richest			15.222	0.004	
	Richer	-0.57	0.264	4.651	0.031	0.565
	Middle	-0.741	0.294	6.371	0.012	0.476
	Poorer	-0.855	0.3	8.134	0.004	0.425
	Poorest	-1.231	0.325	14.36	0	0.292
Exposure to mass media	High			4.287	0.232	
	Partial	0.169	0.208	0.664	0.415	1.184
	Low	0.179	0.21	0.727	0.394	1.196
	No Exposure	-0.117	0.193	0.37	0.543	0.889
	N= 1510, Nagelkerke R^2= 0.126, Cox & Snell R^2=0.087					

Source: *Computed from NFHS-III, 2005-06*

Table: 11 Odds ratio of no anthropometric failure in Jharkhand, 2005-06

		B	S.E.	Wald	Sig.	Exp(B)
Age of the child	Less than 1 Year			24.998	0	
	1 to 2 year	-0.841	0.243	12.013	0.001	0.431
	2 to 3 year	-1.189	0.253	22.007	0	0.305
	3 to 4 year	-0.677	0.227	8.865	0.003	0.508
	4 to 5 year	-0.554	0.233	5.645	0.018	0.575
Sex of the child	Male					
	Female	0.004	0.153	0.001	0.978	1.004
Place of residence	Urban					
	Rural	0.187	0.248	0.57	0.45	1.206
Type of caste or tribe	General			4.116	0.249	
	OBC	-0.265	0.235	1.278	0.258	0.767
	SC	-0.585	0.317	3.419	0.064	0.557
	ST	-0.492	0.301	2.678	0.102	0.611
Religion	Hindu			0.723	0.697	
	Muslim	-0.001	0.207	0	0.998	0.999
	Others	-0.246	0.289	0.723	0.395	0.782
Education level of mother	Higher			6.844	0.077	
	Secondary	-1.539	0.701	4.815	0.028	0.215
	Primary	-1.287	0.741	3.012	0.083	0.276
	No Education	-1.652	0.729	5.139	0.023	0.192
BMI of mother	Overweight/Obese			3.032	0.22	
	Normal	-0.105	0.541	0.038	0.846	0.9
	Thin	-0.377	0.551	0.47	0.493	0.686
Anaemia level of mother	No Anaemia					
	Anaemia	-0.347	0.175	3.949	0.047	0.706
Birth order	1 to 2					
	3 & above	0.02	0.169	0.013	0.908	1.02
Birth Interval	36 months & above					
	Less than 36 months	-0.049	0.158	0.097	0.756	0.952
Mother's work status	Not Working					
	Working	0.196	0.185	1.121	0.29	1.216
Wealth index	Richest			9.576	0.048	
	Richer	-0.971	0.392	6.117	0.013	0.379
	Middle	-1.179	0.435	7.351	0.007	0.308
	Poorer	-1.325	0.448	8.728	0.003	0.266
	Poorest	-1.386	0.465	8.899	0.003	0.25
Exposure to mass media	High			6.858	0.077	
	Partial	0.411	0.296	1.923	0.165	1.509
	Low	-0.317	0.291	1.184	0.277	0.729
	No Exposure	-0.189	0.266	0.506	0.477	0.828
	N= 941, Nagelkerke R^2= 0.149, Cox & Snell R^2= 0.105					

Source: *Computed from NFHS-III, 2005-06*

Table: 12 Odds ratio of no anthropometric failure in Odisha, 2005-06

		B	S.E.	Wald	Sig.	Exp(B)
Age of the child	Less than 1 Year			15.886	0.003	
	1 to 2 year	-0.75	0.235	10.213	0.001	0.473
	2 to 3 year	-0.712	0.23	9.614	0.002	0.491
	3 to 4 year	-0.391	0.223	3.067	0.08	0.677
	4 to 5 year	-0.185	0.223	0.692	0.405	0.831
Sex of the child	Male					
	Female	-0.112	0.144	0.607	0.436	0.894
Place of residence	Urban					
	Rural	0.068	0.211	0.104	0.747	1.07
Type of caste or tribe	General			7.772	0.051	
	OBC	0.005	0.2	0.001	0.978	1.005
	SC	-0.33	0.228	2.091	0.148	0.719
	ST	-0.533	0.233	5.221	0.022	0.587
Religion	Hindu			2.086	0.352	
	Muslim	-1.141	0.854	1.785	0.182	0.319
	Others	-0.283	0.489	0.335	0.563	0.754
Education level of mother	Higher			0.545	0.909	
	Secondary	-0.424	0.588	0.519	0.471	0.654
	Primary	-0.44	0.611	0.519	0.471	0.644
	No Education	-0.445	0.614	0.526	0.468	0.641
BMI of mother	Overweight/Obese			3.235	0.198	
	Normal	-0.743	0.443	2.817	0.093	0.476
	Thin	-0.811	0.451	3.231	0.072	0.444
Anaemia level of mother	No Anaemia					
	Anaemia	0.034	0.153	0.05	0.823	1.035
Birth order	1 to 2					
	3 & above	-0.078	0.154	0.255	0.613	0.925
Birth Interval	36 months & above					
	Less than 36 months	-0.141	0.146	0.934	0.334	0.869
Mother's work status	Not Working					
	Working	0.158	0.171	0.855	0.355	1.172
Wealth index	Richest			22.393	0	
	Richer	-0.629	0.383	2.687	0.101	0.533
	Middle	-1.096	0.385	8.099	0.004	0.334
	Poorer	-1.173	0.4	8.595	0.003	0.309
	Poorest	-1.731	0.417	17.199	0	0.177
Exposure to mass media	High			1.6	0.659	
	Partial	-0.292	0.249	1.372	0.241	0.747
	Low	-0.079	0.226	0.122	0.727	0.924
	No Exposure	-0.009	0.213	0.002	0.966	0.991
	N= 941, Nagelkerke R^2= 0.149, Cox & Snell R^2= 0.105					

Source: *Computed from NFHS-III, 2005-06*

Table: 13 Odds ratio of no anthropometric failure in Chhattisgarh, 2005-06

		B	S.E.	Wald	Sig.	Exp(B)
Age of the child	Less than 1 Year			9.02	0.061	
	1 to 2 year	-0.315	0.235	1.799	0.18	0.729
	2 to 3 year	-0.383	0.23	2.762	0.097	0.682
	3 to 4 year	0.106	0.213	0.247	0.619	1.111
	4 to 5 year	0.149	0.216	0.474	0.491	1.16
Sex of the child	Male					
	Female	-0.142	0.142	0.998	0.318	0.868
Place of residence	Urban					
	Rural	-0.297	0.233	1.631	0.202	0.743
Type of caste or tribe	General			0.091	0.993	
	OBC	-0.011	0.344	0.001	0.975	0.989
	SC	0.028	0.381	0.005	0.941	1.029
	ST	-0.038	0.371	0.011	0.917	0.962
Religion	Hindu			4.106	0.128	
	Muslim	-0.791	0.506	2.445	0.118	0.453
	Others	1.403	1.169	1.441	0.23	4.068
Education level of mother	Higher			8.992	0.029	
	Secondary	-0.355	0.449	0.623	0.43	0.702
	Primary	-0.966	0.478	4.081	0.043	0.38
	No Education	-0.902	0.478	3.57	0.059	0.406
BMI of mother	Overweight/Obese			6.792	0.034	
	Normal	-0.093	0.463	0.04	0.841	0.911
	Thin	-0.465	0.469	0.985	0.321	0.628
Anaemia level of mother	No Anaemia					
	Anaemia	0.303	0.149	4.117	0.042	1.354
Birth order	1 to 2					
	3 & above	-0.346	0.154	5.018	0.025	0.708
Birth Interval	36 months & above					
	Less than 36 months	-0.176	0.143	1.522	0.217	0.839
Mother's work status	Not Working					
	Working	0.363	0.189	3.664	0.056	1.437
Wealth index	Richest			3.399	0.493	
	Richer	-0.712	0.402	3.148	0.076	0.49
	Middle	-0.573	0.398	2.065	0.151	0.564
	Poorer	-0.536	0.409	1.712	0.191	0.585
	Poorest	-0.621	0.429	2.095	0.148	0.538
Exposure to mass media	High			0.386	0.943	
	Partial	0.036	0.236	0.024	0.878	1.037
	Low	-0.044	0.217	0.041	0.839	0.957
	No Exposure	0.078	0.232	0.112	0.738	1.081
	N= 1001, Nagelkerke R^2 = 0.098, Cox & Snell R^2 = 0.070					

Source: *Computed from NFHS-III, 2005-06*

Table: 14 Odds ratio of no anthropometric failure in Madhya Pradesh, 2005-06

		B	S.E.	Wald	Sig.	Exp(B)
Age of the child	Less than 1 Year			9.544	0.049	
	1 to 2 year	-0.311	0.175	3.138	0.077	0.733
	2 to 3 year	-0.506	0.183	7.645	0.006	0.603
	3 to 4 year	-0.37	0.167	4.915	0.027	0.691
	4 to 5 year	-0.168	0.169	0.995	0.319	0.845
Sex of the child	Male					
	Female	0.003	0.11	0.001	0.978	1.003
Place of residence	Urban					
	Rural	-0.202	0.17	1.412	0.235	0.817
Type of caste or tribe	General			10.328	0.016	
	OBC	-0.029	0.162	0.031	0.86	0.972
	SC	-0.513	0.2	6.573	0.01	0.598
	ST	-0.235	0.211	1.234	0.267	0.791
Religion	Hindu			4.311	0.116	
	Muslim	-0.419	0.216	3.771	0.052	0.657
	Others	-0.379	0.42	0.816	0.366	0.684
Education level of mother	Higher			5.858	0.119	
	Secondary	-0.579	0.265	4.788	0.029	0.561
	Primary	-0.608	0.302	4.06	0.044	0.544
	No Education	-0.706	0.297	5.664	0.017	0.493
BMI of mother	Overweight/Obese			26.299	0	
	Normal	-0.734	0.251	8.587	0.003	0.48
	Thin	-1.181	0.263	20.213	0	0.307
Anaemia level of mother	No Anaemia					
	Anaemia	-0.238	0.112	4.479	0.034	0.788
Birth order	1 to 2					
	3 & above	-0.11	0.12	0.844	0.358	0.896
Birth Interval	36 months & above					
	Less than 36 months	-0.025	0.115	0.046	0.83	0.976
Mother's work status	Not Working					
	Working	-0.099	0.125	0.621	0.431	0.906
Wealth index	Richest			3.385	0.496	
	Richer	-0.152	0.211	0.52	0.471	0.859
	Middle	0.049	0.247	0.039	0.843	1.05
	Poorer	-0.163	0.269	0.367	0.544	0.849
	Poorest	-0.309	0.284	1.18	0.277	0.734
Exposure to mass media	High			1.388	0.708	
	Partial	-0.132	0.197	0.445	0.505	0.877
	Low	0.084	0.21	0.162	0.688	1.088
	No Exposure	0.091	0.174	0.275	0.6	1.095
	N= 1815, Nagelkerke R^2 = 0.100, Cox & Snell R^2 = 0.070					

Source: *Computed from NFHS-III, 2005-06*