STUDIES

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Child Nutrition in Gujarat

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CHILD NUTRITION IN GUJARAT

INTRODUCTION

Children, along with women, constitute the most vulnerable group of the population. Children are particularly vulnerable to the deprivation of their basic needs that secure their survival, contribute to their growth and development and ensure their protection. Children are not full social and economic agents and hence they cannot secure resources necessary for their survival, growth and development until they reach a certain age. Similarly, children have no or very limited freedom to make decisions related to their own welfare and benefit. Within the household, they are dependent upon elder members of the household including their parents in meeting out their basic needs. Moreover, for the fulfilment of their basic needs they have to rely to a significant extent upon the production of goods and services by public authorities, especially in areas of education and health. These and many other dependencies of children get manifested typically in the poor social and economic settings. Poverty, at the early stages of life, has enduring consequences on those who survive into adulthood. It condemns them to recurrent poverty spells and a life full of hardship and misery.

Another reason behind increased attention to the well-being of children is the United Nations Convention on the Rights of the Child which lays down principles of non-discrimination in the 'best interests' of the child along with common standards for various rights of children. It takes into account different cultural, social, economic and political realities in which children live. (United Nations, 1989). By ratifying the Convention in 1992, India has committed herself to protecting and advancing children's rights; to developing and undertaking all actions and policies in the light of the 'best interests' of children; and to hold herself accountable for this commitment before the international community. Children's rights include right to survival, right to development, right to protection and right to participation.

The above considerations constitute the background for the present report which focusses on analysing the pattern of child growth in Gujarat. Child growth is one of the domains of child well-being as articulated in the United Nations Convention on the Rights of the Child as well as in the National Policy for Children 2013 (Government of India, 2013). It is well known that the growth of children is directly related to their nutritional status. This direct relationship suggests that growth pattern in children reflects their nutritional status so that the nutritional status of a child can be measured in terms of growth parameters of the child. The standard approach of assessing the nutritional status of a child in this framework is to compare parameters of the growth of the child with normal growth parameters. If the parameters of the growth the child are poorer than normal growth parameters then the child is classified as under-nourished and vice versa.

The key issue in measuring the nutritional status is the identification of the parameters of child growth. The best parameter of child growth is the weight per unit volume of the body (Chaurasia and Pattankar, 1979). The major problem in using the weight per unit volume as parameter of child growth is the measurement of body volume. The gold standard to measure body volume is the water replaced by the body while floating. Chaurasia and Pattankar (1979) have developed a method of approximating the volume of the body on the basis of the length/height and chest circumference of the child.

Different physical (anthropometric) measurements of the child can be used either independently or in combination to assess the growth and hence the nutritional status of the child. The physical growth of the child has two dimensions - linear and parenteral. This means that a multidimensional approach should be adopted to measure the nutritional status of the child. There are many physical (anthropometric) measurements that can be used for the purpose. These include weight, length or height, chest circumference, mid upper arm circumference and

head circumference (Govila, Chaurasia, Dev, 1980; WHO, 1995). Among these, weight and height are the most commonly used. Gomez and others were the first to develop a classification for measuring the nutritional status of children on the basis of body weight (Gomez et al, 1956) which was later modified by Jelliffe (1966). The Indian Academy of Pediatrics has also developed a similar classification (IAP, 1972) which constituted the basis for the child growth monitoring system established under the Integrated Child Development Scheme in India. The World Health Organization, on the other hand, recommends a two dimensional approach (Waterlow et al, 1977, WHO, 1995).

Once the parameters of the growth of a child are decided, the standard approach to assess the nutritional status of the child is to compare growth parameters of a child with growth parameters of reference children. If growth parameters of a child are poorer than those of reference children, then the child is classified as under-nourished. This comparison can be done in two ways. The first is the 'proportion of median' approach in which growth parameters of a child are expressed as proportion of the median value of the reference population. If this proportion is less than the pre-specified cut off point, the child is classified as under-nourished. This method, however, does not take into consideration, the variation in growth parameters of children that constitute the reference population. It is naive to presume that all children in the reference population have the same parameters of growth so the variance is zero.

The second approach, recommended by the World Health Organization, expresses parameters of child growth in terms of the number of standard deviation units that a child's growth parameter deviates from the median value of the reference population. These standard deviation units are called z-scores (WHO, 1995). Statistically, z-score is very similar to the standard normal variate with mean replaced by median to exclude extreme values. If the z-score of a given child is less

than -2, the child is classified as under-nourished. If the z-score of a given child is less than -3, the child is classified as severely under-nourished

The approach suggested by the World Health Organization has many advantages (Sachdev 1994). First, estimation of the z-score takes into consideration, the variation in growth parameters in the reference population (WHO, 1986; Waterlow et al, 1977; Dibley et al, 1987). Second, the cut off points based on the proportion of the reference mean or median differ by age and gender (Nigam 2003). As such, assessing the nutritional status of children of different ages by the same cut off points becomes erratic. The approach recommended by the World Health Organization has now been adopted universally to measure and monitor child under-nutrition. Under the Integrated Child Development Scheme in India, however, classification of children as nourished and under-nourished continues to be based on the IAP classification. It has, however, been observed that the proportion of median cut-off points under the IAP classification does not capture a substantial number of children identified as under-nourished through the z-score classification (Nigam, 2005). The z-score classification has now been used globally to estimate the prevalence of child under-nutrition.

The most commonly used growth parameters to assess the nutritional status of children are weight, height and weight-for-height. Height and weight-for-height, reflect two distinct biological processes. Height reflects the linear growth while weight-for-height reflects the parenteral growth. If a child is low height-for-age with reference to the standard, it is termed as stunted. Similarly, if a child is low weight-for-height, it is termed as wasted. Weight, on the other hand, reflects both linear and parenteral growth. If a child is classified as under-nourished on the basis of weight, then it is not clear whether the under nutrition is due to poor linear growth or due to poor parenteral growth or both. It has also been observed that assessment of nutritional status based on weight, height and weight-for-height overlap and none gives a comprehensive

picture of the nutritional status of the child (Svedberg 2001). Weight-for-age is the most commonly used growth parameter to assess the nutritional status of children. However, Seetharaman and others have found that assessment of the nutritional status on the basis of weight alone underestimates the true prevalence of child under-nutrition by as much as 22 per cent (Seetharaman et al, 2007).

Unfortunately, assessment of the nutritional status of the child based on the three growth parameters depict three different pictures. Svedberg (2001) has therefore suggested the comprehensive index of anthropometric failure (CIAF) to estimate the true proportion of under-nourished children in the community. Obviously, a multidimensional approach, as suggested by the World Health Organization, needs to be adopted to assess the nutritional status of children.

DATA SOURCE

The present analysis is based on two data sources. The first data source is the Rapid Survey of Children (RSoC) 2013-14 which was commissioned by the Government of India, Ministry of Women and Child Development with technical and financial support from the United Nations Children's Fund (UNICEF) across 29 states of the country (Government of India, 2015). The purpose of the survey was to strengthen the data system on children and women in India. In this context, the RSoC 2013-14 focused on assessing the situation of children and women in the country and in its constituent states with special emphasis on access to and utilisation of services made available under the Integrated Child Development Services (ICDS) Scheme of the Government of India. Detailed child specific data collected during the RSoC 2013-14 have not yet been released by the Government of India. However, fact sheets on status of women and children in India and in its 29 states have been released by the Ministry of Women and Child Development of the

Government of India. Data available through these fact sheets constitutes the basis for the present analysis.

The second data source used in the present analysis is the National Family Health survey 2005-06 (NFHS 3) which was carried out by the International Institute for Population Sciences for the Government of India, Ministry of Health and Family Welfare (IIPS, 2008). Child specific data collected during NFHS 3 have been released by the Government of India, Although, the data available through NFHS 3 are now more than 10 years old, yet these data allow child specific analysis of the nutritional status as the child specific data required for the analysis have been released by the Ministry of Health and Family Welfare, Government of India.

Data about weight of the child are also reported routinely under the Integrated Child Development Scheme of the Government of India. However, the reported data available through the routine reporting system of the Integrated Child Development scheme has been found to be associated with a number of errors which make these data unsuitable for analysis.

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Figures 1 and 2 present the current situation of child under-nutrition in Gujarat and India in terms of height-for-age (HA), weight-for-height (WH) and weight-for-age (WA). According to RSoC 2013-14, around 42 per cent children below five years of age were low height-for-age (z-score below -2) while around 18 per cent children below five years of age were very low height-for-age (z-score below -3). Similarly, around 19 per cent child below five years of age were low weight-for-height while around 7 per cent children below five years of age were very low weight-for-height in the state. Finally, around 34 per cent children below five years of age were low weight-for-age while around 10 per cent children

below five years of age were very low weight-for-age in the state. It may also be seen from figures 1 and 2 that the prevalence of under nutrition in children below five years of age in Gujarat is higher than the national average in all indicators of child under-nutrition.

Figures 1 and 2 also suggest that the prevalence of child under nutrition has decreased over time in terms of height-for-age and weight-for-age but in terms of weight-for-height. The proportion of children low eight-for-height in Gujarat has remained more or less unchanged between 2005-06 and 2013-14 according to NFHS3 and RSoC 2013-14 whereas the proportion of children very low weight-for-height in Gujarat has increased during the period under reference. This is in quite contrast to the national average where the proportion of children low weight-for-height as well as proportion of children very low weight-for-height has decreased over time. In fact, the decrease in the prevalence of child under-nutrition measured in terms of weight-for-height and weight-for-age in India has been faster than the decrease in Gujarat but the decrease in the prevalence of child under nutrition in terms of height-for-age has been marginally faster in Gujarat than in India during the period 2005-06 through 2013-14. Obviously, the three most commonly used measured of child under-nutrition give conflicting evidence about the change in the nutritional status of children below five years of age over time which makes it difficult to conclude whether the prevalence of under-nutrition in child below five years of age in the state has increased or decreased.

According to the WHO classification of child under-nutrition based on height-for-age, weight-for-height and weight-for-age, the level of child under nutrition in Gujarat may be classified as very high in terms of all the three anthropometric measures of child nutrition (Table 1). This is in contrast to the situation in the country as whole where the prevalence of child under nutrition may be classified as high in terms of any of the three anthropometric measures of child nutrition. Table 1 suggests that the child under nutrition scenario in Gujarat is far from satisfactory and

has serious implications to normal growth and development of children below five years of age.

RSoC 2013-14 also provides estimates of the proportion of children low height-for-age, low weight-for-height and low weight-for-age for different social classes and for rural and urban children. All measures of child under-nutrition suggest that the prevalence of under-nutrition is substantially higher in rural than in urban children (Table 3). Moreover, the rural-urban inequality in the prevalence of under nutrition is the highest in case of height-for-age but the rural-urban inequality in the prevalence of severe under-nutrition is the highest in case of weight-for-age. In case of the prevalence of severe under-nutrition, the rural-urban inequality is very small in case of height-for-age.

In case of social class, there is no social class which has the highest prevalence of under-nutrition or severe under-nutrition in all the three measures of child under-nutrition. In case of under-nutrition, the prevalence is the highest in Other Backward Classes (OB) in terms of height-for-age but the lowest in Other Classes (OT). When, child under-nutrition is measured in terms of weight-for-height or in terms of weight-for-age, the prevalence is the highest in Scheduled Tribes (ST) but the lowest in Other Backward Classes (OB). A similar situation prevails in case of severe under-nutrition with the exception that the prevalence of child under-nutrition is the lowest in Scheduled Castes (SC) and Other Classes (OT) when under nutrition is measured in terms of height-for-age. Similarly, the social class inequality in the prevalence of child under-nutrition is the highest in terms of weight-for-height but it is very high in terms of weight-for-age in case of severe under-nutrition.

The foregoing discussions highlight the problems involved in assessing the nutritional status of children below five years of age on the basis of the three conventional indicators height-for-age, weight-for-height and weight-for-age. The use of different measure of nutritional

status leads to different conclusions about the nutritional status of children that prevails in the community. It may also be pointed out here that a child who is low height-for-age may also be low weight-for-height. Similarly, a child who is low weight-for-height may also be low height-for-age. Mathematically, it can also be shown that a child who is low weight-for-age is either low height-for-age or low weight-for-height or both. Alternatively, if a child is neither stunted (low height-for-age) nor wasted (low weight-for-height), then it cannot be under-weight (low weight-for-age). Logically also, height is an indicator of linear growth, weight is an indicator of parenteral growth and weight is the combination of the two. This means that a child can be classified into the following four categories on the basis of its height and weight:

1. The child is low height-for-age as well as low weight-for-height. In this case, the child is stunted and wasted (SW).
2. The child is low height-for-age but not low weight-for-height. In this case, the child is stunted but not wasted (SO).
3. The child us low weight-for-height but not low height-for-age. In this case, the child is wasted but not stunted (WO).
4. The child is neither low height-for-age nor low weight-for-height. In this case, the child is neither stunted not wasted and therefor not under-nourished (NU).

The above classification is essentially the two-dimensional approach of assessing the nutritional status of children recommended by WHO (1995). This classification can be represented in the tabular form as depicted in table 4. It may be seen from the table that the total number of under-nourished children according to this classification is $N_{UN}=(N_{SW}+N_{SO}+N_{WO})$ and the prevalence of under-nutrition is N_{UN}/N where N is the total number of children . This prevalence rate gives the comprehensive picture of under-nutrition in children as it takes into account both linear and parenteral growth in children.

The fact sheets based on RSoC 2013-14 2013-14 released by the Government of India do not provide data to estimate the prevalence of child under-nutrition in Gujarat according to the classification given in table 4. It is however possible to estimate the proportion of children below three years of age who are stunted as well as wasted in Gujarat on the basis of the data available from NFHS 2005-06. The data available through NFHS 2005-06 also permit to estimate the proportion of children 0-35 months of age who were stunted but not wasted and the proportion of children 0-35 months of age who were wasted but not stunted so as to obtain a comprehensive picture of child under-nutrition in the state. Table 5 gives the proportion of children 0-35 months of age who were stunted and wasted according to the data available through NFHS 2005-06 along with the proportion of children who were stunted but not wasted, the proportion of children who were wasted but not stunted and the proportion of children who were neither stunted nor wasted and, therefore, were not under-nourished. In Gujarat, the proportion of children aged 0-35 months who were either low height-for-age (stunted) or low weight-for-height (wasted) or both was almost 64 per cent compared to around 59 per cent in India. Similarly, the proportion of children aged 0-35 months who were low height-for-age (stunted) as well as low weight-for-height (wasted) was almost 26 per cent in Gujarat but only about 20 per cent in India. The proportion of children who were low height-for-age (stunted) but not low weight-for-height (wasted) was about 14 per cent in Gujarat but almost 17 per cent in India whereas the proportion of children who were low weight-for-height (wasted) but not low height-for-age (stunted) was almost 24 per cent in Gujarat but around 22 per cent in India. However, the prevalence of stunting (proportion of children low height-for-age) as well as the prevalence of wasting (proportion of children low weight-for-height) in children aged 0-35 months was higher in Gujarat as compared to India according to NFHS 2005-06. This means that there were only about 36 per cent children aged

0-35 months who were neither low height-for-age (stunted) nor low weight-for-height (wasted). In India, by comparison, more than 41 per cent of children aged 0-35 months of age were neither stunted nor wasted.

DETERMINANTS OF CHILD NUTRITION

Determinants of child under nutrition Gujarat can be analysed in the context of conceptual framework developed by UNICEF (1990). This framework identifies immediate, underlying and basic determinants of the nutritional status of the child. Immediate determinants of the nutritional status of the child are dietary intake and health status. The underlying determinants are those which manifest themselves at the household level. The first underlying determinant is household feed security; the second is the quality of care for children and women; and the third is the health environment and services. Finally, the basic determinants of the nutritional status of the child manifest themselves at broader geographical level - district, state, etc. They constitute the social, economic, cultural, political, and environmental context of child nutrition (Smith and Haddad, 2014). The World Bank (2004), on the other hand, has identified four proximate determinants of child under-nutrition: 1) infant feeding practices; 2) infections, especially diarrhoea; 3) maternal weight reflecting the nutritional status of the mother; and 4) weight of the child at birth. Moreover, standard of living, social class, maternal schooling, birth order and infrastructure such as safe drinking water and sanitation have been identified as social and economic correlates of child under nutrition.

The fact sheets based on RSoC 2013-14 provide state specific estimates of the following indicators that have been used to analyse the determinants of child under nutrition:

1 Proportion of children 0-23 months of age breast fed within one hour of birth.

2 Proportion of children 0-5 months of age who were exclusively breast fed.

3 Proportion of children 0-59 months of age who had diarrhoea during the 15 days prior to the survey.

4 Proportion of children 0-35 months of age with birth weight less than 2500 grams.

5. Breast fed children aged 6-23 months fed a minimum number of times.

6. Breast fed children aged 6-23 months had a minimum dietary diversity.

7. Households practising open defecation.

In addition per capita income defined as the per capita net state domestic product at constant (2004-05) prices has also been used in the analysis as a measure of the standard of living. Estimates of the per capita income for different states of the country are not available through RSoC 2013-14. As such, estimates of pre capita income at constant prices prepared and released by the Central Statistics Office of the Government of India have been used in the analysis. The method adopted for the analysis was automatic linear modeling. This method has a number of advantages over the conventional and commonly used linear regression analysis model (Yang, 2013).

Results of the determinants analysis are presented in table 6 which may be summarised as under:

1. The prevalence of stunting (STU - proportion of children aged 0-59 months low height-for-age) is found to be statistically significantly associated, in order of importance, with: 1) proportion of households practising open defecation (ODF); 2) proportion of children 0-23 months of age breast fed within one hour of birth (BF1); and 3) per capita income (PCI). Moreover, the sign of the

regression coefficients of the three predictor variables is found to be in the expected direction and inter-state variation in the three predictor variables account for almost 65 per cent of the inter-state variation in the prevalence of stunting (STU).

2. The prevalence of wasting (WAS - proportion of children 0-59 months of age low weight-for-height) is found to be statistically significantly associated with: 1) proportion of children 0-23 months of age breast fed within one hour of birth (BF1); 2) proportion of children 0-35 months of age with birth weight less than 2500 grams (LBW); and 3) proportion of households practising open defecation (ODF). The sign of the coefficient of LBW and ODF is in expected direction but the sign of the coefficient of BF1 is in opposite direction - an increase in BF1 is found to be associated with the increase in the prevalence of wasting. The model, however, explains only about 27 per cent of the variation in the prevalence of wasting (WAS).

3. The prevalence of under weight (UWT - proportion of children 0-59 months of age low weight-for-age) is found to be statistically significantly associated only with the proportion of households practising open defecation (ODF). A decrease in the proportion of households practising open defecation is expected to contribute to a decrease in the prevalence of under weight in children aged 0-59 months of age (UWT). Inter-state variation in ODF is found to explain more than 64 per cent of the inter-state variation in UWT.

4. The proportion of severe stunting (SST - proportion of children aged 0-59 months of age very low height-for-age) is found to be statistically significantly associated with only per capita income (PCI). An increase in PCI is expected to lead to a decrease in the prevalence of severe stunting.

5. The prevalence of severe wasting (SWA - proportion of children 0-59 months of age very low weight-for-height) is found to be statistically significantly associated with: 1) proportion of children 0-23 months of age breast fed within one hour of birth (BF1); and 2) proportion of children aged 0-35 months with birth weight less than 2500 grams (LBW). The analysis once again indicates that an increase in BF1 may lead to an increase in prevalence of severe stunting.

6. The prevalence of severe under weight (SUW - proportion of children 0-59 months of age very low weight-for-age) is found to be statistically significantly associated with: 1) proportion of households practising open defecation (ODF); and 2) the proportion of children 0-59 months of age who had diarrhoea during 15 days prior to the survey (DIA). The sign of the coefficient of ODF is in expected direction but the sign of the coefficient of DIA is in the opposite direction. The model, however, explains less than one third of the inter-state variation in the prevalence of severe under weight.

In would be interesting to examine how the actual prevalence of child under nutrition in Gujarat differs from the prevalence of child under nutrition predicted by the models resulting from the application of automatic regression modeling method. This comparison is presented in figure 3 which shows that the actual estimates of all the six indicators of child under nutrition in Gujarat are well above the estimates predicted by models based on the key determinants of child under nutrition. This essentially mean that Gujarat is a negative outlier as far as child under nutrition is concerned.

CONCLUSIONS

The present analysis highlights the fact that there is substantial scope for improvement in the nutritional status of children in Gujarat. The state continues to be a negative outlier in India as far as child under nutrition is concerned as the prevalence of child under nutrition in the state is well-above the prevalence predicted by a number of key immediate, underlying and basic determinants of the nutritional status of children.

Although based on limited data, the findings of the present analysis have significant policy implications. The most critical determinant of child under nutrition in the state appears to be the rampant practice of open defecation in the state, especially in the rural areas. The present analysis suggests that elimination of the practice of open defecation in the state may contribute very significantly towards the reduction in the prevalence of all the three commonly used measures of under nutrition - stunting, wasting and under weight - in children below five years of age of the state.

Another critical factor in improving the nutritional status of children of the state appears to be the reduction in the prevalence of low birth weight children. Low birth weight is found to be having serious implications in terms of the parenteral growth of children which is reflected in terms of the prevalence of wasting. The prevalence of low birth weight children is directly related to the nutritional status of mothers which may be captured through maternal weight. Information about maternal weight is not available from RSoC 2013-14 or from any other source. In any case, it is obvious that any effort to reduce the prevalence of wasting in children must be extended to address the challenge of under nutrition in mothers.

The present analysis is based primarily on the variation in both prevalence and determinants of child under nutrition across states of India

as RSoC 2013-14 does not provide information for administrative units below state level. However, the present analysis highlights the needs of local level analysis of the prevalence and determinants of child under nutrition. Unfortunately, lack of necessary data at the local level forbids such an analysis.

REFERENCES

Chaurasia AR, Pattankar J (1979) An index for the measurement of growth in children. Indian Journal of Pediatrics, 46:261-65.

Dibley MJ, Goldsby JB, Staehling NW, Townbridge FL (1987) Development of normalized curves for international growth reference: historical and technical consideration. American Journal of Clinical Nutrition 46: 736-748.

Gomez F, Galvan RR, Frenk S, Munoz JC, Chavez R, Vazquez J (1956) Mortality in second and third degree malnutrition. Journal of Tropical Paediatrics, 2:77-83.

Government of India (2013) National Policy for Children 2013. New Delhi, Ministry of Women and Child Development.

Government of India (2015) Rapid Survey of Children 2013-14. New Delhi, Ministry of Women and Child Development.

Govila AK, Chaurasia AR, Dev DA (1980) Anthropometric measurements in immunized and non-immunized children of Gwalior. Indian Journal of Physical Anthropology and Human Genetics, 6:63-66.

Indian Academy of Pediatrics (1972) Report of the Nutrition Sub-Committee. Indian Pediatrics, 9:360.

International Institute for Population Sciences (2008) National Family Health Survey India 2005-06, India. International Institute for Population Sciences.

Jelliffe DB (1966) The Assessment of Nutritional Status of Community. Geneva, World Health Organization. WHO Monograph Series 53.

Nigam AK (2003)Determining grades of malnutrition in children: standard deviation classification and the alternative. Demography India 32: 137-155.

Nigam AK (2005) Managing severely malnourished children: cue from analysis of nutrition survey data. Demography India 34(1): 53-62.

Ranjan A (2012) The challenge of under nutrition in India. In Aalok Ranjan (Ed) India 2011. Mortality, Health and Development. Bhopal, MLC Foundation and Shyam Institute.

Sachdev HPS (1994) Assessment of nutritional status in children. In HPS Sachdev and P Choudhary (Eds) Nutrition in Children in Developing Country Concerns. New Delhi, Maulana Azad Medical College.

Seetharaman N, Chacko TV, Shankar SLR, Mathew AC (2007) Measuring malnutrition - The role of z scores and the composite index of anthropometric failure (CIAF). Indian Journal of Community Medicine, 32:35-39.

Svedberg P (2001) Poverty and Under-nutrition: Theory, Measurement and Policy. Oxford, Oxford University Press.

United Nations (1989) United Nations Convention for the Rights of the Child. New York, United Nations.

Waterlow JC, Buzina R, Keller W, Lane JM, Nichaman MZ, Tanner JM (1977) The presentation and use of height and weight data for comparing the nutritional status of children under the age of 10 years. Bulletin of World Health Organization, 55:489-98.

World Bank (2004) India Attaining the Millennium Development Goals in India. How Likely and What Will It Take To Reduce Infant Mortality, Child Malnutrition, Gender Disparities and Hunger-Poverty and To Increase School Enrolment and Completion? Washington DC, World Bank. Human Development Unit. South Asia Region.

World Health Organization (1995) Physical Status: The Use and Interpretation of Anthropometry. Report of a WHO Expert Committee.. Geneva, World Health Organization. Technical Report Series No. 854.

Figure 1
Prevalence of under-nutrition in children less than 5 years of age
Gujarat and India

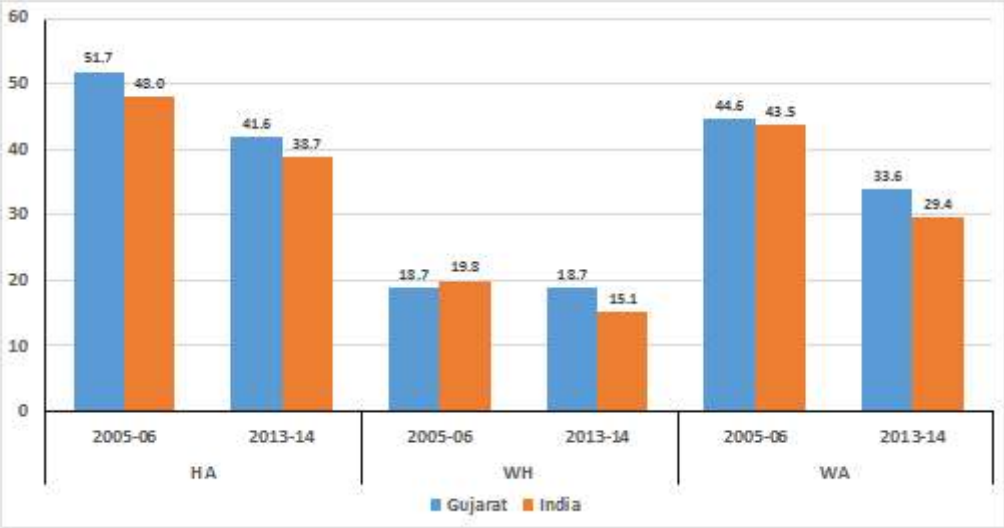


Figure 2
Prevalence of severe under-nutrition in children less than 5 years of age
Gujarat and India

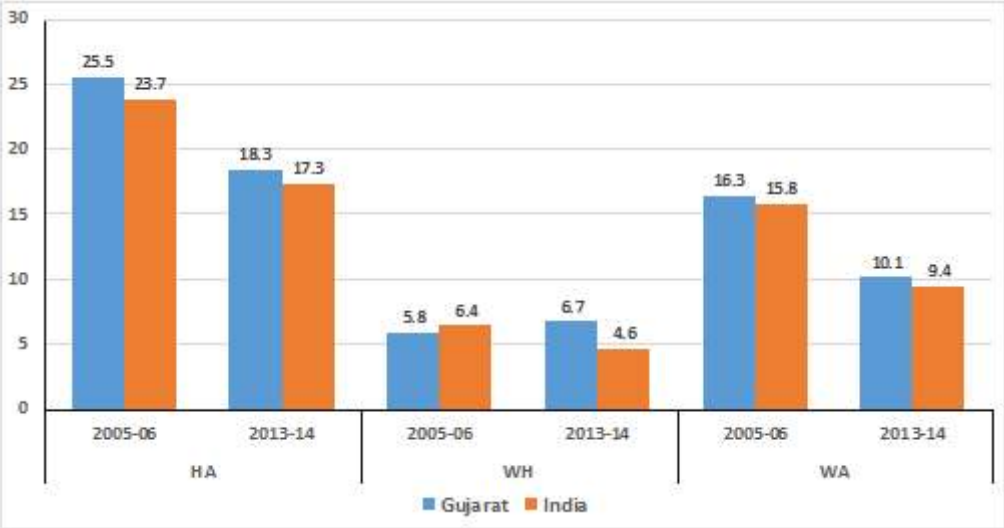


Table 1

Prevalence of child under-nutrition in Gujarat and India, 2013-14

Indicator	Period	Under nutrition		Severe under nutrition	
		Gujarat	India	Gujarat	India
HA	2005-06	51.7	48.0	25.5	23.7
	2013-14	41.6	38.7	18.3	17.3
WH	2005-06	18.7	19.8	5.8	6.4
	2013-14	18.7	15.1	6.7	4.6
WA	2005-06	44.6	42.5	16.3	15.8
	2013-14	33.6	29.5	10.1	9.4

Source: RSoC 2013-14 and NFHS 2005-06

Table 2

WHO classification of child under-nutrition based on height-for-age, weight-for-height and weight-for-age

Proportion of children low	Level of child under-nutrition			
	Low	Medium	High	Very high
Height-for-age	<20	20-29	30-39	≥40
Weight-for-height	<5	5-9	10-14	≥15
Weight-for-age	<10	10-19	20-29	≥30

Source: WHO

Table 3

Child under-nutrition by residence and social class in Gujarat, 2013-14

Residence/Social class	Under-nutrition			Severe under-nutrition		
	HA	WH	WA	HA	WH	WA
Residence						
Rural	44.6	19.7	35.6	18.8	7.2	11.3
Urban	36.4	17.1	30.4	17.5	6.0	8.2
Inequality index	0.148	0.101	0.112	0.052	0.128	0.222
Social class						
SC	42.3	18.6	31.8	16.4	6.8	9.5
ST	41.9	21.7	39.4	19.0	7.5	13.8
OB	44.3	16.6	32.1	20.4	6.0	9.3
OT	38.0	19.2	31.6	16.4	7.1	8.8
Inequality index	0.113	0.198	0.195	0.090	0.170	0.401

Source: RSoC 2013-14 except the inequality indexes which have been calculated by the author on the basis of RSoC 2013-14 data.

Table 4

Two-way classification of nutritional status of children

Parenteral growth	Linear growth		
	Normal	Stunted	Total
Normal	N_{NU}	N_{SO}	N_{NW}
Wasted	N_{WO}	N_{SW}	N_{TW}
Total	N_{NS}	N_{TS}	N

Table 5

Nutritional status of children 0-35 months of age in Gujarat and India according to the two-way classification, 2005-06

Parenteral growth	Linear growth		
	Normal	Stunted	Total
		Gujarat	
Normal	36.26	14.29	50.55
Wasted	23.69	25.76	49.45
Total	59.95	40.05	100.00
		India	
Normal	41.43	16.66	58.09
Wasted	21.79	20.12	41.91
Total	63.22	36.78	100.00

Source: Ranjan (2012)

Table 6

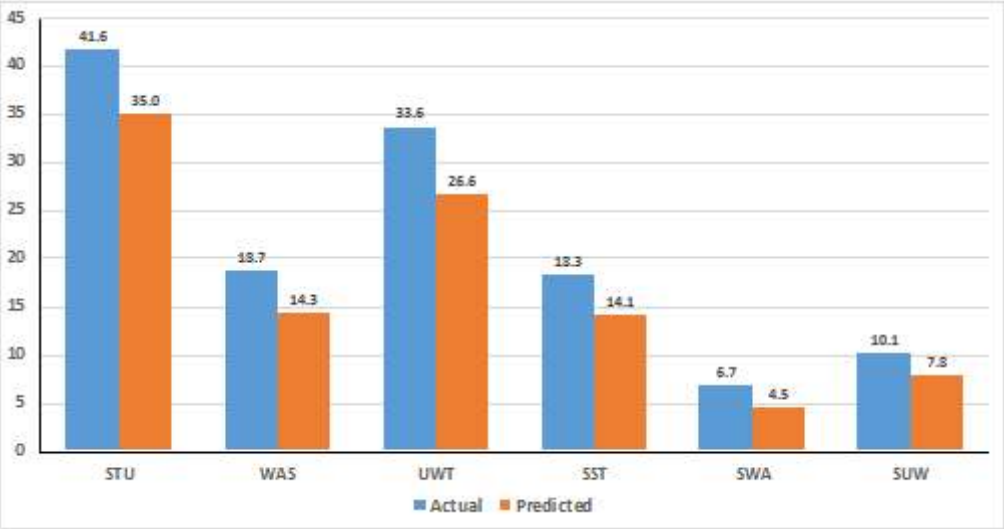
Relationship of indicators of child nutrition with selected proximate indicators of child nutrition

Variables		Coefficient	'p'	Importance
Dependent	Independent			
STU	ODF	0.165	0.002	0.520
R^2=0.648	BF1	-0.147	0.014	0.298
	PCI	-0.092	0.049	0.183
WAS	BF1	0.145	0.007	0.506
R^2=0.269	LBW	0.431	0.022	0.346
	ODF	0.047	0.122	0.148
UWT	ODF	0.271	0.000	1.000
R^2=0.643				
SST	PCI	-0.127	0.002	1.000
R^2=0.284				
SWA	BF1	0.058	0.011	0.723
R^2=0.163	LBW	0.125	0.104	0.277
SUW	ODF	0.101	0.001	0.783
R^2=0.319	DIA	-0.426	0.064	0.217

STU Proportion of children aged 0-59 months stunted
WAS Proportion of children aged 0-59 months wasted
UWT Proportion of children aged 0-59 months under weight
SST Proportion of children aged 0-59 months severe stunted
SWA Proportion of children aged 0-59 months severely wasted
SUW Proportion of children aged 0-59 months severely under weight
BF1 Proportion of children aged 0-23 months breast fed within one hour of birth
LBW Proportion of children aged 0-35 months having birth weight less than 2500 gms
ODF Proportion of households practising open defecation

Figure 3

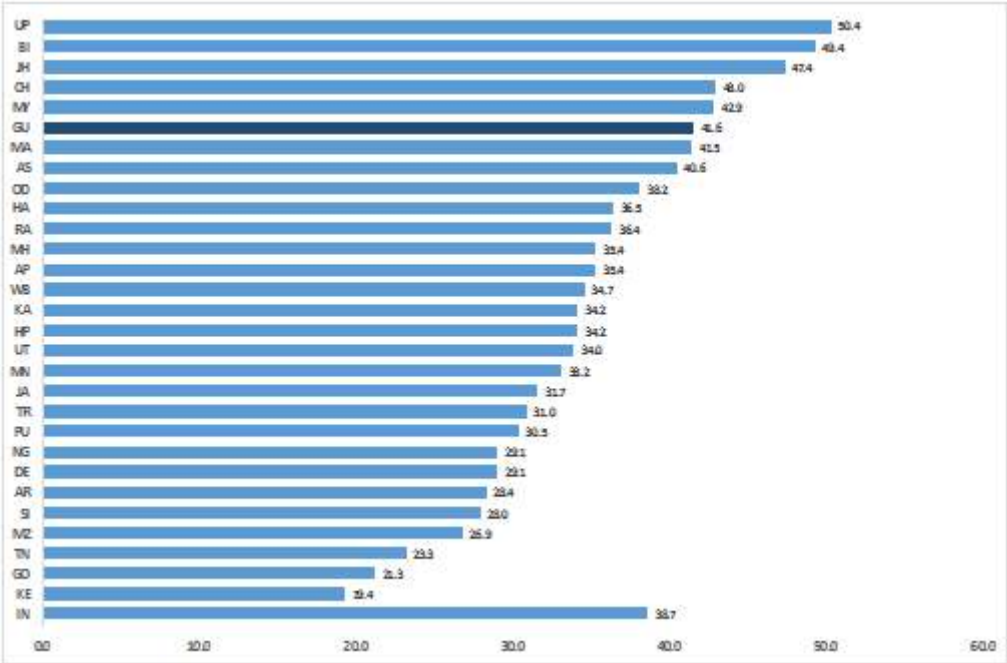
Actual and predicted values of indicators of child under nutrition in Gujarat



PCI Per capita income (thousand rupees) at constant (2004-05) prices

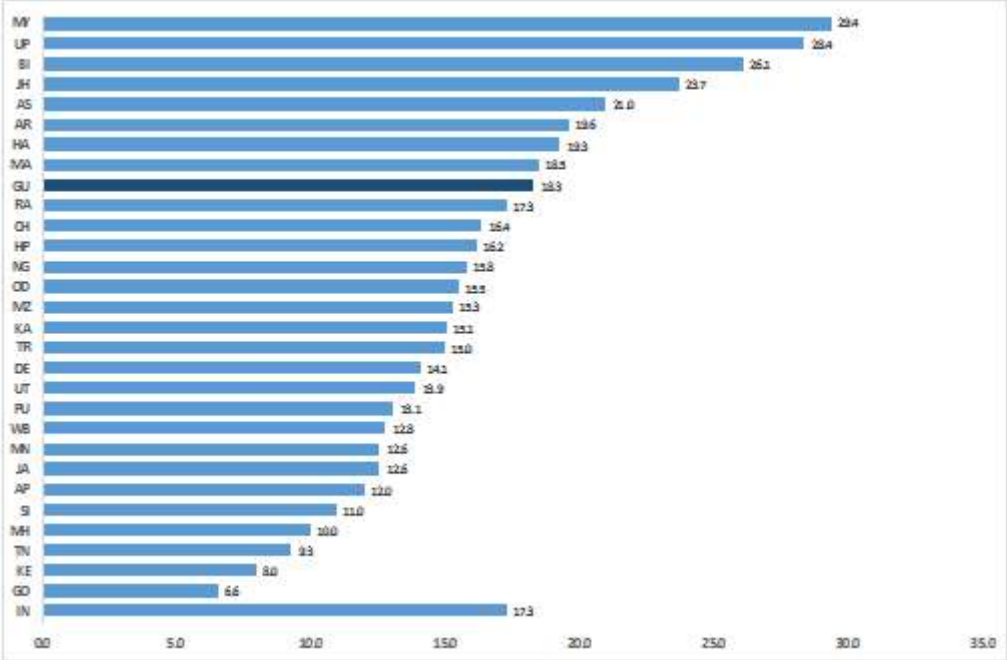
DIA Proportion of children 0-59 months of Age had diarrhoea during 15 days prior to the survey.

Figure 4
Proportion of children below five years of age low height-for-age in India and states, 2013-14



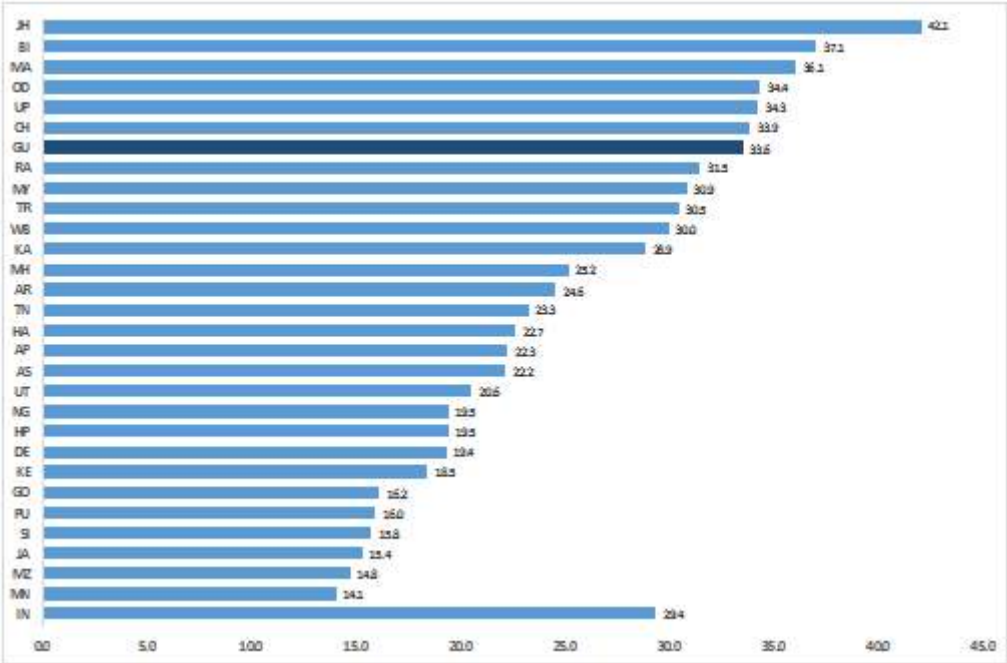
Source: RSoC 2013-14

Figure 5
Proportion of children below five years of age very low height-for-age in India and states, 2013-14



Source: RSoC 2013-14

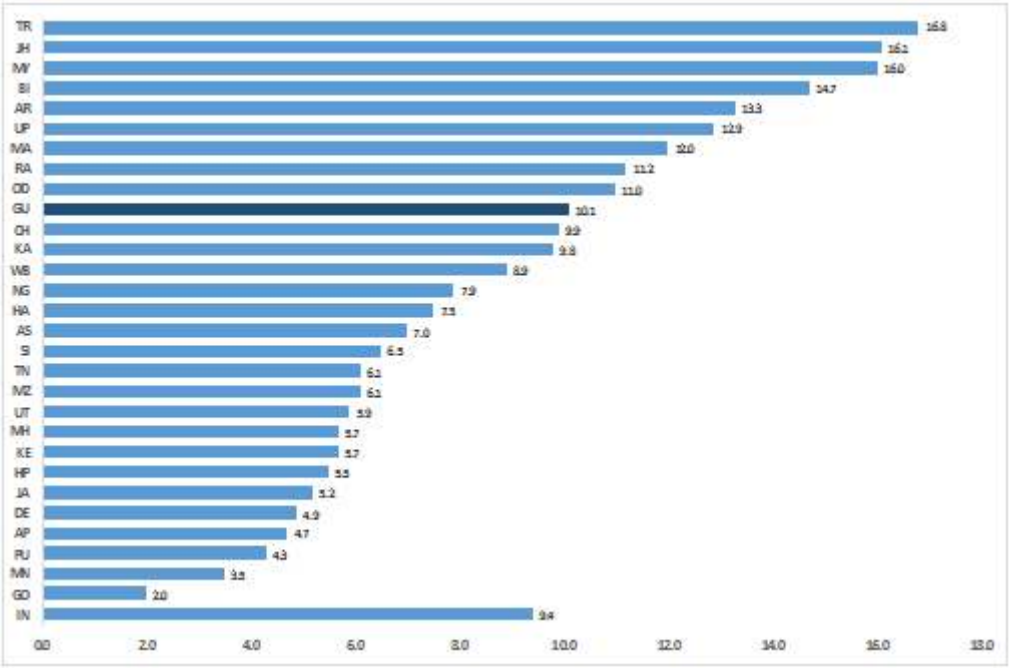
Figure 8
Proportion of children below five years of age low weight-for-age in India and states, 2013-14



Source: RSoC 2013-14

Figure 9

Proportion of children below five years of age very low weight-for-age in India and states, 2013-14



Source: RSoC 2013-14