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Adoption of WHO Growth Standards (2006) – Issues and Implications

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Preschool children are an important nutritionally vulnerable segment of the population; they are the future citizens of the country. Therefore, prevention, early detection, prompt and effective treatment of undernutrition in preschool children had received priority attention. Height and weight have been widely used as anthropometric indices for assessment of nutritional status of preschool children. Until recently the WHO had recommended use of National Centre for Health Statistics (NCHS) standards for assessment of nutritional status of preschool children. The NCHS standards have the following limitations:

- the standards were based on formula fed children from a single community in the USA; growth pattern of breast fed infants is different from that of formula fed infants
- children were measured once every three months, which is not adequate to describe the rapid and changing rate of growth in early infancy.
- there were shortcomings inherent in the statistical methods available at that time which led to inappropriate modelling of growth patterns.

During the nineties, a WHO Working Group¹ analysed available data on growth of infants who were breast fed in the first year of life and found that the growth curve of breast fed infants differed significantly from the NCHS standards. In order to derive appropriate global standards for growth of breast fed infants during early childhood, WHO conducted a multi-centre

study in Brazil, Ghana, India, Norway, Oman, and United States. Each centre enrolled healthy term infants who had no known illness or conditions that might affect their growth, and were breast fed as per the international feeding guidelines; growth data and related information on about 8500 children from diverse ethnic backgrounds and cultural settings who did not have any environmental constraints to growth were collected. Weight-for-age, height-for-age and weight-for-height and BMI for age standards for preschool children were computed from this study. In April 2006, WHO released the new growth standards for preschool children² based on this study and recommended that instead of the NCHS growth standards, member states may use new standards in view of

- the WHO policy on promoting breast feeding and
- the urgent need to use the standards for BMI for age for early detection and correction of under and over nutrition in preschool children.

This article attempts to:

- review currently used growth standards in India
- compare the currently used NCHS and Indian Academy of Pediatrics (IAP) growth curves with the WHO (2006) growth curves
- compare the growth curves of low middle income preschool children from NFI study in Delhi with NCHS, IAP and WHO (2006) growth curves;
- compare prevalence of undernutri-

tion using these three standards

- compare prevalence of underweight in different age groups from District Level Household Survey using NCHS and WHO (2006) standards
- assess potential clinical and programmatic implications of use of WHO standards

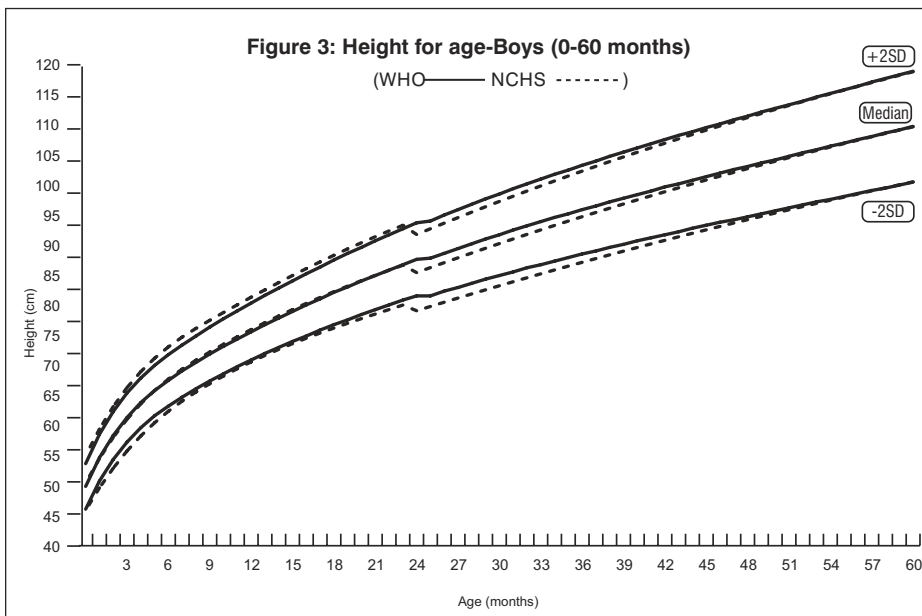
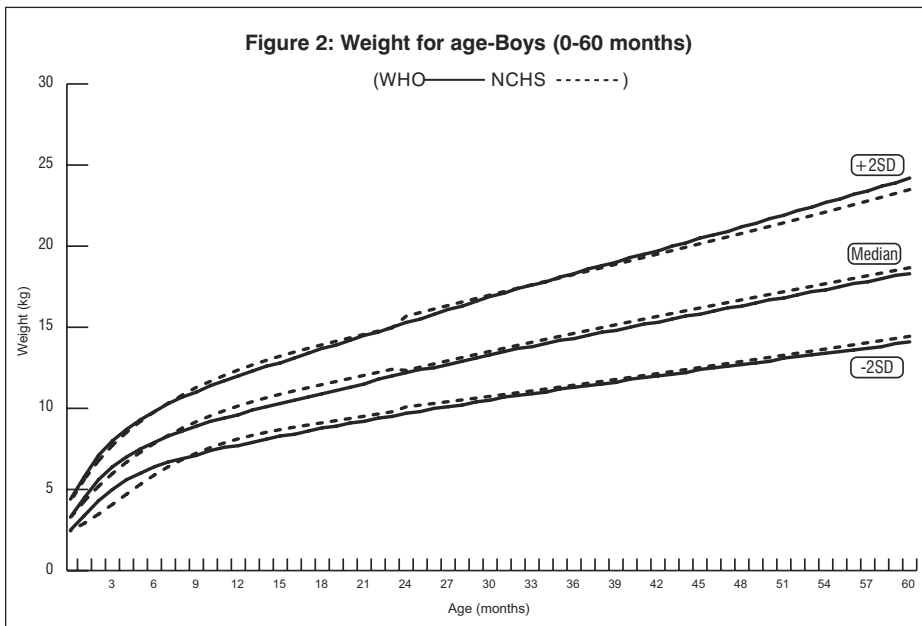
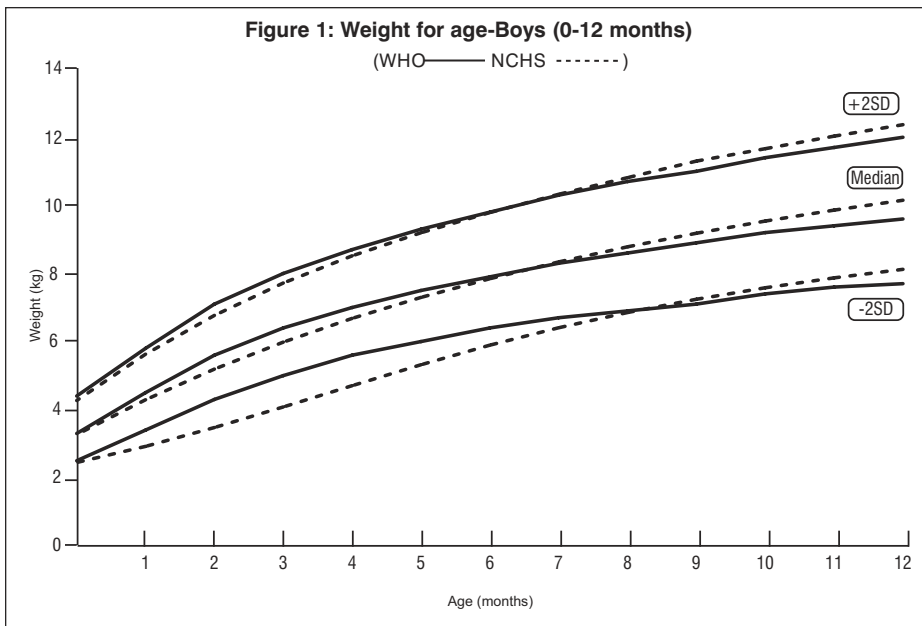
In order to avoid any confusion between the two WHO standards (old and new) the earlier WHO/NCHS standards are referred to as NCHS standards in the present article.

Currently used growth standards in India

India had used the NCHS/Harvard standards based on formula fed infants for assessment of nutritional status of preschool children in clinical settings, national nutrition programmes and national nutrition surveys, in spite of the universal breast feeding practices in the country. All the major national surveys carried out by National Nutrition Monitoring Bureau³, National Family Health Survey NFHS 1⁴, NFHS2⁵ and NFHS3⁶ and District Level Household Survey⁷ have used NCHS standards for assessment of prevalence of under

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nutrition. In clinical settings, weight for age is the most widely used indicator and most clinicians use NCHS standards. In some secondary and tertiary care settings, paediatricians use weight for age and height for age for assessment of nutritional status; comparisons are with the NCHS standards.

In the ICDS programme weight for age is used for assessment of nutritional status because of the following advantages:

- balances are available in most areas, up to village level;
- weighing is a simple operation; almost all persons involved in assessment of nutritional status have been trained in weighing children and classifying them according to the weight-for-age charts;
- with nutrition and health interventions, deficit in weight for age can be readily reversed; so weight for age can be used to assess improvement following interventions.

ICDS uses IAP standards based on the Harvard Unisex standards derived from formula fed infants for assessment of nutritional status of preschool children.

Use of Harvard Standards in ICDS and NCHS standards in the surveys has led to several problems. Prevalence of undernutrition in preschool children as assessed by NCHS standards (used in the surveys) is substantially higher than prevalence of undernutrition as assessed by IAP standards (used in ICDS reporting). People, who do not know that the different standards have been used, feel that ICDS system under-reports undernutrition. Use of unisex Harvard standards results in apparently higher prevalence of under-nutrition in girls; this is often interpreted as an indication of gender discrimination in infant and young child feeding. Though NNMB provides data on prevalence of undernutrition using both NCHS and IAP standards⁸, very few go through these finer details that could correct these misconceptions.

Comparison of growth curves NCHS and WHO (2006) growth curves

A comparison of the WHO (2006) weight for age growth curves with the earlier used NCHS growth curves is given in Figure 1. It is obvious that in the first six months of age the breast

fed infants in the WHO (2006) standards are heavier than the formula fed NCHS infants; after six months the breast fed infants in the WHO (2006) standards weigh less than the formula fed infants in the NCHS standards and by 12 months of age breast fed children of all groups (-3SD to +3 SD) in WHO (2006) weigh less than the corresponding counter parts in the NCHS standards.

Figure 2 provides the information on weight of children in the 0-60 month age group according to WHO (2006) and the NCHS standards. Between 12-60 months children between -3SD and median in the WHO (2006) standards are lighter than the corresponding counterparts in the NCHS standards; but those above the median in the WHO standards are heavier than the NCHS counter parts.

Figure 3 provides the information on height of children in the 0-60 month age group according to WHO (2006) and the NCHS standards. In all ages upto 48 months and most groups, the children in the WHO standards are taller than the corresponding counterparts in the NCHS standards.

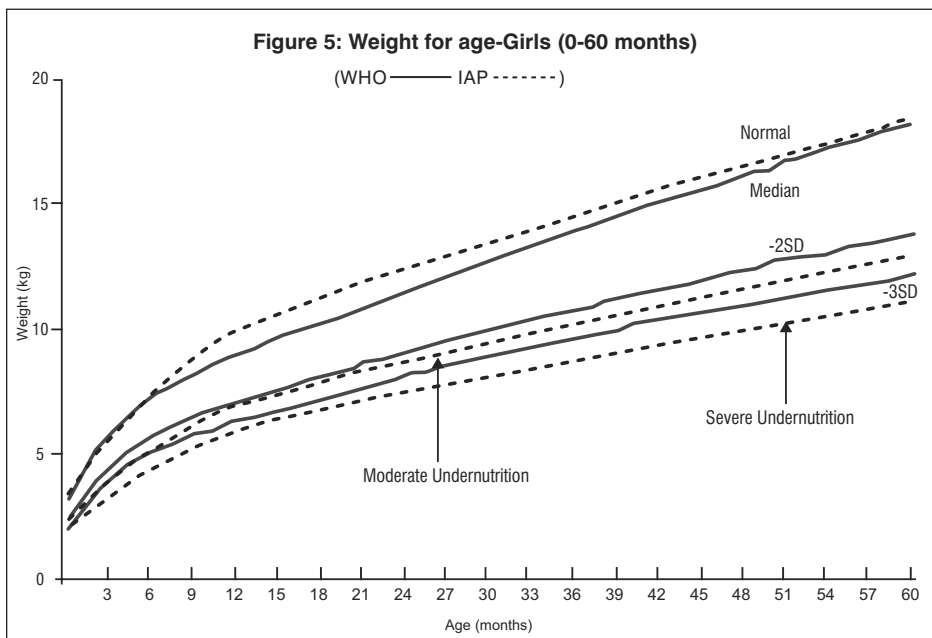
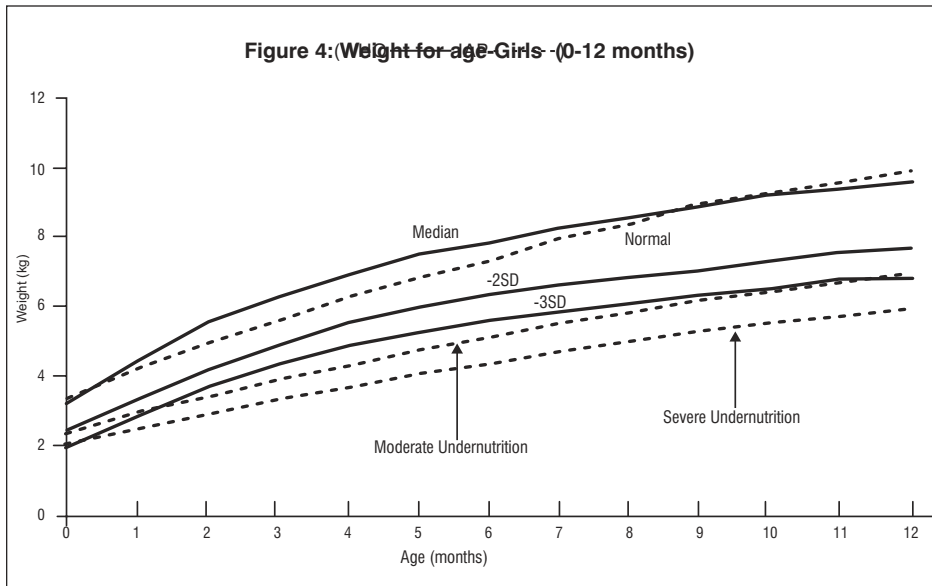
WHO (2006) and the IAP standards

In the ICDS programme, Harvard unisex growth standards for weight for age modified by the IAP is used for detection of undernutrition in pre-school children. The IAP standards are in Table.

Comparison between the WHO (2006) and the IAP growth curves is shown in Figure 4. As with the NCHS there are significant differences between the IAP and the WHO (2006) growth curves in the first year of life. The IAP normal (more than or equal to 80% of Harvard standards) is well below the median of the WHO (2006) standards in the first six months but is above the median of the WHO (2006) standards by 12 months. After the first twelve months the normal of the IAP standards is higher than the median of the WHO (2006) standards. Moderate undernutrition by IAP standards coincides with -3SD of the WHO (2006) standards after the first six months. Right from 2 months the severe and very severe grades of undernutrition are below the -3SD of the WHO (2006) standards.

After the first 6 months the IAP normal lies just above the median of the WHO (2006) standards; mild un-

Table: IAP Standards	
>= 80% of the Harvard Median	Normal
70-79% of the Harvard Median	Mild under nutrition
60-69% of the Harvard Median	Moderate under nutrition
50-59 % of the Harvard Median	Severe under nutrition
<50% of the Harvard Median	Very severe under nutrition



dernutrition is between -1 and -2 SD of the WHO (2006) standards; moderate undernutrition is between -2 and -3 SD of the WHO (2006) standards (Figure 5); both severe and very severe undernutrition of the IAP standards are below -3 SD of the WHO (2006) standards. The fact that the IAP uses unisex Harvard standards while the WHO (2006) has gender-disaggregated standards for growth is another reason for the observed differences between the growth curves.

Nutrition Foundation of India's (NFI's) study on growth of preschool children in Delhi

NFI has initiated a study on growth of preschool children from low middle income group residing in the areas covered by six anganwadis in North West Delhi to investigate factors influencing growth of children from low middle income group;

The three-year study is expected to provide data on effect of feeding

and caring practices at home, food supplements provided in the anganwadi and morbidity on undernutrition rates in preschool children.

In the last six months data on socio-economic status, demographic profile, infant and young child feeding practices and morbidity have been collected in 1252 children (621 boys and 631 girls) in the 0-6 year age group. All these children were weighed; height was measured in those who could stand erect. Growth curves for weight for age, height for age and BMI for

age of these children are computed and compared with the WHO (2006) growth curves (Figure 6-8).

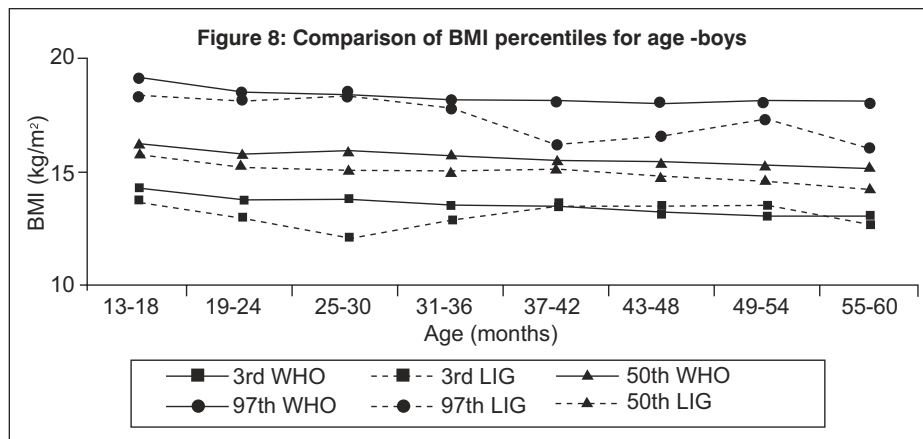
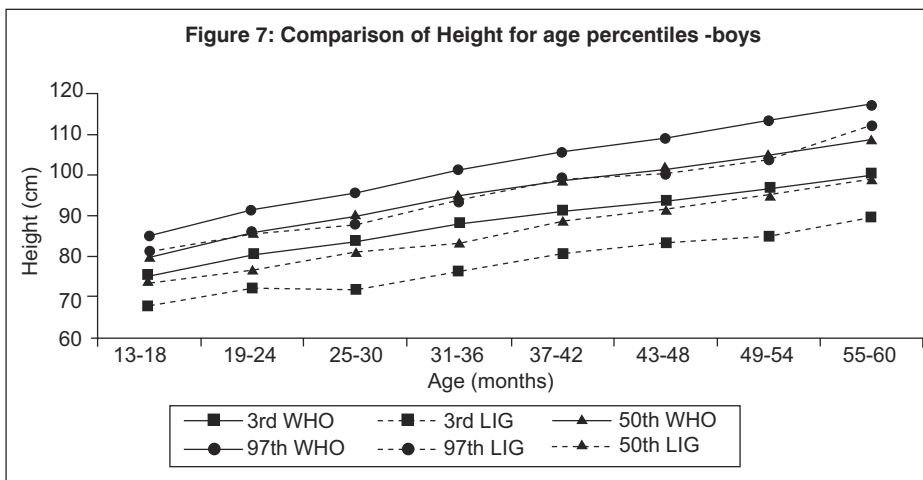
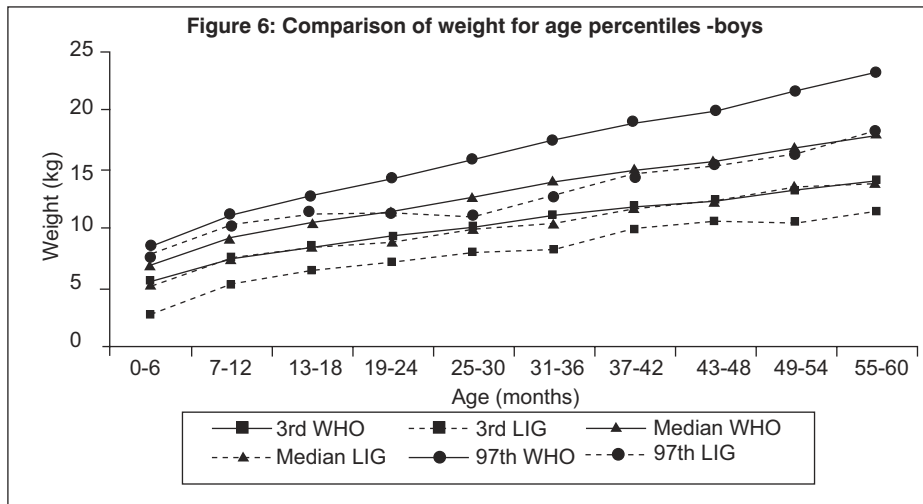
The median height and weight of children from low middle-income group families is comparable to the 3rd centile of the WHO (2006) standards. However, the BMI for age presents a totally different picture; the median, 3rd centile and 97th centile of the BMI for age for these children are just below than the respective centiles of the WHO (2006) standards.

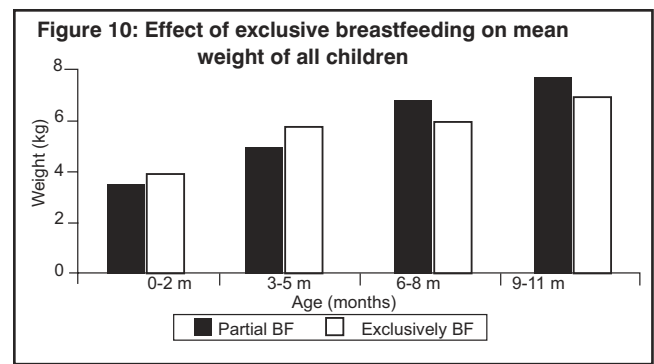
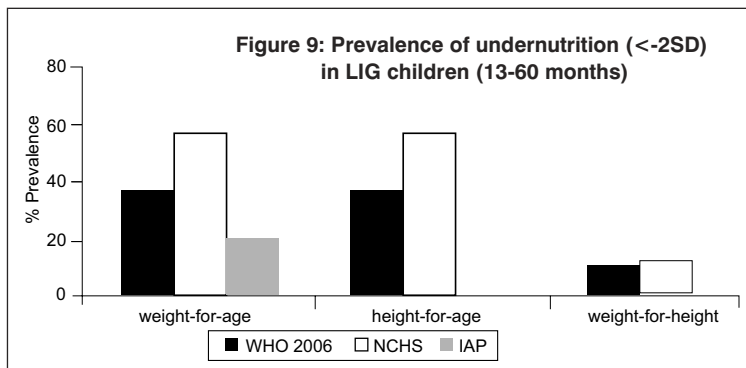
Prevalence of moderate and severe undernutrition in 13-60 month old children in this study was computed according to IAP, NCHS and WHO (2006) standards (Figure 9). Prevalence of underweight is lowest by IAP standards, higher with the WHO (2006) standards and highest with the NCHS standards. Stunting rates are lower with the WHO (2006) standards as compared to NCHS standards. It is noteworthy that the wasting rates with WHO standards (2006) are less than 15% even though the stunting and underweight (nearly 40%) rates are high. If BMI for age rates in these children are used as criterion for assessment of undernutrition about 12% of the children are undernourished (BMI of <-2SD of the WHO (2006) standards).

Body weight and prevalence of under-nutrition in these children in relation to infant feeding practices and morbidity due to infections was computed using the WHO (2006) standards. Too early introduction of milk substitutes (in the 3-5 month age group) and too late introduction of complementary feeds (in the 6-8 month age group) are associated with lower mean weight (Figure 10). Morbidity due to infection was lowest in the under three months infant who were mainly breast-fed. There was a progressive increase in morbidity rates with increasing age (Figure 11). Prevalence of under nutrition was higher in children with morbidity (Figure 12). It is obvious that computing undernutrition rates using of the WHO (2006) standards clearly brings out the importance of poor infant and child feeding and caring practices as determinants of growth faltering in infancy and early childhood

WHO (2006) standards for BMI for age: its use in the dual nutrition burden era

Reported underweight rates in India are higher than that of Sub-Saharan Africa but under five mortality rates and morbidity rates in children in India are much lower. This paradoxical situation has been termed as the South Asian enigma. There have been speculations as to whether wasting could be a more appropriate index of undernutrition for assessment of risk of morbidity and mortality due to increased susceptibility to infections. It is expected that data from the NFI study collected over the next three years will provide answer to this im-





portant question.

Currently India is undergoing developmental, demographic, nutrition and health transition. While undernutrition remains a major concern, over-nutrition is also emerging as a public health problem. Over-nutrition in India begins in early childhood. The International Obesity Task Force has recommended that BMI for age is the most appropriate index for assessment of over-nutrition in children. Some of the earlier studies carried out by NFI has shown that BMI for age is a more effective tool for detection of both under and over nutrition in school children⁹. With the ready availability of the BMI for age standards provided in the WHO (2006) standards, it will be possible to assess the relative merits of the three indices weight for age, height for age and the BMI for age in preschool children for early detection of both under and overnutrition and risk of functional de-compensation associated with them.

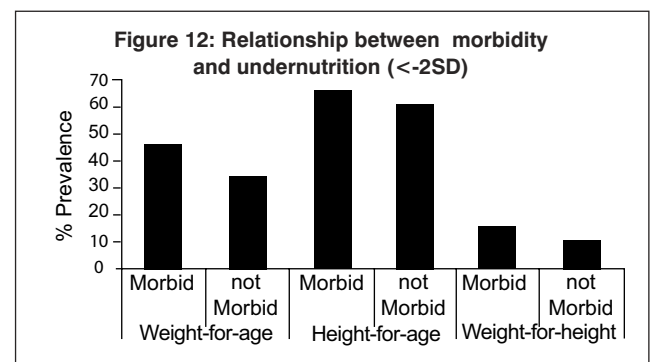
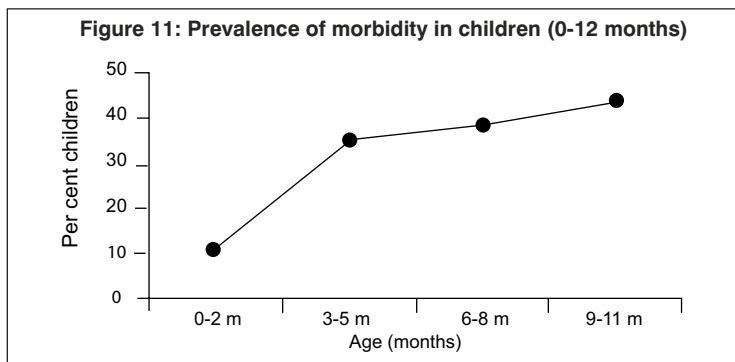
Underweight rates: comparison between NCHS and WHO (2006) standards

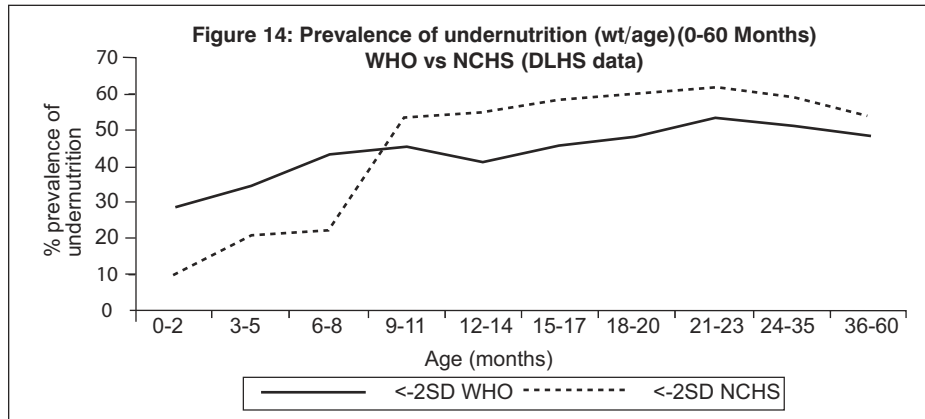
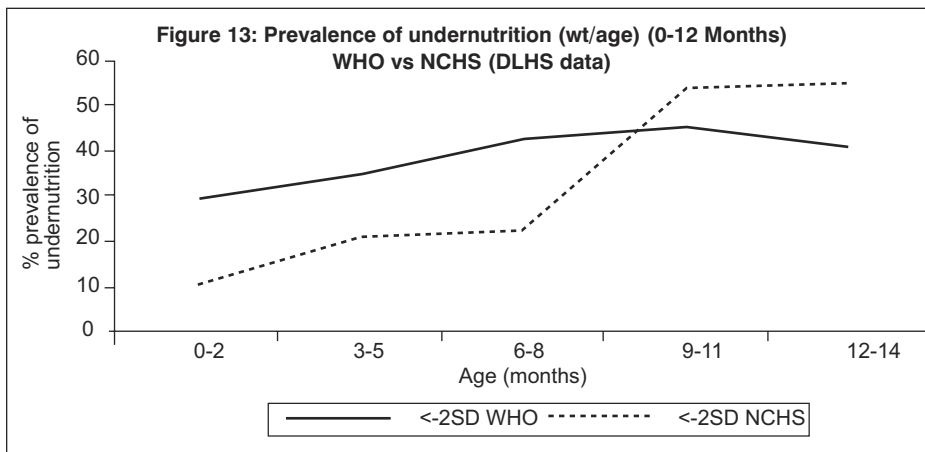
Weight for age is the most widely used index for assessment of undernutrition in clinical practice; it is the only index used in the ICDS programme. It is important to assess whether changing over to WHO (2006) standards will lead to changes in prevalence of

undernutrition and if so, the magnitude of the change in different age groups. Analysis of data on weight for age of 2.4 lakh preschool children from the District Level Household Survey was taken up for this purpose. International Institute for Population Sciences (IIPS) Mumbai provided the DLHS database to National Institute of Health and Family Welfare. Data analysis plan was prepared through collaboration between NFI and NIHFV. Data analysis was done at NIHFV and the results were shared with NFI. There were substantial differences in prevalence of undernutrition (weight for age) as assessed by NCHS and WHO standards (Figure 13 and 14). The maximum difference in underweight rates is in the critical first year of life. Computed underweight rates using WHO (2006) standards are higher as compared to the computed underweight rates using NCHS standards in the first six months. This should be viewed as a correction of a historical fallacy of using NCHS standards based on formula fed infants and not as alarming rise in underweight rates in the 0-6 age group. After first year the prevalence of underweight rates computed from the WHO standards is lower than the underweight rates computed using the NCHS standards. This should not be interpreted as a fall in undernutrition rates and lead to a sense of complacency that undernutrition rates are falling.

Clinical and programme implications of adoption of WHO (2006) standards

Review of the data on undernutrition rates in different age groups from the DLHS database computed on the basis of NCHS and WHO standards provides fascinating information. The reported under-nutrition rates in the 0-3 month age group as assessed by the NCHS norms (10%) is unrealistically low when one takes into account the 30% low birth-weight rate in the country. If the WHO (2006) standards are used prevalence of under-nutrition in the first three months is about 30%; this suggests that exclusive breast feeding followed by majority of mothers in this period protects the infant from further deterioration in nutritional status. A small rise in the prevalence of undernutrition between three and six months is seen if the WHO standards are used; this is likely to be due to too early introduction of milk substitutes and higher morbidity in this period. A further rise in the undernutrition rate between six and twelve months seen with the WHO standards is likely to be due to too late introduction or inadequate amount of complementary feeds to children in this age group as well as increase in morbidity and inadequate care during infections. Prevalence of under nutrition based on WHO standards clearly brings out the importance of too early introduction of breast milk substitutes, too late





introduction of complementary feeds and poor care during morbidity as major factors associated with rising prevalence of undernutrition in infants. This data can serve as a very useful tool for advocacy and awareness building so that there is focussed attention on two critical interventions to improve young child nutrition namely nutrition education to ensure appropriate infant and child feeding and health education to improve timely access to health care.

There is a second peak in undernutrition rates around two years of age when the child shifts totally to adult food; this is perhaps related to inadequate intake of food because of poor child feeding practices. Nutrition education that in view of the small stomach capacity children should be fed 5-6 times in order to receive adequate quantity of food may help in improving the dietary intake and nutritional status of children in this age group. Thus use of WHO (2006) growth standards can make an important contribution in clearly bringing into focus the importance of increasing investment in nutrition and health education and healthcare to improve infant and young child feeding habits during the critical period of 0-36 months which can result in substantial

reduction in under-nutrition rates in preschool children.

Summary

Data so far presented suggest that the WHO (2006) standards have the following advantages:

- they are based on growth of breast fed infants (including Indian infants and children)
- they identify the critical age(s) when growth faltering occurs and factors associated with growth faltering, thereby facilitate focussed interventions aimed at improving nutritional status of infant and young child.

If both Ministry of Women and Child Development and Ministry of Health and Family Welfare decide to change over to the WHO (2006) standards, the problems due to use of NCHS standards in clinical practice and the nutrition surveys and IAP standards in the ICDS Programme will disappear. If such a decision is taken it should be followed by several immediate steps in order to ensure smooth and rapid transition from currently used standards to WHO (2006) standards. The existing growth charts based on NCHS standards currently used in the health system and ICDS growth

charts based on IAP standards have to be replaced by the WHO (2006) growth charts. There should be appropriate orientation training of all the personnel involved - from policy makers to programme implementers in the health and ICDS programmes. It might be preferable to conduct joint orientation training between health and ICDS personnel which could accelerate convergence and synergy between the two sectors. Orientation training of CDPOs, supervisors and anganwadi workers to the WHO (2006) standards and the implications of their use should receive priority attention. There will be a need to revise the various norms for the ICDS Programme; for instance funds for providing the double ration to children with moderate and severe undernutrition would require considerable upward revision. This might be the most appropriate time for the transition because it might be relatively easy to incorporate all these requirements while formulating the Eleventh Five Year Plan. Efforts should also be made to provide state-wise data on current status (based on NFHS 3 data) and goals for the Eleventh plan using WHO (2006) standards.

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References:

1. WHO Working Group on Infant Growth. An evaluation of infant growth: The use and interpretation of anthropometry in infants. Bull World Health Organ. 73:165-74, 2003.
2. WHO Multicentre Growth Reference Study Group. WHO Child Growth Standards: Length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age: Methods and Development. Geneva: World health Organization. 2006.
3. NNMB National Nutrition Monitoring Bureau 1979-2002. NNMB Reports. National Institute Of Nutrition, Hyderabad
4. International Institute of Population Sciences. National Family Health Survey 1. Mumbai. 1992-93.
5. International Institute of Population Sciences. National Family Health Survey 2. Mumbai.1998-99.
6. International Institute of Population Sciences. National Family Health Survey 3. Mumbai.2004-05.
7. Ministry of Health and Family Welfare 2004. District Level Household Survey 2002-03. Government of India, New Delhi
8. NNMB National Nutrition Monitoring Bureau. NNMB Reports. National Institute Of Nutrition, Hyderabad.2005.
9. Nutrition Foundation of India. Twenty-Five Years Report 1980-2005. New Delhi.2005.