



# NFI BULLETIN

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## New Growth Norms for Nutritional Assessment of Children

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Adequate nutrition during early years of life is of paramount importance for growth, development and long-term health through adulthood. It is during infancy and early childhood that irreversible faltering in linear growth and cognitive deficits occur. Poor nutrition during this critical period contributes to significant morbidity and mortality. Long-term consequences include reduced work capacity, impaired intellectual performance and increased risk of chronic diseases. The quality of infant and young child feeding is, therefore, fundamental for achieving optimal growth and development and the very survival of children.

### Strategy for Infant and Young Child Feeding

The Global Strategy for Infant and Young Child Feeding was developed by the WHO and UNICEF in 2003<sup>1</sup>. It provides a comprehensive framework for promoting appropriate feeding practices and reducing malnutrition. The Strategy recommends that infants should be exclusively breastfed for the first six months of life and thereafter, should receive adequate and safe complementary foods while breastfeeding is continued for two years or beyond. The transition from exclusive breastfeeding to complementary feeding, covering the period from 6-24 months of age is the most vulnerable period, when growth faltering starts in many children. Many factors contribute to malnutrition in the complementary feeding period. These include late introduction, poor nutritional quality and insufficient amounts of complementary

foods. Early introduction of complementary foods may displace breast milk and increase the risk of infection. Repeated infections affect appetite and further reduce food intake resulting in growth failure. Early detection of growth faltering and promotion of appropriate complementary foods is important for prevention of malnutrition.

### Assessment of Child Growth

Anthropometric measurements are commonly used for assessing growth and nutritional status of children<sup>2</sup>. These include weight for age, height for age and weight for height. Although the prevalence of low weight for age and height for age are often used interchangeably to describe chronic malnutrition, they provide very different information on what the problem is, how it can be remedied and the age when this is possible. Low height for age reflects the cumulative effects of numerous insults experienced by children during infancy and early childhood. It begins at birth and continues through the initial 40 months, after which time it is irreversible. In contrast, low weight for age is reversible, can reflect either acute or chronic malnutrition. After 12 months of age, weight for height generally improves. Children with acute malnutrition require different nutrition and health interventions than those with chronic malnutrition.

Through out the world, children fail to grow in length and weight in a remarkably similar age-specific pattern, despite vast differences in the prevalence of low weight-for-age and height-for-age, between the regions<sup>3</sup>. Faltering

in length extends through the first 3 to 4 years of life. In contrast, faltering in weight is concentrated between 3 and 12 months. After 12 months of age, a child may be stunted and of low weight-for-age, but his weight-for-height ratio improves. In other words, weight gain can be adequate even while the process of stunting continues for another two years. While failure to gain weight is a signal of inadequate nutrition, adequate weight gain does not necessarily mean that a child is growing normally.

Differences in the degree of growth failure in weight and height have implications for assessing the true prevalence of chronic malnutrition<sup>3,4</sup>. In Africa, the mean height-for-age at 24 months is about -2, whereas wt/age is -1.5. In Asia, height-for-age is -2 and weight-for-age is -1.8. In Latin America, height-for-age is -1.3 whereas weight-for-age is 0.8. Thus, the prevalence of stunting generally exceeds that of low weight-for-age. This is particularly true in Latin America where the prevalence of stunting is about twice that of low weight-for-age. Therefore, assessing malnutrition using low weight-for-age may underestimate the true prevalence

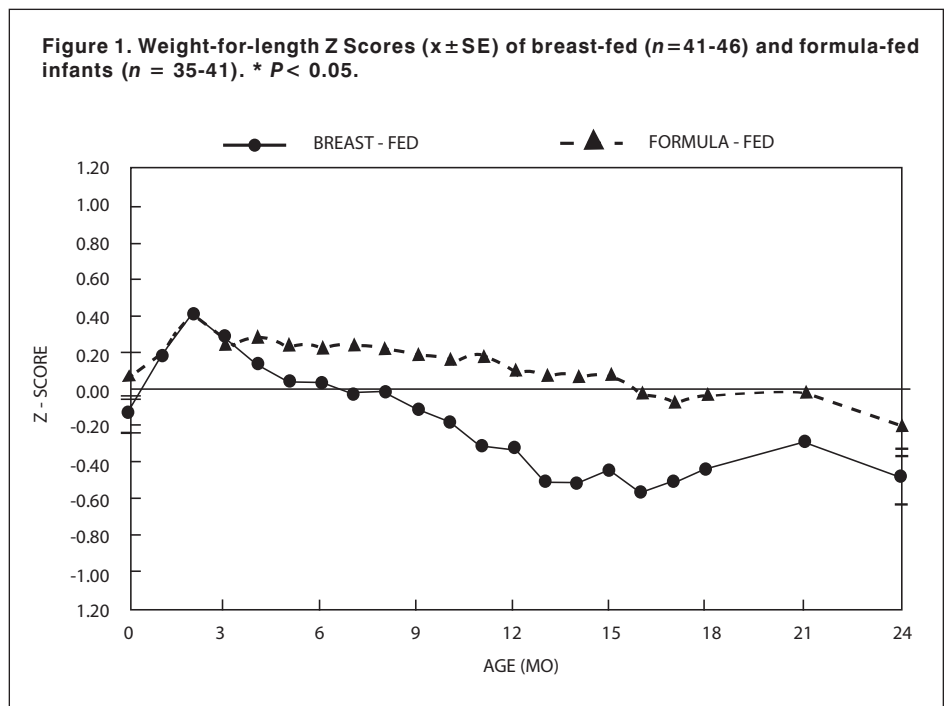
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of growth retardation. This is also important for monitoring trends or evaluating the effects of interventions. Weight distribution, when corrected for height, may be normal or shifted towards the right, indicating a tendency toward over weight among children who are stunted. There is a need to shift the focus from weight-for-age to height-for-age and weight-for-height for assessing malnutrition and identifying populations that could benefit from interventions. This requires proper training of field workers to improve their skills in anthropometric assessment.

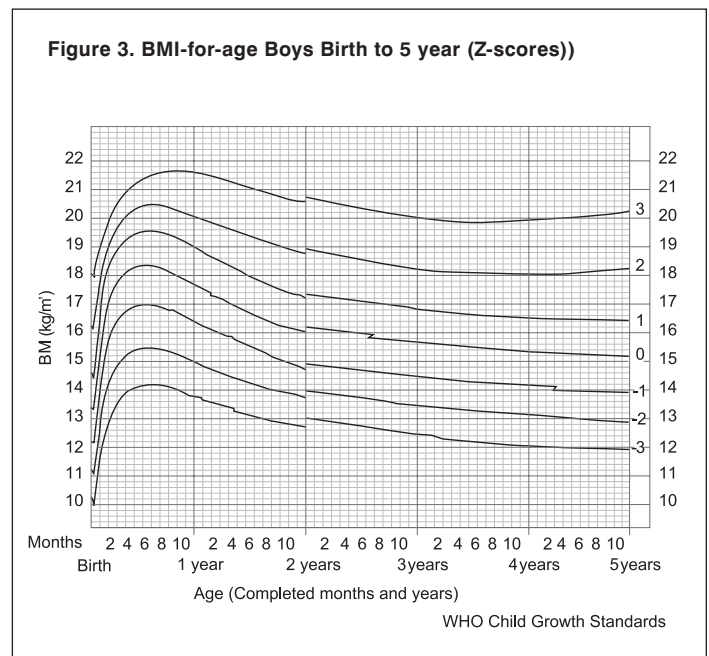
### Child Growth Standards

Anthropometric assessment involves the use of growth standards. They provide a useful tool for assessing nutritional status and well being of children. The terms growth standard and growth reference are used interchangeably, though their meaning is different. A standard reflects an optimum level, suggesting that all children have the potential to achieve that level, while growth reference is simply used for comparison. The National Centre for Health Survey / World Health Organisation (NCHS/WHO) growth reference is widely used all over the world<sup>2</sup>. However, its limitations are well recognized. The growth reference is based on formula fed children from a single community in the US. The children were measured every three months, which is not adequate to describe the rapid and changing rate of growth in early infancy. Also, shortcomings inherent in the statistical methods available at

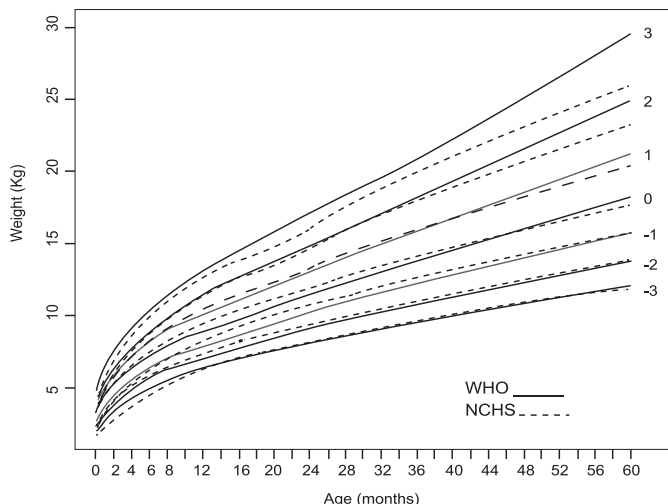


the time led to inappropriate modeling of growth patterns. There are several studies to show that growth pattern of breast fed infants is different from that of formula fed infants and the current growth reference. For example, in a longitudinal study of American infants, weight for length z-scores were significantly lower in breast fed than formula fed infants from 7-24 months<sup>5</sup> Figure 1. Triceps and sub-scapular skin folds and percent body fat were also lower indicating that breast fed infants are leaner compared to their formula fed counterparts even in populations of high socioeconomic status. The WHO working group on infant growth

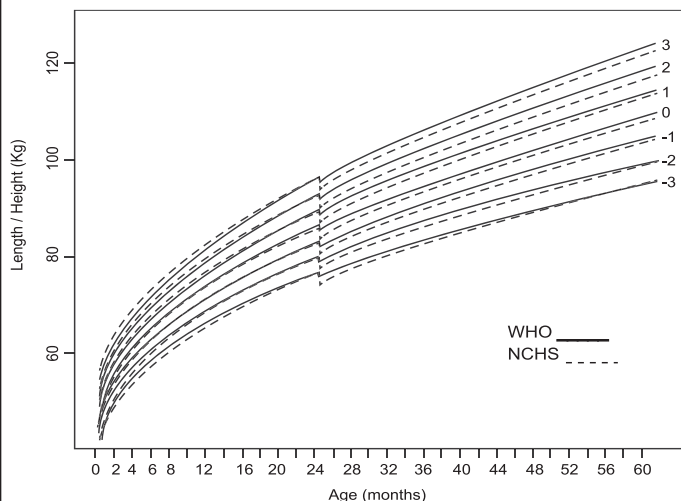
reviewed the available data on breast fed infants; who were exclusively breast fed for at least 4 months and continued breastfeeding for 12 months<sup>6</sup>. Analysis of pooled data set showed that growth curves of breast fed infants deviated significantly from the NCHS reference, suggesting that these standards are not appropriate for assessing physiological growth of healthy infants. There is a need for international growth standards that will show how children should grow in all settings, rather than reflect growth pattern of children in a specific population. Recognition of this fact has led to the development of new growth standards<sup>7</sup>.



**Figure 4. Comparison of WHO with NCHS weight-for-age Z-scores for girls**



**Figure 5. Comparison of WHO with NCHS length-for-age Z-scores for girls**



**WHO Multi-center Growth Reference Study**

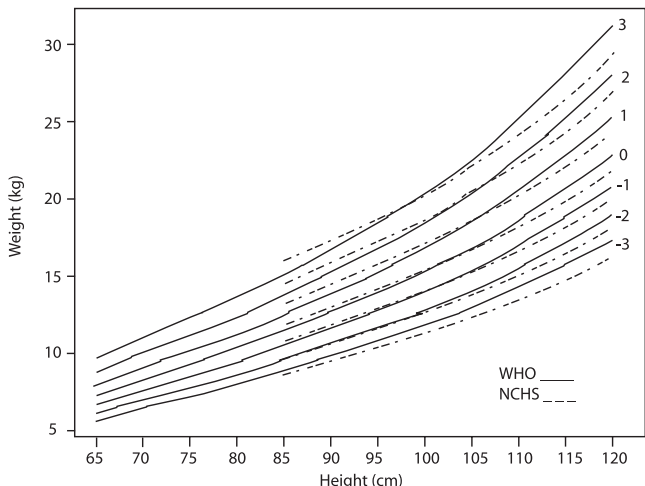
The WHO conducted a multi-center study and collected growth data and related information on about 8500 children from diverse ethnic backgrounds and cultural settings<sup>8,9</sup>. The participating countries include Brazil, Ghana, India, Norway, Oman, & United States. Trained staff using a common protocol collected the data. The study was designed to combine a longitudinal follow up of children from birth to 24 months and a cross sectional study of children aged 18 to 71 months. Children were selected from communities where there were no

environmental constraints to growth. They were 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. The new growth reference is based on breastfeeding as the biological norm. The measurements include weight-for-age, height-for-age and weight-for-height. Data on Body Mass Index (BMI) was generated for children under 5 yrs for the first time (figures 2 & 3). Other measurements include head circumference, mid-arm circumference, triceps and sub-scapular skin folds. Current references do not provide values for these parameters. In addition, key motor milestones like

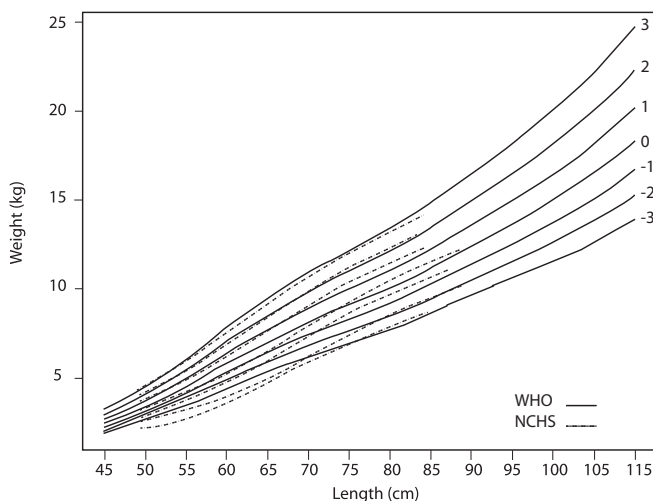
sitting, standing and walking were measured, linking motor development to physical growth.

The WHO report on growth standards was released on 27 April 2006<sup>9</sup>. It provides details of the growth study including study design and methodological process followed for development of growth standards. The report presents the first set of data on length and height-for-age, weight-for-age, weight-for-length, weight-for-height and BMI. It also provides comparison between the new standards and NCHS growth references. There are differences not only in the populations used, but also in the methodologies

**Figure 6. Comparison of WHO with NCHS weight-for-height Z-scores for girls**



**Figure 7. Comparison of WHO with NCHS weight-for-length Z-scores for girls**



applied to construct the two sets of growth curves.

The data showed great similarities in growth across all study centers<sup>9,10</sup>. The new standards demonstrate that child populations in different regions of the world have the same growth potential. They can attain same heights and weights when their health care needs are met. However, the new standards apply to children from birth to five years of age. Genetic influence on the ultimate height in adulthood cannot be ruled out.

## Differences Between the New Standards and NCHS References

As expected, there are important differences between the new standards and NCHS references (figures 4-7). However, these vary by age, sex, anthropometric measure and specific percentile or z-score curve. Differences are particularly important in infancy. Impact on population estimates of child malnutrition will depend on age, sex, anthropometric indicator considered and population-specific anthropometric characteristics.

Thus, it will not be possible to provide an algorithm that converts prevalence values based on previous references to those based on the new standards or vice versa.

In the past, growth of breast fed infants after the first three months was judged as inadequate using the old NCHS reference. The new charts may now classify more formula fed infants as overweight. A notable effect is that stunting will be greater throughout childhood when assessed using the new WHO standards compared to the previous international reference (Figure 5). For wasting, the main difference between the new standards and the old reference is during infancy, up to about 70 cm length, when wasting rates will be substantially higher using the new WHO standards (Figure 6, 7). With respect to overweight, use of the new WHO standards will result in a greater prevalence that will vary by age, sex and nutritional status of the index population.

## Summary

The growth charts based on the new WHO standards differ from the existing standards in many innovative ways. They describe 'how children should grow', which is a prescriptive

approach, not just a descriptive one. They show that all children can attain a similar standard of height and weight with adequate feeding and health care. It is a more pro-active way of evaluating child growth. A key characteristic of the new standard is that it establishes breastfeeding as the biological norm. Furthermore, the pooled sample from the six participating countries creates a truly international standard, in contrast to the previous growth reference based on children from a single country. The new growth standards go beyond the current references and include new indicators like BMI and skin folds. These charts will be particularly useful in monitoring childhood obesity, which is relevant to both developed and developing countries.

Poor growth during infancy leads to childhood malnutrition in many developing countries, which if followed later in life by an increased intake of calories could result in overweight or obesity. It is not uncommon to see an under-nourished child in the same household as an overweight adult. The WHO standards are useful for detecting both undernutrition and obesity, thus addressing the double burden of malnutrition. Additionally, the development of reference data for six key motor development milestones will provide a unique link between physical growth and motor development

The new WHO standards provide a technically robust tool that represents the best description of physiological growth for children under five years. They depict normal growth under optimal environmental conditions and can be used to assess children everywhere. The growth charts will be useful to nutritionists, pediatricians and other health professionals concerned with childcare.

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## FOUNDATION NEWS

● The Foundation organized a symposium on “;Nutrition in late infancy and early childhood (6-24 months)” on 5<sup>th</sup> and 6<sup>th</sup> July, 2006. The symposium was supported by Ministry of Women and Child Development (Government of India) and World Bank. The speakers were from research institutes, and academia in India, World Bank, ICDDR-Bangladesh, UNICEF and CARE-India. The Proceedings and the recommendations of the meeting are being published.

### ● Study Circle Lectures

Dr Meera Chatterjee: “Reproductive Health of poor women in South Asia” on 25<sup>th</sup> August, 2006.

Dr B Sesikeran: “Nutrition and Apoptosis” on 25<sup>th</sup> September, 2006.

### ● Symposium on “Health Care for the people – New Initiatives”

The Foundation is organizing a symposium on “Health Care for the people – New Initiatives” on November 30<sup>th</sup> and December 1<sup>st</sup> 2006.

● Annual General Body Meeting of the Foundation was held on July 7<sup>th</sup>, 2006.