EDITORIAL

Growth Curves for School-age Children and Adolescents

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Growth curves are an essential tool in pediatric practice. Their value resides in helping to determine the degree to which physiological needs for growth and development are being met during the important childhood period. However, their usefulness goes far beyond assessing children's nutritional status. Many governmental and United Nations agencies rely on growth charts for measuring the general well-being of populations, formulating health and related policies, and planning interventions and monitoring their effectiveness.

There is now broad international consensus on the utility of the WHO Child Growth Standards (*www.who.int/childgrowth/en*) for assessing the growth of children 0 to 5 years of age. The standards are derived from children who were raised in environments that minimized constraints to growth such as poor diets and infection. In addition, their mothers followed healthy practices such as breastfeeding, and not smoking during and after pregnancy(1). Because the standards depict physiological human growth under optimal environmental conditions, they provide an improved tool for assessing growth.

The WHO standards have been well received worldwide and are being adopted faster than expected. Thus far, over 100 countries are at different stages of their implementation. The standards provide an opportunity to:

- redefine and revitalize actions to promote optimal child growth;
- foster the adoption of "best practices", such as incorporating height and BMI to assess the dual burden of under- and over-nutrition (stunting and overweight);
- provide coherence between national and international infant feeding guidelines that recommend breastfeeding as the optimal source of nutrition during infancy and the charts recommended for assessing the pattern of infant growth; and
- harmonize growth assessment systems within and between countries.

Much less is known about the growth and nutritional status of school-age children and adolescents in both developed and developing countries. Reasons for this lack of knowledge include the rapid changes in somatic growth, problems of dealing with variations in maturation, and difficulties in separating normal variations from those associated with health risks. Another key source of this knowledge gap is the lack of an internationally agreed method for assessing growth and nutritional status during this period of life.

The release of the WHO standards for preschool children and increasing public health concern over childhood obesity have stirred interest in developing appropriate growth curves for school-age children and adolescents(2). For this purpose, some authors emphasize using contemporary convenient (i.e. recent and logistically feasible) samples, while others feel it would be better to follow an approach analogous to the one WHO used in developing standards for preschool children based on a prescriptive design(3).

A significant inherent problem of updating growth curves using contemporary samples such as the one based on affluent Indian children published in this issue(4) is that the resulting weight-based curves, such as the BMI, will be markedly skewed to the right, thereby redefining overweight and obesity as 'normal'(5). This biological drawback of several contemporary growth curves results in a substantial underestimation of the prevalence of childhood obesity(5). Moreover, it overestimates the prevalence of thinness (e.g. children below the 3rd percentile) prompting overfeeding of children who are healthy and constitutionally small, and thus potentially promoting increasingly overweight populations.

In the present Indian study published in this issue of *Indian Pediatrics*(4), the 85th and 95th percentiles for BMI at 18 years are above 25 and 30, respectively, suggesting that "as the authors acknowledge "if they use the 85th and 95th percentiles as cut-offs for defining overweight and obesity, they will be accepting higher BMI (overweight children) as "normal" at all ages. To overcome this flaw the authors propose using the 75th percentile on the current BMI curves as a cut-off for screening for overweight boys and girls. The recommendation of the IAP National Task Force for Childhood Prevention of Adult Diseases is that Indian children >10 years of age are to be considered overweight if their BMI is >85th percentile for age(6).

A key question is whether recommending a lower percentile, such as the 75th percentile, as the cut-off for defining overweight is the appropriate way forward. A central purpose of growth charts is to provide sensible cut-offs for screening for growth problems. Lowering the proposed cut-offs for defining childhood overweight as updated growth curves become increasingly skewed upwards cannot be the solution. A better approach would be to construct growth curves using samples that have achieved expected linear growth while still not being affected by excessive weight gain relative to linear growth.

The case made for using a national reference has traditionally been that it is more representative of a nation's children than any other reference could be. But with the child obesity epidemic this no longer holds for weight or BMI. As soon as a new reference is produced, it is out of date.

The need to harmonize growth assessment tools conceptually and pragmatically prompted the convening of an expert group meeting in January 2006 to evaluate the feasibility of developing a single international growth reference for school-age children and adolescents(3). The group recognized the limitations of existing reference curves for assessing childhood obesity (*e.g.* the NCHS/WHO growth reference, the CDC 2000 growth charts, and the IOTF cut-offs) and recommended that appropriate growth curves for these age groups be developed for clinical and public health applications.

Following the expert group meeting, WHO proceeded to reconstruct the 1977 NCHS/WHO growth reference from 5-19 years. It used the original sample (a non-obese sample with expected heights), supplemented with data from the WHO Child Growth Standards (to facilitate a smooth transition at 5 years), and applied state-of-the-art statistical methods(7). The new curves are closely aligned with the WHO Child Growth Standards at 5 years, and the recommended adult cut-offs for overweight and obesity at 19 years (BMI of 25 and 30, respectively). The full set of tables and charts for height, weight and BMI is available at *www.who.int/growthref/en*, including application tools such as software for clinicians and public health specialists(8). The WHO reference 2007 for school-age children and adolescents provides a suitable reference for the 5 to 19 years age group to be used in conjunction with the WHO Child Growth Standards from 0 to 5 years.

Childhood obesity is a significant public health problem that causes a wide range of serious complications and increases the risk of premature illness and death later in life. The interpretation of weight-based indices such as BMI needs to be based on prescriptive standards or, if these are not available, on reference data that do not underestimate the prevalence of overweight and obesity. Using appropriate growth curves is crucial since the accurate evaluation of child growth

trajectories and the choice of interventions to improve child health are highly dependent on the growth charts used. Similarly, there is a need to use the same reference data for assessing both individuals (clinical use) and populations (health planning use) to ensure coherence between what paediatricians see in the clinic and the population-based data health planners use in designing treatment and preventive services.

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