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DISCUSSION: CONDITIONAL GROWTH CHARTS

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First, I would like to congratulate the authors for an interesting application of their semiparametric quantile regression model to longitudinal human growth data. On an earlier occasion, I had an opportunity to collaborate with the authors on applying this method for the purpose of constructing semilongitudinal growth charts for height and for body mass index. As my background is in medicine rather than statistics, I will focus my comments below more on the underlying biological aspects and leave the mathematical and statistical comments to the other discussants.

1. Human growth. Much of the current understanding of physical growth of children derives from auxological works from as early as the 1950s. They are still quite valid because the biological nature of human growth has remained basically the same. Two good sources for understanding human growth can be pointed out: the book on the history of ideas concerning growth written by James Tanner [4] and another book with general text, written by David Sinclair [2], that gives an overview of the various manifestations of human growth.

Human growth can be divided into the phases of fetal, infant, childhood and pubertal growth. These phases overlap in time and interact with each other, that is, development during one phase may influence that in another. A child inherits, separately from both parents, the genes that largely determine the "growth channel," the tempo or timing of growth events and the potential for adult height. Potential adult height can be, to a good approximation, viewed as a built-in or "programmed" property. If the growth of a child has been disturbed for a period that is not exceedingly long, by an environmental factor or an illness, some form of catch-up or catch-down growth usually follows. For this reason, it seems unlikely that final adult height can be increased much, for example, by medication. As an example of an inherited growth pattern, a child can be long and stout during infancy but gradually become slender and shorter in stature in early childhood. Another example is a child whose one parent was late in maturation during puberty and is tall as an adult, whereas the other parent was early in maturation and is short. This child could have inherited, say, late pubertal maturation and short adult height and would be exceptionally short at the age when most of his/her peers have entered puberty and their growth has accelerated according to their pubertal growth spurt. Assessment of growth during puberty is difficult without any knowledge about the "biological" or "maturational" age of the child. All in all, growth is a complicated process with a series of changes, not just addition of material.

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