

DISCUSSION: CONDITIONAL GROWTH CHARTS

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1. Overview. Wei and He are to be congratulated on an innovative and important article. The conditional approach to growth charts described in their article is important in a practical sense, and the use of quantile regression is both natural and well motivated. We look forward to further application of their idea to actual practice, because the concept of “falling behind” in one’s growth cycle has two meanings: the usual standard growth chart, and the conditional growth chart described here. We have described the Wei and He approach to pediatricians, and they all grasped the essential clever idea immediately and were enthusiastic about the idea.

Our commentary will focus on three aspects of the approach used by the authors, specifically (a) the use of *unpenalized* B-splines as described by the authors; (b) conditional versus marginal semiparametric modeling of longitudinal data; and (c) some alternative modeling approaches to “catch-up” that may get at the issue more directly and flexibly.

2. B-splines should be penalized. One purpose of discussions, of course, is to make things a little lively, and here is our contribution. In our view, one should have some skepticism of how nonparametric unpenalized B-splines and unpenalized regression splines really are in the context of *nonparametric* regression. More precisely, and less inflammatory, the connection between asymptotic theory for unpenalized splines and actually attempting to be at least reasonably nonparametric is not at all clear.

There is obviously a need to balance practical behavior and ease of implementation with theory. Kernel methods (see below) are one means of doing this. In the spline context, there are four approaches: smoothing splines, penalized regression splines, unpenalized regression splines and free-knot splines; see [18] for a recent review. As authors, we have observed the following.

- Smoothing splines are basically penalized regression splines that place a knot at every value of the covariate. We have no idea how to do asymptotic theory for

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