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## BMI Trajectories in Youth and Adulthood

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Data from numerous longitudinal studies, including the Fels Longitudinal Study and the Bogalusa Heart Study, reveal that youth with higher BMI are more likely to have obesity in adulthood than youth with lower BMI.<sup>1</sup> These studies have also revealed that although the positive predictive value of obesity in childhood and adolescence is high (typically >90%), most adults with obesity did not have obesity in childhood or adolescence. In this issue of *Pediatrics*, Buscot et al<sup>2</sup> use an innovative statistical method, the Bayesian Hierarchical Piecewise regression,<sup>3</sup> and data from the Young Finns Study between 1980 and 2011 to model BMI trajectories. Similar to other studies, the authors found that individuals with lower BMIs in young childhood, specifically age 6 years, were less likely to have obesity in adulthood. Perhaps more importantly, BMI trajectories in adolescence and early adulthood were important determinants of obesity status between the ages of 34 and 49 years. The unique contribution of the Buscot study is that the rate of BMI change in both childhood and early adulthood and the estimated age at which BMI begins to plateau (or the increases in BMI begin to slow) were associated with the final, adult BMI. Girls with normal weight who became adults with in both childhood and early adulthood, as well as an older mean age (30 vs 17 years) at which the rate of BMI change slowed in comparison with girls with normal weight who were not obese in adulthood.

The applicability of these findings to BMI levels in youth today or to BMI trajectories in the United States is uncertain given the increase in obesity prevalence since 1980 (the baseline of the Young Finns Study) and differences in BMI levels between Finland and the United States. The prevalence of obesity among both youth and adults at the time of data collection between 1980 and 2011 was higher in the United States than in the Young Finns study. In the United States, the prevalence of childhood overweight and/or obesity was 15% in 1980,

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which increased to 32% in 2011 to 2012.<sup>4</sup> In the Buscot study, the 1980 baseline prevalence of overweight and/or obesity was 8.4%; in Finland in 2009 to 2010, the prevalence was 20% in boys and 12% in girls.<sup>5</sup> Although these estimates are based on different definitions of childhood obesity, estimates of combined overweight and obesity are comparable for ages between 9 and 17 years.<sup>6</sup> BMI trajectories may differ between heavier children, such as those in the United States, and leaner children in the Young Finns Study. Consequently, the Buscot study may not reflect current trajectories in the United States and elsewhere.

There are limitations associated with using BMI as an index of body fatness and with analyzing BMI categorically. Buscot et al<sup>2</sup> categorized individuals into 4 groups on the basis of BMI levels: (1) normal weight in childhood and nonobese in adulthood; (2) overweight or obese in childhood and nonobese in adulthood; (3) overweight or obese in childhood and obese in adulthood; and (4) normal weight in childhood and obese in adulthood. The baseline categories for groups 2 and 3 combined children who were either overweight or obese, possibly because there were too few children in the obesity category to have a category based on childhood obesity alone. The adult BMI status, on the other hand, grouped the overweight and normal-weight categories together. Individuals in the overweight category are heterogeneous, and a large proportion do not have excess body fat.<sup>7</sup> Although the authors acknowledged this as a limitation, the categorization labeled an overweight child who became an overweight adult as “High-BMI resolving” and a normal-weight child who became an overweight adult as the “reference group.” Moreover, the authors classified subjects based on their first youth measurement and their last adult measurement. As a result, youth who were normal weight at the first measurement were categorized as normal weight until the end of the study even if all subsequent BMI measurements during childhood indicated that the child was overweight or obese. Conversely, a youth who was overweight or obese only at the first measurement and subsequently normal weight through childhood was categorized as overweight or obese. These categorizations may impact the interpretation of the BMI trajectories.

Although understanding which children are likely to have obesity in adulthood contributes to our understanding of adult obesity, weight gain during adulthood is also an important factor in the high prevalence of adult obesity.<sup>8</sup> In fact, in a systematic review and meta-analysis, 70% of adults with obesity did not have obesity as a child or adolescent. A strength of the Buscot analysis is that BMI trajectory was modeled through young adulthood, not just until the end of childhood.

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