

Childhood BMI and Pubertal Timing

Changes over time and associations with adult cardiovascular mortality

Akademisk avhandling

Som för avläggande av medicine doktorsexamen vid Sahlgrenska akademien, Göteborgs universitet kommer att offentligens försvaras i hörsal Arvid Carlsson, Academicum, Medicinaregatan 3, Göteborg, fredagen den 15 mars, klockan 9.00

av **Maria Bygdell**

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Avhandlingen baseras på följande delarbeten:

- I. Bygdell M*, Ohlsson C*, Céline J, Saternus J, Sondén A, Kindblom JM. **The rise and recent decline of childhood obesity in Swedish boys: The BEST cohort.**
International Journal of Obesity (Lond). 2017;May;41(5):807-812.
- II. Bygdell M*, Kindblom JM*, Celind J, Nethander M, Ohlsson C. **Childhood body mass index is inversely associated with pubertal timing in normal weight but not in overweight boys.**
American Journal of Clinical Nutrition. 2018;Dec;108(6):1259-1263.
- III. Ohlsson C*, Bygdell M*, Celind J, Sondén A, Tidblad A, Säwendahl L, Kindblom JM. **A secular trend for earlier pubertal timing in boys born 1947-1996.**
Submitted manuscript.
- IV. Ohlsson C, Bygdell M, Sondén A, Rosengren A, Kindblom JM. **Association between excessive BMI increase during puberty and risk of cardiovascular mortality in adult men: a population-based cohort study.**
The Lancet Diabetes & Endocrinology. 2016;4(12):1017-2104.

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Abstract

Puberty in boys has long been an under-investigated area of research mainly due to the lack of an easily available pubertal marker, corresponding to menarche for girls. Using a unique, large, population-based cohort, this thesis targets some of the knowledge gaps regarding puberty and BMI change during puberty in boys. We collected information on height and weight throughout childhood until young adulthood for all included subjects from archived school health records and from the military conscription register, into the BMI Epidemiology study (BEST) cohort. Using these measurements, we estimated prepubertal childhood BMI, post pubertal young adult BMI, BMI change during puberty, and age at Peak Height Velocity (PHV) an objective assessment of pubertal timing. Through linkage with the Cause of Death register we obtained cause of death for all subjects. Childhood BMI and the prevalence of overweight and obesity among 8-year-old boys have overall increased substantially since birth year 1946 until birth year 2006. However, after a significant increase in BMI starting in the 1970s and with a peak at birth year 1991, we observed a moderate but significant decrease (**Paper I**). Furthermore, we have demonstrated that childhood BMI was inversely associated with pubertal timing in normal weight but not in overweight boys (**Paper II**). Age at PHV displayed a clear secular trend towards earlier puberty among boys. Since the 1940s until birth year 1996, the pubertal growth spurt was 1.5 months earlier per decade, and this trend could only slightly be explained by the coinciding increase in childhood BMI (**Paper III**). We demonstrated that BMI change during puberty, but not childhood BMI, was independently associated with the risk of adult cardiovascular mortality. This association between BMI change during puberty and cardiovascular mortality was non-linear, with 22% increased risk of cardiovascular mortality per additional increase in BMI units for individuals in the highest quartile. (**Paper IV**). This unique material has enabled us to identify long-term trends of childhood BMI and pubertal timing, and to identify a large BMI increase during puberty as a novel independent risk marker for increased risk of adult cardiovascular mortality. The results from this thesis have the potential to transmit directly into benefits for the society through adjustments of the school health care program for improved identification of individuals at risk.

Keywords: BMI Epidemiology Study, childhood BMI, BMI change during puberty, Peak Height Velocity, pubertal timing, cardiovascular mortality