Rational
Growth references of today have growth charts for total height vs the chronological age1 with different tools for the clinician: corrected for gestational age2, corrected for parental heights, & reference for prepubertal height. However, there are no specific references for height, weight & BMI considering biological age such as individual timing for the onset of puberty.

Aim
To fill this gap, we aimed to develop pubertal references for height SDS, weight SDS, BMI SDS, aligned for the individual onset of pubertal growth, obtained from QEPS-growth model3,4.

Results
For both girls and boys we present onset of pubertal height aligned references for:
1. total (QEPS) height SDS, specific pubertal height SDS, QES-function height SDS (left);
2. for total weight SDS (mid panel);
3. BMI SDS (right panel);
Height references, are updated for ongoing positive secular trend in height in Sweden5. In contrast, weight & BMI references were made similar to weight status in children from before the obesity epidemic, ie as the Swedish references of the GrowUp1974, Gothenburg cohort2,6.

Methods
QEPS-model3,4 For each individual, a QEPS-function estimated height curve was obtained. Onset of puberty was defined as AgeP5, at 5% of specific P-function height. All references were expressed in SDScores, aligning onset of pubertal growth of individuals in the reference population for total (QEPS) height, specific pubertal-function height, & ongoing QES-function height. This alignment, at Age P5, was also used for the LMS method developed total weight and total BMI references.

Conclusion
A paradigm shift for monitoring growth & weight during puberty by using references for pubertal height, weight & BMI, aligned for individual onset of pubertal growth.

For the first time considering the individual timing of puberty, comparing with peers of the same biological age/maturatation, giving magnitude & tempo of growth in SDScores during puberty "in the clinic for the individual child "in research for groups of children in order to estimate the change obtained for every time-period from onset to end of pubertal growth.

Material
Onset of puberty was here defined as onset of individual pubertal growth spurt, ie the response for the sex-steroids in bone.
The response in gonads, as breast or testicular development, was defined when SD scores were made comparable with peers of the same biological age/maturation.

References:

Contact: Kerstin.Albertsson.Wikland@gu.se

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