New study identifies two alternative patterns of childhood BMI development

A recently published LongITools study led by the University of Oulu identified two new childhood BMI patterns, challenging the traditional view of weight status. The findings suggest that BMI development varies across generations and may not be a sufficient standalone measure in children's healthcare.

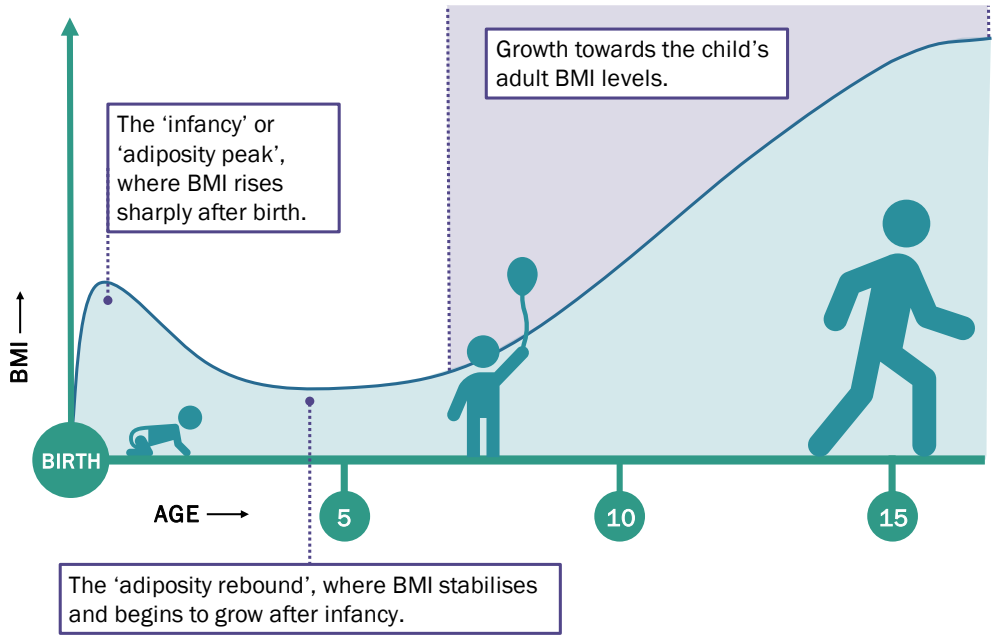
The new study, published in the International Journal of Obesity, investigated how children's body mass index (BMI) development can vary between individuals. It examined the possibility of dividing individuals into different groups reflecting the comparative 'maturational' age of their BMI, rather than just their chronological age. As a result, two new patterns were identified – strengthening the case for clinicians that BMI alone may not be a sufficient measure of weight status in children. Noticeable generational differences could also suggest that BMI development can be influenced by factors in the wider environment children grow up in. The answer may lie in how society and our environment have changed between generations.

Why was this study necessary?

Studies into how we change as we age – known as 'longitudinal phenomena' – often notice that, whilst we all broadly share the same developmental trajectories, we often do so differently, hitting milestones at different times. Until this LongITools study, no known research had addressed how BMI trajectories could vary between children with respect to time (known as the 'phase variation' in their chronological development) as they grew up.

As children develop, their BMI, calculated using their weight and height, changes and moves towards their adult BMI. As shown in the figure below, this happens following a distinct trajectory, with two key periods: 'infancy' or 'adiposity' peak (when very young children reach a maximum BMI before it falls again) and 'adiposity rebound' (where the BMI of children, typically around four to six years of age, increases for a second time, towards their adult level). The study aimed to explore if children's BMI development can vary, separate from just looking at their chronological age, and if there were distinct, non-conventional BMI patterns children moved through at different times.

An illustrative figure demonstrating how BMI traditionally develops in children ('Type 1')



What was done and what did we find?

Researchers utilised data from nearly 6,200 children from two large cohorts – the Northern Finland Birth Cohort 1966 and 1986. With twenty years between the two, the cohorts provide an interesting snapshot of generational differences. Researchers looked at children's height and weight at set intervals, from 3 months to 16 years, to track BMI development.

The study revealed some interesting differences in the development of children across their cohorts. BMI trajectories could be divided into three noticeably distinct profiles, observed in both sexes. Type 1 trajectories match the traditional understanding of BMI development, but the two new ones – Type 2 and Type 3 – have not previously been reported in any of the literature. They differ from the Type 1 trajectories in how slowly or rapidly the BMI changes with time.

The Different Trajectories seen in Childhood BMI Development

Type 1 represents the traditional BMI pathway for a child (as per the figure above).

Type 2 has a steeper rise and fall before and after the infancy BMI peak, and a less clearly defined adiposity rebound than seen in type 1.

Type 3 has similar timeframes to a type 1 trajectory, but - in contrast - the peaks and troughs tend to be more irregular, following a less distinct pattern than those seen in the other types.

Additionally, the prevalence of 'Type 2' trajectories in the 1986 cohort suggests a potential generational change in the way children's BMI develops as they grow. Changes in their wider environment – in terms of nutrition levels, social support and primary care procedures – could explain this. Even in the twenty-year cohort gap, several of these environmental factors had changed and may have influenced these differing developmental pathways.

First author and doctoral researcher at the University of Oulu, Anni Heiskala says:

"This LonglTools study shows there are nuances in the timing of how our bodies develop and these deserve attention from the research community . Understanding variations in BMI trajectories will help future studies better target interventions and investigate long-term health trends."

Research will continue to investigate the underlying causes of these different trajectories, strengthening the possibility of personalised preventative measures to safeguard children's health into adulthood. This paper provides further evidence for clinicians and parents that a child's BMI, at any given time, is not a conclusive measure of the overall weight status of children.

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Paper

Anni Heiskala et al. Timing based clustering of childhood BMI trajectories reveals differential maturational patterns; Study in the Northern Finland Birth Cohorts 1966 and 1986. *International Journal of Obesity* (2025).

Link to paper:

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Paper: Timing based clustering of childhood BMI trajectories reveals differential maturational patterns; Study in the Northern Finland Birth Cohorts 1966 and 1986.

About LonglTools

LonglTools is a five-and-a-half-year research project, which commenced on 1st January 2020, with a total grant of €11,997,448 from Horizon 2020. It is also one of nine projects in the European Human Exposome Network. To keep up to date with the project's progress please follow @longitools on X or LonglTools Project on LinkedIn.

Partners:

- University of Oulu, Finland (Project Coordinator);
- Ab.Acus, Italy;
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About Horizon 2020

http://ec.europa.eu/programmes/horizon2020/en/what-horizon-2020