

Why measure childhood obesity, disparities and geographical variations?

Height and body mass index (BMI) are anthropometric measures associated with optimal growth and development critical for health and wellbeing. They measure the quality of nutrition and healthiness of the environments lived in during childhood and adolescence and are highly predictive of health and developmental outcomes throughout life. Having low height-for-age and being underweight raises the risk of morbidity and mortality, reduces cognitive development, and impairs educational performance and work productivity in later life. Inversely, childhood overweight and obesity are linked with poor mental health and educational outcomes, in addition to higher risk of disability and premature death in adulthood. Global data related to children's and adolescent's health and nutrition is essential to adequately design, implement and evaluate policies and strategies related to maternal nutrition, early childhood feeding and physical activity, and to monitor determinants of childhood obesity throughout the life course.



STOP project findings: Mini-summary

- **Childhood Obesity Surveillance System:** A protocol was developed to provide a standardised framework for the surveillance of anthropometric measurements associated with growth and development of children of pre-school age. (1)
- **WHO European child malnutrition data model:** In the absence of comprehensive data, a predictive statistical model was developed to estimate the changes in stunting and overweight prevalence for children under 5 years. The models show that there is a general decreasing trend in stunting prevalence in Europe. For the overweight models, there is an increasing prevalence up until the mid-2000's, at which point the overweight prevalence slightly decreases. (2)
- **Global BMI and height trends:** The STOP study presented the first comparable estimates of height and BMI in school-aged children and adolescents for 200 countries and territories, from 1985 to 2019. Overall, the height and BMI trajectories over age and time of school-aged children and adolescents are highly variable across countries. (3)
- **Socioeconomic status (SES) and obesity risk:** A scoping review of the most common and meaningful SES indicators to determine childhood obesity risk found that in Europe, lower parental SES commonly relates to higher childhood obesity. (4)
- Additionally, STOP proposed **The Equivalized Household Income Indicator (EHII)**, as a method to assess disposable household income. The method is constructed using only basic parental and household characteristics, typically available in birth cohort studies. It was applied on two cohorts in France and two in Italy and it was found that basic parental and household characteristics can accurately predict household income. (5)

(STOP publications are referenced 1-5)

Implications of findings for policy design

- **Modelling estimates** of malnutrition data for pre-school children is an effective way for non-statisticians to produce estimates from sparse data. Better informed policy decisions can be made with increased data for the surveillance of pre-schoolers.
- **Heterogeneous age trajectories and time trends of height and BMI** in late childhood and adolescence raise the need to rethink and revise common features of global health and nutrition programmes. There is a requirement for policies and interventions at home, at school, in the community, and through the health system to support healthy growth during the entire period from birth to adolescence through enhanced nutritional quality, healthier living environment, and provision of high-quality preventive and curative care.
- **For surveillance of BMI and SES in Europe**, the harmonisation of indicators is necessary to enhance comparability of results between countries. Such harmonisation, particularly the application of the indicators to inform policies, will need to consider differences between countries, for instance in welfare systems or the way that income or educational level varies.
- **The newly developed indicator, EHII**, provides a more accurate method than presently used to predict household income, which is an indicator of child SES. Using EHII could lead to more tailored policies related to health inequalities for the European context.

The quality of nutrition and the healthiness of environments is critical for optimal growth and development in childhood



Spotlight on socio-economic inequalities research ⁽⁴⁾

Socioeconomic status and child obesity risk

In Europe, lower parental socioeconomic status commonly relates to higher childhood obesity. The STOP project undertook a review gathering evidence on which SES indicators are most used, as well as evidence on meaningful determinants of childhood obesity. The review was based on 53 studies and 121 association analyses (the relationship between indicator and obesity).

Overall, results confirmed that children with parents with lower SES have greater likelihood of obesity in Western and high-income countries. Mother's education was the most used indicator (n of association analyses = 24). Parental education was the most used indicator group (n of association analyses = 51). These indicators show that lower educational attainment is associated with higher levels of childhood obesity. Composite SES indicators (comprising of education, occupation, income and affluence variables) showed the most frequent associations between lower SES and higher levels of childhood obesity. However, parental employment indicators did not show any significant associations with obesity.



The Equivalized Household Income Indicator (EHII) ⁽⁵⁾

The STOP project developed the Equivalized Household Income Indicator (EHII) to aid standardisation and comparability of household income across cohorts for estimation of child socioeconomic position (SEP). The indicator uses external data from the pan-European surveys 'European Union Statistics on Income and Living Conditions' (EUSILC) and internal data from the cohorts. It was constructed using only basic parental and household characteristics which are typically available in birth cohort studies. The method has been applied to four birth cohorts from two different countries, Italy (cohorts: Piccolipiù and NINFEA) and France (cohorts: ELFE and EDEN). The distribution of EHII was compared with other SEP-related variables available in the cohorts, and association between EHII and child body mass index (BMI) was estimated.

It was found that basic parental and household characteristics may be used, with a fairly good performance, to predict the household income. A strong relationship was found between EHII and both the self-reported income and other individual socioeconomic-related variables. Lower SES status was associated with higher child BMI. Overall, EHII allows a harmonised income measure that can be used over different European populations.

European Union Statistics on Income and Living Conditions (EUSILC). Available online: <https://ec.europa.eu/eurostat/web/microdata/european-union-statistics-on-income-and-living-conditions>



STOP Publications (see www.stopchildobesity.eu for an up-to-date list)

(1) Ezzati M, Breda J. D2.1: Data collection protocol and meeting report. 2019. <http://www.stopchildobesity.eu/wp-content/uploads/2020/05/D2.1.pdf>.

(2) WHO and UNICEF-WHO-WB Joint Child Estimates Group (JME). D2.2: WHO EURO data gathering, assessment and analysis for stunting and overweight in children under 5 years of age. 2021. <http://www.stopchildobesity.eu/wp-content/uploads/2021/10/D2.2.pdf>.

(3) NCD Risk Factor Collaboration (NCD-RisC). Height and body-mass index trajectories of school-aged children and adolescents from 1985 to 2019 in 200 countries and territories: a pooled analysis of 2181 population-based studies with 65 million participants. 2020. Lancet. 396: 1511-24. [https://doi.org/10.1016/S0140-6736\(20\)31859-6](https://doi.org/10.1016/S0140-6736(20)31859-6).

(4) Sares- Jaskö L, Grönqvist A, Mäki P, Tolonen H, Laatikainen T. Family socioeconomic status and childhood adiposity in Europe - A scoping review. 2022. Preventive Medicine. 160. [10.1016/j.ypmed.2022.107095](https://doi.org/10.1016/j.ypmed.2022.107095).

(5) Pizzi C, Richiardi M, Charles M-A, Heude B, Lanoe, J.L., Lioret S, Brescianini S, Toccaceli V, Vrijheid M, Merletti F, Zugna D, Richiardi L. Measuring Child Socio-Economic Position in Birth Cohort Research: The Development of a Novel Standardized Household Income Indicator. 2020. Environmental Research and Public Health. 17, 1700. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7084936/>.