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## **Inequalities in children's energy balance-related behaviours: a European perspective**

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## SUMMARY

Childhood overweight is one of the most serious public health challenges of the 21st century with increasing global prevalence in the last decades at an alarming rate. Even if some individuals are more genetically susceptible to gain weight, there is a consensus that the fundamental causes of the childhood overweight and obesity epidemic are the changes in lifestyle behaviours causing a positive imbalance between energy intake and energy expenditure. In order to address more specific goals for overweight and obesity prevention among school-aged children, it is necessary to differentiate the most relevant energy balance-related behaviours (EBRBs) in this age group. In addition, the prevalence of overweight and obesity is considerably higher among youth from lower socio-economic backgrounds and thus likely to augment broader social health inequalities. Recent studies also reported differences in childhood overweight and obesity prevalence and EBRBs levels according to ethnicity. Understanding the influence of socio-economic and ethnic variables on the EBRBs patterns leading to obesity is critical to developing effective public policies and interventions to prevent childhood overweight and obesity. The work presented in this thesis, as described in **Chapter 1**, aims to gain insight into the role of several EBRBs (i.e. sugared-sweetened drinks, breakfast skipping, active transportation to school, sports engagement, TV and computer time and sleep duration) that may explain parental educational and ethnic inequalities in childhood overweight in school-aged children across different countries in Europe.

To address the main aim of this thesis the following research questions were formulated:

1. Regarding the mediating role of children's EBRBs in the associations between socioeconomic variables and children's body composition (part 1):
  - a) Are EBRBs mediating variables in the associations between parental education and children's body composition?
  - b) Are EBRBs mediating variables in the associations between ethnic background and body composition?
2. Regarding the associations between parental education and children's EBRBs (part 2):

- a) How do EBRBs cluster in European children and is there an association with parental education?
- b) Is parental education independently associated with parental physical activity and children's physical activity?
- c) Are parental sports participation and TV time mediating variables in the associations between parental education and children's sports participation and TV time?

The work conducted for this thesis is part of a larger research project – i.e. the cross-sectional study of the “European Energy balance Research to prevent excessive weight Gain among Youth” (ENERGY)-project. The cross-sectional study was carried out between March and July 2010 in Belgium, Greece, Hungary, the Netherlands, Norway, Slovenia and Spain, among pupils in the final years of primary education (aged 10-12). The general aim of the cross-sectional study was to provide up to date information on the prevalence of overweight and obesity, on the most important EBRBs and their personal as well as socio-cultural, physical and economic environmental determinants.

The first part of the thesis (chapters 2 and 3) focuses on the mediating role of children's EBRBs in the associations between socioeconomic determinants and children's body composition. **Chapter 2** explored if several EBRBs could help to explain differences in children's body composition according to parental education (question 1a). Sugared-sweetened drinks intake, breakfast skipping, sports participation, TV time and computer time partially mediated the association between parental education and children's body composition, while no mediation effect was found for active transportation to school and usual sleep duration. The results of this study thus suggest that tailored overweight and obesity prevention strategies in low SES pre-adolescent populations should develop specific strategies focussing on the importance of daily breakfast consumption, increasing sports participation and decreasing TV viewing and computer use.

**Chapter 3** assessed the potential mediating role of specific EBRBs in the association between ethnic background and body composition in the Greek and Dutch subsamples of the ENERGY-study, where significant differences in body composition according to ethnic background were found (question 1b). Partial mediation was found for sugared drinks consumption, sports participation and

sleep duration in the Greek sample, and breakfast skipping in the Dutch sample. After adjusting the models for parental education, the mediating pathways were not statistically significant any more. Therefore, more studies are needed to disentangle which variables are able to further explain the ethnic differences in children's body composition.

**Chapter 4** explored the clustering of several EBRBs in European children and its distribution by BMI status and assessed its association with parental education (question 2a). Clusters characterized by lower activity levels and higher sugared drinks consumption were more prevalent in overweight and obese children. Children with lower educated parents were more likely to present unhealthier EBRBs clustering, characterized by higher sugared drinks intake, higher screen time and lower physical activity. The results highlight the importance of specifically focusing on lower educated parents and their children in order to develop effective primary prevention strategies.

**Chapter 5** examined the independent associations of parental education and parental physical activity with children's physical activity levels (question 2b). The results showed that parental education was associated with children's physical activity in Greek and Spanish girls and Norwegian boys. Parental physical activity appeared to be associated with children's physical activity in more than half of the participating countries. These results suggest that parental education and parental physical activity are independent factors associated with children's physical activity, although the results were gender- and country-specific.

**Chapter 6** assessed whether differences in two specific physical activity (i.e. sports participation) and sedentary (i.e. TV time) behaviours according to parental education were mediated by parental sports participation and TV time (question 2c). Parental TV time partially mediated the association between parental education and children's TV time in all countries, in which significant associations were present (i.e. Greece, Hungary, the Netherlands, Slovenia). Parental education differences in children's sports participation were found in four countries (i.e. Greece, Hungary, Norway and Spain), but these differences were partially mediated only in Greece and Norway. Child reports on parental behaviour appeared to be more relevant than parents' self-reports as correlates of children's own sports and TV time, but parental self-reported behaviours appear to be more relevant for explaining parental educational differences in children's TV and sports time.

Finally, **chapter 7** summarizes the main findings of this thesis, critically discusses theoretical and methodological issues derived from this thesis and ends with the main conclusions and implications for further research and public health.

The studies described in this thesis have led to the following main conclusions:

First, the results suggest that some important EBRBs, i.e. sugared-sweetened drinks intake, breakfast skipping, sports engagement, TV and computer time, in European children aged 10 to 12 are partially mediating the associations between parental education / ethnicity and children's body composition. Second, the results also indicate that children with lower educated parents tend to have unhealthier combinations of EBRBs. Therefore, strategies aiming to reduce socio-economic inequalities in childhood overweight and obesity should focus on these important EBRBs. Finally, the results also stress the association of some parental EBRBs and children's EBRBs (namely TV time and sports participation) and the mediating effect of those behaviours in the association between parental education and children's behaviours.