

(19.7%), sedentary behaviours also increased, mainly due to the increased time spent playing computer games 1-2h/day (2008: 12.2% to 2016: 75.5%). School environment features in this regard also showed that most schools provided 90 minutes or more per week of physical education classes to the children from the 1st and 2nd grade, however in 2008 (81.9% and 79.6%) this situation was more common than in 2016 (65.1% and 64.3%). There was no improvement found in the Portuguese children's healthy eating habits between 2008 and 2016 and although the availability of fresh fruit, at schools, increased (2008: 33.3% vs. 2016: 66.5%) free milk offer decreased from 2008: 91.8% to 2016: 74.1%.

CONCLUSIONS: The results support the positive changes concerning childhood obesity over the last 10 years. Nonetheless, more action and initiatives are still required to improve the children's lifestyle habits and, thus, nutritional status.

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Food patterns and obesity

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Eating habits develop during the first years of life, being shaped by characteristics and behaviors within the family context. The family is, in turn, embedded in a larger social context where factors such as socioeconomic position influence children's diet through the influence exerted on parental behaviors. However, research on determinants of preschool children's diet is particularly scarce and studies based on conceptual frameworks are especially warranted. Also, evidence base for interventions in preschool children is limited and research on dietary determinants of childhood obesity has focused mainly on specific nutrients and foods, prospective studies examining the association of empirically derived dietary patterns practiced at pre-school age with adiposity being particularly scarce.

We examined a broad range of potential determinants of dietary patterns among 4-years-old children enrolled in the Generation XXI birth cohort (Porto, 2005-2006), supporting the analysis on a framework considering plausible pathways between determinants to better understand upstream and downstream factors, overall and direct effects, as well as factors most relevant to the child's diet. Children's diet was also considered as an outcome, and the relationship between dietary patterns followed at 4 years of age and adiposity three years later was examined considering a conceptual model to evaluate sex-heterogeneity on this association. Three dietary patterns were identified at child's 4 years of age: high in Energy-Dense Foods [named "Energy-Dense Foods" (EDF) dietary pattern], followed by 41% and 51% of children at 4 and 7 years, respectively; low in foods typically consumed at main meals and intermediate in snacks (named "Snacking" dietary pattern) followed by 14% of children at 4 years and 10% at 7 years; higher in vegetables and fish and lower in unhealthier foods such as EDF (named "Healthier" dietary pattern), followed by 45% and by 39% of children at 4 and 7 years of age, respectively. Early maternal lower socioeconomic position indirectly increases the odds of

exposing their children to unhealthier dietary patterns, while lower maternal education at child's delivery directly increases these odds. These findings may reflect a transgenerational influence of less-favorable socio-economic conditions on children's diet. Specific maternal behaviors are associated with children's dietary patterns, above and beyond socio-economic and demographic factors, and maternal diet is a key factor to the child's diet. Children practicing unhealthier dietary patterns at the age of 4 years were more likely to follow the unhealthier pattern 3 years later. Likewise, higher adiposity persisted across the two ages in both girls and boys, but a dietary pattern high in EDF was consistently positively associated with adiposity 3 years later only in girls. In boys, we have found an interesting interaction between protein intake and glycemic load. Those who have higher intake of both protein and glycemic index have higher levels of adiposity. Interventions developed with the aim of preventing unhealthy dietary behaviors among preschool children should involve mothers, with emphasis on their diet and special attention to lower socio-economic status groups. Also, considering the prevalence of children following unhealthier dietary patterns at the early age of 4 years, as well as tracking of both dietary patterns and adiposity into later age, preschool interventions might be a major step in the promotion of health.

FOOD SECURITY AND IAN-AF

Risk / benefit assessment

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Human diet may present both risks and benefits to consumers. Risk-benefit assessment (RBA) intends to estimate the benefits and risks for humans following exposure (or lack of exposure) to a particular food or food component and to integrate them in comparable measures. For instance, any policy action directed at the adverse effects also affects the degree of beneficial effects and *vice versa*. In the last years, a few number of European projects within the RBA of foods have been conducted and some challenges remained and new became apparent, however the RBA methodologies are far from being well established. In contrast, risk assessment (RA) within food safety is a well-established discipline across the European Union (EU). In Portugal, a recent example is the RA study performed under MYCOMIX (<https://youtu.be/CsKaz3mt2J4>), a national funded project that studied the toxic effects of children exposure to multiple mycotoxins. The output of this project highlighted the knowledge gaps on the contra-balance beneficial health effect of these foods, and the need to determine the risk-benefit, since they are vehicles of food components that could be assumed as beneficial.

"RiskBenefit4EU – Partnering to strengthen the risk-benefit assessment within EU using a holistic approach" (<https://riskbenefit4eu.wordpress.com/>) is a recent European project funded by European Food Safety Authority integrating a multidisciplinary team from Portugal, Denmark and France. This project aims to strengthen the EU capacity to assess and integrate food risks and benefits in the areas of microbiological, nutritional and chemical components through the development of a harmonized framework. To validate all the developed tools, a Portuguese case study on cereal-based foods will be considered. RiskBenefit4EU will contribute for the development and the establishment of RBA as a tool to provide scientific evidence to inform risk management decisions in the area of food safety and nutrition.