

# Ultra-Processed Food Consumption among the Paediatric Population: An Overview and Call to Action from the European Childhood Obesity Group

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Just for a moment, think of food or beverage products that are extensively marketed, commonly consumed and widely liked by children. It is quite likely that the examples you are thinking of fall within the category of ultra-processed foods (UPF). UPF are ready-to-eat formulations of processed substances that have been extracted or refined from whole foods and that typically contain added flavours, colours, and other cosmetic additives, with little, if any, whole food remaining [1]. Soda, flavoured dairy drinks, packaged snacks, many breakfast cereals, flavoured ice creams, instant noodles and soups, nuggets and similar reconstituted meat products are all examples of UPF. These products are generally high in free sugars, saturated fat, and sodium, and low in protein, dietary fibre, micronutrients and phytochemicals, relative to their unprocessed/minimally processed counterparts [2, 3]. They are also highly palatable, energy dense, with a high glycaemic load [4].

As the sale and consumption of these products increases worldwide [5, 6], children and adolescents have the concerning distinction of being their leading consumers [7, 8]. In the United Kingdom, 65% of calories eaten by primary and secondary school children come from UPF [9, 10]. A

majority of 7-year-old British children eat a diet of predominantly UPF including white bread, biscuits, fizzy drinks, crisps and chips [11]. A similarly high intake of UPF (>55%) is seen in paediatric populations of the United States and Canada [12, 13]. Between the years 2009–2014, US pre-schoolers were getting close to 60% of their daily calories from mass produced breads, cookies, savoury snacks, reconstituted meat products, milk-based drinks, breakfast cereals, juices and sodas, and frozen and ready-to-eat meals [12]. Among US school-aged children and adolescents UPF provided 66.2 and 66.4% of total daily energy respectively. Pizzas, sodas and juices were among the most consumed products among these age groups [12]. In low- and middle-income countries, the consumption of UPF is lower (18–35%), but young children are still their earliest adopters and their largest consumers [3, 14, 15].

There are also worrying inequalities in UPF consumption, with multi-dimensional socio-economic disadvantage being positively associated with UPF-based dietary patterns. European children whose mothers have relatively low education attainment, are younger, or have difficulty affording food are more likely to eat cheaper, less nutri-

tious, processed food [16]. Children in low income households, with parents of migrant backgrounds who lack a social network, from single-parent families or with unemployed parents are disproportionately likely to be high UPF consumers. Besides household financial disadvantage, the presence of older siblings and being cared for at home by someone other than the mother, have also been found to predict a UPF-rich diet in children [17, 18].

A dietary pattern characterized by large amounts of UPF may have dire consequences for children's impressionable palates, defining lifelong consumption patterns [19, 20]. As in adults, these products may also be central to explaining the relationship between diet and health among children. Poor rates of breastfeeding in the first hour of life, shorter than recommended or no exclusive breastfeeding, and discontinuation of breastfeeding prior to 2 years favour the incorporation of early and frequent consumption of UPF among children [21]. Some evidence also suggests that the incorporation of energy dense foods like UPFs decreases breast milk intake and may drive early cessation of breastfeeding [22, 23]. More evidence is needed to differentiate whether these decisions of substituting breast milk were the active and informed choice of the mother or a function of food industry marketing. A reliance on UPF before 2 years of age can lead to one or more forms of malnutrition. As children grow into toddlerhood, micronutrient deficiencies as well as development of overweight and obesity add to the health concerns [24]. Adolescents are especially vulnerable to undernutrition and to the double burden of malnutrition [25], which is no wonder, given that any dietary patterns based on these products is bound to be of poor nutritional quality – high in sugar, energy density, unhealthy fats and salt, and low in dietary fibre, protein, vitamins and minerals [13, 26]. Besides nutritional deficiencies, there is some suggestion that the academic ability of children and adolescents on UPF diets may be compromised [27]. A tendency of higher consumption of added sugar (refined sugar, honey, corn syrup) and UPF was found among children with overweight, diagnosed with food addiction [28]. A high UPF intake has also been associated with an increased waist circumference [29], dyslipidaemia [30], metabolic syndrome [31], asthma and wheezing among children [32], hypertension [33], metabolic syndrome [34], myocardial infarction and stroke [35], gastrointestinal disorders, total and breast cancer [36], depression, and all-cause mortality among adults [37].

Recent research implicating UPF in the direct causation of weight gain and obesity in adults [38] is the most robust assessment of this association to date and there

seems to be generally consistent evidence to suggest that these causal effects translate to the paediatric population, affecting body composition over time [39]. While the mechanisms driving these influences are yet to be fully identified, the role of the protein leverage hypothesis in partially explaining the increase in energy intake, the increase in meal eating rate, and changes in the appetite suppressing hormones and hunger hormones with a UPF diet have been acknowledged [38].

So why is it that we see such a consistent global trend in the intake of UPF among children despite all that is currently known about its negative consequences? The food environment and the nutrition transition are clearly propagating this trend [40, 41]. However, underpinning these are the true drivers – policies and trade agreements that support and actively facilitate the penetration of transnational food corporations into the global food system and national political inertia that prevents the implementation of strong regulations around taxation, marketing restrictions and nutrition labelling. This situation has resulted in the easy penetration and access of UPF across diverse settings including within day-care centres, pre-schools/nurseries and schools [42–45] and perhaps even the early introduction of breast milk substitutes and UPF as complementary foods. Voluntary measures, attempts at product reformulation, self-regulation and the presence of advisory guidelines fall short of creating meaningful change. Transnational corporations have circumvented nutrition standards for school meals and the sale of competitive foods within schools in contexts like the US, with indirect endorsements or the sale of copy-cat snacks [46, 47] and have succeeded in rolling back standards for school lunches [48]. While some attempt has been made to restrict the marketing of these products to children via television [49–51], digital food marketing (including in social media, online gaming and on websites of interest to young people) remains largely uncharted territory [52–55]. Digital UPF promotion is increasingly delivered through smart phones and tablets, resulting in an uninterrupted, immersive commercial experience [56, 57]. They are also more interactive than traditional forms of marketing (e.g., points earned on games may be traded for UPF branded merchandise); and personalizable (consumer location can be tracked via GPS, and immediate promotions based on past purchases can be encouraged when the consumer is within the vicinity of fast food restaurants). All these strategies help secure a future consumer base of brand-loyal children who are more likely to find these nutrient-poor, energy-dense UPF appealing, especially when they come emblazoned with cartoon

**Table 1.** Policy and programmatic actions for the paediatric population

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*Policy*

Developing and enforcing breast feeding guidelines  
Supporting and facilitating women's choice to breast feed  
Enforcing restrictions on the promotion of breast milk substitutes  
Developing dietary guidelines for the paediatric population that categorically stress the avoidance of ultra-processed foods and-beverages  
Regulating the sale and consumption of ultra-processed foods in and around schools  
Restricting marketing of ultra-processed foods to kids  
Taxation of ultra-processed foods and beverages  
Front-of-pack labels for ultra-processed foods and beverages  
Targeted support for the vulnerable sub-groups including socio-economically disadvantaged families

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*Programs*

Emphasis on environmental and contextual determinants of ultra-processed food intake in programs and interventions  
Community-based interventions aimed to improve parents' cooking skills and confidence  
Focusing on water as the beverage of choice  
Nutrition and behavior-change counselling during health screening that is based on the avoidance of ultra-processed products and in the healthy incorporation of minimally processed foods and accounts for every stage of the food decision making process from-planning to grocery shopping to cooking and eating  
Nutrition education as part of the school curriculum that encourages nutrition label literacy and helps identify and avoid ultra-processed products

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*Research*

Increasing conflict-of-interest free funding for research on paediatric health and ultra-processed food  
Advancing dietary assessment methods to better distinguish and capture ultra-processed products eaten both at home and outside  
Monitoring food industry practices  
Surveillance of ultra-processed foods and beverage reformulation  
Monitoring and evaluating policies and programmes  
Uncovering the mechanisms of action of ultra-processed foods and beverages in the potential causation of various health outcomes, particularly in the paediatric population  
Improving understanding of the determinants of ultra-processed foods and beverage consumption

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characters, celebrities, and appealing imagery and messaging that associates these products with happiness and reward [58, 59].

In this current, UPF-promoting food environment, even the most motivated parent faces a challenge to ensure that their child's diet is based on nutrient-dense unprocessed/minimally processed foods, including whole grains, fruits, nuts and seeds, and vegetables, and fresh homemade meals that incorporate these ingredients. The convenience of UPF, its long shelf life and the increasing diversity in cost, type and ingredients (organic, gluten free, vegan) appeals to a wide consumer base [60]. The effects of UPF in shifting meal-time behaviours – decreasing confidence in cooking skills and lower frequencies of family meals, shortening meal times, increasing constant grazing, and reliance on ready-to-eat meals that can be consumed while indulging in some form of screen-time [10, 61] – also detrimentally affect health by interrupting opportunities for modelling positive behaviours and strengthening social bonds within family units.

Indeed, it is becoming increasingly difficult to rationalize not taking a clear, universal, UPF-avoidance stance in our obesity prevention and treatment efforts, particularly as early evidence shows some promise of the focus on UPF in the prevention and treatment of paediatric obesity [62]. If the morbidity burden and the mortality and economic costs associated with the consumption of UPF are to be stymied, it is imperative we invest in a unified, global framework, which categorically stresses the avoidance of these foods and that which goes beyond leaving it to the food industry to self-police itself. This framework will also need to be flexible to account for and address contextual realities – initiatives that address the social vulnerabilities to UPF intake in one region may not be easily adaptable, or even applicable to another. Promoting the intake of minimally processed foods as the antidote may partially counteract UPF effects in countries with strong culinary traditions but other contextually relevant strategies must also be considered. Table 1 lists some possible initiatives that would meet the urgent need

for a global framework of regulatory and unified responses to the entry, production, promotion, and sale of these products.

The European Childhood Obesity Group seeks to increase awareness among the European population of the high health, social, psychological and economic impacts of childhood obesity and, in evaluating the available scientific and clinical evidence on UPF, recognizes the importance of directly targeting the high consumption of UPF. The European Childhood Obesity Group calls for more conflict-of-interest free research, the development of guidelines, and the dissemination of knowledge regarding the negative effects of UPF consumption among children and adolescents.

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