

## **Pester Power and its Consequences**

### **Do European Children's Food Purchasing Requests Relate to Diet and Weight Outcomes?**

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# Pester Power and Its Consequences: Do European Children's Food Purchasing Requests Relate to Diet and Weight Outcomes?

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## ABSTRACT

**Objective:** Children may influence household spending through “pester power.” This study examines pestering through parent-child food shopping behaviors in relation to children’s diet and weight status.

**Design:** Cross-sectional and prospective analyses drawn from the IDEFICS study, a cohort study of parents and their children. Children’s height and weight were measured and their recent diets were reported by parental proxy based on the Children’s Eating Habits Questionnaire – Food Frequency Questionnaire (CEHQ-FFQ) at baseline and 2-year follow-up. Parents also completed questionnaires at both time points about pestering, including whether the child goes grocery shopping with them, asks for items seen on television, and is bought requested food items.

**Setting:** Participants were recruited from eight European countries for the IDEFICS study (non-nationally representative sample).

**Subjects:** Study participants were children between ages 2-9 at enrollment and their parents. A total of 13,217 parent-child dyads were included at baseline. Two years later, 7,820 of the children were re-examined.

**Results:** Most parents (63%) at baseline reported “sometimes” acquiescing to their children’s requests to purchase specific foods. Pestering was modestly associated with weight and diet. At baseline, children whose parents “often” complied consumed more high-sugar and high-fat foods. Children who “often” asked for items seen on TV were likely to become overweight after 2 years (OR=1.31), whereas “never” asking protected against overweight (OR=0.72).

**Conclusion:** Pestering was modestly related to diet and weight in cross-sectional, but not longitudinal analyses. Asking for items seen on TV had the most robust relationships across child outcomes and over time.

## KEYWORDS

children; obesity; weight; marketing

## INTRODUCTION

Childhood obesity is a growing global public health problem. One source of excess calories may come from children’s increased purchasing power in today’s consumer culture.

31 This may take the form of children's own spending and, at younger ages, their influence over  
32 adults' spending. The latter can be achieved through persistent pestering or nagging by children.  
33 The "ability children have to badger their parents into purchasing items they would otherwise not  
34 buy" is known as *pester power*<sup>(1)</sup>.

35 As children's role in household purchases has increased, the marketing industry has  
36 responded by developing strategies directed at children. Research from a large multinational  
37 database of children ages 9-14 showed that brand loyalty increases from the age of ten, creating  
38 an incentive for companies to attract young customers<sup>(2)</sup>. Companies may actively target children  
39 through television commercials, online marketing campaigns or front-of-package labeling –  
40 often with the use of cartoon or celebrity sponsorship. A recent review of experimental studies  
41 involving children's mascots and licensed characters found high rates of recognition for popular  
42 characters and a greater likelihood of choosing foods presented with familiar characters<sup>(3)</sup>.

43 Previous research from several countries has found children's products in supermarkets  
44 to be high in sugar and/or fat<sup>(4-6)</sup>. Meanwhile, television ads for food during children's  
45 programming are often for unhealthy food items<sup>(7-9)</sup>. One large multi-country study documented  
46 more than 12,000 television advertisements for food on popular children's channels and found  
47 the most common advertisements consisted of fast food (12%) and candy (12%)<sup>(7)</sup>. Additional  
48 mechanisms for marketing to children extend to the school environment as well as Internet and  
49 social media realms<sup>(10, 11)</sup>.

50 Advertising to children is worrisome due to the strong body of evidence demonstrating  
51 that marketing exposure has a negative impact on diet and weight<sup>(1, 12)</sup>. In fact, in 2010, the  
52 World Health Organization (WHO) released a set of recommendations to restrict marketing of  
53 foods high in saturated fat, trans fat, added sugar, or salt to children<sup>(13)</sup>. Furthermore, a recent  
54 economic analysis by McKinsey identified media restriction, namely restriction of high-calorie  
55 food advertising, as an important approach for a multi-faceted solution to obesity<sup>(14)</sup>.

56 Marketing may also result in increased pestering by children. A review of twelve studies  
57 examined pestering across different settings and countries, including the United States, England,  
58 India, and Saudi Arabia<sup>(15)</sup>. Among these studies, eleven demonstrated an association between  
59 advertising and children's purchase requests. In surveys and interviews, mothers have frequently  
60 attributed their children's pestering for new items to advertisements, including packaging,  
61 characters, and commercials<sup>(16, 17)</sup>.

62 In one of the earliest studies to identify pester power, an observational field study of  
63 children ages 3-11 years old during a grocery store trip, the children made an average of 15  
64 purchase requests – mostly for cereal and candy – and almost half (45%) of all requests were  
65 successful<sup>(18)</sup>. More recently, an observational study of parent-child supermarket shoppers, found  
66 parents purchased approximately half (52%) of the products children verbally requested<sup>(19)</sup>.  
67 Others have estimated that nagging is responsible for 34% of children’s food sales<sup>(20)</sup>. Children  
68 often pester for unhealthy foods. For example, in a study of British parents, researchers found  
69 correlations between children’s attempts to influence their parent’s purchases and the type of  
70 product, with the strong correlations for sweets, snack foods, and cereals<sup>(21)</sup>.

71 Given children’s preference for both high-sugar and high-fat foods<sup>(22, 23)</sup>, and the  
72 powerful forces of marketing such items to children, it is plausible that frequent compliance with  
73 children’s food requests could result in unhealthy diets. However, the effect of pestering on  
74 health outcomes is unknown. We are not aware of any study that prospectively examines  
75 “pestering” in relation to diet and changes in weight status, from an international perspective.  
76 Looking at eight European countries for evidence, this study identifies predictors of diet and  
77 weight status by examining pestering in the parent-child shopping relationship, including  
78 shopping together, item requests, and request compliance.

79

## 80 **METHODOLOGY**

### 81 **Data**

#### 82 *Study sample*

83 The IDEFICS (Identification and prevention of dietary- and lifestyle-induced health  
84 effects in children and infants) study is a longitudinal study of 16,228 children ages 2-9 years  
85 from selected survey centers in eight European countries participating in the baseline survey:  
86 Hungary, Italy, Cyprus, Estonia, Belgium, Germany, Spain and Sweden. A detailed description  
87 of the study design and sample characteristics has been published previously<sup>(24)</sup>. In brief,  
88 participants in the IDEFICS study were recruited through school settings to receive a  
89 multidimensional obesity prevention intervention consisting of changes at the community,  
90 school, and home settings. All participating centers obtained approval from their governing  
91 ethical committees; all children gave oral assent after parents had provided written informed  
92 consent. It should be noted that the country-specific cohorts were not sampled to yield nationally

93 representative estimates of anthropometric or behavioral characteristics. The baseline survey was  
94 conducted between September 2007 and May 2008 with follow-up two years later. At each  
95 survey, weights and heights of children were measured, and a parent questionnaire completed.  
96 As part of the questionnaires, parents reported on their children's behaviors, including a food  
97 frequency questionnaire (FFQ) and questions about other food-related behaviors, including  
98 family food purchasing patterns and children's purchase requests. We limited our cross-sectional  
99 analyses to 13,217 parent-child dyads with complete baseline information on the variables of  
100 interest. Additional prospective analyses were conducted on a subset of 7,820 dyads with  
101 complete two-year follow-up information. Between the baseline and follow-up surveys, a health-  
102 promotion intervention was implemented in all participating countries, with control and  
103 intervention communities that were matched on area-level sociodemographics. A more detailed  
104 description of the intervention is published elsewhere.<sup>(25)</sup> In short, the intervention included six  
105 program objectives: increasing water consumption, increasing fruit and vegetable consumption,  
106 decreasing daily TV viewing time, increasing daily physical activity levels, strengthening parent-  
107 child relationships by spending more time together, and establishing adequate sleep duration  
108 patterns. Overall, there was no difference in weight or diet outcomes as a result of the  
109 intervention, as previously reported elsewhere.<sup>(26, 27)</sup>

110

### 111 *Definition of pester power*

112 We examined three different but related aspects of pestering with questions driven and  
113 developed by previous consumer research; namely, research that identifies parents as key gate  
114 keepers, communication buffers, and responsible agents for helping their kids to learn how to  
115 navigate within a commercial environment and control one's spontaneous desires.<sup>(28-30)</sup>

116 First, parents were asked "Do you usually take your child along grocery shopping?" and  
117 selected from four answer choices, including "I try to avoid it because it is faster alone", "I try to  
118 avoid it because he/she is pushing for treats", "I enjoy choosing the food together with my  
119 child", and "I have to, but don't enjoy it." This question assesses exposure to shopping situations  
120 and avoidance behavior of parents. The rationale is that the more often children are taken along  
121 grocery shopping, the more opportunities for teaching consumer and food literacy, the more  
122 opportunities for the child to exert pester power, and the more exposed the child is to shopping  
123 stimulation. Grocery shopping is part of a regular routine, and parent's handling of such

124 situations is based on previous experience. One reason to avoid it is that it takes longer (“I try to  
125 avoid it because it is faster alone”), another reason is to avoid pestering and to prevent arguing in  
126 an often stressful situation in a public space (“I try to avoid it because he/she is pushing for  
127 treats”). On the other hand, parents might regard shopping with their kids as joyful common time  
128 or even a teachable moment (“I enjoy choosing the food together with my child”), others might  
129 simply have no alternative (“I have to, but don’t enjoy it”).

130 Second, parents were asked to report categorical frequencies for TV-stimulated specific  
131 pestering in response to “Does your child ask for items he/she saw on TV?” Options included  
132 “Never”, “Sometimes”, “Often”, and “My child hardly watches TV”.

133 Finally, parents self-reported “When your child asks for a specific food item which is not  
134 on your shopping list, do you buy it?” as a measure of giving in to their children’s product  
135 requests. Response options included “Usually not”, “Sometimes”, “Often”, “Only if there is extra  
136 money”, and “Only when the item is healthy”.

137

### 138 *Weight and diet outcomes*

139 The primary outcome reported here was weight status at baseline and change over two  
140 years. Study staff recorded child height and weight during a physical examination at each time  
141 point. Standing height was measured using a Seca 225 stadiometer (Seca, Birmingham, UK) and  
142 body weight was measured using a prototype of the TANITA BC 420 SMA digital scale  
143 (TANITA Europe GmbH, Sindelfingen, Germany). Body mass index (BMI) was calculated as  
144  $\text{kg/m}^2$ . BMI z-scores were calculated using procedures developed by the US Centers of Disease  
145 Control and Prevention (CDC). BMI z-scores greater than or less than 3 standard deviations were  
146 excluded from analyses to remove extreme and illogical values. Obese weight status was defined  
147 as BMI in the 95<sup>th</sup> percentile and above for age and sex based upon CDC growth charts.  
148 Overweight status was defined as BMI in the 85<sup>th</sup> percentile and above. The CDC definition of  
149 weight status differs from other reference systems, resulting in different prevalences of  
150 overweight and obesity. A comparison of the prevalences observed using different classifications  
151 systems in the IDEFICS cohort is published elsewhere<sup>(31)</sup>.

152 The secondary outcomes were propensity to consume foods high in sugar and food high  
153 in fat based on the food frequency section of the Children’s Eating Habits Questionnaire (CEHQ-  
154 FFQ). This instrument was designed to be completed by parental proxy, to reflect children’s

155 consumption of foods while at home or with parents, over the past 4 weeks. The CEHQ-FFQ has  
156 been found to be reproducible with mean kappa coefficients ranging from 0.41 to 0.60 and  
157 Spearman's correlation higher than 0.5 for 81% of the food items<sup>(32)</sup>, and a validation study of the  
158 CEHQ-FFQ against repeated 24-h dietary recall found that under 12% of the food groups were  
159 misclassified<sup>(33)</sup>. Because the questionnaire includes various foods and drinks that are high in  
160 added sugars and fats, indicators have been developed to reflect recent consumption of these  
161 items, relative to all items. Parents recorded typical consumption frequency of 43 pan-European  
162 food items from 14 food groups during the preceding 4 weeks for their child's meals at home and  
163 when under parental control. Frequency categories were "Never/less than once a week", "1-3  
164 times a week", "4-6 times a week", "1 time per day", "2 times per day", "3 times per day", "4 or  
165 more times per day" and "I have no idea". Sugar propensity was calculated as the percentage of  
166 high-sugar foods out of all foods consumed at home in one week. High-sugar foods included  
167 fresh fruit with added sugar, fruit juice, sugar-sweetened drinks, diet soft drinks, sweetened  
168 breakfast cereals, sweetened milk, sweetened yoghurt, jam/honey, chocolate- or nut-based  
169 spread, chocolate-based candies, non-fat candies, cake/pudding/cookies and ice cream. Similarly,  
170 fat propensity was calculated as the percentage of high-fat foods out of all foods consumed at  
171 home in one week. High-fat foods included fried potatoes, whole fat milk, whole fat yoghurt,  
172 fried fish, cold cuts/sausages, fried meat, fried eggs, mayonnaise, cheese, chocolate- or nut-based  
173 spread, butter/margarine on bread, nuts/seeds/dried fruits, salty snacks, savoury pastries,  
174 chocolate-based candies, cake/pudding/cookies and ice cream. The sugar and fat propensities  
175 have previously been used to describe eating habits in children<sup>(32,34)</sup> and correlate with the  
176 percentage of sugar and fat intake reported by a 24-h dietary recall.<sup>(34)</sup>

177

### 178 *Statistical analyses*

179 Chi-square tests were used to explore country differences in the pester power variables.  
180 Regression analyses were used to estimate relationships between the pester variables and  
181 outcomes of interest in cross-sectional and prospective analyses. Each of the three pester  
182 variables were entered into separate analyses. All regression analyses were adjusted for age, sex,  
183 country, and maximum parent education. Categorical dummy variables were used for sex,  
184 country, and maximum parent education (International Standard Classification of Education  
185 (ISCED) levels 0-6)<sup>(35)</sup>. For the prospective analyses, additional adjustments were made.



186 Prevalent cases at baseline were excluded from analyses with dichotomous 2-year outcomes  
187 (overweight, obese). We report odds ratios (OR) with 95% confidence intervals (CI) for these  
188 dichotomous outcomes. In regression models with continuous outcomes (BMI z-score, sugar  
189 propensity, fat propensity), we controlled for baseline levels and reported effect estimates  $b$  and  
190 the corresponding standard errors (SE) in tables. All prospective analyses controlled for whether  
191 or not the parent-child dyad received the multidimensional intervention, however there were no  
192 differences in weight or diet outcomes between the two groups. All statistical tests were  
193 conducted without adjusting for multiplicity using STATA software version 11 (StataCorp).  
194 Accordingly, all statistical results should be interpreted from a more exploratory view. For the  
195 sake of convenience, effects that are statistically significant at a 0.1%, 1%, or 5% significance  
196 level are marked with stars in the respective tables.

197 Additional stratified and multilevel models were used to conduct sensitivity analyses,  
198 focusing on the question “how often does your child ask for items on television”. We used a  
199 random effects multi-level model (individuals nested within countries). We also examined  
200 potential interactions of country and age with asking for items on television . Finally, we tested  
201 for differences between boys and girls.

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## RESULTS

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### Sample Characteristics

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A total of 13,217 children were included in the baseline analytic sample with complete data. Descriptive statistics are shown in Table 1. The sample was evenly split between boys and girls. Half of the children had parents with a maximum ISCED of 3 or 4, equivalent to upper secondary or post-secondary non-tertiary education. The mean age of the children was 6.0 years. Only one-tenth (11%) of the children were obese at baseline, however one-quarter (24%) were overweight.

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### Pester Prevalence

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Table 2 describes the patterns of pester behaviors by country. Approximately half of the parents (55%) reported that they took their child grocery shopping (either “I enjoy choosing the food together with my child” or “I have to, but don’t enjoy it”). Reasons for avoiding shopping together varied by country (Pearson  $\chi^2_{21}=851.28$ ;  $p<0.001$ ). Parents from Sweden and Germany

216 had the lowest proportion (2% and 3%, respectively) reporting “I try to avoid it because he/she is  
217 pushing for treats”, compared to 1 in 5 of the parents from Cyprus (21%).

218 Country differences also existed in television-motivated pestering (see Table 2; Pearson  
219  $\chi^2_{21}=2421.85$ ;  $p<0.001$ ). Only 3% of Swedish children “often” asked for items seen on TV, but  
220 up to one-quarter of Italian (26%) and Hungarian (23%) children “often” asked for such items.  
221 The most common response among all countries was that children “sometimes” asked for items  
222 from TV.

223 When parents were asked about how often they bought specific food items the child  
224 asked for that were not on their shopping lists, most parents (range: 51-69%) reported  
225 “sometimes” purchasing requested items (see Table 2; Pearson  $\chi^2_{28}=1830.19$ ;  $p<0.001$ ). One-  
226 third (32%) of Spanish parents and one-quarter (25%) of Swedish parents reported “usually not”  
227 fulfilling such requests. A small fraction (11%) of parents reported buying the requested item  
228 “only if it is something healthy”.

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#### Cross-sectional Analyses

231 The cross-sectional analyses showed a number of relationships between baseline  
232 shopping behaviors and weight and diet outcomes (see Table 3). Parents who avoided shopping  
233 with their children because they push for treats were more likely to have children who were  
234 obese (OR=1.25, 95%CI: 1.05-1.49) or overweight (OR=1.18, 95% CI: 1.03-1.36), compared to  
235 parents who reported that they enjoyed choosing foods with their child. Children who pushed for  
236 treats also had higher BMI z-scores, sugar propensity, and fat propensity.

237 Parents whose children “often” asked for items seen on TV were more likely to have  
238 obese (OR=1.19, 95% CI: 1.03-1.37) or overweight (OR=1.22, 95% CI: 1.09-1.36) children.  
239 “Often” asking for items was also associated with higher BMI z-scores and sugar and fat  
240 propensities. Children who “never” ask for items from TV or “hardly watch TV” had lower  
241 propensities to consume sugar, but not fat. Children who “hardly watch TV” had a significantly  
242 lower proportion of high-sugar foods in their diet.

243 Whether the parents purchased requested items was not associated with weight status, but  
244 was significantly correlated with sugar and fat. Children whose parents usually did not purchase  
245 requests had lower sugar ( $b=-2.28$ ,  $SE=0.29$ ) and fat propensities ( $b=-1.57$ ,  $SE=0.25$ ). Similarly,  
246 children whose parents only bought requested items that were healthy had lower sugar and fat

247 propensities, although the differences were not as large. Children whose parents “often” bought  
248 requested items had diets with almost 4% higher frequency of sugary foods and 2% higher  
249 frequency of high-fat foods, relative to total number of foods consumed. Interestingly, parents  
250 who reported buying requested items only if there was money for extras had children whose diets  
251 were higher in sugar and fat.

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#### Prospective Analyses

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A total of 7,820 children had complete information at the two-year follow-up. A few associations persisted over time (see Table 4). Whether the parent had usually taken the child grocery shopping did not appear to be associated with weight after two years. There were significant relationships between the “I try to avoid it because it is faster alone” group and diet, but these translated to less than half a percentage point each in lower frequency of high-sugar foods and high-fat foods. Pushing for treats at baseline was not associated with worse weight or dietary outcomes at the two-year follow-up.

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Asking for items on the television remained associated with increased odds of becoming overweight. Those who “never” asked for such items were less likely to become overweight (OR=0.72, 95% CI: 0.55-0.96) while those who “often” asked were more likely to become overweight (OR=1.31, 95% CI=1.02-1.68). Obesity at the two year follow-up was not related to asking for items at baseline. A few differences in BMI z-scores and diet outcomes were of marginal magnitude, but statistically significant.

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[Table 4 around here]

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Whether the parent purchased items their child asked for remained unassociated with prospective weight outcomes. “Never” purchasing items was significantly associated with lower sugar and fat propensities in the child’s diet, although these differences appear to be smaller than corresponding differences in the cross-sectional analysis. Having “often” purchased items was associated with a higher sugar, but not fat propensity. In contrast, buying “only if the item is healthy” was associated with a lower fat propensity, but not sugar propensity.

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#### Sensitivity Analyses

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We conducted sensitivity analyses to ensure the robustness of our results, focusing on the question “how often does your child ask for items on television” as this appeared to be the pester

278 variable with the largest association with weight status and diet. The random effects multi-level  
279 model yielded similar results to our original model with country-fixed effects – all cross-  
280 sectional and prospective associations were in the same direction and of similar magnitude. We  
281 examined whether the prospective analysis of overweight was due to a country effect and found  
282 no evidence of interaction between country and asking for items on television. In individual  
283 country analyses, differences in weight outcomes for children who “often” asked for items from  
284 television could not be detected, although they were significant in the pooled sample (see Figure  
285 1). We tested an interaction of age and found that the effect on the weight outcomes was stronger  
286 in the older children. When we tested for differences between boys and girls, we found no  
287 significant sex differences, even for the diet outcomes of sugar and fat propensity scores. The  
288 associations between asking for items from television remained strong and significant in cross-  
289 sectional analyses for both the boys and girls in sex-stratified analyses.

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291

## DISCUSSION

292 Pestering was modestly related to diet and weight in this multi-country sample and we  
293 found more cross-sectional, rather than prospective, associations. Children who were perceived  
294 as pushing for treats, who often asked for items on the television and whose parents often gave in  
295 to purchase requests had diets that were higher in both fat and sugar. Over the two year follow-  
296 up time, children who never asked for items seen on television were less likely to become  
297 overweight, while children who often asked were more likely. Pestering also displayed major  
298 variations in its prevalence across the eight countries. These differences in pestering behavior  
299 may be attributed to culture or governmental intervention. For example, Sweden, which has strict  
300 regulations on commercials for children’s TV programs<sup>(36)</sup> that effectively limit exposure to  
301 marketing, had the lowest proportion of children who often ask for items from TV.

302 It is interesting to note that pushing for treats at baseline, which was associated with  
303 worse diets and weight outcomes in the cross-sectional analyses, did not have the same negative  
304 outcomes in the longitudinal analyses. This may suggest that preventing exposure over time to  
305 the stimulation that comes from grocery shopping may nullify the increased health risks  
306 associated with pestering. However, given the lack of longitudinal associations with the different  
307 shopping behaviors, it may be that parental behavior measured two years ago is not a very strong  
308 predictor of weight and diet.

309 Previous research has found that children prefer and request high-fat and high-sugar  
310 items<sup>(18)</sup>, thus it is not surprising that in our study, children whose requests were granted  
311 consumed diets associated with higher sugar and fat. A small proportion of parents (4%) reported  
312 giving in to their child's requests if there was extra money. These children's diets were  
313 associated with higher sugar and fat, but less than the group of children whose requests were  
314 often granted. This suggests that financial constraints may limit poor dietary habits brought on  
315 through pestering. In addition, children whose parents bought requested items deemed "healthy"  
316 consumed a lower proportion of foods with sugar and fat than the reference group (children  
317 whose parents "sometimes" bought requested items), however the difference in fat was smaller  
318 than in those children whose parents routinely refused. Since the diet scores are proportional  
319 measures, the "healthy" items appear to still be contributing fat. Such results might indicate that  
320 highly restrictive parents are more effective at managing their child's pestering and overall diet,  
321 or that parents' perceptions of "healthy" need to be redefined.

322 An online survey of UK parents found that as many as 40% of parents felt they did not  
323 have enough information about children's healthy diets and that parental knowledge about  
324 appropriate nutritional guidelines was worse for older children, so that as they grow older and  
325 adopt more sophisticated pestering strategies, parents are less equipped with diet knowledge<sup>(16)</sup>.  
326 The same study also found that 80% of mothers had been asked by their children to buy an  
327 advertised food product, which is similar to our finding that 78% of children sometimes or often  
328 asked for items from television.

329 This study is subject to several limitations. Parents might be reluctant to answer honestly  
330 about how often they give in to their child's requests. To address such a social desirability bias,  
331 parents were assured of the confidentiality of all their responses, but this is unlikely to fully  
332 eliminate this type of biased reporting. However, if parents were reluctant to admit buying items  
333 their children asked for, this bias would under-report pester power and the true differences could  
334 be larger than those observed in this study. In addition, one of the questions about pestering  
335 ("Does your child ask for items he/she saw on TV?") asks about the child's behavior, rather than  
336 the parent's behavior, which may reduce the aforesaid bias associated with self-report. Although  
337 this question does not explicitly ask about food items, given that the preceding question is about  
338 grocery shopping and the succeeding question is about the child asking for specific food items,  
339 we expect that parents were thinking about their child behaviors related to food.

340 Other limitations of the study include the discrepancies between cross-sectional and  
341 prospective results. Longer-term health outcomes were not present at follow-up where they  
342 would have been most expected if the relation was causal. These discrepancies may be due to the  
343 considerably decreased sample size from baseline to follow-up with resulting loss of statistical  
344 power. Alternatively, the relatively short time of two years may have been insufficient to detect  
345 associations of the same magnitude seen at baseline which might reflect more years of exposure  
346 or changes in other lifestyle factors, such as activity level, that we did not account for. Still, the  
347 stronger cross-sectional results cannot be considered causal and may in some instances reflect  
348 reverse causation. For instance, children whose parents avoided shopping with them because the  
349 child pushed for treats were heavier and had worse diets, but it could be the case that avoiding  
350 shopping is driven by the child's weight status, rather than the other way around.

351 We did not include parental BMI or diet in our analyses. Although these measures can be  
352 strongly correlated with child outcomes – both through genetic and environmental influences –  
353 we did not collect information on parental diet, and self-reported height and weight were not  
354 available for all parents.

355 Finally it must be acknowledged that the dietary instrument has certain weaknesses  
356 including the fact that it is too short to capture the whole diet and is limited to foods that the  
357 parent is in control of. Although it has been validated against a 24-hour recall with moderately  
358 favorable results<sup>(33)</sup>, the strength of this outcome is far lower than those based on measured  
359 anthropometry.

360 However, the study is not without strengths including the fact that the design was  
361 standardized across eight European countries with varying obesity prevalence, food cultures, and  
362 legislation regarding advertising to children. All anthropometric measures and parental  
363 questionnaires were designed to capture the same information across all eight survey countries  
364 representing northern, southern, eastern, and western parts of Europe. Thus it is one of the few  
365 studies that can examine associations between pestering behaviors and health outcomes in a  
366 large, aggregated data set, while also considering the profound differences in context that exist  
367 between countries.

368 Advertising exposure is one avenue for change with the potential to span across these  
369 cultural divides. In our study, asking for items from television had a robust relationship with diet  
370 and weight. Previously, researchers across eleven countries coded television advertisements on

371 popular children's television channels and found an average 18% of advertisements were for  
372 food, and of those, 67% were for noncore foods such as fast-food, snack foods, and candy<sup>(7)</sup>.  
373 Based on those findings, the authors estimated that a child who watches 2 hours of TV  
374 programming per day would be exposed to approximately 56 to 126 food advertisements per  
375 week. Both Galst and White<sup>(18)</sup> and Chamberlain, Wang, and Robinson<sup>(37)</sup> found positive  
376 correlations between children's media exposure and the number of requests they made. Although  
377 children in another study reported being influenced by high fat, sugar and salt food ads, their  
378 actual consumption was related to parental control<sup>(28)</sup>. This finding has implications for  
379 interventions at the parental level and supports a recommendation that parents are important  
380 actors in educating children and preventing childhood obesity<sup>(38)</sup>. However, an analysis of the  
381 Swedish IDEFICS cohort found that parental norms – whether parents consumed sugar  
382 sweetened beverages and whether they approved of their child's sugar sweetened beverages –  
383 was associated with increased odds of the child consuming at least one sugar sweetened beverage  
384 a week, but exposure to commercial TV was significantly associated with sugar sweetened  
385 beverage consumption even after controlling for social norms<sup>(39)</sup>. This suggests that only  
386 addressing parental reactions to pestering may not be enough to meaningfully improve children's  
387 diets and weight status.

388 The insight that parental guidance might not be effective enough has also driven proposals  
389 for stricter regulations on food advertising policy at both the European and country level. A  
390 global advocacy movement to limit marketing of unhealthy food products to children and  
391 adolescents is growing.<sup>(40)</sup> For example, Consumers International, a world federation of consumer  
392 groups across 120 countries, in conjunction with a broad range of like-minded allies, is  
393 campaigning for a "Global Convention on Healthy Diets" to protect and promote healthy diets,  
394 using a similar political mechanism as the highly successful "Framework Convention on  
395 Tobacco Control".<sup>(41)</sup> Such a convention could be a game changer. A 2013 WHO report on  
396 marketing of food high in fat, salt and sugar to children shows that most of the countries within  
397 the WHO European region opt for self-regulatory approaches rather than hard government-led  
398 regulation.<sup>(42)</sup> To date, most of these food advertising policies in Europe are based on voluntary  
399 self-regulatory approaches by industry.<sup>(43)</sup> In a recent project report, we provide an overview of  
400 the different regulatory schemes regarding food advertising to children within the IDEFICS  
401 intervention countries of the present study.<sup>(44)</sup> Only Sweden, Estonia and Spain have a

402 noteworthy national regulation in place to limit exposure of children to food marketing. But even  
403 here, governments rely largely on voluntary self-regulation of industry and such codes and  
404 pledges tend to only be effective if monitored closely by independent groups such as consumer  
405 organizations and if the reputational or financial consequences of non-compliance are substantial.  
406 <sup>(45)</sup> For instance, the “EU Pledge” to prohibit advertising of products not fulfilling  
407 nutritional criteria to children under 12 years (2014) resulted in little impact<sup>(46)</sup> and a recent  
408 examination of 281 products produced by EU Pledge signatory company found that only 29 of  
409 these products should have be marketed to children according to the WHO’s criteria for a  
410 nutritionally balanced diet.<sup>(47)</sup>

411 In conclusion, many of the observed associations in this study between pestering and diet  
412 and weight status were moderate in magnitude. Asking for items from TV had a fairly robust  
413 relationship with our outcomes of interest. In the prospective analyses, never asking for items  
414 from TV was a protective factor against incident obesity and overweight, while often asking was  
415 a risk factor for becoming overweight. Our findings, in conjunction with previous research,  
416 suggest a closer examination of the role of advertising in children’s health outcomes.



417

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538

539

**Table 1. Sample characteristics, IDEFICS study – baseline**

	<i>n</i>	<i>%</i>
Total	13,217	
Country		
Italy	2,088	15.8
Estonia	1,618	12.2
Cyprus	942	7.1
Belgium	1,482	11.2
Sweden	1,613	12.2
Germany	1,720	13.0
Hungary	2,390	18.1
Spain	1,364	10.3
Female	6,526	49.4
Parent ISCED <sup>a</sup>		
Pre-primary	89	0.7
Primary	243	1.8
Lower secondary	1061	8.0
Upper secondary	4643	35.1
Post-secondary	2192	16.6
First stage tertiary	4129	31.2
Second stage tertiary	860	6.5
Obese	1472	11.1
Overweight	3112	23.5
	<i>Mean</i>	<i>SD</i>
Age	6.01	1.81
BMI z-score	0.22	1.11
Sugar propensity	25.5	11.74
Fat propensity	25.8	9.41

<sup>a</sup> ISCED = International Standard Classification of Education

Table 2. Characteristics of child-parent behaviors regarding shopping by country, IDEFICS study – baseline

	Country								
	Italy (n = 2088)	Estonia (n = 1618)	Cyprus (n = 942)	Belgium (n = 1482)	Sweden (n = 1613)	Germany (n = 1720)	Hungary (n = 2390)	Spain (n = 1364)	All countries (n = 13217)
<b>Do you usually take your child along to grocery shopping? (%)</b>									***
I try to avoid it because it is faster alone.	29	36	35	38	44	34	37	41	36
I try to avoid it because he/she is pushing for treats.	18	13	21	5	2	3	6	10	9
I enjoy choosing the food together with my child.	49	44	37	55	48	57	52	39	49
I have to, but don't enjoy it.	5	7	8	2	6	5	5	10	6
<b>Does your child ask for items he/she saw on TV? (%)</b>									***
Never	6	12	5	27	47	15	6	35	18
Sometimes	67	72	65	65	48	67	67	51	63
Often	26	14	29	6	3	12	23	8	15
My child hardly watches TV	2	2	2	3	2	6	3	6	3
<b>When your child asks for a specific food item which is not on your shopping list, do you buy it? (%)</b>									***
Usually not	6	10	6	13	25	14	4	32	13
Sometimes	61	66	51	69	59	68	54	51	60
Often	19	10	16	10	3	7	20	5	12
Only if I have the money for extras	1	4	5	1	2	5	9	0	4
Only if it is something healthy	12	11	22	6	11	7	14	11	11

\*p&lt;0.05; \*\*p&lt;0.01; \*\*\*p&lt;0.001

**Table 3. Cross-sectional association between parent-child consumer behaviors and weight/diet outcomes, IDEFICS study – baseline**

	Outcomes									
	Obese (BMI ≥ 95th %ile)		Overweight (BMI ≥ 85th %ile)		BMI z-score		Sugar propensity		Fat propensity	
	OR	[95% CI]	OR	[95% CI]	b	(SE)	b	(SE)	b	(SE)
<b>Do you usually take your child along to grocery shopping?</b>										
I try to avoid it because it is faster alone.	0.87*	[0.76,0.99]	0.93	[0.85,1.02]	-0.01	(0.02)	0.42*	(0.2)	0.55**	(0.17)
I try to avoid it because he/she is pushing for treats.	1.25*	[1.05,1.49]	1.18*	[1.03,1.36]	0.10**	(0.03)	1.70***	(0.34)	1.44***	(0.29)
I enjoy choosing the food together with my child.	(ref)		(ref)		(ref)		(ref)		(ref)	
I have to, but don't enjoy it.	0.82	[0.63,1.07]	0.95	[0.79,1.14]	-0.01	(0.04)	1.71***	(0.4)	1.53***	(0.35)
<b>Does your child ask for items he/she saw on TV?</b>										
Never	0.85	[0.70,1.04]	0.91	[0.79,1.03]	-0.06*	(0.03)	-1.55***	(0.27)	-0.26	(0.23)
Sometimes	(ref)		(ref)		(ref)		(ref)		(ref)	
Often	1.19*	[1.03,1.37]	1.22***	[1.09,1.36]	0.10***	(0.03)	1.72***	(0.26)	1.74***	(0.23)
My child hardly watches TV	0.80	[0.54,1.19]	0.86	[0.66,1.11]	-0.12*	(0.05)	-3.60***	(0.53)	-0.79	(0.46)
<b>When your child asks for a specific food item which is not on your shopping list, do you buy it?</b>										
Usually not	1.01	[0.83,1.22]	1.06	[0.92,1.21]	0.04	(0.03)	-2.28***	(0.29)	-1.57***	(0.25)
Sometimes	(ref)		(ref)		(ref)		(ref)		(ref)	
Often	1.05	[0.89,1.24]	1.04	[0.92,1.19]	0.03	(0.03)	3.73***	(0.29)	2.00***	(0.26)
Only if there is extra money	1.20	[0.90,1.60]	1.09	[0.87,1.36]	0.06	(0.05)	1.64***	(0.5)	1.07*	(0.43)
Only if the item is healthy	0.90	[0.75,1.09]	0.92	[0.80,1.05]	-0.03	(0.03)	-1.81***	(0.3)	-0.56*	(0.26)
<b>Observations</b>	13,217		13,217		13,217		13,217		13,217	

\*p<0.05; \*\*p<0.01; \*\*\*p<0.001

Independent logistic (obese, overweight) and linear (BMI, sugar propensity, fat propensity) regression analyses.

All analyses control for child's age, sex, country, and parent's education.

**Table 4. Prospective association between parent-child consumer behaviors and weight/diet outcomes, IDEFICS study**

	Outcomes									
	Obese (BMI ≥ 95th %ile)		Overweight (BMI ≥ 85th %ile)		BMI z-score		Sugar propensity		Fat propensity	
	OR	[95% CI]	OR	[95% CI]	b	(SE)	b	(SE)	b	(SE)
<b>Do you usually take your child along to grocery shopping?</b>										
I try to avoid it because it is faster alone.	0.86	[0.64,1.16]	0.92	[0.75,1.13]	0.00	(0.01)	0.46*	(0.22)	0.47*	(0.21)
I try to avoid it because he/she is pushing for treats.	1.10	[0.75,1.61]	1.10	[0.81,1.49]	-0.01	(0.02)	0.58	(0.36)	0.60	(0.34)
I enjoy choosing the food together with my child.	(ref)		(ref)		(ref)		(ref)		(ref)	
I have to, but don't enjoy it.	0.72	[0.39,1.34]	0.95	[0.64,1.41]	0.02	(0.03)	0.35	(0.43)	-0.08	(0.4)
<b>Does your child ask for items he/she saw on TV?</b>										
Never	0.63	[0.40,1.01]	0.72*	[0.55,0.96]	-0.07***	(0.02)	-0.53	(0.28)	0.10	(0.26)
Sometimes	(ref)		(ref)		(ref)		(ref)		(ref)	
Often	1.15	[0.84,1.59]	1.31*	[1.02,1.68]	0.02	(0.02)	0.45	(0.3)	0.68*	(0.28)
My child hardly watches TV	0.38	[0.12,1.21]	0.63	[0.33,1.18]	-0.11**	(0.04)	-0.54	(0.59)	0.61	(0.55)
<b>When your child asks for a specific food item which is not on your shopping list, do you buy it?</b>										
Usually not	0.92	[0.59,1.43]	1.04	[0.79,1.38]	-0.02	(0.02)	-0.68*	(0.3)	-1.03***	(0.28)
Sometimes	(ref)		(ref)		(ref)		(ref)		(ref)	
Often	1.13	[0.78,1.64]	1.02	[0.76,1.37]	0.02	(0.02)	1.93***	(0.34)	0.32	(0.32)
Only if there is extra money	1.09	[0.49,2.41]	1.00	[0.55,1.80]	-0.04	(0.04)	-0.39	(0.64)	1.17	(0.6)
Only if the item is healthy	0.78	[0.50,1.21]	0.97	[0.72,1.31]	-0.02	(0.02)	-0.08	(0.33)	-1.20***	(0.3)
<b>Observations</b>	6975		6026		7820		7820		7820	

\*p<0.05; \*\*p<0.01; \*\*\*p<0.001

Independent logistic (obese, overweight) and linear (BMI, sugar propensity, fat propensity) regression analyses.

All analyses control for age, sex, country, parent's education, and intervention group.

Obese (overweight) analyses limited to children who were not obese (overweight) at baseline.

BMI, sugar propensity, and fat propensity analyses control for their respective baseline levels.

Figure 1. Association of often asking for items on television on overweight status at 2-year follow-up, IDEFICS study

