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Dietary factors and their associations with socioeconomic background in Finnish girls and boys 6–8 years of age – the PANIC Study

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ABSTRACT

OBJECTIVES. To study nutrient intake, food consumption and meal pattern and their associations with socioeconomic background in Finnish children.

METHODS. The subjects were a population sample of 424 children (211 girls, 213 boys) 6–8 years of age. Nutrient intake and meal pattern were measured by food records, and food intake and socioeconomic characteristics were assessed by questionnaires.

RESULTS. Intakes of saturated fat, sucrose and salt were higher and intakes of vitamin D, iron and fibre and unsaturated-to-saturated fat ratio lower than recommended. Less than 5% of children consumed vegetables, fruit and berries as recommended. Children with highest parental education more likely ate fish (OR 2.20, 95% CI 1.06–4.54), fibre-rich bread (OR 5.06, 95% CI 1.80–14.29) and main meals (OR 2.54, 95% CI 1.34–4.83) but less likely used soft margarine (OR 0.43, 95% CI 0.20–0.94) as recommended than children with lowest parental education. Children with highest household income more likely consumed skimmed milk (OR 2.43, 95% CI 1.21–4.88) and fish (OR 2.21, 95% CI 1.12–4.36) as recommended than children with lowest household income. Only 34% of girls and 45% of boys ate all main meals daily. Snacks provided as much as 42% of total energy intake.

CONCLUSIONS. Children do not meet recommendations in all important nutrients. Children from lowest socioeconomic position least likely consumed fish, skimmed milk and fibre-rich bread and ate main meals but most likely used soft margarine as recommended. Less than half of children ate all main meals daily.

Keywords. Children, diet, nutrients, meal pattern, socioeconomic status.

INTRODUCTION

Dietary factors play an important role in the development of many chronic diseases. Diet high in fibre and unsaturated fat and low in salt and saturated fat has been shown to improve risk factors for cardiovascular and metabolic diseases (Strazzullo *et al*., 2009, Erkkilä *et al*., 2008, King, 2005). Dietary habits tend to be established in early childhood and to stay stable to adulthood (Mikkilä *et al*., 2005, Wang *et al*., 2002). Thus, childhood is a crucial period for the development of healthy dietary habits that will prevent chronic diseases in later life.

Previous studies suggest that the intakes of saturated fat, sucrose and salt are higher and intakes of fibre, unsaturated fat and vitamin D are lower than recommended in preschoolers and secondary school pupils in Finland (Hoppu *et al*., 2008, Kyttälä *et al*., 2008). However, data on the diet of primary school children are scarce. Moreover, Finnish school children and adolescents from families with a lower socioeconomic status have been suggested to have less healthy dietary factors, such as a lower consumption of vegetables and fruit and a higher consumption of high-fat milk and butter than children from families with a higher socioeconomic status (Haapalahti *et al*., 2003, Laitinen *et al*., 1995). However, there are few studies on the association of socioeconomic background of a family with dietary habits of younger school children.

The objective of the present study was to investigate nutrient intake, food consumption and meal pattern in Finnish girls and boys 6–8 years of age and the associations of socioeconomic background with these dietary factors.

MATERIAL AND METHODS

Study design and subjects

The present study is part of the Physical Activity and Nutrition in Children (PANIC) Study, which is an ongoing 2-year controlled exercise and diet intervention study in a representative population sample of children 6–8 years of age. Altogether 736 children who started the first grade in primary schools of a geographically and socioeconomically balanced area in the city of Kuopio, Finland, in 2007–2009, were invited to participate in the study. Of them, 512 children participated in the

baseline examinations between October 2007 and November 2009. The study protocol was approved by the Research Ethics Committee of the Hospital District of Northern Savo. Both children and their parents gave their written informed consent.

Altogether 493 (96%) of all 512 families that participated in the baseline examinations returned the food records that were used for the assessment of dietary intake and eating frequency. After excluding children whose food records were insufficiently filled out, contained other than four consecutive days or were returned after the start of the intervention, the subjects for the present analyses included 424 children (211 girls, 213 boys). The first 220 children lacked the food consumption questionnaire, as the questionnaire was developed and added into the measurements after the start of the study. The questionnaire was filled out by parents of 285 children (147 girls, 138 boys).

Assessments

Dietary intake was assessed by food records of four consecutive days that consisted of two weekdays and two weekend days (99.5% of children) or three weekdays and one weekend day (0.5% of children). The parents were instructed to record all food and drink consumption of their children and to ask their children about their food consumption outside home. The schools and afterschool clubs were asked about the type and preparation of the served food. When the parents returned the records, clinical nutritionists checked the records and filled in missing information with them.

The food records were analysed using The Micro Nutrica® dietary analysis software (version 2.5, The Social Insurance Institution of Finland) with the food composition data from national analyses and international food composition tables (Rastas *et al.*, 1993). Vitamin and mineral supplements were not included in these analyses. Meals were defined by clinical nutritionists according to the recorded time and the type of food individually for each child taking into account the whole meal pattern of the child. Breakfast, lunch and dinner were classified as main meals and all in-between eating and drinking occasions as snacks. The mean daily intakes of nutrients were compared with the Finnish nutrition recommendations for this age group (National Nutrition Council 2005).

Food consumption was also assessed by a questionnaire developed for the present study to complete the food record data. The type of food usually chosen and the frequency of using selected food items were asked.

The level of education in the family based on the highest completed or ongoing degree (vocational school or less, vocational high school, university) and the annual household income (≤30000 €, 30001–60000 €, ≥60001 €) were inquired by a questionnaire.

Statistical analysis

Statistical analyses were performed by the SPSS statistical analysis software (v. 14.0 for Windows, SPSS Inc., Chicago, IL). Normality of distributions was analysed by the Kolmogorov-Smirnov test. Means, standard deviations, medians and interquartile ranges for nutrient intakes were calculated. Differences in nutrient intakes between genders were compared by the T-test for independent samples for normally distributed variables and by the Mann-Whitney's U-test for abnormally distributed variables. Gender-adjusted logistic regression analyses were used to model the associations of socioeconomic factors with diet. Associations with a *P*-value of <0.05 were considered statistically significant.

RESULTS

Basic characteristics

The mean (standard deviation) of the age of children was 7.6 (0.4) years. Defined by the highest degree in the family, 17.4% of the families had vocational school degree or less, 45.2% had vocational high school degree and 37.4% had university degree. The family income was ≤30000€ in 19.3% of the families, 30000–60000€ in 42.9% of the families and ≥60001€ in 37.8% of the families. In the highest income group, 61.8% of the families had university degree, 33.1% vocational high school degree and 5.1% vocational school degree or less. In the lowest income group, 15.2% of the families had university degree, 46.8% vocational high school degree and 38.0% vocational school degree or less.

Intakes of energy and nutrients

The mean energy intakes from saturated fat and sucrose were higher and the mean energy-adjusted intake of fibre was lower than recommended in both girls and boys (Table 1). The mean intakes of monounsaturated and polyunsaturated fat just reached the lower limit of the recommendations in the boys but did not reach the recommendations in the girls. Moreover, the mean (standard deviation)

of the unsaturated-to-saturated fat ratio was 1.3 (0.3) in both girls and boys, that is much lower than desired (>2.0).

The mean intakes of vitamin D and iron were lower than recommended and the mean intake of sodium chloride was higher than recommended in both girls and boys (Table 1). The intakes of other vitamins and minerals were adequate.

Food consumption

As recommended, the children commonly used skimmed milk, low-fat cheese, low-fat meat cuts and fibre-rich bread (Table 2). However, most children chose fat-containing yoghurts instead of fat-free yoghurts. Three quarters of the girls but two thirds of the boys chose the recommended vegetable oil-based margarine on bread. More than half of the children consumed fish less often than the recommended twice a week. Consumption of vegetables, fruit and berries was commonly lower than the recommended five portions per day, and almost fifth of children consumed them one portion or less daily. Sugar-sweetened drinks were a common source of sucrose: half of the children consumed sugar-sweetened drinks several times per week, and a quarter consumed them daily.

Meal pattern

Both girls and boys had on average 5.5 eating occasions per day. The girls had 2.7 and the boys had 2.8 main meals, and both girls and boys had 2.7 snacks daily. In all 44.6% of the boys and 34.1% of the girls ate all three main meals on all four days. As many as 95.3% of the girls and 95.8% of the boys ate breakfast every day, and the rest of the children skipped breakfast on one day. Altogether 75.4% of the girls and 78.9% of the boys had lunch every day, 18.0% of the girls and 15.5% of the boys on three days and 6.7% of the girls and 5.7% of the boys on two days or less often. Moreover, 48.3% of the girls and 55.4% of the boys had dinner every day, 31.8% of the girls and 32.4% of the boys on three days and 19.9% of the girls and 12.2% of the boys on two days or less often. Of total energy intake, 17.1% and 16.4% was obtained from breakfast, 21.1% and 20.9% from lunch, 19.7% and 21.3% from dinner, and 42.3% and 41.3% from snacks, in the girls and the boys respectively. The proportions of sucrose, fat, saturated, monounsaturated and polyunsaturated fat of energy intake and fibre density in main meals and snacks are presented in Figure 1. Snacks contained 67.7% of the daily sucrose intake in the girls and 66.6% in the boys.

Socioeconomic background and dietary habits

Children whose parents were in the highest income group more likely received energy as recommended (OR 2.32, 95% CI 1.01–5.31, *P*=0.047) than children whose parents were in the lowest income group. However, children whose parents were in the highest income group less likely received protein as recommended (OR 0.32, 95% CI 0.14–0.71, *P*=0.005) than children whose parents were in the middle-income group. No other statistically significant associations of energy-adjusted intakes of energy nutrients, vitamins or minerals with education or income were found.

The recommended skimmed milk was 2.43 times more commonly used in children whose parents were in the highest income group than in children whose parents were in the lowest income group (Table 3). Recommended fish consumption was 2.21 times more common in children whose parents were in the highest income group and 2.20 times more common in children whose parents had university degree, compared with the lowest income and education groups. Children whose parents had university degree had a 5.06-fold odds and children whose parent had vocational high school education had a 2.57-fold odds of choosing the recommended fibre-rich bread instead of white bread compared with the children whose parents had vocational school education or less. However, the higher the parental education level, the lower odds of choosing the recommended spread (soft margarine) on bread (*P* for trend 0.023). No statistically significant associations of income or education with consumption of cheese (≤17% of fat vs. >17% of fat), cold cuts (≤4% of fat vs. >4% of fat), yoghurts (fat-free vs. ≥2% of fat), vegetables, fruit and berries (≥3 portions/day vs. <3 portions/day), sugar-sweetened drinks (once/week or less vs. twice/week or more) and puddings and ice cream (once/week or less vs. twice/week or more) were found.

Children from families with vocational high school degree (OR 3.02, 95% CI 1.61–5.68) and from families with university degree (OR 2.54, 95% CI 1.34–4.83) more likely consumed all three main meals daily than children from families with vocational school degree or less.

Household income or parental education was not associated with receiving energy from main meals (65–75% of daily energy) or from snacks (25–35 % of daily energy) as recommended (Nordic Council of Ministers, 2004).

DISCUSSION

The present study in a representative population sample of girls and boys 6–8 years of age shows that intakes of saturated fat, sucrose and salt were higher and intakes of vitamin D, iron and fibre and unsaturated-to-saturated fat ratio lower than recommended (National Nutrition Council 2005). These results are consistent with those reported previously among Finnish preschoolers and secondary school pupils (Hoppu *et al.*, 2008, Kyttälä *et al.*, 2008). We also observed that less than half of children ate all main meals every day. An important finding of the present study is that socioeconomic background modifies dietary habits of children. Children with highest parental education more likely consumed fish and fibre-rich bread and more likely had main meals but less likely used soft margarine as recommended than children with lowest parental education. Moreover, children with highest household income more likely consumed skimmed milk and fish as recommended than children with lowest household income. The associations of parental education and household income with dietary habits were different, because parental education may provide better knowledge and household income better economic possibilities for healthy dietary choices. Therefore, the effects of parental education and incomes on the diets of the children are not identical.

Fibre intake was relatively low among children in the present study. Only 11% of the girls and 7% of the boys met the target fibre density. Although 90% of the children chose fibre-rich bread instead of white bread, the consumption of fibre-rich bread and other fibre-rich grain products was too low to ensure sufficient intake of fibre. The target fibre intake may be more challenging among children whose parents are in the lowest education group who more likely used white bread instead of fibre-rich bread in the present study. Previous studies have shown that high-fibre diet has favorable effects on cardiovascular risk factors in children and adults (Ruottinen *et al*., 2010, King 2005). Fibre-rich diet is also associated with a higher vitamin and mineral intake and a lower fat intake in children (Ruottinen *et al*., 2010). Thus, increase in fibre intake should improve overall dietary quality and cardiovascular health in childhood and later in life.

Also consumption of vegetables, fruit and berries was far lower than recommended in children (National Nutrition Council 2005). However, previously reported low consumption of vegetables and fruit in school children and adolescents from families with a low socioeconomic status (Haapalahti *et al.*, 2003, Laitinen *et al.*, 1995) was not found in the present study.

As many as three quarters of children consumed more sucrose than recommended. Particularly, snacks were high in sugar and regular consumption of sugar-sweetened beverage was common. In previous studies, sugar-sweetened dairy products and drinks have been reported to be the main sources of sucrose among Finnish children (Erkkola *et al.*, 2009, Ruottinen *et al*., 2008). High consumption of sugar-sweetened drinks has been associated with raised risk of obesity in children (Moreno & Rodriguez, 2007). Moreover, high sucrose intake has an unfavorable effect on dental health (Touger-Decker & Cor van Loveren, 2003). Therefore, more attention should be paid on dietary intake of sucrose in children.

Fat intake was at the recommended level in children. However, the unsaturated-to-saturated fat ratio of diet was generally too low. The children commonly consumed skimmed milk and low-fat cold cuts and cheese, but they also ate high-fat yoghurts, puddings and ice-cream. Children from families with high parental income more likely drank skimmed milk than children from families with low parental income. However, children whose parents were in the lowest education group more likely used soft margarine on bread than children whose parents were in the highest education group. These findings suggest that although the intakes of saturated and unsaturated fat were not associated with socio-economic groups, the sources of saturated and unsaturated fat may differ among socio-economic groups. Because replacing saturated fat with unsaturated fat in diet has been observed to decrease cardiovascular morbidity and mortality (Erkkilä *et al*., 2008), improving the quality of dietary fat would be beneficial since childhood.

More than half of the children ate fish less often than the recommended twice a week. In Finland, children are offered at least one fish meal per week at school lunch (National Nutrition Council 2008). Thus, in many children, the fish meal at school was the only time when they ate fish. An important finding of the present study is that children from families with low socioeconomic status were less likely to reach the recommended fish consumption than children from families with high socioeconomic status. Higher fish consumption would increase the unsaturated-to-saturated fat ratio but also the intake of vitamin D. Vitamin D intake has increased markedly in 10 years among Finnish children (Talvia *et al*., 2004), as milk and certain dairy products have been fortified and the fortification of soft margarines has increased. Based on the present study, however, dietary intake of vitamin D among children in Finland still remains inadequate in most girls and boys.

In previous studies from other countries, 60–85% of children and adolescents have eaten breakfast regularly (Croezen *et* al., 2009, Macdiarmid *et al.*, 2009, Nicklas *et al*. 1993). Breakfast has been reported to be skipped more often than other meals (Rampersaund *et al.*, 2005). In contrast to these

studies, we found that even 95% of girls and 96% of boys had breakfast every day. In the present study, about three quarters of the children ate lunch and about half of the children ate dinner daily. Eating lunch is more regular most likely because practically all children eat the free school lunch on school days. Because children from low socioeconomic background were more likely to skip main meals, free school lunch may be particularly important for them. Free school lunch also increases the consumption of fish, vegetables, vegetable oil-based margarine, fibre-rich bread and skimmed milk across all socioeconomic groups (National Nutrition Council 2008). Regular meal frequency has been shown to be important in preventing weight gain (Würbach *et al.*, 2009), and omitting main meals has been found to indicate less healthy food choices and nutrient intakes in adolescents (Sjöberg *et al*., 2003).

Based on Nordic Nutrition Recommendations children should have 2–3 snacks daily and receive 25–35% of daily energy from snacks (Nordic Council of Ministers, 2004). In other studies from Finland (Hoppu *et al*., 2008) and from other European countries (Adams *et al.* 2005, Sjöberg *et al*. 2003), adolescents aged 11–16 years derived 35–44% of daily energy from snacks. However, there is limited data on energy intake from snacks among younger children. In the present study, 42% of daily energy intake was received from snacks. Energy derived from snacks seems to vary with age and region and to be rather high among young school children in Finland. In addition, snacks were higher in sucrose than main meals. Snacks are an important source of energy and many nutrients for all, but especially young children, as they cannot eat large amounts at main meals (Nordic Council of Ministers, 2004). However, dietary quality of snacks should be improved to meet the needs of nutrients.

A strength of the present study is that we used four-day food records to assess dietary intakes and eating frequency among children. Although the four-day food record is considered the most valid method to assess diet at population level (Buzzard, 1998), misreporting when using food record is still possible. In the present study, 21.9% of the girls and 26.4% of the boys can be considered underreporters of total energy intake when comparing dietary energy intake with energy intake calculated by a formula of 1.39xBMR (basal metabolic rate) – 2.24xBMR in boys and 1.30xBMR – 2.10xBMR in girls (Torun *et al*., 1996). It has been shown that underreporting does not affect the proportions of energy nutrients (Hirvonen *et al*., 1997). To reduce the effect of underreporting, the micronutrient intakes were adjusted for total energy intake.

The present study shows that important components of diet do not meet dietary recommendations among Finnish primary school children. Especially children with low socioeconomic position are

less likely to eat as recommended than children with high socioeconomic position. More attention should be paid also on regular main meal consumption and the quality of snacks in children. These results should be taken into account in nutrition policy, healthcare and education programs targeted to primary school children.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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Table 1. Intakes of energy, energy nutrients, fibre, vitamins and minerals in girls and boys, and the recommended values.

		Girls (n=211)			Boys (n=213)			
	Recommended intake[1]	Mean (SD)	Median (IQR)	% meeting recommended intake	Mean (SD)	Median (IQR)	% meeting recommended intake	P^2
Energy, kcal	1630–1770 (girls) 1770–1960 (boys)	1545 (279)	1527 (1371–1714)	15.6	1735 (309)	1749 (1503–1970)	18.8	**<0.001**
Fat, E%	25–35	29.7 (5.1)	29.3 (25.8–32.8)	70.6	30.3 (5.2)	30.5 (26.7–33.9)	65.7	0.201
Saturated fat, E%	< 10	12.0 (2.8)	11.9 (10.1–14.0)	23.7	12.3 (2.8)	12.1 (10.1–14.2)	23.5	0.337
Monounsaturated fat, E%	10–15	9.8 (1.8)	9.6 (8.7–10.8)	38.9	10.1 (1.9)	10.0 (8.6–11.4)	48.4	0.148
Polyunsaturated fat, E%	5–10	4.9 (1.3)	4.7 (4.1–5.5)	37.0	5.0 (1.3)	4.8 (4.0–5.7)	42.7	0.443
Protein, E%	10–20	16.7 (2.3)	16.7 (15.2–18.3)	92.4	16.9 (2.6)	16.6 (15.0–18.5)	89.2	0.522
Carbohydrates, E%	50–60	52.2 (4.8)	52.5 (49.3–55.4)	65.4	51.4 (5.5)	51.1 (47.7–55.2)	51.6	0.108
Sucrose, E%	< 10	12.6 (3.4)	12.4 (10.5–14.4)	20.4	12.6 (3.9)	12.5 (10.1–15.0)	23.9	0.983
Fibre								
g		14.0 (3.9)	13.7 (11.2–15.9)		14.8 (4.2)	14.4 (11.9–16.9)		**0.036**
g/MJ	3	2.2 (0.6)	2.1 (1.8–2.5)	11.4	2.1 (0.6)	2.0 (1.6–2.4)	7.0	**0.029**
Vitamin D								
µg	7.5	5.5 (1.7)	5.5 (4.3–6.5)	12.3	6.3 (2.4)	6.0 (4.4–7.6)	27.2	**0.001**
µg/MJ	1.0	0.9 (0.3)	0.8 (0.7–1.0)	28.0	0.9 (0.3)	0.8 (0.6–1.1)	28.2	0.976
Vitamin E								
mg	6.0	6.4 (1.7)	6.3 (5.4–7.4)	57.3	7.1 (2.1)	7.0 (5.7–8.3)	69.0	**<0.001**
mg/MJ	0.9	1.0 (0.2)	1.0 (0.8–1.1)	62.6	1.0 (0.2)	0.9 (0.8–1.1)	60.1	0.395
Folate								
µg	130	186 (45.5)	185 (153–213)	89.1	195 (52.4)	192 (153–227)	90.6	**0.039**
µg/MJ	45.0	28.9 (6.2)	28.5 (24.4–33.1)	0.5	27.0 (6.4)	26.3 (22.6–30.5)	0.9	**<0.001**
Vitamin C								
mg	40.0	86.3 (38.4)	75.0 (57.4–114)	92.9	86.9 (48.8)	78.2 (52.8–108)	89.2	0.484
mg/MJ	8.0	13.5 (6.1)	11.9 (9.0–17.2)	81.5	12.0 (6.7)	10.5 (7.3–15.1)	71.4	**0.001**
Sodium								
mg		2236 (435)	2238 (1967–2515)		2590 (600)	2531 (2128–2981)		**<0.001**
mg/MJ		348 (54.2)	348 (311–382)		358 (64.7)	350 (313–390)		0.194
Sodium chloride								
g		5.4 (1.0)	5.4 (4.7–6.0)		6.2 (1.4)	6.1 (5.1–7.2)		**<0.001**
g/MJ	< 0.5	0.8 (0.1)	0.8 (0.7–0.9)	0.5	0.9 (0.2)	0.8 (0.8–0.9)	0.9	0.194
Potassium								
mg	2 000	2 799 (576)	2819 (2424–3138)	92.4	3 048 (689)	3047 (2618–3496)	93.9	**<0.001**
mg/MJ	350	435 (72.8)	432 (383–485)	87.2	421 (77.0)	409 (368–464)	83.1	**0.047**
Calcium								
mg	700	1099 (307)	1095 (899–1297)	91.0	1240 (368)	1254 (1004–1495)	91.5	**<0.001**

mg/MJ	100	171 (42.2)	170 (145–201)	93.4	170 (43.0)	173 (142–201)	94.8	0.901
Iron								
mg	9.0	7.8 (1.8)	7.7 (6.7–8.8)	21.8	8.7 (2.2)	8.6 (7.2–10.0)	43.2	**<0.001**
mg/MJ	1.6	1.2 (0.3)	1.2 (1.0–1.3)	6.2	1.2 (0.3)	1.2 (1.1–1.3)	8.0	0.706
Magnesium								
mg	200	256 (50.7)	254 (224–290)	87.2	281 (59.3)	276 (241–321)	91.1	**<0.001**
mg/MJ	35.0	39.8 (6.3)	39.0 (35.7–44.2)	79.1	38.8 (6.1)	38.7 (34.8–42.0)	74.1	0.153
Zinc								
mg	7.0	9.3 (1.8)	9.3 (8.0–10.5)	90.5	10.5 (2.2)	10.5 (8.9–12.2)	95.8	**<0.001**
mg/MJ	1.1	1.4 (0.2)	1.4 (1.3–1.6)	95.8	1.5 (0.2)	1.5 (1.3–1.6)	95.8	0.654

[1] Recommended means for long-term nutrient intakes (National Nutrition Council 2005).

[2] Difference in means between girls and boys tested with T-test for independent samples and Mann-Whitney's U-test.

SD, standard deviation. IQR, interquartile range.

Table 2. Food consumption in girls and boys.

	Girls, % (n)	Boys, % (n)	P^1
Milk or sour milk			
Skimmed milk or sour milk	63.3 (93)	66.7 (92)	
Milk or sour milk, ≥ 1.0% of fat	30.6(45)	28.3 (39)	
Doesn't drink milk or sour milk	6.1 (9)	5.1 (7)	0.819
Cheese			
≤ 17% of fat	61.2 (90)	48.6 (67)	
> 17% of fat	24.5 (36)	34.1 (47)	
Does not eat cheese	14.3 (21)	17.4 (24)	0.093
Cold cuts and sausages on bread			
Whole meat cuts, ≤ 4% of fat	68.0 (100)	63.8 (88)	
Sausages, ≤ 12% of fat	5.4 (8)	10.1 (14)	
Sausages, > 12% of fat	12.2 (18)	16.7 (23)	
Does not eat cold cuts or sausages	14.3 (21)	9.4 (13)	0.202
Yoghurts			
Fat-free	20.4 (30)	17.4 (24)	
≥ 2% of fat	64.6 (95)	71.0 (98)	
Does not eat yoghurts	15.0 (22)	11.6 (16)	0.502
Spread on bread			
Vegetable oil-based margarine, 23–70% of fat	73.5(108)	66.7 (92)	
Butter or butter-oil-mixture or does not use	26.5 (39)	33.3 (46)	0.210
Fish			
≥ 2 times / week	42.2 (62)	43.5 (60)	
< 2 times / week	57.8 (85)	56.5 (78)	0.824
Vegetables, fruit and berries[2]			
≥ 5 portions / day	4.1 (6)	3.6 (5)	
4 portions / day	8.8 (13)	12.3 (17)	
3 portions / day	34.7 (51)	27.5 (38)	
2 portions / day	34.7 (51)	37.0 (51)	
≤ 1 portion / day	17.7 (26)	19.6 (27)	0.688
Bread			
Rye bread or wholegrain bread, ≥ 5% of fibre	88.4 (130)	88.4 (122)	
White bread, < 5% of fibre	11.6 (17)	11.6 (16)	0.994
Sugar-sweetened drinks (juice, soft drinks, chocolate)			
once / week or less	16.3 (24)	17.4 (24)	
2–6 times / week	57.1 (84)	53.6 (74)	
daily	26.5 (39)	29.0 (40)	0.835
Puddings and ice cream			
once / week or less	60.5 (89)	65.9 (91)	
2–5 times / week	35.4 (52)	28.3 (39)	
≥ 6 times / week	4.1 (6)	5.8 (8)	0.390

[1] Difference between boys and girls from Pearson's χ^2-test.

[2] 1 portion = e.g. 1 dl of salad, 1 dl of berries, 1 small fruit.

Table 3. Odds ratios (95% confidence intervals) of consuming selected food items as recommended.

	Skimmed milk[1] OR (95% CI)	**Soft margarine on bread**[2] OR (95% CI)	**Fish ≥2 times/week** [3] OR (95% CI)	**Bread ≥ 5% of fibre** [4] OR (95% CI)
Family income				
≤ 30000€ (n=58)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
30001–60000 € (n=110)	1.94 (0.97–3.86)	0.62 (0.30–1.27)	1.94 (0.98–3.82)	0.59 (0.22–1.58)
≥60001€ (n=111)	**2.43 (1.21–4.88)**	0.82 (0.39–1.70)	**2.21 (1.12–4.36)**	1.49 (0.49–4.55)
P for trend	**0.017**	0.956	**0.032**	0.314
Parental education				
vocational school or less (n=54)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
vocational high school (n=128)	1.32 (0.66–2.67)	0.69 (0.32–1.49)	**2.69 (1.34–5.43)**	**2.57 (1.11–5.92)**
university (n=101)	1.30 (0.63–2.69)	**0.43 (0.20–0.94)**	**2.20 (1.06–4.54)**	**5.06 (1.80–14.29)**
P for trend	0.536	**0.023**	0.094	**0.002**

Logistic regression analyses adjusted for gender.

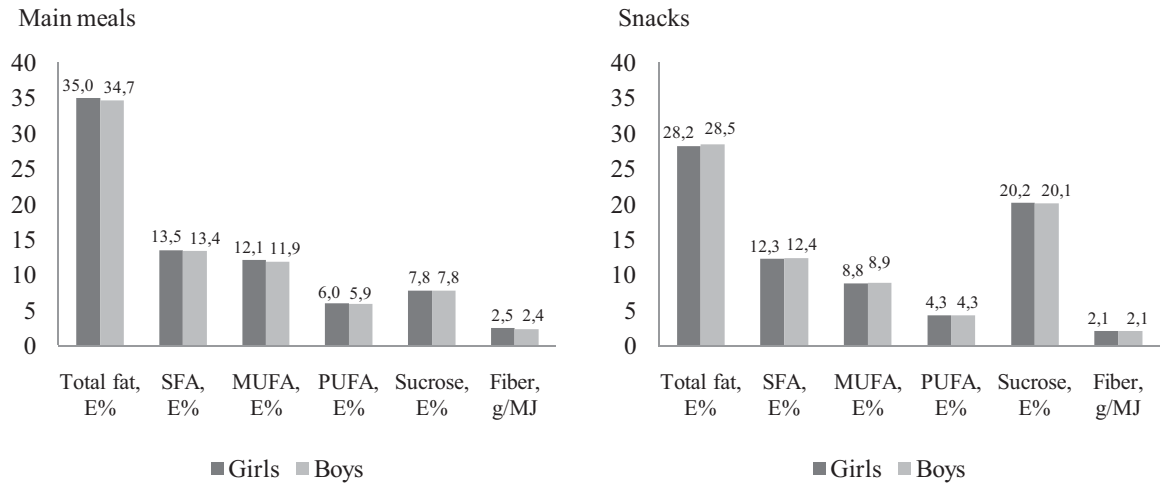
[1]Milk encoded as 0=other than skimmed milk, 1=skimmed milk. Children who did not drink milk were excluded.

[2]Spread on bread encoded as 0=butter or butter-oil-mixture, 1=vegetable oil-based margarine, 23–70% of fat. Children who did not use spread on bread were excluded.

[3]Fish encoded as 0=<2 times/week, 1=≥2 times/week.

[4]Bread encoded as 0=white bread, <5% of fibre, 1=rye bread or wholegrain bread, ≥5% of fibre.

Figure 1. Proportion of total fat, saturated, monounsaturated and polyunsaturated fatty acids and sucrose from total energy intake as well as fibre density from main meals and snacks in girls and boys.



SFA, saturated fatty acids; MUFA, monounsaturated fatty acids; PUFA, polyunsaturated fatty acids.
No significant differences were found between girls and boys.