

# Dietary habits and nutrient intake of Finnish adolescents

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## Abstract

*Objective:* To evaluate food and nutrient intake and especially eating during the school day among Finnish secondary-school pupils.

*Design:* Cross-sectional study. Data were collected using a structured questionnaire mailed to home and by 48 h dietary recall interviews performed at schools in 2007.

*Setting:* Twelve schools in three cities in Finland.

*Subjects:* The seventh grade pupils (a total of 1469 at the mean age of 13·8 years). Questionnaire data were available from 726 pupils and dietary data from a subgroup of 40% (*n* 306).

*Results:* According to the questionnaire data, 40% of the girls and 28% of the boys reported eating fresh vegetables daily and the respective figures for fruit were 32% and 23%. Altogether, 71% of the adolescents reported having school lunch every day. The average intake of sucrose was higher and the average intakes of fibre, iron, folate and vitamin D were lower than recommended. School lunch provided around 20% of daily energy intake, while the recommended daily energy intake level is one-third. However, the school lunch as consumed was nutritionally superior to the other daily meals. Snacks provided 41% of the daily energy. The most common sources of sucrose were sugary drinks.

*Conclusions:* Low consumption of fruit and vegetables and abundant consumption of sucrose-rich drinks and snacks are the main problems in the diet of Finnish adolescents. The nutritional quality of the school lunch is good, but the supply of healthy snacks must be improved in schools. Schools can promote healthy eating habits by making healthy choices easy during the school day.

**Keywords**  
Adolescents  
Nutrient intake  
School meals

Finnish adolescents are facing the same health problems as adolescents in all Western countries. The prevalence of overweight and obesity has been increasing during the last decades, including in Finland<sup>(1)</sup>. Decreased physical activity and increased consumption of snacks, such as sweets, sugar-sweetened drinks and fast foods, may have contributed to this trend<sup>(2)</sup>. The diet of Finnish adults has been systematically monitored over many years, but the data on the diet of Finnish children and adolescents are scarce. Some questionnaire-based national studies, such as the School Health Promotion Study<sup>(3)</sup>, have included only a few questions concerning food habits and the school meals of adolescents. Detailed, representative and systematically collected information on the dietary intake of Finnish adolescents is lacking.

Finland was the first country in the world to provide free school meals, in 1948<sup>(4)</sup>. Nowadays free school lunch is offered to every pupil in primary education (grades 1–9) as well as in upper secondary or vocational schools on each school day. The new dietary guidelines for school meals by the National Nutrition Council in Finland were published in spring 2008<sup>(5)</sup>. The municipalities are

responsible for organising and monitoring school meals. There are great differences in the financial and practical resources for school catering between municipalities.

According to the guidelines<sup>(5)</sup>, the school lunch should provide about one-third of daily energy intake. The proportions of energy nutrients should be as follows: proteins 15%, fats 30% and carbohydrates 55%. The nutrient composition of the meals should be monitored by calculating the nutrient density – the amounts of some indicator vitamins and minerals per MJ. The school meal should contain all the components of a well-balanced meal: a main course, salad, bread and milk. The lunch is preferably served between 00·11 and 00·12 hours, and the time for eating should be at least half an hour. School canteens have self-service system, and therefore pupils can choose their own meals. Teachers or catering personnel usually supervise and assist only the youngest schoolchildren. Special diets are offered for those with food allergies or other special dietary requirements.

In 2007, the National Board of Education and the National Public Health Institute recommended that the selling of sweets, soft drinks and sugary juices should not

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be allowed in schools<sup>(6)</sup>. However, it is still common for unhealthy snacks and drinks to be sold in schools from vending machines or from kiosks or canteens, often run by students' unions<sup>(7)</sup>. Currently only a few school catering services offer free snacks or sell healthy snacks to pupils during the afternoon school hours. The policies concerning the selling of snacks and drinks depend on the local decision-makers, usually the head teachers of the schools.

The aim of the present study was to evaluate food and nutrient intake, and especially eating patterns during the school day (school lunch and snacks), among Finnish secondary-school pupils. This was a baseline study for an intervention study that aimed to improve the eating habits of adolescents. Only the baseline data are presented in this article, but the results of the intervention have been published in the final report of the project<sup>(8)</sup>.

## Subjects and methods

The study was approved by the ethical committee of the Hospital District of Helsinki and Uusimaa. In total, twenty-three schools in four cities around Finland were invited to participate in the study. The schools were selected based on their size: each school had at least 100 pupils in the seventh grade. Letters explaining the study protocol were sent to the chief education officers of the cities and to the head teachers of the schools, and their approval to participate in the study was sought. In one city, all six schools refused to participate mainly because they had already participated in many projects and studies. Finally, twelve schools in three cities (Tampere, Lahti and Mikkeli) agreed to participate.

All the seventh grade pupils ( $n$  1469) in twelve study schools were invited to participate in the study. Introductory meetings about the study were organised for guardians and pupils, and letters explaining the study and consent forms were sent to pupils' homes. Written informed consent was obtained both from the adolescents and their guardians before the start of the study. A total of 769 pupils (52%) of the original sample agreed to participate. The study was performed in April–May 2007 and at that time the participants were on average 13.8 years old.

Structured questionnaires including questions about family, general health behaviour, eating habits and opinions about healthy eating were sent by post to the homes of the participants. In the questionnaire, the adolescents were asked to record the frequency of their consumption of selected foods and drinks during the past 7 days (five-category scale, ranging from never to more than once a day). The questionnaire also included questions about school lunch, snacks eaten at school and meals taken at home. Altogether, 726 adolescents (400 girls and 326 boys) returned their questionnaire after one reminder.

A field study with dietary interviews was performed at schools during school hours. Computer-assisted 48 h dietary recalls for a randomly selected 40% subgroup of the participants (final  $n$  306; 170 girls and 136 boys) were performed by trained nutritionists. A picture book of food portions was used to estimate portion sizes<sup>(9)</sup>. School meal menus were available to help the adolescents to remember foods eaten at school lunch. Nutritional data were entered and processed by the Finessi software that uses the Fineli<sup>®</sup> nutrition database (see article by Reinivuo *et al.* in this issue).

In the Results section, the general dietary habits at home and at school are presented based on the questionnaire data. Nutrient intakes are calculated as the mean values from the food intake data of the previous 2 days. Intake from dietary supplements is not included. Results are presented separately for boys and girls and intakes are compared to the Finnish Nutrition Recommendations<sup>(10)</sup>. Differences between the sexes were tested by  $\chi^2$  or Fisher's exact test for the questionnaire data. The nutrient intake data were not normally distributed and were tested by Mann–Whitney  $U$  test. All statistical analyses were performed with the SAS statistical software package version 8.2 (SAS Institute Inc., Cary, NC, USA).

## Results

### *Subject characteristics*

Sociodemographic and background characteristics of the subjects are presented in Table 1. Of the parents, one-fifth had a university degree and most worked outside the home. Two-thirds of the adolescents lived with their mother and father.

About half of the adolescents had 5–10€ pocket money per week and about one-third had <5€. The distance from home to school was <3 km in 54% of the adolescents. Almost 90% of the adolescents reported that their health was very or fairly good at the moment.

### *Frequency of food consumption and dietary habits at home*

According to the questionnaire data, the consumption of fresh vegetables and fruit was generally low. Of the girls, 40% reported eating fresh vegetables and 32% eating fruit daily. Among boys, the respective figures were 28% and 23%. Every tenth boy and 4% of the girls also reported that they had not eaten any vegetables or fruit during the previous 7 d period. Approximately one-third of the adolescents reported having eaten rye bread daily.

Boys (81%) reported eating breakfast daily more often than girls (69%). One-tenth of the girls and 5% of the boys reported having breakfast seldom or never. Dinner (a hot meal) in the evening was eaten by 79% of the boys and 71% of the girls daily; less than half of families had dinner together.

### School lunch

In total, 71% of the adolescents reported having school lunch every day and 22% reported 3–4 times per week. However, not all components of the school lunch were always eaten (Fig. 1). Most boys and girls reported that they usually ate the main course and approximately 70% ate the bread. Girls reported eating a salad more often but drinking milk less often than boys. Only one-quarter of the girls and one-third of the boys reported eating all the different components of the school lunch, which in addition to the main course included salad, bread and milk.

In total, 45% of the adolescents responded that the school lunch tasted good or fairly good. The most common reasons for not eating the lunch were not liking the food or not being hungry. Time spent eating lunch was usually very short – 82% of the pupils reported eating their lunch in < 15 min.

**Table 1** Sociodemographic and background characteristics of the subjects according to questionnaire data

	Girls (n 400)	Boys (n 326)
	%	%
Parental education		
Mother with university degree	19	22
Father with university degree	20	22
Parental employment		
Mother working outside the home	82	84
Father working outside the home	88	88
Living in the same household with		
Mother and father	64	72
Single mother	20	16
Mother and stepfather	11	9
Single father or other guardian	4	3
Pocket money per week		
< 5 €	30	35
5–10€	51	49
≥ 11€	19	16
Distance to school		
< 3 km	55	54
≥ 3 km	45	46

The adolescents were also asked about how to improve the school lunch. They wanted better-tasting main courses (69%), and fresh bread (47%) and desserts (50%) to be served more often. Girls wanted a greater variety of salads and boys wanted to have a longer lunch break. They also wished that queuing times were shorter.

### Snacks during the school day

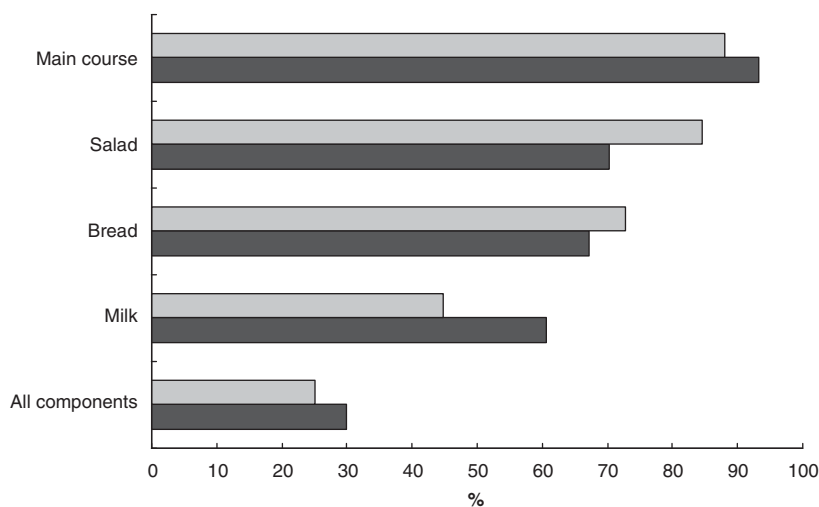
Consumption of sugary snacks and drinks at school was found to be very common among adolescents. According to the questionnaire data, the most commonly consumed snacks during school time were sweets or chocolate (35%) and bread (34%). Girls ate cereal bars and fruit more often than boys, whereas boys more frequently drank sugary soft drinks. The snacks were bought from the canteen, kiosk or vending machines at school, from shops outside the school grounds, or were brought in from home.

It was found that school policies had a strong impact on snack consumption, and there were great differences between the schools. If unhealthy options were readily available, they were also commonly chosen. For example, sweets and soft drinks were the most commonly consumed snacks at one school where pupils were permitted to leave the school grounds during the lunch break, and many pupils went to buy sweets from the local shops. There were also soft-drinks vending machines at the school premises. On the other hand, sandwiches were commonly eaten as a snack at schools where the selling of snacks was organised by school catering services and healthy options such as milk, yoghurt and fruit were available at a low price.

### Nutrient intakes

The intakes of energy providing nutrients in girls and boys are presented in Table 2. The energy intakes of both boys and girls were lower than the reference values for this age group.

The intakes of carbohydrates, proteins and total fat were in the recommended range, but the intake of SFA



**Fig. 1** Proportion (%) of girls (□) and boys (■) eating different components of the school lunch

**Table 2** Daily intakes of energy and energy-providing nutrients

	Girls (n 170)		Boys (n 136)		Recommendation	P value*
	Mean	SD	Mean	SD		
Energy (MJ)	6.7	2.0	8.3	2.3	9.5/10.8	0.001
Energy (kcal)	1602	479	1978	553	2270/2580	0.001
Protein (g)	62	18	80	24		0.001
Protein (E%)	16.0	3.0	16.7	3.2	10–20	
Carbohydrate (g)	209	68	255	77		0.001
Carbohydrate (E%)	54.1	7.1	53.2	7.0	50–60	
Sucrose (g)	50	33	64	38		0.001
Sucrose (E%)	12.3	6.4	13.0	6.4	<10	
Fibre (g)	16.6	7.6	16.9	7.7		
Fibre (g/MJ)	2.5	1.0	2.0	0.7	3	0.001
Fat (g)	55	23	68	25		0.001
Fat (E%)	29.8	6.9	30.0	6.5	25–35	
SFA (g)	21.0	10.4	27.0	11.2		0.001
SFA (E%)	11.5	3.5	11.8	3.4	10	
MUFA (g)	20.0	8.8	25.0	9.7		0.001
MUFA (E%)	10.9	3.0	10.9	2.6	10–15	
PUFA (g)	9.6	4.2	11.8	4.8		0.001
PUFA (E%)	5.3	1.7	5.2	1.5	5–10	
Trans FA (g)	0.68	0.44	0.81	0.40		0.001
Trans FA (E%)	0.37	0.18	0.36	0.13	<1	

FA, fatty acid.

\*Difference between sexes.

**Table 3** Daily intakes of vitamins from food

	Girls (n 170)		Boys (n 136)		Recommendation	P value*
	Mean	SD	Mean	SD		
Vitamin A (µg)†	537	472	524	370	700/900	
Vitamin A (µg/MJ)†	81	71	64	48	80	0.01
Vitamin D (µg)	5.0	2.8	6.6	3.8	7.5	0.001
Vitamin D (µg/MJ)	0.75	0.39	0.79	0.40	1	
Vitamin E (mg)‡	7.1	2.7	8.1	3.1	8/10	0.01
Vitamin E (mg/MJ)‡	1.1	0.28	0.97	0.25	0.9	0.01
Vitamin K (µg)	77	35	82	38	–	
Vitamin K (µg/MJ)	11.6	4.5	10.0	4.2	–	0.01
Thiamin (mg)	1.1	0.43	1.3	0.58	1.2/1.5	0.001
Thiamin (mg/MJ)	0.16	0.05	0.17	0.07	0.12	
Riboflavin (mg)	1.7	0.67	2.2	0.89	1.3/1.7	0.001
Riboflavin (mg/MJ)	0.25	0.08	0.27	0.10	0.14	
Niacin (mg)§	22	6.7	28	10	15/20	0.001
Niacin (mg/MJ)§	3.3	0.69	3.4	0.88	1.6	
Pyridoxine (mg)	1.6	0.59	2.1	1.3	1.3/1.6	0.001
Pyridoxine (mg/MJ)	0.24	0.08	0.25	0.12	0.13	
Folate (µg)	190	73	203	69	300	0.05
Folate (µg/MJ)	29	8.6	25	6.4	45	0.001
Vitamin B <sub>12</sub> (µg)	3.9	2.4	5.3	2.7	2	0.001
Vitamin B <sub>12</sub> (µg/MJ)	0.60	0.34	0.65	0.30	0.2	0.05
Vitamin C (mg)	93	60	87	59	75	
Vitamin C (mg/MJ)	14.1	8.5	10.6	6.8	8	0.001

\*Difference between sexes.

†Retinol equivalent.

‡Alphatocopherol.

§Niacin equivalent.

exceeded the recommended level. The intake of sucrose was higher and the intake of fibre was lower than recommended. The most common sources of sucrose were sugary juices and soft drinks; 36% and 28% of the sucrose intake in boys and girls, respectively, were from these drinks.

The average intakes of vitamin D, folate and iron from food per unit of energy (MJ) fell below the recommended

levels in both boys and girls (Tables 3 and 4). In addition, the average intake of vitamin A was below the recommendation among boys.

#### **Nutrient intakes from different meals**

During school days, around 20% of daily energy intake was derived from the school lunch (Table 5), compared

**Table 4** Daily intakes of salt and minerals from food

	Girls ( <i>n</i> 170)		Boys ( <i>n</i> 136)		Recommendation	<i>P</i> value*
	Mean	SD	Mean	SD	Girls/boys	
Salt (g)	5.5	1.8	7.1	2.2	6/7	0.001
Salt (g/MJ)	0.83	0.17	0.87	0.17	–	
Potassium (g)	3.0	0.99	3.6	1.1	3.1/3.5	0.001
Potassium (g/MJ)	0.46	0.10	0.45	0.11	0.35	
Phosphorus (mg)	1277	421	1596	515	700	0.001
Phosphorus (mg/MJ)	193	43	196	47	80	
Calcium (mg)	1032	428	1273	553	900	0.001
Calcium (mg/MJ)	156	53	157	60	100	
Magnesium (mg)	278	89	325	99	280/350	0.001
Magnesium (mg/MJ)	42	9.6	40	9.0	35	0.050
Iron (mg)	8.9	3.1	10	3.3	15/11	0.001
Iron (mg/MJ)	1.35	0.33	1.27	0.29	1.6	0.050
Selenium (μg)	51	16.2	67	21	40/50	0.001
Selenium (μg/MJ)	7.7	1.7	8.2	1.6	4	0.010
Zinc (mg)	9.4	3.0	12.0	3.8	9/12	0.001
Zinc (mg/MJ)	1.4	0.31	1.5	0.36	1.1	
Copper (mg)	1.1	0.40	1.2	0.38	0.9	0.001
Copper (mg/MJ)	0.16	0.04	0.15	0.03	0.1	0.001
Iodine (μg)	190	67	248	86	150	0.001
Iodine (μg/MJ)	29	7.8	30	8.0	17	

\*Difference between sexes.

**Table 5** Nutrient intakes from different meals during schooldays

	Breakfast		School lunch		Dinner		Snacks		Recommendation
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Girls	<i>(n</i> 126)		<i>(n</i> 132)		<i>(n</i> 122)		<i>(n</i> 136)		
Energy (kJ)	1147	565	1269	547	1986	978	2806	1421	
Protein (E%)	14.5	5.2	19.9	6.2	22	6.1	12.4	4.7	10–20
Carbohydrate (E%)	62	15.7	50	11.8	44	10.7	60	12.8	50–60
Sucrose (E%)	13.5	11.3	3.7	5.1	3.7	4.9	17.5	11	10
Fibre (g/MJ)	3.3	2.2	3.7	2.1	2	1.1	2.7	1.5	3
Fat (E%)	23	14	30	12.5	34	11	27	11.4	30
SAFA (E%)	10	6.9	8.8	4.4	11.8	5.1	11.6	5.8	10
MUFA (E%)	7.7	6	12.4	6.1	13.1	5	9.4	4.8	10–15
PUFA (E%)	3.7	2.7	6.8	3.4	6.5	3	4.4	2.5	5–10
Folate (μg/MJ)	34	20	39	21	30	21	25	11.5	45
Vitamin C (mg/MJ)	20	32	18	25	9.7	7.3	13.6	15.2	8
Salt (g/MJ)	0.73	0.36	1.1	0.32	1.2	0.41	0.6	0.24	
Calcium (mg/MJ)	213	128	150	258	160	87	161	87	100
Iron (mg/MJ)	1.5	0.79	2	0.98	1.7	0.96	1.1	0.43	1.6
Proportion of the meal of the total daily energy (%)	16.5	6.3	19.3	7.6	29.4	11.6	40.9	14.9	–
Boys	<i>(n</i> 101)		<i>(n</i> 102)		<i>(n</i> 97)		<i>(n</i> 105)		
Energy (kJ)	1301	575	1687	724	2315	838	3481	1783	
Protein (E%)	14.2	4.8	22	5.8	23	5.7	12.4	4.5	10–20
Carbohydrate (E%)	64	12.8	47	9.2	44	9.7	61	11.9	50–60
Sucrose (E%)	16.4	14.3	2.5	3.8	4.7	7.2	22	13.8	10
Fibre (g/MJ)	2.4	1.6	2.9	1.5	1.7	0.96	2	1.17	3
Fat (E%)	22	10.9	31	9.7	34	8.6	26	9.7	30
SAFA (E%)	10.4	6.5	10	3.6	11.7	4.5	11.7	5.0	10
MUFA (E%)	6.9	4	1.5	5	12.8	4	8.8	3.7	10–15
PUFA (E%)	3.2	2.1	6.2	3.2	6.1	2.9	4.2	2.6	5–10
Folate (μg/MJ)	29	19	36	10.5	28	18.3	21	9.2	45
Vitamin C (mg/MJ)	16.9	30	13	9.9	9.6	9.1	10.9	11.7	8
Salt (g/MJ)	0.8	0.43	1.2	0.33	1.2	0.36	0.61	0.24	
Calcium (mg/MJ)	199	104	172	108	152	85	158	83	100
Iron (mg/MJ)	1.3	0.69	1.7	0.54	1.6	0.58	1	0.36	1.6
Proportion of the meal of the total daily energy (%)	16	6.1	20.4	8.1	28.2	8.6	40.8	15.7	

to a recommended daily energy intake level of one-third. However, the nutrient density of the school lunch met the recommendations. Both among girls and

boys, 41% of daily energy intake came from snacks, including drinks. Snacks contained large amounts of sucrose (Table 5).

When the proportions of energy providing nutrients and nutrient densities of different meals (breakfast, school lunch, dinner and snacks) during school days were compared, it was found that the nutritional quality of the school lunch was superior to that of other daily meals. The quantity and quality of fat were good in the school lunch, and the school lunch was a better source of fibre, folate, vitamin C and iron than the family dinner.

## Discussion

When compared to the dietary intake of adults and pre-school children in Finland (see other articles in this issue), the nutritional challenges of Finnish adolescents resemble those of the other age groups. Low intakes of vitamin D, folate and fibre and low consumption of fruit and vegetables are common in all age groups. Furthermore, the differences between sexes in food habits were noticeable among adolescents. These differences may be partly explained by different taste preferences, e.g. girls have been found to like fruit and vegetables more than boys, whereas boys seem to prefer fatty and sugary foods<sup>(11)</sup>.

In other European countries, adolescents' intakes of calcium, iron and zinc have been observed to be lower than recommended<sup>(12–14)</sup>. In Finland, the consumption of milk products is abundant, and therefore, calcium intake is sufficient on average. Increasing the consumption of vegetables and fruit and wholemeal bread and cereals would improve the intakes of fibre and folate among Finnish adolescents. Dietary vitamin D is especially important in Northern European countries where exposure to sunlight is limited, and therefore, vitamin D has been added to milk since 2003 and to fat spreads since the 1950s. However, the situation is still not satisfactory, and new strategies to improve vitamin D levels by fortification or supplementation have been proposed<sup>(15)</sup>. Adequate vitamin D intake is essential during puberty for reaching the maximum peak bone mass<sup>(16)</sup>. Low energy intake of adolescents in the present study may be explained by under-reporting, which has been found to be common at this age, specifically among girls<sup>(17)</sup>.

The weakness of the present study is the low participation rate of only 52%. It is possible that the selection bias may have affected the results and the situation may be even worse among non-participants. Motivating adolescents to participate is a challenge, and response rates have also been found to decline notably in questionnaire studies of Finnish adolescents during the past decades<sup>(18)</sup>. Furthermore, school studies requiring active parental consent have generally produced low participation rates, and improving the participation rates may require the use of monetary incentives both for teachers and pupils<sup>(19)</sup>.

Free school meals prepared according to national recommendations form a good basis for the diet of children and adolescents in Finland, compared to many other

countries where pupils have to pay for their school lunch, go home to eat during the lunch hour or have to take their packed lunch to school<sup>(14)</sup>. In addition, the nutritional quality of school meals in other European countries does not often meet the dietary recommendations; specifically, total and saturated fat contents have been found to be high<sup>(20)</sup>. Furthermore, the quality of packed lunches may be even worse<sup>(21)</sup>. The nutritional quality of Finnish school meals was found to be good in the present study and, in fact, the school lunch was the most nutritious meal of the day, better than the family dinner.

As previous studies in Finland have already found<sup>(22)</sup>, it is of concern that not all adolescents eat the school lunch daily and that many do not eat all components of the lunch. In the present study, girls did not eat breakfast or dinner daily than boys. Skipping meals was not so common among 10–11-year-old Finnish children<sup>(23)</sup>, and therefore, it seems to increase with increasing age. Among Swedish adolescents, skipping main meals was found to be associated with poorer nutrient intake<sup>(24)</sup>. Family meals have been associated with better nutritional quality of the diet and healthier meal patterns<sup>(25)</sup>. Therefore, encouraging the consumption of proper meals and decreasing the consumption of snacks would improve the diet of Finnish adolescents.

Unhealthy dietary habits of children and adolescents are of concern in all European countries. Therefore, the European Union has started a special school fruit programme to promote fruit and vegetable consumption in the member states<sup>(26)</sup>. Compared to many other countries, consumption of vegetables and fruit is very low among Finnish adolescents. In the Health Behaviour of School-aged Children study, which included forty-one countries and regions, the daily fruit consumption of 15-year-olds was among the lowest in Finland. In Finland, only 28% of the girls and 14% of the boys reported eating fruit daily compared to Italy where the figures were 47% and 37%, respectively<sup>(27)</sup>. Furthermore, the consumption of fruit and vegetables seems to decrease with age<sup>(28)</sup>, and therefore, the promotion of their consumption among adolescents is very important. Increasing the supply of fruit and vegetables at school could also diminish socio-economic differences in food consumption<sup>(29)</sup>.

As seen in the present study, the consumption of sugary snacks and drinks that contribute to a high intake of sucrose occurs frequently in the diet of Finnish adolescents. High sucrose intake has generally been associated with poor quality of diet<sup>(30)</sup>. Consumption of unhealthy snacks was very common during school hours. School food environment and policies have been shown to have a strong impact on the food habits of pupils<sup>(31,32)</sup>. Schools should promote the adoption of healthy eating habits not only through education, but also by making healthy choices easy during the school day. Unhealthy snacks sold in schools, especially soft drinks and sweets, should be replaced by healthier options<sup>(33)</sup>.

Dietary habits are established early in life and show long-term stability<sup>(34)</sup>. Therefore, nutrition interventions should be targeted at children and adolescents. Parents are responsible for providing healthy food at home and their involvement and role-model setting for healthy eating is crucial<sup>(35)</sup>. In Finland, the STRIP intervention project has shown good results by repeated nutritional counselling from early childhood<sup>(36)</sup>. Beyond the home environment, schools are an ideal place to support healthy eating through the provision of well-balanced school meals and health education<sup>(37)</sup>.

In the future, systematic monitoring of health and nutrition of Finnish children and adolescents will be needed. The basic monitoring strategies, e.g. weight monitoring, could be organised within the school health-care system. In addition, detailed nutrition monitoring would need systematic and representative studies. Development and validation of dietary survey methodology, e.g. FFQ and data collection via Internet, for different age groups are also urgently needed<sup>(38)</sup>.

In conclusion, free school meals and well-organised school catering systems offer unique potential for improving the dietary habits of Finnish adolescents. Schools offer a good framework for promoting healthy eating, especially if more financial resources to improve the quality and taste of school meals are made available. Decision-makers in municipalities need more information on the health benefits of good school meals and they should allocate enough financial resources to improve school meals. Assuring adequate financial resources for school meals is a good investment for public health.

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