

Socio-economic and demographic variations in school lunch participation of French children aged 3–17 years

Carine Dubuisson^{1,*}, Sandrine Lioret¹, Ariane Dufour¹, Gloria Calamassi-Tran¹, Jean-Luc Volatier², Lionel Lafay¹ and Dominique Turck³

¹French Agency for Food, Environmental and Occupational Health Safety (ANSES), Direction of Risk Assessment for Nutrition and Food Safety, Dietary Survey Unit – Nutritional Epidemiology, 27–31 Avenue du Général Leclerc, 94701 Maisons Alfort Cedex, France: ²French Agency for Food, Environmental and Occupational Health Safety (ANSES), Office of Scientific Support for Risk Assessment, Maisons-Alfort, France: ³Department of Paediatrics, Jeanne de Flandre Children's Hospital and Lille University Faculty of Medicine, Lille, France

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Abstract

Objective: To assess school canteen attendance in a French nationally representative sample of children and to analyse its association with the socio-economic and demographic characteristics of the children and their families.

Design: Data from the second French national cross-sectional food consumption survey (INCA2), performed in 2006–2007, were used. Information on usual weekly school canteen attendance was collected through a self-reported questionnaire, and demographic and socio-economic variables through a face-to-face questionnaire. The associations between school canteen attendance and the socio-economic and demographic variables were investigated by multivariate logistic regression analyses.

Setting: The INCA2 sample was representative of the children aged 3–17 years in France.

Subject: Analysis was performed on 1413 schoolchildren who completed the school canteen attendance questions.

Results: Some 65.6% of schoolchildren aged 3–17 years had school lunch at least once weekly. This rate of attendance was positively correlated with age. Whatever the school level, school canteen attendance was positively associated with the educational level of the caregiver/parent. In pre- and elementary-school children, enrolment at the school canteen was also higher when the caregiver/parent worked, or in single-parent families. In secondary-school children, school lunch participation decreased with children living in more densely populated areas and increased with the level of the household's living standards.

Conclusions: School canteen attendance was positively associated with children's socio-economic background. This could reduce the effectiveness of the forthcoming school meal composition regulations designed to improve the diet of children from deprived backgrounds, who are more likely to have unhealthy food habits.

Keywords
School lunch
Education
France
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Children

To promote healthier eating behaviours and to tackle the increasing prevalence of overweight and obesity in the paediatric population, many industrialised countries have set up school nutrition policies⁽¹⁾. Controlling the availability of food items on school premises is one way to lead children and adolescents towards healthier food choices at lunchtime^(1–5) and may help to balance their energy intake⁽⁵⁾. In France, the school food environment has been included in national nutrition policies since the implementation of the first National Nutrition and Health Plan (PNNS1)⁽⁶⁾ in 2001. The morning snack was discouraged

in elementary schools in 2004 by a circular† from the Ministry of Education⁽⁷⁾, whereas beverages and food vending machines have been banned by law⁽⁸⁾ from school premises since 2005. In 2006, the second National Nutrition and Health Plan (PNNS2)⁽⁶⁾ proposed several actions dedicated to schools, among which was improving the nutritional quality of food offered. Indeed, balanced school meals must be provided in order to

† In France, a circular is a text issued by a ministry intended to be applied by public officers. It is not compulsory but acts as a recommendation.

*Corresponding author: Email carine.dubuisson@anses.fr

encourage schoolchildren to adopt healthier dietary patterns. In France, new national and compulsory regulations will define standards for school meal composition and portion size and will replace the national recommendations introduced on 25 June 2001 by an inter-ministerial circular^(9,10).

From a public health point of view, the impact of this regulation to improve the dietary habits of schoolchildren will depend first on the school canteen attendance rate and second on whether or not the children with unhealthy eating behaviours actually attend school canteens. Nearly six million French children aged 3–17 years took lunch at school, almost five days per week, in the late 1990s⁽¹¹⁾. The rate of school canteen attendance (at least three school lunches per week) in lower and upper secondary French schools was estimated at 67%, based on a national school survey conducted in 2005–2006⁽⁹⁾. Previous studies performed in 1998–1999^(12,13) showed that this attendance was strongly associated with socio-economic and demographic factors. Many of these factors are at the same time associated with dietary patterns, as well as with childhood overweight and obesity in France^(14,15). An analysis of the socio-economic factors involved in school canteen attendance could consequently be useful to identify whether social and economic measures are needed to accompany school food environment policies. Given this background, the objectives of the present study were to: (i) estimate the attendance at school canteens in 2006–2007, based on a nationally representative sample of French children; and (ii) analyse the associations between school meal attendance and the socio-economic and demographic characteristics of the children.

Materials and methods

Data from the second French national cross-sectional food consumption survey, INCA2 (2006–2007), were used in the analysis.

Participants

The French INCA2 food consumption survey was carried out between December 2005 and May 2007 by the French Food Safety Agency (AFSSA). A complex sampling design, which has been described elsewhere^(16–18), was used to obtain a nationally representative sample of French people. Briefly, two independent random samples of 3- to 17-year-old children and 18- to 79-year-old adults were drawn on the basis of a multistage cluster sampling technique. The sampling frame was extracted from the national census published by INSEE (French National Institute of Statistics and Economic Studies). First, 181 primary geographical units, stratified by region of residence and size of urban area, were randomly selected with probability proportional to size. Then, households were randomly drawn from each primary unit and two independent sampling frames were set up: the first restricted to households including at least

one child and the second including households with or without children. Finally, within each household, either a child or an adult was randomly selected. A participation rate of 69% was obtained for children, yielding a sample of 1455 children aged 3–17 years.

Measurements

Diet was assessed using an open-ended 7 d food record. Each day of the diary was divided into three main meals and three between-meals. For the main meals, the consumption location was chosen from six proposals (at home, at a canteen, at a friend's home, at a fast-food outlet, at a restaurant, other). Behavioural, demographic and socio-economic variables were collected by self-reported and face-to-face questionnaires. A trained and certified investigator delivered the 7 d record and the self-administered questionnaire to the home and explained to the parents and their child how to complete them. Children aged 10 years or less were helped by their parents or caregivers to fill out the documents. After the survey week, the investigator came back and checked the accuracy of the information reported in the documents. The face-to-face questionnaire was then administered partly to the child and partly to his/her adult caregiver (mainly the mother; 80%).

The self-reported questionnaire included questions on usual weekly school canteen attendance and, in cases where the child never attended the school canteen, on the reasons for not taking lunch at school. Several answers were proposed; otherwise a free answer could be noted. The face-to-face questionnaire included questions on socio-economic issues (household's income, head of household's and child caregiver's occupations, employment status and educational level), as well as indices of household living standards such as 'having gone away on holiday for more than 4 days within the last 12 months' (yes/no), 'number of cars in the household', 'number of domestic electrical appliances', 'how the financial situation was perceived' (positively/negatively), 'financial access to desired food products' (yes/no), 'whether the idea of lacking food would be a concern' (yes/no), 'giving up health care for financial reasons' (yes/no) and 'housing occupation status' (first-time buyer or owner/tenant/tenant in social housing and others (free housing, etc)). Other information, such as region, type of settlement in which the household was located, household composition and child's school level, was collected during the face-to-face interview.

The survey was approved by the Data Protection Authority (Commission Nationale Informatique et Libertés, CNIL).

Data analysis

All analyses were computed with the STATA statistical software package release 10 (StataCorp LP, College Station, TX, USA). Individual data were weighted for unequal

sampling probabilities and for differential non-responses by region, urban area size, age, gender, head of the household's occupation, size of the household and season. The external data used came from the INSEE national data set for 2005.

Children aged 3–17 years were classified according to the school level that they attended (pre-school, elementary, lower and upper secondary schools). Twenty-six unschooled children were excluded and sixteen schoolchildren did not complete the questions on school canteen attendance. Analysis was carried out on 1413 children.

Usual school canteen attendance was defined with a three-class variable: 'regular users' (at least 3 lunches/week), 'occasional users' (1 or 2 lunches/week) and 'non-users' (less than 1 lunch/week). Another two-class variable was also created to be used in logistic regression ('regular or occasional users' *v.* 'non-users').

The occupational status of the child's caregiver was classified as 'high' (executives, top management and professional categories), 'medium' (employees, technicians and similar), 'low' (manual workers, unemployed) or 'economically inactive' (retired and non-working mothers or fathers). An indicator variable on his/her employment status was also created: 'working' or 'non-working' (retired, non-working mother or father, unemployed). The educational level of the child's caregiver was defined according to three levels: 'high', 'middle' or 'low'. 'High' was assigned to university level, 'middle' to secondary school level and 'low' to elementary school level. An additional socio-economic factor, called the 'household living standards index', was used. It was derived from correspondence analysis performed on the matrix based on the variables coding for the household's living standards, as previously described⁽¹⁹⁾. The score of each household on the first principal component was used as the summary index, and divided into tertiles. This index did not include the household's income because of 21% of missing values, but they were compared with each other for external validation.

The household composition was described using two variables: the number of children (one; two; three or more) and the number of adults (one; two or more).

The prevalence of school canteen attendance was estimated by school level and for each socio-economic factor, taking into account the complex design of the survey (svy: procedures). Pearson χ^2 tests were used to compare frequencies. Critical *P* value was set at *P* = 0.05.

Multivariate logistic regression analyses were performed to investigate the associations between school canteen attendance as the dependent variable and the socio-economic (child caregiver's occupational and employment status, educational level, household wealth index) and demographic (child's age and gender, region, urban area size, child caregiver's age and household composition) variables (svy: logistic procedure). All of

these variables were first introduced simultaneously and then removed step-by-step from the model (according to the *P* value) to avoid collinearity. Critical *P* values that selected the final remaining variables in the model were set at *P* = 0.05. The lowest category of each socio-economic indicator was taken as the reference group to estimate the odds ratios.

Results

Description of the participants

The general characteristics of the participants are presented in Table 1 according to their school level. Four specific characteristics for each school level were observed. First, the average age of the caregiver/parent increased with school level. Second, caregivers/parents of pre-school children had higher educational levels than those of children attending upper secondary school. Third, 35% of the younger children (pre-school and elementary school) had at least two sisters or brothers, whereas almost half of the children in upper secondary schools were alone in the household. Fourth, children attending upper secondary schools lived more often in city centres than in rural areas (scattered settlements or villages) and young children lived more frequently in suburban areas. The other socio-economic (occupational status, employment status, household wealth index) and demographic (number of adults in the household, gender ratio) variables were equally divided into the four school level categories.

School canteen attendance

Nearly two-thirds of French children had lunch at school at least once weekly (Table 1). The highest attendance was observed in lower secondary school (71.5%) and the lowest in pre-school (59.0%; *P* = 0.004). Most children attending the school canteen used it regularly. The occasional user rate was higher among young schoolchildren (10.4% and 14.6% in pre-school and elementary school, respectively).

According to bivariate analysis, school lunch attendance at least once weekly did not differ significantly between girls and boys. However, school canteen attendance varied with other socio-economic and demographic factors (Tables 2 and 3). At every school level, school canteen attendance rose with the educational level and occupational status of the child's caregiver. Their working status also had a role, mainly for young schoolchildren. When one of the parents did not work, the child often did not have lunch at school. Conversely, young children from single-parent families, or whose caregiver was older, had lunch at school more frequently. The school canteen attendance of older schoolchildren also rose in line with the living standards index of the household, with those from deprived households attending

Table 1 Characteristics of 3- to 17-year-old children sampled in the second French national cross-sectional food consumption survey (INCA2, 2006–2007), according to school level

	Pre-school		Elementary school		Lower secondary school		Upper secondary school		All 3–17 years		P value
<i>n</i> _{raw} / <i>n</i> _{weighted}	192/257		416/537		511/405		294/215		1413/1414		
	% or Mean	95% CI or SE	% or Mean	95% CI or SE	% or Mean	95% CI or SE	% or Mean	95% CI or SE	% or Mean	95% CI or SE	
Gender male (%; 95% CI)	51.9	44.0, 59.8	53.8	48.4, 59.3	48.7	43.1, 54.4	46.7	38.1, 55.3	50.9	47.6, 54.3	0.43
Age (years; mean, SE)	4.8	0.97	8.5	1.56	13.2	1.55	16.2	0.88	10.4	4.06	<0.001
School canteen attendance (%; 95% CI)											<0.001
Regular user (≥3/week)	48.6	40.7, 56.4	50.3	44.7, 56.0	67.1	62.4, 71.7	59.0	49.4, 68.6	56.1	52.8, 59.4	
Occasional user (1–2/week)	10.4	5.4, 15.4	14.6	10.6, 18.5	4.4	2.5, 6.4	5.4	2.4, 8.3	9.5	7.6, 11.5	
Non-user (<1/week)	41.0	33.3, 48.8	35.1	29.6, 40.5	28.5	23.9, 33.1	35.6	25.5, 45.7	34.4	31.1, 37.6	
CC's age (years; mean, SE)											<0.001
<i>n</i>	189		411		500		291		1391		
Age	35.5	0.50	39.6	0.48	44.0	0.47	46.8	0.52	41.2	0.29	
CC's occupational status (%; 95% CI)											0.15
<i>n</i>	190		411		500		284		1385		
High	8.7	4.4, 12.9	8.9	5.7, 12.2	9.4	6.4, 12.3	15.6	10.6, 20.6	10.0	8.1, 11.9	
Medium	46.3	38.2, 54.3	55.7	50.3, 61.0	55.4	49.9, 60.9	52.0	42.9, 61.1	53.3	50.0, 56.7	
Low (including unemployed)	18.7	12.1, 25.3	15.8	11.8, 19.9	14.4	10.5, 18.3	9.3	5.4, 13.2	15.0	12.4, 17.5	
Economically inactive	26.4	19.2, 33.5	19.6	14.7, 24.5	20.8	15.7, 25.9	23.0	12.0, 34.0	21.7	18.6, 24.8	
CC's employment status (%; 95% CI)											0.29
<i>n</i>	192		416		510		294		1412		
Working	64.7	56.6, 72.8	73.2	68.1, 78.3	73.9	68.7, 79.1	71.7	61.3, 82.0	71.6	68.5, 74.8	
Non-working	35.3	27.2, 43.4	26.8	21.7, 31.9	26.1	20.9, 31.3	28.3	18.0, 38.7	28.4	25.2, 31.5	
CC's educational level (%; 95% CI)											0.009
<i>n</i>	192		413		507		293		1405		
High	42.1	34.3, 49.9	36.4	31.2, 41.6	29.6	24.6, 34.7	27.5	20.9, 34.1	34.1	31.2, 37.1	
Medium	46.3	38.4, 54.2	53.5	48.0, 59.0	53.1	47.9, 58.3	50.6	41.9, 59.3	51.7	48.4, 54.9	
Low	11.6	6.5, 16.6	10.1	6.8, 13.4	17.3	12.7, 21.8	21.9	11.3, 32.5	14.2	11.5, 16.9	
No. of children in household (%; 95% CI)											<0.001
<i>n</i>	192		416		511		294		1413		
1 child	11.9	8.0, 15.8	12.2	9.1, 15.2	30.5	25.8, 35.2	44.3	36.3, 52.2	22.3	20.0, 24.5	
2 children	52.6	45.0, 60.2	53.6	47.9, 59.3	44.2	38.7, 49.8	33.0	25.5, 40.4	47.6	44.5, 50.7	
3 or more children	35.5	27.5, 43.4	34.3	28.5, 40.0	25.3	20.6, 29.9	22.8	12.3, 33.3	30.2	26.9, 33.4	
No. of adults in household (%; 95% CI)											0.14
<i>n</i>	192		416		511		294		1413		
1 adult (single-parent family)	7.1	3.1, 11.1	9.2	6.2, 12.2	12.1	8.6, 15.6	13.6	8.9, 18.3	10.3	8.5, 12.2	
2 or more adults	92.9	88.9, 96.9	90.8	87.8, 93.8	87.9	84.4, 91.4	86.4	81.7, 91.1	89.7	87.8, 91.5	
Settlement (%; 95% CI)											0.003
<i>n</i>	192		416		511		294		1413		
Scattered	14.0	8.9, 19.1	11.2	7.3, 15.2	13.6	9.5, 17.8	8.4	5.0, 11.8	12.0	9.5, 14.5	
Village	19.6	13.3, 25.8	33.7	27.7, 39.6	31.9	26.5, 37.2	21.7	16.1, 27.4	28.8	25.3, 32.3	
Suburban	44.7	37.1, 52.3	30.7	25.3, 36.1	32.3	27.0, 37.7	40.9	32.4, 49.4	35.3	31.8, 38.8	
City centre	21.7	15.2, 28.2	24.4	19.9, 29.0	22.2	17.4, 26.9	28.9	19.7, 38.1	24.0	21.0, 26.9	
Household wealth index (%; 95% CI)											0.15
<i>n</i>	192		416		511		294		1413		
Low	41.2	33.2, 49.2	32.7	27.4, 37.9	33.6	28.5, 38.7	34.4	24.2, 44.6	34.8	31.4, 38.1	
Medium	36.3	29.0, 43.6	32.6	27.2, 37.9	31.2	26.4, 36.1	32.3	24.7, 39.9	32.8	29.8, 35.9	
High	22.5	15.9, 29.0	34.8	29.8, 39.8	35.2	30.3, 40.0	33.3	26.2, 40.4	32.4	29.5, 35.3	

CC, child's caregiver.

Table 2 Prevalence of regular and occasional school canteen (SC) attendance (%; 95% CI), and multivariate-adjusted odds ratios (ORa, 95% CI) for SC attendance according to socio-economic factors among sampled children attending pre-schools and elementary schools in the second French national cross-sectional food consumption survey (INCA2, 2006–2007)

	Pre-school				Elementary school				Total			
	SC attendance		ORa* (n 192)	95% CI	SC attendance		ORa* (n 413)	95% CI	SC attendance		ORa* (n 597)	95% CI
	%	95% CI			%	95% CI			%	95% CI		
Gender												
Boys	63	52, 74			67	60, 74			66	60, 72		
Girls	55	44, 65			63	55, 71			60	54, 66		
P value		0.27				0.43				0.18		
Child's age, OR (95% CI)	1.17	0.85, 1.61			0.97	0.84, 1.13			1.04	0.96, 1.13		
P value		0.34				0.72				0.29		
Region												
Ile de France	84	72, 95	0.68	0.14, 3.16	79	67, 91	1.17	0.39, 3.53	81	72, 89	0.78	0.31, 1.97
North-west	47	29, 65	0.11	0.03, 0.43	79	71, 88	1.32	0.50, 3.53	69	61, 77	0.52	0.23, 1.16
North-east	47	30, 63	0.12	0.03, 0.46	38	27, 48	0.16	0.06, 0.42	41	31, 50	0.17	0.07, 0.39
South-east	44	26, 62	0.09	0.02, 0.37	59	45, 72	0.44	0.18, 1.09	54	43, 65	0.25	0.11, 0.58
South-west	82	68, 97	1	–	81	70, 93	1	–	82	72, 91	1	–
P value		0.0003		0.0008		<0.0001		<0.0001		<0.0001		<0.0001
Settlement												
Scattered	72	52, 91			74	59, 90			73	61, 85		
Village	53	35, 71			54	45, 64			54	46, 62		
Suburban	55	43, 66			67	57, 77			62	54, 70		
City centre	65	49, 82			73	63, 82			70	62, 79		
P value		0.40				0.03				0.02		
No. of adults in household												
1 adult (single-parent family)	81	63, 99	5.70	1.51, 21.54	83	72, 95			83	73, 92	4.03	1.71, 9.51
2 or more adults	57	49, 65	1	–	63	57, 69			61	57, 66	1	–
P value		0.05		0.02		0.01				0.001		0.001
No. of children in household												
1 child	62	45, 79			68	51, 76	1	–	63	53, 74		
2 children	63	53, 73			75	69, 81	1.44	0.72, 2.88	71	66, 76		
3 or more children	53	38, 67			50	39, 61	0.34	0.15, 0.74	51	41, 60		
P value		0.40				0.0001		0.0003		0.0003		
CC's age, OR (95% CI)	1.08	1.02, 1.14			1.00	0.97, 1.04			1.03	1.00, 1.06	1.04	1.00, 1.07
P value		0.008				0.79				0.06		0.03
CC's occupational status												
High	74	51, 98			77	60, 94			76	62, 90		
Medium	69	59, 79			73	67, 79			72	67, 77		
Low (including unemployed)	66	47, 85			51	36, 65			56	45, 68		
Economically inactive	30	16, 45			47	32, 62			41	30, 52		
P value		0.0007				0.0007				<0.0001		
CC's employment status												
Working	71	62, 80	4.31	2.01, 9.25	71	66, 77			71	66, 76	2.40	1.53, 3.73
Non-working	37	25, 50	1	–	48	36, 60			44	35, 53	1	–
P value		<0.0001		<0.0001		0.0003				<0.0001		<0.0001

Table 2 Continued

	Pre-school			Elementary school			Total					
	SC attendance		ORa* (n 192)	SC attendance		ORa* (n 413)	SC attendance		ORa* (n 597)			
	%	95% CI		%	95% CI		%	95% CI				
CC's educational level												
High	72	60, 83	5.30	1.30, 21.64	78	70, 85	7.43	3.06, 18.01	76	69, 82	5.29	2.47, 11.32
Medium	52	40, 64	2.58	0.72, 9.19	62	54, 70	3.38	1.54, 7.43	59	52, 66	2.62	1.31, 5.21
Low	41	19, 64	1	—	33	18, 49	1	—	36	24, 49	1	—
P value	0.02		0.015†		<0.0001		<0.0001†		<0.0001		<0.0001†	
Household wealth index												
Low	45	31, 59			60	50, 70			56	47, 65		
Medium	68	56, 79			65	55, 75			65	57, 72		
High	64	50, 78			69	61, 78			68	61, 76		
P value	0.03				0.41				0.09			

CC, child's caregiver.

*Multi-adjusted OR on the variables selected by the backward step-by-step logistic regression procedure.

†P value for trend.

the school canteen less. Considering demographic factors, households in south-western France were more likely to enrol their young children in the school canteen than those living in eastern France. In secondary-school children, the type of settlement in which the household was located was more relevant than the region: at least 90% of children from scattered rural settlements attended the school canteen *v.* 54% of children living in city centres.

When computing all these variables into a multivariate-adjusted model, only some of them retained a significant *P* value. Concerning demographic factors, school canteen attendance still varied according to region for pre-school or elementary-school children; and the effect of the settlement in which the household was located remained relevant for children attending secondary schools. The primary socio-economic factor explaining school canteen attendance was the parent's educational level, at every school level. The employment status, but not the occupational status, also influenced enrolment in school canteen, but only for children going to pre-school or upper secondary school. The single-parent status of the family led to higher school canteen attendance in pre-school children. Finally, the living standard index of the household conditioned attendance at the school canteen for secondary-school children, but this was not the case in pre-schools and elementary schools.

Reasons for not attending the school canteen

The main reason for never attending the school canteen was that somebody prepared lunch at home (53.5 to 59.5%; Fig. 1). In addition, parents of children in pre-school and elementary school cited the proximity between school and home (35.0% and 38.2%, respectively), the child's unwillingness to attend the canteen (14.4% and 7.0%) and the price of school lunches (7.3% and 11.2%). Children in lower and upper secondary schools stated their dislike of eating at the canteen (15.3% and 25.0%, respectively), the proximity between school and home (8.7% and 12.5%) and their preferring to eat elsewhere (8.6% and 12.8%). Among the children never attending the school canteen, almost 36% of them, living in rural areas or in mid-sized cities (20 000 to 100 000 inhabitants), did so because their house was near the school, *v.* 8% of those who lived in small cities (2000 to 20 000 inhabitants; *P* = 0.006, results not shown).

Discussion

The INCA2 survey (2006–2007) was the first one to assess regular attendance at the school canteen in a nationally representative sample of children aged 3–17 years in France. Indeed, the earlier INCA survey (1998–1999) provided school canteen attendance rates of children aged 3–14 years only during the 7d of the study⁽¹³⁾. Likewise, data from the Ministry of Education give rates of

Table 3 Prevalence of regular and occasional school canteen (SC) attendance (%; 95% CI), and multivariate-adjusted odds ratios (ORa, 95% CI) for SC attendance according to socio-economic factors among children sampled attending lower and upper secondary schools in the second French national cross-sectional food consumption survey (INCA2, 2006–2007)

	Lower secondary school				Upper secondary school				Total			
	SC attendance		ORa* (n 507)	95% CI	SC attendance		ORa* (n 293)	95% CI	SC attendance		ORa* (n 800)	95% CI
	%	95% CI			%	95% CI			%	95% CI		
Gender												
Boys	75	68, 82			69	56, 81			73	67, 79		
Girls	68	61, 75			61	46, 75			65	58, 73		
P value		0.18				0.38				0.12		
Child's age, OR (95% CI)	0.94	0.79, 1.13			1.07	0.62, 1.87			0.93	0.83, 1.04		
P value		0.52				0.80				0.18		
Region												
Ile de France	67	55, 79			66	48, 81			67	57, 77		
North-west	79	70, 88			54	28, 78			70	56, 84		
North-east	61	49, 72			57	39, 73			59	49, 69		
South-east	72	62, 82			74	62, 84			73	65, 80		
South-west	80	68, 91			86	71, 94			81	71, 91		
P value		0.06				0.19				0.09		
Settlement												
Scattered	91	85, 99	9.03	2.59, 31.43	93	84, 100	9.52	2.54, 35.75	92	87, 98	10.29	3.49, 30.35
Village	84	76, 92	3.74	1.66, 8.43	86	77, 95	3.56	1.30, 9.78	84	78, 91	3.55	1.84, 6.84
Suburban	59	51, 68	1.04	0.59, 1.85	59	45, 73	1.40	0.62, 3.19	59	52, 67	1.19	0.74, 1.90
City centre	59	47, 70	1	–	48	27, 69	1	–	54	43, 66	1	–
P value	<0.0001		<0.0001†		0.002		0.001†		<0.0001		<0.0001†	
No. of adults in household												
1 adult (single-parent family)	63	51, 72			67	51, 83			64	55, 74		
2 or more adults	73	68, 78			64	53, 75			70	64, 75		
P value		0.13				0.77				0.32		
No. of children in household												
1 child	68	61, 75			73	64, 80			70	65, 75		
2 children	74	66, 81			67	53, 79			72	65, 79		
3 or more children	72	62, 82			45	22, 71			65	50, 77		
P value		0.61				0.08				0.40		
CC's age, OR (95% CI)	0.99	0.95, 1.04			0.94	0.89, 0.99			0.97	0.94, 1.01		
P value		0.74				0.01				0.09		
CC's occupational status												
High	86	75, 97			82	67, 91			84	76, 92		
Medium	75	69, 80			75	66, 83			75	70, 79		
Low (including unemployed)	65	51, 78			54	34, 73			62	51, 73		
Economically inactive	61	24, 54			33	15, 56			51	36, 66		
P value		0.06				0.0001				0.0001		
CC's employment status												
Working	74	69, 79			76	69, 82	4.10	1.87, 8.95	75	71, 79		
Non-working	64	51, 77			36	16, 53	1	–	53	41, 66		
P value		0.13			<0.0001		<0.0001		0.0004			

Table 3 Continued

	Lower secondary school			Upper secondary school			Total					
	SC attendance		ORa* (n 507)	SC attendance		ORa* (n 293)	SC attendance		ORa* (n 800)			
	%	95% CI		%	95% CI		%	95% CI				
CC's educational level	80	71, 88	3.75	1.55, 9.10	72	61, 82	2.16	0.69, 6.78	77	70, 84	3.24	1.63, 6.43
High	73	68, 79	2.39	1.30, 4.42	76	67, 84	3.47	1.31, 9.20	74	70, 79	2.97	1.76, 4.99
Medium	53	71, 88	1	—	27	12, 50	1	—	43	28, 57	1	—
Low												
P value		0.008		0.006†		<0.0001		0.04		<0.0001		0.002†
Household wealth index	60	51, 70	1	—	45	29, 61	1	—	54	45, 63	1	—
Low	73	65, 80	2.06	0.83, 5.11	76	65, 84	2.06	0.83, 5.11	74	68, 80	1.76	1.11, 2.77
Medium	82	74, 90	3.32	1.31, 8.41	84	75, 92	3.32	1.31, 8.41	83	77, 89	2.29	1.42, 3.71
High												
P value		0.003		0.01†		<0.0001		0.01†		<0.0001		<0.0001†

CC, child's caregiver.
 *Multi-adjusted OR on the variables selected by the backward step-by-step logistic regression procedure.
 †P value for trend.

pupils enrolled at the canteen in secondary schools, but no information on individual attendance. Additionally, the INCA2 survey provided dietary and nutritional intakes at the individual level^(16,18) that may later be compared according to the children's school canteen attendance level. Its representativeness was checked by comparison with the national census and corrected by the weighting factor applied to the children of the final sample.

However, some limitations of the INCA2 survey in studying school lunch attendance have to be emphasised. It was primarily designed to assess individual food intake and did not gather information on the schools attended by children such as size, location, presence of a canteen on the premises, catering service organisation, lunch price, etc., yet some of these characteristics were described as being associated with school lunch participation⁽²⁰⁾. Consequently, our work focused on the relationship between the socio-economic and demographic background of the children and their attendance at the school canteen, independently of the school characteristics. Moreover, the reasons for not participating in school lunch could not be compared between school levels, as this information was collected by a multiple-choice question and the proposals differed between age classes. Although the reasons given, other than those suggested, were probably underestimated, they were maintained as they provided qualitative information on the main barriers to school lunch attendance.

School canteen attendance in 2006–2007

In the present study, the weekly (at least once weekly) school lunch participation rate was established as from 59.0% in pre-school to 71.5% in lower secondary school, with most children using the school canteen more than three times weekly. From pre-school to lower secondary school the rate of pupils enrolled at the canteen increased and the share of occasional users decreased. In upper secondary school, school canteen attendance was slightly lower, and the share of children preferring to have lunch elsewhere increased. The higher rate of school canteen users in secondary schools may be explained by the average distance between secondary school and home, which is higher than for elementary schools. Indeed, secondary schools are fewer and more scattered than elementary schools. Therefore, more children may have to use school transportation and stay at school for lunch. This hypothesis is supported by the impact of the settlement in which the household was located on the school canteen attendance of secondary-school children.

Our results were consistent with other national data available for secondary schools, which supported the representativeness of our study. A national study carried out on public secondary schools estimated the rate of pupils enrolled in the school canteen (at least three school lunches per week) at 67% in 2005–2006⁽⁹⁾. Moreover, data from the Ministry of Education supplied

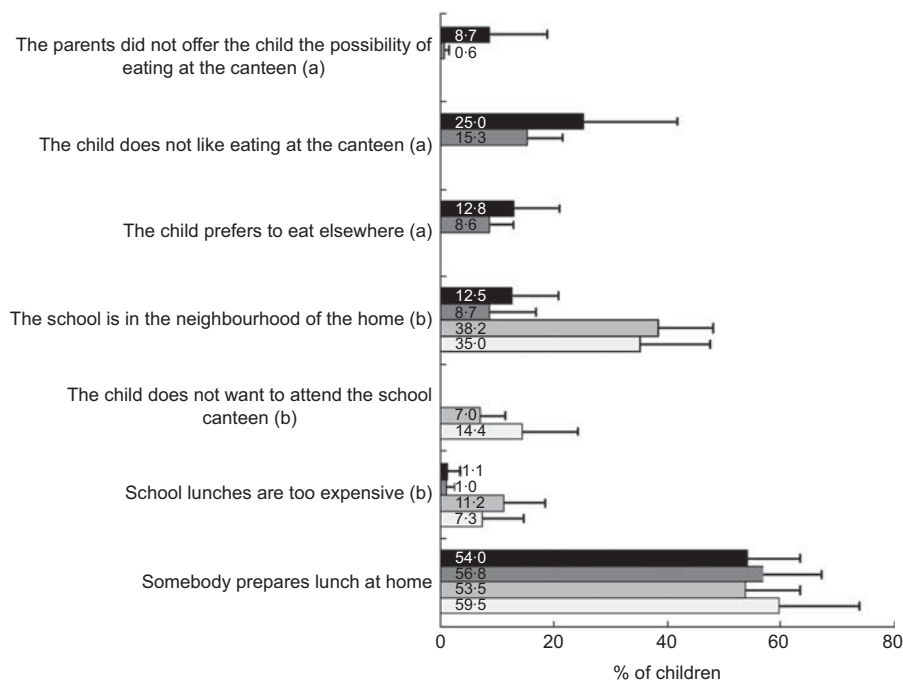


Fig. 1 Reasons for never attending the school canteen, according to school level (□, pre-school; ▒, elementary school; ▓, lower secondary school; ■, upper secondary school): children aged 3–17 years sampled in the second French national cross-sectional food consumption survey (INCA2), 2006–2007. Bars represent the percentage of children reporting the answer, with 95% confidence interval shown by error bar. (a) The answer was not suggested by default in the 3- to 10-year-olds' questionnaire, but could have been cited by the child; (b) the answer was not suggested by default in the 11- to 17-year-olds' questionnaire, but could have been cited by the child

enrolment rates of 64% in 2006–2007, also in secondary schools⁽²¹⁾, including private schools. To our knowledge, no national data are available with which to compare our figures in pre-schools and elementary schools. Abroad, data on school lunch participation are also scarce and the figures mentioned were mainly lower than in France. In the USA, the last School Nutrition Dietary Assessment Study (SNDA-III) reported that 91% of elementary- and secondary-school children ate lunch at school in 2004–2005, but the share taken in school cafeterias was not specified⁽²²⁾. However, a study carried out in Pennsylvania assessed at 56.5% the average daily participation in school lunch in high schools⁽²⁰⁾. Nearer to France, use of the school canteen was assessed at 39.3% and 35.1% among English children in primary and secondary schools respectively in 2008–2009⁽²³⁾ and at 42.0% of elementary-school children in southern Spain⁽²⁴⁾.

Compared with earlier French data, children seemed to attend the school canteen more frequently. In 1998–1999, 42% and 47% of boys and girls aged 3–14 years had at least one lunch at school during the survey week⁽¹³⁾. In 2006–2007, from the 7 d diary record, the figures were 67% and 60%, respectively (results not shown). The increased school canteen attendance is corroborated by data from the Ministry of Education. From 1997 to 2007, school lunch enrolment increased steadily by 10 percentage points in lower secondary schools⁽²¹⁾. This rise

corresponded with the implementation in 1997 of financial aids aimed at helping children from low-income families to have school lunch.

Demographic and socio-economic variation of school lunch participation

In 2006–2007, school canteen attendance was strongly associated with region, which is a common result in France^(12,13,25), and with the settlement in which the household was located. The region was more discriminating in young schoolchildren and the settlement in secondary-school children. For the latter, results concerning the reasons for not attending the school canteen suggested that the distance from home to school could easily explain the role of settlement. Children living in city centres had a higher probability of living in the vicinity of a secondary school than children living in scattered rural areas or villages. In contrast, as elementary schools are found even in scattered rural areas or villages, the effect of settlement is lower. The regional east–west gradient is more difficult to clarify. Regional socio-economic differences could be put forward but the effects of both socio-economic and demographic factors remained significant in the multivariate-adjusted regression model. Moreover, the French national study carried out on secondary public school canteens in 2005–2006⁽⁹⁾ suggested that the effect of region on school lunch participation remained independently of the school

catering characteristics and the lunch price (results not shown). Thus, it may just reflect cultural regional differences that could not be clarified further by the data available from those surveys.

School meal attendance was linked more closely with the socio-economic characteristics of the caregiver/parent (mostly the mother) than with those of the head of the household (results not shown). In the multivariate-adjusted model, only the educational level of the former, but not his/her occupational status, remained associated with school canteen attendance at every school level. This result highlights the predominant role of education rather than professional occupation in school lunch participation. This hypothesis was further advanced in a study on deprived lower secondary schools in suburban Paris⁽²⁶⁾, in which school canteen attendance was explained by the parent's relationship with the school institution. Parents who had enjoyed going to school (and thus were more likely to have a high educational level) were more inclined to enrol their child in the school canteen than those parents who had not liked school as a pupil. Nevertheless, income considerations were maintained in the multivariate model for children attending secondary schools, but not pre-schools or elementary schools. In France, the price of school lunches in pre- and elementary schools is fixed by the town council and varies automatically according to a coefficient based on household income and composition. High-income households pay the full price whereas deprived households pay a reduced price. In secondary schools, a single price is fixed by the school. Several allowances are proposed to help deprived households to afford the cost of school lunches. These allowances have to be claimed for by the families. This second system may be less effective at promoting the school canteen to low-income families because they may not claim for all the allowances they are entitled to or could encounter difficulties in completing the different application forms. This may explain why the household living standards index remained a significant factor in school canteen attendance in secondary schools only. However, the price was cited as one of the main reasons for not attending the school canteen in elementary schools. Family organisation and constraints also influenced school canteen attendance, mainly for young children. Indeed, the non-working status of the caregiver decreased the children's attendance at the school canteen, and this corresponded with the result on non-attendance because of somebody at home preparing lunch. Employment status could also explain the greater attendance of pre-school children from single-parent families: the only parent has to work and therefore should prefer that his/her young child has lunch at school.

The relationship between school lunch participation and socio-economic and geographic factors had already been described in 1999. At that time, household income was mainly advanced as the explanatory socio-economic

factor⁽¹³⁾. However, only the characteristics of the head of the household were available in the INCA1 survey. Our study showed that school canteen attendance was more linked to the caregiver/parent characteristics. Despite the implementation of state aids to promote the school lunch participation of children from low-income families, the socio-economic disparities persisted over the years. It has been shown that educational level and socio-economic background both play an important role in individual dietary habits^(27–30). Usually, higher socio-economic groups adopt better dietary habits according to the nutritional recommendations for a healthy diet and this seems to remain the case over the years^(27,31). These differences were often explained by a better knowledge of nutritional issues and healthy dietary behaviour in this population category^(32,33). In France, recent data from the INCA2 survey⁽³⁴⁾ showed that consumption of the foods (fruit, vegetables, dairy products) and nutrients (sodium, calcium) targeted by school meal recommendations⁽³⁵⁾ were socio-economically dependent and that children from lower education backgrounds were less in line with the recommendations. Moreover, the INCA2 survey also pointed out a strong inverse relationship between parents' educational level and child overweight⁽¹⁹⁾. In Great Britain, a similar educational gradient was mentioned in the nutritional intake of pre-school children⁽²⁸⁾. From a public health point of view, the low school lunch participation of children from deprived backgrounds could decrease the effectiveness of the upcoming law on the nutritional composition of school meals that is designed to encourage them to adopt healthier dietary habits. Implementation of supporting policy on school meal prices may counteract this effect, like in the USA where school lunch programme participation increased positively with the percentage of students eligible for free/reduced-price meals⁽²⁰⁾. Furthermore, these children could then be a vector of healthier dietary habits into their family^(36,37). Otherwise, the nutritional policy on school lunches may increase existing differences in dietary behaviour among children according to their socio-economic background⁽³⁸⁾.

Conclusions

In France, school lunch participation is high, particularly in secondary schools. Like dietary habits, overweight and many other health issues, school canteen attendance is associated with socio-economic and demographic factors, mainly the educational level of the caregiver/parent. In a context of future regulations concerning school meal composition, ways to improve the participation of children from low socio-economic backgrounds, such as increasing financial aids, should be found in order to lead these children towards healthier dietary habits on a long-term basis.

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