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Short Communication

Does breakfast-club attendance affect schoolchildren's nutrient intake? A study of dietary intake at three schools

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Lack of breakfast has been implicated as a factor contributing to children's poor diets and school performance. Breakfast-club schemes, where children are provided with breakfast in school at the start of the school day, have been initiated by the Department of Health in schools throughout England, UK. The aim of the present study was to compare the energy and nutrient intakes of schoolchildren who attended breakfast clubs (attendee subjects) with those who did not (control subjects). Three different schools were studied, involving a total of 111 children aged between 9 and 15 years. There were fifty-nine attendee and fifty-two control subjects. The two groups were matched for eligibility for school meals. All subjects completed a 3 d weighed food diary for estimation of nutrient intake. Height and weight were measured and BMI calculated. Nutrient intake data were analysed using a general linear model with age as a covariate. The demographic and anthropometric characteristics of the attendee and control subjects were similar. Children who attended breakfast clubs had significantly greater intakes of fat (% energy), saturated fat (% energy) and Na than control subjects. Thus, in these schools breakfast-club participation was not associated with superior nutrient intake or improvements in dietary pattern.

The recent National Diet and Nutrition Survey of young people aged 4–18 years (Gregory & Lowe, 2000) reported that schoolchildren's diets were not meeting recommended standards. Diets were high in fat, particularly saturated fat and Na, and were low in some minerals including Ca and Fe; there was a dearth of fruits and vegetables, and this was particularly evident in the diets of children from lower socio-economic groups (Gregory & Lowe, 2000). Lack of breakfast has been implicated as a factor contributing to children's poor diets (Nicklas *et al.* 1993; Ruxton & Kirk, 1997), with an estimated 6 % of all children in the UK aged 8–16 years (400 000 pupils) regularly missing breakfast (Sodexho, 2000). In a survey of schoolchildren in Edinburgh (UK), breakfast contributed 14 % energy and 9–36 % micronutrient intakes/d (Ruxton *et al.* 1996). 'Breakfast clubs', a form of before-school provision serving food to children who arrive early, offer a potential strategy to address this problem. For instance, Anderson & Bell (2000) reported that children's nutrient intake could be improved through changed food choices in a breakfast-club setting.

In 1999 the Department of Health introduced a new pilot initiative to support the development of breakfast clubs in schools across England, UK. The main aims of the scheme were to provide breakfast to children who might otherwise not have eaten, to establish a positive relationship at the start of the school day and to offer children a choice of healthy food, which may help to encourage healthier eating habits. As part of a broad-based national evaluation project based at the University of East Anglia (Breakfast Clubs Evaluation Group, 2002), an in-depth investigation of the effects of breakfast-club attendance on dietary intake was conducted in a small sample of three schools. The objective of the present study was to compare the energy and nutrient intake of schoolchildren who attended breakfast clubs with those who did not (control subjects). The study was entirely observational and no attempt was made to manipulate the schools' breakfast menu or the

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children's food choice. The nutrients selected for analysis were those known to be problematic in schoolchildren's diets. The diet study was a more detailed study within the framework of the larger national evaluation.

Methods

Participants

Three different schools were studied. Schools 1 and 2 were secondary schools located in a mid-sized town in southern England, while School 3 was a junior school located in a large city in northern England. School 1 had 542 pupils on its roll, 24 % of whom were eligible for free school meals. School 2 was of similar size, having 554 pupils on its roll, of whom 22 % were eligible for free school meals. Both of these schools had <5 % of pupils from ethnic minority groups. School 3 had a total of 320 pupils, of whom 44 % were eligible for free school meals and 81 % were from ethnic minorities. All three schools had received funding for breakfast-club provision under the Department of Health scheme. These particular schools were selected because they were geographically convenient to the research team. The choice of breakfast foods and drinks available at each school was recorded. These breakfast menus were standard throughout the dietary recording period.

Children who used the breakfast club for at least 3 d per week and for most weeks in the school term were considered to be eligible. Control subjects were randomly selected from the same classes as breakfast-club attendees. The two groups (attendees and controls) were matched for eligibility for free school lunches in order to reduce confounding by socio-economic status. In the schools surveyed, breakfast clubs were open to all schoolchildren irrespective of their eligibility for free school lunches. Subjects were aged between 9 and 15 years and were of both sexes. A sample size of 100 subjects was estimated to provide 80 % power to detect a difference in energy intake of 10 % between the groups.

All subjects completed a 3 d weighed food diary for estimation of nutrient intake. Subjects were given Soehnle digital scales (Murrhardt, Germany; accurate to 1 g and weighing up to 2 kg) and instructed to weigh and record all items of food and drink consumed over three consecutive schooldays. Explanation as to how to use the scales and fill in the diary was given to the children in small groups. During the dietary recording period, the children were seen daily by the research investigator to monitor progress with the diary, check for detail of foods and drinks consumed and to encourage compliance. All breakfast club subjects attended the breakfast club during the dietary recording period. Food intake information was analysed using FOODBASE dietary software (Institute of Brain Chemistry and Human Nutrition, London, UK). The data were collected between May and July 2000.

Height and weight measurements were made without shoes and in school uniform (without jumpers or jackets). Height was measured to the nearest mm and weight to the nearest 0·5 kg. BMI was calculated using the formula: weight (kg)/height $(m)^2$. Subjects also completed questionnaires that covered information on gender, ethnicity, occupation of head of household, special dietary habits and journey time to school.

Statistical analysis

Results are reported as means values with their standard errors unless otherwise indicated. The characteristics of the attendees and controls were compared using t or χ^2 tests as appropriate. Nutrient intake data were analysed using a general linear model (GLM) procedure within SPSS (version 10.0; SPSS Inc., Chicago, IL, USA). School, breakfast-club attendance, ethnicity, gender and eligibility for free school meals were specified as main effects, with age as a covariate. The socio-demographic indices were included as explanatory variables as they may potentially confound the relationship between breakfast-club attendance and dietary intake. For the purposes of the GLM analysis, ethnicity was recoded as a binary variable including only White *v.* Asian subjects. Results were considered significant when $P<0·05$.

Results

School breakfast-club menus

The foods offered at the breakfast club at school 1 comprised cereals with semi-skimmed milk and sugar, white sliced bread or toast with margarine (non-polyunsaturated), Marmite (a yeast-extract spread; Unilever Bestfoods UK, Crawley, Sussex, UK), peanut butter and jam. There was also a choice of fruit squash or hot chocolate to drink. The breakfast provided at school 2 was a sausage sandwich (white bread and non-polyunsaturated margarine with mixed pork and beef sausage fried in non-polyunsaturated vegetable oil) and tea with semi-skimmed milk. At school 3 a selection of snacks was available including cereal bars, flapjacks (oat and syrup biscuit), sausage rolls, doughnuts, crisps, buttered toast and fruit squash. The energy and nutrient composition of a typical breakfast at each school is given in Table 1.

Sample characteristics

A total of 111 children (fifty-nine attendees and fifty-two controls) successfully completed the study. Of these, twenty-eight (fourteen attendees and fourteen controls) were from school 1, twenty-nine (eighteen attendees and

Table 1. Energy and nutrient composition of typical breakfast by school

	School 1	School 2	School 3
Total energy (MJ)	2·55	1·88	1·57
Protein (% energy)	9·7	12·0	5·4
Fat (% energy)	37·8	53·9	53·9
Saturated fat (% energy)	10·7	18·9	14·6
Carbohydrate (% energy)	52·6	34·3	40·7
Vitamin C (mg)	10·2	0·0	7·4
Ca (mg)	216·3	127·3	55·1
Fe (mg)	4·8	1·8	1·2
Na (mg)	689·0	1066·1	406·1

eleven controls) were from school 2 and fifty-four (twenty-seven attendees and twenty-seven controls) were from school 3. The response rate (number of subjects satisfactorily completing diary (*n*)/total number of subjects approached (*n*)) was 52 % for attendees at school 1 compared with 32 % for controls. The corresponding values for school 2 were 38 and 11 %. The response rate was 54 % for both attendees and controls at school 3.

The characteristics of the sample according to group are presented in Table 2. There were no significant differences between attendees and controls for any of these characteristics. Over the 3 d recording period 33 % of the control group missed breakfast on at least one occasion.

Results from the GLM analysis (Table 3) show that those children who attended breakfast clubs had significantly higher intakes of fat (% energy), saturated fat (% energy) and Na (mg) and a lower intake of carbohydrate (% energy) than control subjects. The effect was not simply that of a different pattern of macronutrient contribution to energy intake, in that children who attended breakfast clubs also recorded greater absolute intakes of fat (results not shown). The GLM analysis also showed that gender and school were significantly associated with vitamin C intake ($P=0{\cdot}011$ and $P=0{\cdot}001$ respectively). The mean intakes of vitamin C were (mg/d): school 1 73·2 (SEM 11·0); school 2 33·9 (SEM 10·4); school 3 52·2 (SEM 8·8). Intake of vitamin C was higher for girls than boys (63·3 (SEM 5·9) and 42·8 (SEM 7·1) mg/d respectively). Gender was significantly ($P=0{\cdot}033$) associated with Fe intake. Fe intake was greater in boys than girls (8·5 (SEM 0·54) and 7·2 (SEM 0·46) mg/d respectively).

Table 2. Characteristics of attendees and control subjects

	Control		Attendee	
	n	%	*n*	%
Gender				
Male	23	44·2	27	45·8
Female	29	55·8	32	54·2
Ethnicity				
White	30	57·7	42	71·2
Black	1	1·9	1	1·7
Asian	21	40·4	16	27·1
Eligibility for FSM				
Eligible	18	35	22	37
Not eligible	34	65	37	63
Age (years)	11·4	0·18*	11·7	0·16*
BMI	18·6	0·53*	17·9	0·34*

FSM, free school meals.
* SEM.

Discussion

The mean daily energy intake of schoolchildren in the present survey was below the estimated average requirement, and fat and carbohydrate intakes were above and below dietary reference values respectively (Department of Health, 1991). The children's diets also tended to be high in Na, low in Ca and Fe and adequate for vitamin C. However, it should be noted that comparisons with dietary reference values are difficult, since the sample straddles two of the dietary reference values age groupings. The daily energy intake of this sample was broadly comparable with national data (Gregory & Lowe, 2000).

The present study indicates that children who attend breakfast clubs have a poorer nutrient intake than other children at the same schools. The primary difference between the groups was a greater reliance on fat, including saturated fat, as an energy source amongst the breakfast-club attendees. Absolute fat intakes followed the same pattern. The diets of children attending breakfast clubs also tended to be higher in Na.

These effects were particularly marked at school 2, which provided fried sausage sandwich and tea for breakfast, and least marked at school 3. In the latter school the children used the breakfast club in an unorthodox way, tending to purchase snacks such as crisps for later consumption during the school day. Whilst the size of the effect differed between schools its direction was consistent across schools. These results are in agreement with the study of Gordon *et al.* (1995), who found that participation in the US school breakfast program resulted in higher breakfast intakes of fat and saturated fat energy and lower intakes of carbohydrate energy.

There may be two reasons for the observed effect. First, the breakfast provided at the club may be contributing to a poorer nutrient intake. Second, children who attend breakfast clubs may have habitual diets that are unhealthier

Table 3. Intake of energy and nutrients per d by attendance at breakfast club*
(Mean values with their standard errors)

	Control		Attendee		Statistical significance of difference: *P*
	Mean	SE	Mean	SE	
Total energy (MJ)	6·66	0·31	7·06	0·28	NS
Protein (% energy)	11·1	0·4	11·6	0·3	NS
Fat (% energy)	36·8	1·1	41·0	0·7	0·003
Saturated fat (% energy)	12·9	0·5	14·3	0·4	0·032
Carbohydrate (% energy)	52·2	1·0	47·2	0·9	0·001
Vitamin C (mg)	56·0	6·5	47·6	4·9	NS
Ca (mg)	574·5	36·1	630·4	35·2	NS
Fe (mg)	7·7	0·5	8·2	0·3	NS
Na (mg)	1940·8	126·6	2381·3	114·6	0·023

* For details of subjects and procedures, see Table 2 and p. 1004.

than other children. These reasons are not mutually exclusive. While we have not analysed specifically the nutrient contribution of breakfast to total daily intake in the two groups, it is clear from the data collected on the content of the breakfast menus, particularly from the breakfasts at schools 2 and 3, that the foods and drinks on offer were not consistent with Department of Health guidelines for food provision at breakfast clubs. The resultant nutrient content of a typical breakfast, again particularly at schools 2 and 3, was also far from desirable. Thus, these breakfasts have the potential to contribute in a negative way to children's dietary intake.

Equally, children making use of breakfast clubs may come from backgrounds where food choice may be restricted and dietary patterns are sub-optimal. For instance, missing breakfast has been shown to be associated with social deprivation (Sodexho, 2000). The present study attempted to overcome socio-economic confounding of diet by matching the groups for eligibility for free school meals at the sampling stage, and by including eligibility for free school meals as an explanatory factor in the statistical model. The attendee and control groups were similar in socio-economic status, as measured by the questionnaire data on occupation of head of the household. Nevertheless, there could be residual confounding by other unmeasured factors, particularly given the relatively poor response of the control group.

In conclusion, the present study indicates that participation in these particular breakfast clubs is not associated with an improved mean daily nutrient intake and did not serve to establish healthier eating habits amongst children. The study is limited in that it surveyed only three schools, which may not be representative of national provision. For example, the national survey of food provision at breakfast clubs (Breakfast Clubs Evaluation Group, 2002) showed that 40 % of the breakfast clubs sampled provided fruit or fruit juice, 90 % offered cereals and 17 % offered biscuits and pastries. In our small sample, none of the breakfast clubs surveyed provided fruit or fruit juice, one-third offered cereal and one-third offered biscuits and pastries. It must also be remembered that breakfast clubs may have important functions aside from the promotion of healthy eating. These may include the alleviation of hunger and the improvement of children's social and educational development.

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