

## Short communication

# Key differences between school lunches and packed lunches in primary schools in England in 2009

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### Abstract

*Objective:* To compare the key differences between school lunches and packed lunches as consumed in a nationally representative sample of primary schools, 6–8 months after the nutrient-based standards for school lunch became mandatory.

*Design:* Data on 6580 pupils' school lunches and 3422 pupils' packed lunches were collected between February and April 2009 from pupils attending primary schools in England. Fieldwork was conducted over five consecutive school days. Fieldworkers randomly selected ten pupils taking a school lunch and five pupils bringing a packed lunch each day at each school, and recorded and weighed all food and drink items consumed, as well as any leftovers.

*Setting:* A nationally representative sample of 136 state-maintained primary schools in England.

*Subjects:* A total of 10 002 pupils aged 4–12 years.

*Results:* Mean intakes of protein, fat, saturated fat and vitamin C from both types of lunch met the nutrient-based standards. Pupils taking school lunches on average consumed significantly more protein, NSP, vitamin A, folate and Zn and less fat, saturated fat, non-milk extrinsic sugars (NMES), Na, Ca, vitamin C and Fe than pupils taking packed lunches. Energy intakes were low in both groups.

*Conclusions:* Packed lunches were less likely to accord with food-based or nutrient-based standards than school lunches. Higher levels of Na, NMES, fat and percentage energy from saturated fat emphasise the difficulties associated with optimising nutrient intakes from packed lunches.

**Keywords**  
Primary school  
School lunch  
Packed lunch  
England  
Nutrient content

Primary-school pupils in England consume approximately one-third of their daily food intake at lunchtime<sup>(1)</sup>, provided either by the school as a school lunch (39.3% of pupils) or as a packed lunch brought from home<sup>(2)</sup>. A typical primary-school lunch would consist of two courses: a hot or cold main meal, a starchy accompaniment, a portion of vegetables/salad and a dessert/fruit. Water and bread would also be freely available. A packed lunch would typically contain a sandwich, a yoghurt, a chocolate biscuit, a piece of fruit and a bottle of squash.

Since the 1980s, parents have increasingly viewed packed lunches as more nutritious than school meals, or at least more likely to be consumed by their child at lunchtime<sup>(3–5)</sup>. However, studies conducted before the introduction of the 2006 food-based standards found that packed lunches typically contained fewer fruit and vegetables and more sources of sugar, saturated fat and Na than school lunches<sup>(3–5)</sup>, although they often provided more Ca and Fe<sup>(6)</sup>. Packed lunches consumed by pupils from low-income households were typically of poorer nutritional quality<sup>(7)</sup>.

With the introduction of the mandatory food-based and nutrient-based standards<sup>(8)</sup> in September 2008, primary-school food at lunchtime has improved compared with 2005<sup>(9)</sup>. These standards do not apply to packed lunches brought from home, although a good number of primary schools have introduced packed lunch policies to support healthier eating and offer clear guidance and an opportunity to improve food consumed by all pupils<sup>(10)</sup>. In 2006, a study assessed the quality of packed lunches in 8–9-year-old pupils (*n* 1294) across the UK and reported that they were still of poor nutritional quality; only 1% of packed lunches met all of the nutrient-based standards for England<sup>(11)</sup>.

This is the first report to compare school lunches and packed lunches following the introduction of compulsory nutrient-based standards for school lunches in primary schools in September 2008. On the basis of direct measures of lunchtime consumption in a nationally representative sample of 136 state-maintained primary schools in England, the findings highlight the key differences between 6580 school lunches and 3422 packed lunches.

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## Experimental methods

The School Food Trust carried out a cross-sectional survey of the lunchtime food provision and consumption in a nationally representative sample of 136 primary schools in England 6–8 months after the introduction of compulsory nutritional standards for school food. The survey assessed: (i) the catering provision of food and drink at lunchtime; (ii) the pupils' choices and consumption of food at lunchtime (including packed lunches); (iii) the nutrient content of school lunches; and (iv) the compliance of provision with the standards for school food. The present paper explores differences in food choice and nutrient intake between those pupils who took a school lunch and those who consumed a packed lunch (part (ii)), whereas the remaining findings (parts (i), (iii) and (iv)) are published elsewhere<sup>(12,13)</sup>. The method for measuring consumption replicated that used in a similar survey carried out in 151 primary schools in 2005<sup>(14)</sup>.

Fieldwork was conducted over the lunchtime period on five consecutive days at each school between February and April 2009. Ten pupils consuming a school lunch and five pupils consuming a packed lunch were selected at random (using a predefined selection schedule), in the dining room, at lunchtime. Consent to participate was given at the school level but pupils were asked whether they wished not to take part once approached. A total of forty-seven pupils (0.7%) either refused to take part or record sheets were incorrectly filled out. Trained fieldworkers recorded and weighed the food choices of a total of 6580 pupils taking a school lunch and 3422 pupils bringing a packed lunch during the fieldwork period (a further 175 pupils were excluded as no data on age or sex were recorded, pupils were aged 3 years or they consumed a mixture of food purchased from school and food brought from home). Data on age, sex, class teacher and year group were also collected from the pupils. Fieldworkers at ten of the schools recorded data from more than the required five packed lunches on  $\geq 1$  d. One of the 136 schools had 100% take-up of school meals; therefore, no pupils with a packed lunch were selected from this school. Consumption of each item was estimated by subtracting the leftover weight from the weight of the portion served. The energy and nutrient content of food and drink consumed was estimated using the Food Standards Agency (FSA) nutrient databank<sup>(15)</sup>. Food coding and recipe analysis was carried out by trained nutritionists following the FSA method<sup>(16)</sup>.

Data were analysed using the Statistical Package for the Social Sciences statistical software package version 15.0 (SPSS Inc., Chicago, IL, USA). Mean weights of food consumed and energy and nutrient intakes from school lunches and packed lunches were compared using ANCOVA, adjusting for age, sex and school.

## Results

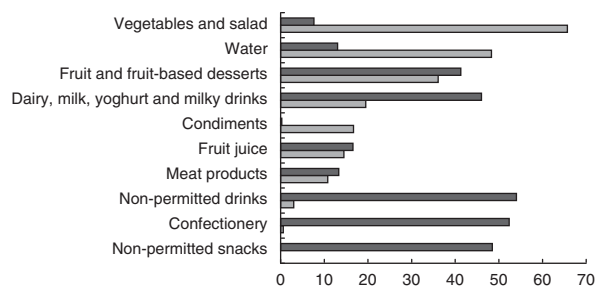
Analysis refers to food and drink items as consumed by pupils aged between 4 and 12 years. Figure 1 shows the percentage of pupils who consumed a food from each food group (only food groups comparable between school lunches and packed lunches have been included). Among pupils who consumed a packed lunch,  $\geq 48\%$  consumed non-permitted drinks, confectionery and non-permitted snacks (as defined by the food-based standards for school lunch<sup>(8)</sup>), whereas pupils who ate a school lunch almost never consumed these items. Fruit, fruit juice and dairy products were eaten more often by pupils consuming a packed lunch (41%) than a school meal (36%). Pupils bringing a packed lunch consumed meat products (such as sausages, meat pies, scotch eggs and pasties) more often, whereas pupils in the school lunch group consumed vegetables and salad and drank water much more often. Overall, pupils consumed an average of 1.6 portions of fruit and vegetables per day from all dishes served at school at lunchtime compared with 1.0 portion from packed lunches.

Table 1 shows the mean energy and nutrient intakes from school lunches compared with packed lunches. A total of fifty-nine pupils consuming a packed lunch and 116 pupils consuming a school lunch were excluded from the analysis as data on age and/or sex were missing (Table 1). Table 2 shows the age distribution of pupils in the sample by school lunch type.

Mean intakes of protein, fat, saturated fat and vitamin C from both types of lunch met the nutrient-based standards. However, mean intakes from packed lunches were, on average, higher in fat, saturated fat and vitamin C compared with school lunches.

Mean intakes of energy, carbohydrate, Fe, NSP, folate and Zn from both school lunches and packed lunches fell below the minimum standards<sup>(8)</sup>. School lunches as eaten, on average, provided more NSP, folate and Zn, but less energy, carbohydrate and Fe than packed lunches.

Mean intakes of Ca from school lunches, but not from packed lunches, fell below the minimum standard.



**Fig 1** Percentage of pupils who ate a food from each food group, by type of lunch, primary schools, England, 2009. Base: 3422 pupils bringing a packed lunch (■) and 6580 pupils taking a school lunch (□). Fruit included fruit-based desserts provided at school lunches (containing an average of 40% fruit). All differences were statistically significant at  $P < 0.001$

**Table 1** Mean energy and nutrient intake, by type of lunch, primary schools, England, 2009

	Nutrient-based standard	School lunch (n 6580)		Packed lunch (n 3422)		Difference
		Mean	SD	Mean	SD	
Energy (kJ)	2219.0	1651.6	751.1	1883.6	721.0	-232.0
Protein (g)	7.5	15.1	7.1	13.5	6.4	1.6
Carbohydrate (g)	70.6	56.9	26.5	64.2	25.2	-7.3
NMES (g)	15.5	12.0	10.6	18.1	13.1	-6.1
Fat (g)	20.6	13.3	8.6	17.3	8.9	-4.0
Saturated fat (g)	6.5	5.0	3.7	6.5	3.9	-1.5
NSP (g)	4.2	3.6	2.1	2.7	1.6	0.9
Na (mg)	499.0	443.3	284.3	626.9	307.0	-183.6
Vitamin A ( $\mu$ g)	175.0	242.5	330.3	115.9	185.8	126.6
Vitamin C (mg)	10.5	17.3	16.9	25.9	29.6	-8.6
Folate ( $\mu$ g)	53.0	49.8	26.2	38.1	29.0	11.7
Ca (mg)	193.0	167.5	121.5	211.6	120.6	-44.1
Fe (mg)	3.0	1.9	0.9	2.0	1.0	-0.1
Zn (mg)	2.5	1.7	1.0	1.5	0.8	0.2
Percentage of energy from						
Protein	-	16.1	5.8	12.1	4.2	4.0
Fat	$\leq 35.0$	28.7	10.4	33.9	9.6	-5.2
Saturated fat	$\leq 11.0$	10.9	5.4	12.7	5.4	-1.8
Carbohydrate	$\geq 50.0$	54.9	10.7	54.2	9.7	0.7
NMES	$\leq 11.0$	10.8	8.5	15.1	10.3	-4.3

NMES, non-milk extrinsic sugars.

Base: 6580 pupils taking a school lunch (data on 6696 pupils were collected from all 136 schools, 116 pupils were excluded from the analysis as they had missing data on sex and two were aged 3 years) and 3422 pupils taking a packed lunch (data on 3481 pupils were collected from 135 of the schools as one school served only 100% school lunches, fifty-nine pupils were excluded from the analysis as they had missing data on sex and/or age and three were aged 3 years).

All differences between school lunch and packed lunch were found to be statistically significant at  $P \leq 0.001$  (analysis of covariance adjusted for age, sex and school).

**Table 2** Ages of pupils in the sample, by lunch type, primary schools, England, 2009

Age (years)	School lunch	Packed lunch	All
	n	n	n
4	470	273	743
5	983	466	1449
6	982	502	1484
7	1002	448	1450
8	919	452	1371
9	892	502	1394
10	899	515	1414
11	432	264	696
12	1	0	1
Total	6580	3422	10 002

Base: 6580 pupils taking a school lunch and 3422 pupils taking a packed lunch.

Intakes from school lunches met the maximum standards for non-milk extrinsic sugars (NMES) and Na and the minimum standard for vitamin A, whereas intakes from packed lunches did not. All differences were statistically significant ( $P \leq 0.001$ ).

Intakes from school and packed lunches met recommended levels for percentage energy from fat and total carbohydrate. However, the mean percentage energy from fat from school lunches was lower than that from packed lunches (28.7% *v.* 33.8%). Intakes from packed lunches exceeded government recommendations for percentage energy from NMES and saturated fat, whereas school lunches were within the recommended levels.

## Discussion

Pupils who brought packed lunches consumed more dairy, milk, yoghurt and milk drinks and more fruit and fruit juice than pupils who took a school lunch, resulting in higher intakes of Ca and vitamin C. Pupils who ate packed lunches also consumed more non-permitted snacks (savoury snacks with added fat, sugar or salt), non-permitted drinks, confectionery and meat products (as described by the food-based standards for school lunch<sup>(8)</sup>) than did pupils in the school lunch group (all of which are high in fat, sugar or salt). The resulting intakes of NMES, Na and percentage energy from saturated fat were greater in packed lunches than in school lunches, and failed to meet government recommendations. Although high in vitamin C, fruit juice also contributed to higher intakes of NMES among pupils consuming packed lunches.

The introduction of nutrient-based standards for school food has improved the nutritional profile of food and drink consumed compared with 2005<sup>(12,13)</sup>. However, despite this improved provision, pupils' consumption does not always reflect these positive changes in provision. There is no direct evidence that the nutritional profile of packed lunches has shown a similar improvement over the same period (e.g. as schools have introduced packed lunch policies<sup>(10)</sup>), although a comparison between the present findings and those collected by Evans *et al.*<sup>(11)</sup> for 8-9-year-olds in 2006 shows higher consumption of NSP, vitamin A,

vitamin C, folate, Ca, Fe and Zn, and lower levels of NMES. However, consumption of fat and Na was higher.

Along with carbohydrate, NSP, folate, Ca, Fe and Zn, the average energy intake of pupils consuming a school lunch fell below that recommended<sup>(8)</sup>. Other results from the present study (reported elsewhere)<sup>(12)</sup> have shown that the energy content of the average school meal as provided by the school was 2622 kJ (626.3 kcal)<sup>(12)</sup>. Pupils are not, therefore, consuming enough of the food available to them. This could be because of small or inappropriate portion sizes or food being discarded. An increase in energy intake from a menu that is nutritionally balanced may also lead to better intakes of micronutrients.

Despite lower intakes of energy, the nutrient content of the average school lunch is more favourable than that of an average packed lunch, but pupils must be encouraged to choose and eat more of the foods on offer in order to maximise the benefit of eating a school lunch. Likewise, in a bid to improve the packed lunch items chosen by parents and pupils and to ensure that they are more in line with the nutritional standards for school food and current dietary recommendations, schools should be encouraged to implement a packed lunch policy (e.g. limiting fatty or salty snacks, sugary drinks and confectionery being brought by pupils to school) as part of a whole school approach towards healthy eating. This may benefit pupils by addressing the gap between the nutritional content of packed lunches and school lunches and help to support other government initiatives, e.g. the Change4Life<sup>(17,18)</sup> campaign to reduce the prevalence of childhood overweight and obesity. Ideally, pupils should be encouraged to take school lunches rather than opting for packed lunches to ensure that they have access to a range of healthy food and drink items, thus helping them to choose and consume energy-appropriate and nutrient-dense meals at lunchtime.

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### References

1. Gregory J *et al.* (2000) *National Diet and Nutrition Survey of Young People aged 4 to 18 Years*. London: The Stationary Office.
2. Nelson M, Lever E, Nicholas J *et al.* (2009) Fourth annual survey of take up of school lunches in England. [http://www.schoolfoodtrust.org.uk/UploadDocs/Library/Documents/annual\\_survey2008-2009.pdf](http://www.schoolfoodtrust.org.uk/UploadDocs/Library/Documents/annual_survey2008-2009.pdf) (accessed March 2010).
3. Ruxton CHS, Kirk TR & Belton NR (1996) The contribution of specific dietary patterns to energy and nutrients intakes in 7–8 year old Scottish schoolchildren. II. Weekday lunches. *J Hum Nutr Diet* **9**, 15–22.
4. Evans CEL, Greenwood DC & Cade JE (2010) *A Comparison of the Nutrient Intakes of British Primary School Children: A Systematic Review and Meta-Analysis*. Leeds: Nutritional Epidemiology Group, Centre of Epidemiology and Biostatistics, University of Leeds.
5. Rogers IS, Ness AR, Hebditch K *et al.* (2007) Quality of food eaten in English primary schools: school dinners versus packed lunches. *Eur J Clin Nutr* **61**, 856–864.
6. Rees GA, Richards CJ & Gregory J (2008) Food and nutrient intakes of primary school children: a comparison of school meals and packed lunches. *J Hum Nutr Diet* **21**, 420–427.
7. Nelson M, Erens B, Bates B *et al.* (2007) Low Income Diet and Nutrition Survey. <http://www.food.gov.uk/science/dietarysurveys/lidnsbranch/> (accessed March 2010).
8. Department of Education and Employment (2007, 2008) The Education (Nutritional Standards and Requirements for School Food) (England) Regulations 2007 (SI 2007/2359) as amended by the Education (Nutritional Standards and Requirements for School Food) (England) (Amendment) Regulations 2008 (SI 2008/1800). [http://www.opsi.gov.uk/si/si2007/ukxi\\_20072359\\_en\\_1](http://www.opsi.gov.uk/si/si2007/ukxi_20072359_en_1); [http://www.opsi.gov.uk/si/si2008/ukxi\\_20081800\\_en\\_1](http://www.opsi.gov.uk/si/si2008/ukxi_20081800_en_1) (accessed March 2010).
9. The School Food Trust (2010) Primary school food survey 2009: 1. School lunch: provision, selection and consumption. [http://www.schoolfoodtrust.org.uk/UploadDocs/Library/Documents/sft\\_primary\\_school\\_food\\_survey\\_2009.pdf](http://www.schoolfoodtrust.org.uk/UploadDocs/Library/Documents/sft_primary_school_food_survey_2009.pdf) (accessed March 2010).
10. Wood L & Nicholas J (2009) *Schools Food Panel*. London: School Food Trust; available at [http://www.schoolfoodtrust.org.uk/UploadDocs/Library/Documents/sft\\_sfp7\\_report\\_final.pdf](http://www.schoolfoodtrust.org.uk/UploadDocs/Library/Documents/sft_sfp7_report_final.pdf)
11. Evans CEL, Greenwood DC, Thomas JD *et al.* (2009) A cross-sectional survey of children's packed lunches in the UK: food- and nutrient-based results. *J Epidemiol Community Health* **64**, 977–983.
12. Haroun D, Harper C, Wood L *et al.* (2010) The impact of the food-based and nutrient-based standards on lunchtime food and drink provision and consumption in primary schools in England. *Public Health Nutr* (Epublication a head of print version).
13. The School Food Trust (2010) Primary school food survey 2009. Full Technical Report. <http://www.schoolfoodtrust.org.uk/school-cooks-caterers/reports/primary-school-food-survey-2009-full-technical-report> (accessed September 2010).
14. Nelson M, Nicholas J, Suleiman S *et al.* (2005) School meals in primary schools in England. <http://www.dcsf.gov.uk/research/data/uploadfiles/RR753.pdf> (accessed March 2010).
15. Food Standards Agency (2003) *NDNS Nutrient Databank v 1.32.0 Release 1.32.0*. London: FSA.
16. National Diet and Nutrition Survey (2008–2009) Appendix A – Dietary data coding and editing. <http://www.food.gov.uk/multimedia/pdfs/publication/ndns0809appendixa.pdf> (accessed September 2010).
17. HM Government (2008) Healthy weight, healthy lives; a cross-government strategy for England. [http://www.dh.gov.uk/prod\\_consum\\_dh/groups/dh\\_digitalassets/documents/digitalasset/dh\\_084024.pdf](http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/documents/digitalasset/dh_084024.pdf) (accessed March 2010).
18. Change4Life Campaign (2010) <http://www.nhs.uk/change4life/Pages/change4life.aspx> (accessed March 2010).