Improving School Meals in the London Borough of Southwark

An Evaluation of a Healthy Eating Intervention

Dr Angela Madden, Dr Ruth Ash, Rebecca Harrex, Joanna Radalowicz

Department of Health and Human Sciences

London Metropolitan University

Holloway Road, London N7 8DB

June 2005

1 Summary

School meals have the potential to provide an important source of good nutrition for young people. However, published evidence shows that most children do not make healthy choices when offered food at school and this suggests that they may benefit from a health intervention to optimise their dietary intake. The aim of the present study was to evaluate an intervention undertaken to improve healthy food choices made by children eating at school.

The food consumed by children in the school dining area was evaluated before and after the intervention by examining their trays at the start of the meal and weighing any leftovers. Mean energy, macronutrient and fruit and vegetable intake were determined and the differences between the two periods compared.

Completed records were obtained from 180 children before and 198 after the intervention. A significant reduction in mean energy, protein, fat and carbohydrate intake was observed after the intervention while the children also ate significantly more fruit and vegetables (12.0 ± 10.4 vs 30.0 ± 30.5 g / day, $P<0.05$). However, in spite of these improvements, the mean intake of fat remained high (40 ± 9% of total energy) and the total amount of fruit and vegetables consumed remained low. The study showed that nutritional intake from school meals can be significantly improved by an intervention. Although the benefits observed were somewhat limited, the results suggest that further attempts to optimise school meals should be investigated.

Contents page

2 Background

The prevalence of obesity in children and adolescents in the UK has increased substantially in the last thirty years (Chinn & Rona 2001, McCarthy et al 2003). Obesity is associated with an increased risk of morbidity and death and therefore addressing this increased prevalence is an important public health issue. The recent National Diet and Nutrition Survey of young people aged 4-18 years reported that between one quarter and one third of their intake of energy, fat, fibre, iron, calcium, vitamin C and folate was provided by school meals (Department of Health 2000). However, an examination of school meals in secondary schools in England found that most children do not make healthy food choices and that existing practices in school dining rooms have little influence on improving these choices (Nelson et al 2004). Therefore, although school meals are an important source of nutrients and could provide a potentially valuable route for optimizing the dietary intake of young people, this does not appear to be happening at present.

An intervention to increase the healthy food choices and thus improve nutrient intake has been undertaken in a secondary school in the London Borough of Southwark. This report describes the evaluation of the effects of the intervention.

3 Aim

To evaluate the food and nutrients from school meals consumed by children before and after an intervention to improve healthy food choices.

Specific objectives

1) to measure the mean change in energy and macronutrient intake;

2) to measure the mean change in fruit and vegetable intake;

3) to collect limited qualitative information on the children's perception of their school meals.

4 Methodology

4.1 Overview

The evaluation was undertaken over two separate 1-week periods, before and after the intervention in one London secondary school. Two researchers visited the school dining area each day and measured the food consumed by children eating there using the method of Nelson et al (2004).

4.2 Participating school

A number of secondary schools in South London were approached by staff from Health First, Lambeth Health Team and Lewisham Primary Care Trust to

participate in the project. In-house catering, to facilitate the intervention, and support from the school staff were required. Three schools initially expressed interest but only one, Kingsdale School (Alleyn Park, Dulwich, London SE21 8SQ) eventually agreed to participate.

Preliminary information from Kingsdale School indicated that the lunch period lasted 45 minutes and all pupils, except those in year 7 (aged 11-12 years), came into the dining area at the same time, i.e. there was no staggering of entry. The pupils in year 7 ate in a different area and were therefore excluded from the study. Approximately 800 lunches were provided by the catering staff each day and the dining area provided seating for between 150 and 200 children.

4.3 Training of project helpers

Ten children from years 8 and 9 at Kingsdale School were identified by school staff and trained by the researchers to assist in supervised data collection. These 'helpers' remained blind to the precise nature of the project but were informed that they were going to be assisting in collecting data on school meals to see what children were eating at their school. The helpers were trained in how to complete food data collection (FDC) sheets (Appendix 1) and in weighing food using sample foods.

4.4 Weighing of food served

Samples of all food items available from the school canteen during lunch times were weighed by the researchers in order to determine average portion sizes. This was carried out during both evaluation weeks, i.e. before and after the intervention, using battery operated weighing scales, accurate to 1 gram (Soehnle, Murrhardt, Germany). Foods were weighed as whole products and as individual food constituents where possible. Samples of foods available every day were weighed three times each week. Samples of other foods appearing less frequently on the menu were weighed twice on the day they appeared. Food items that were pre-packaged such as Kit-Kats were only weighed once as their weights were found to correspond well with the printed weight recorded on the packaging.

4.5 Identification of participating subjects

The children who participated in the study were restricted to those eating in the school dining area. This was because the measurement of waste was required and it was not possible to retrieve this from children who had taken their food outside. Each researcher and their helpers were allocated a section of the dining area from which they randomly selected children to invite to participate in the study. Subjects were approached once they had sat down to eat their meal. They were given a brief explanation about what the study involved and asked if they were willing to participate. Those who agreed were asked their age and

school year and assigned a study number which was attached by sticker to their tray. Their gender and ethnicity was also recorded.

4.6 Recording of food served and eaten

The trays of the participating children were examined visually by either a researcher or supervised helper and an FDC sheet completed for each. The FDC sheets were designed so that all of the foods items available at that meal were listed in one column and the researcher or helper simply had to tick the corresponding box if the item was on the tray and identify if more than one standard portion had been served. After the child had finished their meal, the tray was retrieved using the identifying sticker and any uneaten food remaining was separated, identified, weighed to the nearest gram and recorded on the same FDC sheet.

4.7 Perception of the eating in the dining area

In order to determine how the children felt about their eating environment, and whether this affected their food choices, a sub-sample of ten children eating in the dining area were asked to complete a short questionnaire (Appendix 2). A second short questionnaire (Appendix 3) was completed by a further ten children eating outside the dining area in order to explore why children were not eating there.

4.8 Data analysis.

FDC sheets with information missing or where wastage had not been recorded due to plates not being returned, were discarded. The quantity of food eaten by eaten child was calculated from the food served using the standard portions minus the waste remaining on the tray. Each child's intake was analysed using a computerized nutritional analysis package (Foodbase, Version 3.1 Standard Edition, London Metropolitan University, 2000) to determine energy, protein, fat and carbohydrate content.

A manual calculation was undertaken to determine fruit and vegetable consumption. Data were collapsed into five categories to simplify different types, namely, *fruit* (all types), *vegetable* (all cooked vegetables including pasta sauce), *salad* (lettuce, tomato, cucumber), *tomato puree* and *ketchup*.

Data collected before and after the intervention were compared by means of the independent t-test using the computerized statistical package, SPSS (Version 11.5, SPSS Inc, Chicago 2002) to determine whether there had been any change in content of the meals after the intervention.

4.9 Ethics

Permission to undertake the study was obtained in writing for the Headmaster of Kingsdale School. Children were asked to give verbal consent before participating and their parents were informed in writing by an open letter providing information about the study. No information which could identify individual children was recorded and data were recorded in a neutral and non-judgmental manner. Ethical approval was requested from London Metropolitan University.

5 Intervention

The intervention to improve nutrient intake was by Registered Dietitian, Dianne Boaden between the two evaluation weeks (23 May and 6 June 2005). Details of the intervention are not included in this report.

6 Results

A total of 378 meals were evaluated. The observations were made in 180 children before the intervention and in 198 children afterwards.

6.1 Demography of participants

The food records analysed were obtained from randomly selected pupils in four school year groups, representing young people between the ages of 12 and 16 years (Table 1). More boys than girls took part in the study (Table 2) and more black pupils participated than any other ethnic group (Table 3); this was a reflection of the study population. The Catering Manager reported that approximately 1000 children were catered for each day, of which about 800 of these children were in school years 8 to 11. Approximately 75% of pupils were entitled to free school meals.

Table 1 Distribution of participating pupils by school year groups

	Before intervention		After intervention	
Year group	Number	% of total	Number	% of total
8	50	27.8	56	28.3
9	54	30.0	68	34.3
10	50	27.8	38	19.2
11	26	14.4	36	18.2
Total	180	100	198	100

Table 2 Ethnicity of pupils participating in study

	Before intervention		After intervention	
Ethnicity	Number	% of total	Number	% of total
White	18	11.8	27	13.6
Black	106	69.8	132	66.7
Asian	24	15.8	25	12.6
Oriental	4	2.6	14	7.1
Total	152*	100	198	100

*The ethnicity of 28 children was not recorded

Table 3 Proportion of male and female pupils participating in study

	Before intervention		After intervention	
Gender	Number	% of total	Number	% of total
Male	110	61.1	146	73.7
Female	70	38.9	52	26.3
Total	180	100	198	100

6.2 Macronutrient intake

a) Energy - The mean energy intake was significantly lower after the intervention in the total group of pupils (606 ± 219 vs 701 ± 222 kcal, $P<0.01$) and in boys and girls separately (Table 4). The range of energy intakes across all the pupils studied was 161-1352 kcal before the intervention and 156-1577 kcal afterwards.

Table 4 Energy and nutrient intake before and after intervention. Values expressed as mean ± SD.

	All pupils		Boys		Girls	
	Before (n=180)	After (n=198)	Before (n=110)	After (n=146)	Before (n=70)	After (n=52)
Energy (kcal)	701±219	606±222**	724±203	633±219**	667±240	529±210**
Protein (g)	24.6±11	21.7±9.4**	26.8±10.4	22.8±9.7**	21.0±10.8	18.6±7.9
Fat (g)	34.9±13.1	27.8±13.1**	35.5±12.4	28.9±12.8**	33.9±14.1	24.8±13.4**
CHO (g)	76.9±24.6	71.7±25.8*	79.3±23.1	75.2±26	73.2±26.4	61.9±22.6
%E protein	14±7	15±6	15±7	15±6	13±6	16±8*
%E fat	44±8	40±9**	43±7	40±8**	45±8	40±11**
%E CHO	42±5	45±7**	41±4	45±7**	42±6	45±8

Significant difference between intakes before and after intervention using an independent t-test: *P<0.05; **P<0.01.

%E = percentage energy; CHO = carbohydrate.

b) Protein - The mean protein intake was significantly lower after the intervention in the total number of subjects (21.7 ± 10.9 vs 24.6 ± 9.4 g, P<0.01). The range of protein intakes before and after the intervention was 2.0-54.2 g and 3.0-66.9 g respectively. The mean percentage energy from protein slightly increased for all subjects after the intervention and this was due to a significant increase in the proportion of energy contributed by protein in the girls.

c) Fat - The mean fat intake was significantly lower after the intervention in the total number of subjects (27.8 ± 13.1 vs 34.9 ± 13.1 g, P<0.01). The range of fat intakes across all the pupils was 5.3-73.2 g before and 2.7-70.3 g afterwards. The proportion of energy contributed by fat was significantly lower after the intervention, falling from 44 ± 8 to 40 ± 9 % (P<0.01).

d) Carbohydrate - The mean intake of carbohydrate was significantly lower after the intervention in the total number of subjects (71.7 ± 25.8 vs 76.9 ± 24.6, P<0.05) but this represented a significant increase in the proportion of energy provided by carbohydrate (45 ± 7 vs 42 ± 5 %, P<0.01). The increase in the proportion of energy provided by carbohydrate is due to the larger reduction in the amount of energy provided by protein and fat (74 kcals) than in the amount provided by carbohydrate (20 kcals); thus altering the relative contributions of the macronutrients to total energy.

6.3 Fruit and vegetable intake

Before the intervention, the mean intake of fruit and vegetables per meal across all the pupils was 12.0 ± 10.4 g. This included no fruit as none was available in the dining area. A significant increase was observed after the intervention for total fruit and vegetable intake and for salad and fruit separately (Table 5). The

proportion of fruit and vegetables contributed by each of the subgroups changed following the intervention with increases observed in fruit and salad and relative decreases in vegetables, tomato puree and ketchup.

Table 5 Fruit and vegetable intake before and after intervention. Values expressed as mean weight (g) ± SD.

	All pupils	
	Before (n=180)	After (n=198)
Fruit	0 ± 0	7.9 ± 21.3*
Vegetable	1.8 ± 7.8	2.7 ± 7.6
Salad	1.5 ± 6.1	11.0 ± 20.0*
Tomato puree	2.2 ± 3.1	2.6 ± 3.5
Ketchup	6.5 ± 6.7	6.2 ± 5.9
Total	12.0 ± 10.4	30.3 ± 30.5*

Significant difference between intakes before and after intervention using an independent t-test: *P<0.01.

6.4 Perception of the eating in the dining area

Ten pupils eating school meals in the dining area completed the questionnaire (Appendix 2). Seven of them considered that there was not enough choice and six that there was a lack of healthy food choice. The reasons for disliking the food included that it was always the same (two), the food was ‘junk’ (two), often

hard chips, burnt pizza and greasy food were served and a lack of rice or pasta. One child wrote *'I want chips every day, not to be force fed healthy food.'* More rice and chicken was requested by four children, more pasta by two, fruit (two), desserts (one) and daily fajitas (one). One child wanted *'the same food as the staff get.'* More vegetarian options and more traditional foods would be preferred by eight of the ten pupils while nine of them considered that a menu would be helpful. Three children thought the dining area was not big enough while other comments included that there was not enough control and that the area was dangerous, bad and crowded. One child considered the dining area as *'OK.'* Suggestions for improvements included the provision of more tables (two), more teachers (two), more air (two), removing the walkway and providing menus.

A further ten children who were eating outside the dining area completed the second questionnaire (Appendix 3). Six of them sometimes ate in the dining area but four of them reported that they never did. The reasons given for eating outside included the lack of seats (four), friends not eating there (two), lack of time, other pupils throwing items from the walkway and embarrassment. Nine pupils said that they would eat in the dining area if it was improved and six said that this would lead to them making different food choices. Suggestions for improvements included more chairs (four), proper tables (two), a bigger area, more cleaning, more teachers patrolling, more bins and lines to mark out queues. The food that these pupils were eating included tuna baguettes (six), cheese baguette (2), ham baguette, chocolate (three) and crisps. Their comments on

the choice of food available included *'the food is good', 'the baguettes contain salad which is good', 'some of the food is ok', 'more choice, especially traditional foods such as chicken, curry or rice would be good', 'there should be a full healthy meal, not just salad', 'there should be more vegetarian options'* and *'the food is always the same'.*

7 Discussion

The findings of the analysis of the children's intake before the intervention were similar to those reported in a larger, national survey (Nelson et al 2004). The results also show that the intervention had a significant impact on the macronutrient and fruit and vegetable intakes of school meals consumed. However, even after the intervention, the mean proportion of energy provided by dietary fat, 40%, still exceeded the 35% recommended in the Dietary Reference Values (Department of Health 1991). In addition, the mean intake of fruit and vegetables, 30 g per meal, is very small compared with the widely used healthy eating guideline of five portions or 400 g (80 g x five) per day (British Dietetic Association 1998) and does not reach a quarter of the recently published minimum target of two portions of fruit and vegetable per school meal (Crawley 2005).

Reasons for the increased intake of fruit and vegetables can be attributed to a number of factors including the placement of large salad bowls at the ends of counters serving burgers and pizza. The children were then able to help themselves to any amount of salad they wished to. In addition, the quantity of salad included in the baguettes also changed after the intervention with, for example, the mean content of a tuna baguette increasing from 11 g of cucumber to 13 g of lettuce, 7 g of cucumber and 7 g of tomato. The increase in fruit intake was more simply due to the fact that no fruit was available before the intervention

period, whereas afterwards it was available each day. It is possible that if fruit were placed in a prominent position on the serving counter and priced so that it was available to those on free school meals without them having to go without a whole main meal, the intake of fruit would have been even higher.

Although a salad bowl was on offer during one of the pre-intervention days, the only other vegetables were the salad forming part of the baguette, or small amounts forming part of dishes such as fajitas or vegetable pizza. Both before and after the intervention, these did not amount to a full portion size. The salad available to children after the intervention period was also not consumed in large enough amounts to have equalled a full portion (a desert bowl).

Due to the restricted time available for data collection, two 1-week periods and the lunch period of 45 minutes, it was only possible to survey children eating in the school dining area. It was observed that the majority of those taking their lunches away were choosing baguettes that contained salad, whereas those eating in the dining area tended to choose burgers or pizza, and chips. The mean nutrient intakes calculated may not, therefore, reflect the intake of all children at the school, so further study would need to be done to determine intake of those eating outside the dining area.

The period during which the study took place coincided with a renovation programme at the school, resulting in the usual kitchen and dining areas not being available for use. As a consequence, the catering staff were unable to provide a 'hot meal of the day' for the children although it was still available to staff. The majority of choices therefore available to the children were those considered to be 'fast food' type including burgers, pizza and chips. This may not be a true reflection of usual choices made by the children. However, as conditions were the same for both evaluation periods, before and after the intervention, the significant differences observed probably do represent a small but useful improvement in dietary intake.

The study did not attempt to evaluate the choice of drinks consumed during the lunch period. This was because many children took their drinks away with them, and therefore it would not have been possible to record waste. One of the drink options however, was fruit juice, which if included, would have contributed to fruit intake. Therefore, fruit intake may actually have been higher than that which was recorded.

Although a number of changes to food choice and nutrient intake were observed after intervention, a number of issues were highlighted which could have influenced the choices being made. The first is that of cost. It was discovered that a large proportion of children at the school were entitled to free school

meals. However, this entitlement did not allow children to select any food they liked from the menu, but was worth £1.22 per day. This enabled the children to purchase, for example, a portion of chips (£0.70), and a slice of cheese and tomato pizza (£0.50). However, the vegetable pizza was priced at £0.70, therefore putting it beyond the reach of those unable to pay for their meals, unless they had no chips (the only separate carbohydrate option).

A salad bowl was offered on one of the pre-intervention days, but again this was at further cost, meaning it was unlikely to be chosen. In fact, none of the children surveyed chose the salad, and discussion with the catering staff revealed that only one salad bowl had been sold. After the intervention period, it was noticed that a greater number of children had included salad as part of their meal. Rather than it being sold in individual bowls, it was placed by the food counters so that the children could easily help themselves and it was available to them free of charge. This suggests that a number of the children would choose healthier options if there were no financial constraints.

It is therefore possible that if the children entitled to free school meals were able to spend more, they would be able to choose healthier options, or at least include a piece of fruit or salad with their meal. The recently published Caroline Walker Trust school food standards (Crawley 2005) suggest that local education authorities should agree a sum for free school meals which would allow children

to have a two course meal and a drink.

The method of serving food was also identified as being a potential barrier to change. The foods offered each day were sold from different counters, meaning that a number of long queues formed quickly, as all children were entering the dining area at the same time. Fruit was available from the baguette counter, and therefore, if a child had spent time queuing for the hot option, it was unlikely that they would then queue for a piece of fruit, if there were crisps, chocolate, and muffins etc. available from the counter they were already at. If for example fruit were available from each counter, it would have been more easily available, and visible, and may therefore have been chosen more frequently.

No menu was displayed to show the food available each day. Children, therefore, tended to queue at the counters where they knew the foods definitely being offered there. It is possible that if a healthier option was advertised on a menu, visible by all children, as being served from a particular counter, that there may have been an increased intake.

In summary, the evaluation has shown that the intervention undertaken resulted in a significant improvement in the mean nutrient intake of school food. However, the improved diet still failed to meet a desirable standard and further

input from health professionals is required to optimize the food choice of children eating at school. The findings have raised a practical issues, for example the provision of fruit at all food service counters, which could further improve nutrient intake without resulting in a completely revised menu that children might find unacceptable.

8 Acknowledgements

- The co-operation and support from the pupils, helpers, catering and teaching staff, particularly Roxanne McDougall, at Kingsdale School was greatly appreciated.

- Clare Smith, Theresa Moses, Christine Nolan, Jin Lim and Jane Searle contributed to the setting up of the study and supported its execution.

- The study was funded by through the Public Health Directorate at Southwark Primary Care Trust and Social Services.

9 References

- British Dietetic Association (1998). Give me five campaign. Birmingham: British Dietetic Association.

- Crawley H (2005). Nutrient-based standards for school food. St Austell: Caroline Walker Trust.

- Chinn S, Rona RJ (2001). Prevalence and trends in overweight and obesity in three cross sectional studies of British Children, 1974-94. British Medical Journal **322**, 24-26.

- Department of Health (1991). Dietary reference values for food energy and nutrients for the United Kingdom. Report of the Panel on Dietary Reference Values of the Committee on Medical Aspects of Food. Report of health and social issues, 41. London: Her Majesty's Stationary Office.

- Department of Health (2000). National diet and nutrition survey of young people aged 4 to 18 years. London: The Stationary Office.

- McCarthy HD, Ellis SM, Cole TJ (2003). Central overweight and obesity in British youth aged 11-16 years: cross sectional surveys of waist circumference. British Medical Journal **326**, 624-627.

- Nelson M, Bradbury J, Poulter J, McGee A, Msebele S, Jarvis L (2004). School Meals in Secondary Schools in England, Research Report RR557. London: Food Standards Agency & Department for Education and Skills.

Appendix 1

Food Data Collection Sheet

Gender: Male Female

Ethnicity: White Black Asian Oriental

Age:---------- Year:----------

Date:----------

Food item available	Chosen	Weight of waste (g)
----------	----------	----------
----------	----------	----------
----------	----------	----------
----------	----------	----------
----------	----------	----------
----------	----------	----------
----------	----------	----------
----------	----------	----------
----------	----------	----------
----------	----------	----------
----------	----------	----------
----------	----------	----------
----------	----------	----------
----------	----------	----------
----------	----------	----------

Appendix 2

Questionnaire: Perception of eating in the dining area - to be completed by children eating in dining area.

Q1.What do you think of the choices available?
Good: Some choice: Not sure: Not enough choice: Not enough healthy choice:

Q2. What do you dislike about the menu? Comments.

Q3. What other foods would you like to see? Comments.

Q4. Would you like more vegetarian options?
Yes: No:

Q5. Would you like more traditional foods?
Yes: No:

Q6. Would a menu be helpful?
Yes: No:

Q7. How often do you eat the following foods?:
Fruit? Every day: Sometimes: Not often:
Vegetables? Every day: Sometimes: Not often:
Salad? Every day: Sometimes: Not often:

Q8. What do you think of the eating area? Comments.

Q9. What could be improved?

Appendix 3

Questionnaire: Perception of eating in the dining area - to be completed by children NOT eating in dining area.

Q1. Ethnicity White: Black: Asian: Oriental:
School Year 8: 9: 10: 11:

Q2. How often do you eat in the dining area?
Usually:
Sometimes:
Never:

Q3. Why do you normally not eat in the dining area?
Friends not eating in dining area:
Lack of time:
Lack of seats:
Other: Specify:

Q4. What have you bought to take away?

Q5 How could the eating area be improved? Comments.

Q6. If these things were done, would you eat in?
Yes: No: Maybe:

Q7. Would your food choices be different if the above was done?
Yes: No: Maybe:

Q8. What do you think of the choices available? Comments.