The paper is based on food intake data from primary and secondary schools in Liverpool from a study which also examined fitness, physical activities and activity preferences.

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Eating Habits of Children in Liverpool: a need for health education?

The first years of secondary school may be crucial for implementing healthy eating initiatives and, in particular, influencing boy's attitudes to food.

A national survey of the dietary habits of UK children indicated low consumption of fruit and vegetables and high consumption of less desirable foods such as confectionery, savoury snacks, soft drinks and chips.

Although children are healthier than ever before, an epidemic of diet-related disease is developing. Tooth decay is still a major problem and may be increasing, heart disease and stroke cost the NHS £3.8 billion per year and about one third of cancers are attributable to diet (DH, 1998a).

Studies have found anaemia in 25% children which may impair academic performance (Vereecken & Maes, 2000) and the ability to work. Rickets has been making a come back and osteoporosis may be aggravated by poor calcium intake during adolescence (DH, 1998b). Of most concern however is the year-on-year increase in obesity and even type 2 diabetes is beginning to appear in children. Until recently this was only associated with overweight older adults. Paradoxically, eating disorders like anorexia are also a problem for a few but are very severe, and even affect primary school aged children. Eating a poor diet affects the health of children now and contributes to the later development of diet related disorders (Coles & Turner, 1995) and all these problems are far more common in less affluent areas.

Poor UK dietary habits

The typical diet of UK children is amongst the worst in Europe (Vereecken & Maes, 2000) being high in fat and sugar, low in fibre, iron and calcium, and possibly folate (Nelson 1994). The recent national survey of the dietary habits of children (Gregory et al, 2000) indicated low consumption of fruit and vegetables and high consumption of less desirable foods such as confectionery, savoury snacks, soft drinks and chips. Intakes of saturated fats and sugars were high. Differences between boys and girls were not consistent but there were many age related differences (Gregory et al, 2000); notably, more of the younger children ate biscuits, sugar confectionery, savoury snacks and soft drinks.

Adamson et al (1992) found evidence that dietary habits of adolescents deteriorated between 1980 and 1990 (the proportion of non-milk extrinsic sugars increased; mainly from snack foods) although some improvements had occurred, e.g. fibre and iron intakes increased.

A survey of over 6,000 children discovered that only 59% of respondents ate fruit at least once a day and only 33% ate vegetables or salad at least once a day (HEA, 1996). Hackett et al (1997) found more children from the least affluent areas to consume a greater number of the least desirable foods (Hackett et al, 1997; Bakker, 1991). In general; the more desirable foods such as fruit and vegetables, wholemeal bread and reduced fat milk are less popular than the least desirable foods e.g. confectionery, crisps, chips and soft drinks (Hackett et al, 1997).

Adolescence is a period of very rapid transition physically, mentally and socially. Children gradually become independent, making decisions for themselves including choice of foods.

Health, food and activity

Adolescence is a period of very rapid transition physically, mentally and socially. Children gradually become independent, making decisions for themselves including choice of foods. A crucial period is the move from primary to secondary school when marked changes in diet may be expected. Promoting health through physical activity and sound dietary behaviour is mentioned in the national curriculum although most time is spent on core subjects such as Mathematics, English, Science and Technology. Food and health can be included as part of the cross-curricular theme 'Health' and as minor components of the science and technology curricula. Physical education however, has suffered drastic reductions in curriculum time (Fairclough and Stratton 2000).

Health promotion in Liverpool

'Sportslinx' is a new health promotion initiative for schools based on a partnership between Liverpool Leisure Services Directorate, Liverpool John Moores University, Liverpool Education Directorate, Liverpool Health Authority, Liverpool City Community Colleges and National Governing Bodies for Sport. Sportslinx aims to promote the well-being of children in Liverpool primarily by increasing participation in sport. This project provides an annual 'snapshot' of the food intake, nutritional status, activity patterns, and fitness of an entire year group across the city of Liverpool and some results on food intake are reported here. More detailed data are reported elsewhere (Hackett et al, 2002)

Survey method

This paper is based on a Sportslinx survey in five secondary schools (11-12 year-olds) carried out as a pilot study in 1996/97 and a survey in 77 primary schools (9-10 year-olds) in 1998/99.

All parents gave consent in writing for their child to take part. Questionnaires about the intake of foods (FIQ), physical activities and activity preferences were completed by the children in schools supervised by a teacher. The children were transported to a leisure centre where Sportslinx staff collected data on: height, weight and skinfolds and the children completed the EUROFIT tests (as recommended by the Council of Europe, 1987).

The FIQ has been in use for over 12 years (Hackett et al, 1989; Hackett et al, 1990; Johnson & Hackett, 1997) but was not designed to measure nutrient intake. It is an epidemiological tool for describing the eating habits of groups based on recalling which foods were eaten on the previous day. A list of foods (44 in all but only 28 are reported here) was provided and the subject answers the same question for each food: 'Did you, at any time yesterday, eat any amount of ..... YES / NO'. The foods represent those mentioned in advice on healthy eating ie foods to eat more of / more often and those to eat less of / less often. The main outcome therefore was the proportion of subjects who claimed to have eaten each food (or not) on the previous day. Foods were classified as positive markers (n=11) and negative markers (n=17). The positive markers are those foods which subjects would normally be recommended to eat more of, or more often and the negative markers those foods which subjects would normally be recommended to eat less of, or less often.

Data analysis

All data were analysed using Statistical Package for the Social Sciences. Comparisons between proportions of children claiming to have consumed particular foods were made using chi-squared test whilst differences between the mean number of foods consumed in each group were evaluated using unpaired t-test (2 tailed).

Survey results

A total of 649 children aged 11 or 12 years completed the FIQ; 375 boys and 273 girls (1 child did not record his / her gender or fill in the name of the school attended). The schools reflected the wide range of socio-economic conditions across the city. A total of 3,556 children aged 9 or 10 years completed the FIQ; 1,801 boys and 1,744 girls (2 individuals did not record gender). The numbers answering each question varied but can be calculated from the tables.

Breakfast

The proportion who had eaten breakfast was markedly lower in the older children, especially the girls (82% boys, 68% girls), than in the younger children (92% boys and 90% girls). A greater proportion of older children ate on the way to school especially the boys (31% boys and 23% girls), compared with the primary school-children (15% boys, 10% girls).

The primary school-children who did not eat breakfast were more likely to eat on the way to school than the older children ($p<0.001$). Thus many secondary children were eating breakfast in addition to eating on the way to school (but more boys than girls: 25.3%, 14.3% $p<0.000$ respectively). Conversely, some secondary children, especially girls, did not eat breakfast or eat on the way to school (girls

23.1%, boys 12.0%; $p<0.000$). For the younger children, more boys (12.6%) than girls (7.2%) ate breakfast and on the way to school ($p<0.000$) but a similar proportion of boys (5.9%) and girls (7.2%) neither ate breakfast nor on the way to school ($p>0.05$).

Home for Lunch

About 5% of primary and 7% of secondary children went home for lunch. A significant proportion of children took lunch,'out of school but not at home' particularly the older children (18% boys and 17% girls) compared with the younger (12% for boys and girls).

'Positive marker' foods

There were few differences between the proportions of boys and girls claiming to have eaten positive marker foods (table 1). The positive markers are those foods which subjects would normally be recommended to eat more of, or more often. For both age groups, more boys claimed to have eaten baked beans and more girls claimed to have eaten 'salad' and baked potatoes. More younger boys than girls claimed to have eaten brown breads.

There were few differences between the age groups. The proportion of older children claiming to have eaten fruit, vegetables, and diet fizzy drinks was lower but a higher proportion of older children claimed to have eaten brown breads.

Fruit was the food claimed to have been eaten by most children but consumption of both fruit and vegetables was reported by only 31% of primary and 21% of secondary children.

Fruit and vegetables

Fruit was the food claimed to have been eaten by most children of both sexes and both age groups (table 1). Consumption of both fruit and vegetables was reported by only 31% of primary and 21% of secondary children. Conversely, 23% of primary, and 26% of secondary children did not report eating fruit or vegetables.

Table 1 Reported intake of positive marker foods on the previous day.

Food	Primary children Boys n=1803		Girls n = 1746		Secondary children Boys n=375		Girls n = 273		Primary compared with secondary children
	%		%		%		%		
High fibre flake cereals etc	26.1		23.5	p=0.8	25.6		16.1	**	ns
High fibre oat based cereals	18.4		17.0	ns	14.1		13.2	ns	ns
'Brown' breads	23.1		19.7	*	29.6		27.8	ns	††
Baked or jacket potatoes	13.9		17.3	**	10.9		17.6	*	ns
Fruit	74.2		77.0	p=0.07	69.6		68.9	ns	††
Baked beans	32.4		23.0	**	34.7		21.6	**	ns
Salad vegetables	30.1		33.1	p=0.06	25.1		32.6	*	ns
Vegetables	40.2		38.8	ns	26.1		26.0	ns	††
Diet fizzy drink	44.5		43.4	ns	35.2		37.4	ns	†
Diet cordial	26.4		24.7	ns	22.7		21.2	ns	ns
Any low fat milk	43.0		42.3	ns	45.9		44.3	ns	††

ns = p> 0.10 * difference between boys & girls p<0.05, ** difference between boys and girls p<0.01
† difference between primary & secondary children p<0.05, †† difference between primary & secondary children p<0.01

Overall the girls of both age groups claimed to eat fewer of most of the negative marker foods and more of two of the positive markers indicating a better choice of foods.

'Negative marker' foods

Negative marker foods are those foods which subjects would normally be recommended to eat less of, or less often (table 2). We have seen that fruit was the food claimed to be eaten by most children, however, the next nine foods most commonly mentioned were all negative markers (table 2: fizzy sugared soft drinks, chocolate biscuits, chocolate confectionery, crisps, sweets, plain biscuits, sugar added to food, sugar added to drinks and cordial with sugar).

Seven negative marker foods were reported as having been eaten by more boys than girls of primary age (pre-sugared cereals, cakes etc, chocolate confectionery, sugar added to food, sugar added to drinks, sausages & burgers and full fat milk) and most of these differences were also present in the older children (table 2).

Fewer older children tended to have reported consuming chocolate biscuits, crisps, sugared fizzy drinks and adding sugar to foods than the younger children. Overall the girls of both age groups claimed to eat fewer of most of the negative marker foods and more of two of the positive markers indicating a better choice of foods.

Table 2 Reported intake of negative marker foods on the previous day.

Food	Primary children Boys n=1803	Girls n = 1746		Secondary children Boys n=375	Girls n = 273		Primary compared with secondary children
	%	%		%	%		
Pre-sugared cereals	37.9	32.7	**	36.5	28.6	*	ns
Low fibre cereals	30.2	30.4	ns	30.9	26.4	ns	ns
Plain biscuits	49.0	46.8	ns	48.0	43.6	ns	ns
Chocolate biscuits	60.6	60.2	ns	51.7	53.1	ns	††
Cakes & pastries	36.2	32.1	*	36.8	25.6	**	ns
Puddings eg fruit pie	27.9	26.3	ns	23.7	25.3	ns	ns
Sweets eg toffees	58.0	61.0	p=0.07	57.6	54.6	ns	††
Chocolate confectionery etc	59.1	54.7	**	56.3	37.4	**	††
Sugar added to foods	47.2	41.2	**	40.8	31.1	*	†
Sugar added to drinks	49.3	46.3	p=0.07	57.6	44.3	**	††
Chips	51.5	51.3	ns	51.7	47.3	ns	ns
Crisps	66.3	69.0	p=0.09	50.4	51.6	ns	††
Sausages / burgers	33.8	25.2	**	45.1	28.6	**	††
Meat pies etc	22.7	18.5	**	20.8	16.8	ns	ns
Fizzy drink with sugar	66.9	61.0	**	60.3	54.9	ns	††
Cordial with sugar	58.3	57.2	ns	56.3	58.6	ns	ns
Milk: full-fat	64.3	57.3	**	42.9	36.3	p=0.09	††

ns = p> 0.10 * difference between boys & girls p<0.05, ** difference between boys and girls p<0.01
† difference between primary & secondary children p<0.05, †† difference between primary & secondary children p<0.01

Discussion

Recording food intake can be an excellent way to start a discussion about healthy eating and can help develop a wide range of cognitive skills, including numeracy and writing. Food also gives excellent ingress to topics in the National Curriculum such as: technology, science, history, geography (environmental education), health, citenzenship and PSE generally. Sportslinx aims to feed the data collected back to schools (in an anonymous form) which can form the basis of learning activities. At present each school receives an annual report and a general report is produced for other interested parties such as Primary Care Trusts.

The Food Intake Questionnaire is potentially a valuable educational tool but the results only apply to groups. This preserves an individual's anonymity but allows useful general conclusions to be drawn. The FIQ needs a basic level of literacy (although the format is simple and consistent) and some technical information. Several primary teachers reported giving assistance with the questionnaires indicating that the younger children had more difficulty in completing the questionnaires than the older children. In particular younger children had difficulty in differentiating between spreading fats. Such problems affect all diet surveys and should not prevent comparisons being made over time or by school and sex.

The importance of food-based guidelines has been stressed (DH, 1994; Kearney & McElhone, 1999) and if guidelines are given in terms of foods it is logical to assess their success in the same terms.

Breakfast

More girls and older children did not report eating breakfast (8 - 32 % in total); a study of 7-8 year olds in Scotland found that 94% reported eating breakfast at least twice per week (Ruxton et al, 1996) which is similar to this study.

A hungry child cannot take advantage of learning opportunities, something that has been known for nearly 100 years (Committee on Physical Deterioration, 1904) but it seems this has to be constantly rediscovered. Breakfast clubs in many areas are proving to be a successful way to tackle this problem.

Diet and adolescence

The decline in breakfast suggests that diet deteriorates with age (girls) which might be aggravated by snack foods bought on the way to school (boys). Of particular concern is the relatively high proportion of the older girls who did not eat either breakfast (32%) or on the way to school (23%). One study found that year 10 girls who missed breakfast (21%) were twice as likely to have missed lunch on the previous day too (Balding 2001). Anderson et al (1994) compared the diets of 15 year-olds unfavourably to those of 35 year-olds and diet may be at its worst during adolescence; if so, does this matter? Since the early signs of several serious disorders can be found in adolescents (for example obesity and fatty streaks in the coronary arteries) then clearly it does matter.

Ways are needed to ensure that all boys (especially older) are able to study food and its effects on health.

Diet and health

Perhaps of most importance is that young people understand the links between diet and health, and also between diet and their more immediate concerns such as appearance and fitness, including weight and physical and mental performance. The physical education curriculum can be a useful vehicle for promoting health, including healthy eating, because the relevance is apparent (fitness and energy balance) and the role models potent (sports men & women).

Eating out of school

That fewer younger children ate on the way to school may reflect the presence of adults taking the child to school and developing autonomy in the adolescents. Many children ate outside of the schools at lunchtime (0-85%), perhaps independent of adult supervision in most cases. The variability might reflect the availability of food in the area around the school and possibly each school's policy. Clearly shops selling food in the vicinity of schools profit from this but have no obligation apart from meeting legal requirements.

Conversely, those who provide school meals have a moral if not legal obligation to reflect messages taught in the classroom. Those eating lunch out of school but not at home may be eating at a relative's or friend's house but the higher proportion of the older children eating outside school may represent children effectively roaming the streets - a further argument in favour of attractive school meals. Many schools have demonstrated that children will select healthier options when given the choice and when these options are marketed effectively. The Radio 4 'Food Programme' recently reported (BBC, 2002) a collaboration between a local chef and school. There is a constant need for such innovative initiatives to maintain impetus in healthy eating.

Food and gender

A previous study using the FIQ found more marked differences by sex with a higher proportion of boys recording the least desirable foods than girls (Hackett et al, 1997) but this was of slightly older children (13-14 years). This suggests differences develop with age to the detriment of the boys.

Ways are needed to ensure that all boys (especially older) are able to study food and its effects on health. Design & Technology provides an opportunity for the application of the principles of nutrition to be considered but not all schools will do this. Home Economics in the past provided an excellent framework to put a variety of health issues in context of everyday life and society and specific opportunities for learning about food. Children ignorant about the properties of food and what constitutes a healthy diet, and unable to interpret food labels and marketing information, will not be able to make informed choices. They may then become overly dependent upon ready meals and highly processed foods.

Fruit

Fruit was the food mentioned by most of the children (69 - 77%) which reflects its wide appeal and potential as a focus for healthy eating advice. Cox et al (1998), showed that encouraging fruit intake was more successful than encouraging intake of vegetables. The proportions of children eating fruit is one of the lowest in Europe (Vereecken & Maes, 2000) and every child should eat some fruit every day. Perhaps fruit was relatively poorly available which limited intake (as was identified for adults by Anderson et al 1998), for example in school tuck shops?

Lack of knowledge was not identified as a barrier to healthy eating in a large pan-European study of adults (Kearney & McElhone, 1999). Balding (2001) also found a low proportion of older children to eat fruit 'most days' and evidence that the numbers eating fruit has fallen over time. He also found however, that as children grew older, the proportion eating

...in some key ways diet deteriorates with age perhaps especially in the first year or so at secondary school... Children need support at this time to resist the influences of much older peers.

vegetables 'most days' increased. That fewer older children reported eating fruit and / or vegetables (or diet fizzy drinks) further suggests that in some key ways diet deteriorates with age perhaps especially in the first year or so at secondary school. Children may be keen to exert more influence over their choice (purchase) of foods as a means of expressing their identity. Children need support at this time to resist the influences of much older peers.

After School Clubs

Collecting data and describing the problem is only the first stage of the Sportslinx project. Annual reports are produced which hopefully will influence policy makers. In order to capitalise on the interest which the project generates in schools and to address some of the problems identified, After School Clubs based on 'healthy eating' are being run in any school which requests this. A description of these will be the topic of a further paper.

Healthy eating

Concerns have been expressed about teaching healthy eating in the classroom for fear of promoting eating disorders (Kelly, 2000). Such concerns are entirely misplaced. Children are entitled to the best advice possible on food choice and an opportunity to develop an understanding of why food is important and how it affects health. The prevalence of dieting is high amongst young people but food choice is often poor. What possible harm can well balanced accurate information do? The real problem is perhaps that insufficient time is available to do the job properly.

Children's eating habits leave a lot to be desired; their intake is dominated by the less desirable foods. Fruit was a popular food but far too many children did not eat it and vegetables are almost relegated to the role of garnish. This is aggravated by availability and presentation both within school and outside. Changing from primary to secondary school is a formative time: perhaps more might be done to manage this transition?

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