A simple, and potentially low-cost method for measuring the prevalence of childhood obesity

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Abstract

Background Recent official publications have highlighted obesity as one of the biggest threats to public health and the prevalence of obesity in children is widely believed to be rising rapidly. However, there are no data on the prevalence of childhood obesity at a local level. We have developed a simple low-cost method of gaining such data by working with local schools.

Method We designed our method on the observation that numeracy and data handling skills are often taught in schools by getting children to measure their height and weight. We recruited seven schools and offered them a numeracy lesson plan suitable for year 5 (aged 9–10) children together with healthcare staff to attend the lesson. As part of the lesson, each child's height and weight was measured and recorded anonymously. Parental consent was obtained on an 'opt out' basis. The method was evaluated by questionnaire.

Results We gained data on body mass index for 252 children. In total, 20% of the children were overweight, and 7% obese. The brief questionnaire survey indicated that both teachers and school nurses were happy with the method and would repeat it. Weighing was carried out sensitively.

Conclusion Our findings were in line with national studies of the prevalence of childhood obesity. The method was simple, low-cost and acceptable to schools and school nurses. There seems no reason why this project cannot be used more widely across the Primary Care Trust (PCT) and beyond. We now propose to roll out the method across all primary schools in Birmingham.

Keywords
obesity, childhood, schools, prevalence, measurement

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Introduction

Recent official publications (Department of Health 2004; House of Commons Select Committee 2004) have highlighted obesity as one of the biggest threats to public health. The prevalence of obesity in children is widely believed to be rising rapidly (Chief Medical Officer 2003), though the scale of the problem may have been overestimated (Social Issues Research Centre 2005). An obese child is likely to grow into an obese adult, and adult obesity reduces life expectancy by 9 years (National Audit Office 2001) mainly due to cardiovascular disease and the complications of diabetes. Paediatricians in the UK have started to see cases of obesity-related metabolic syndromes such as insulin resistance, hypertriglyceridaemia and type 2 diabetes in early adolescence (Pontiroli 2004).

The UK government has therefore set a target for health and local authorities to 'halt, by 2010, the year on year increase in the prevalence of obesity in children under 11' (Department of Health 2004).

However, there are no data on the prevalence of childhood obesity at a local level. The Office for National Statistics produces country estimates, but they are not helpful in deciding where to direct public health action or to judge local progress towards the target.

Birmingham City Council's Scrutiny Committee on children's nutrition and obesity (Health Overview and Scrutiny Committee 2004) stated their belief that, '… it is vital that local data on childhood obesity prevalence is collected and analysed, both to monitor the size of the problem and also to estimate the impact of actions to reduce obesity on population health'.

In order to address this need, we decided to estimate the population prevalence of obesity in children aged 9–10 years by trying out a simple low-cost method that harnessed the enthusiasm and capabilities of schools in our area. In doing so, we believe that we have hit upon a method that can be rolled out to all schools.

Aims and objectives

The aims and objectives of the project were:

- to gather baseline data on the body mass index (BMI) in a sample of year 5 (aged 9–10) school children;
- to develop and try out a simple low-cost method of obtaining data on childhood obesity;
- to determine whether schools would find the method acceptable and easy to use regularly.

Method

We designed our method on the observation that numeracy and data handling skills are often taught in schools by getting children to measure their height and weight. We decided to work in partnership with schools to allow us to be part of such a lesson, and to let us use the data anonymously.

We approached all the primary schools in north Birmingham; seven were keen to take part in the project. These included some from the most disadvantaged parts of the Primary Care Trust (PCT) and others from the most affluent.

We arbitrarily chose the year 5 class (aged 9–10) for our pilot. At this age, children are at the threshold between childhood and adolescence. Pragmatically, we felt that it would be the easiest age group to work with, and it would give us a snapshot of the levels of childhood obesity in children before they enter puberty.

We saw the involvement of school nurses as vital. The school nurse for each of the participating schools was invited to take part. All agreed and a meeting was held to tell them more about the project and answer their queries and concerns. It was agreed that, where possible, school health link workers would also attend the lessons to help with measurements.

At a convenient time before the lesson, the school nurse compiled a class list and allocated a number to each child. For each child we recorded date of birth, gender and postal area of residence.

Lesson plan

Working with an educational advisor, we developed a lesson plan suitable for the Key Stage 2 numeracy curriculum (designed for children aged 9–11, see Box 1). This plan was offered to the school, along with a member of healthcare staff (usually the school nurse, plus a link worker) to attend the lesson and help take the measurements thus ensuring consistency of results.

Potential concerns

In developing this method, we had to address two issues of potential concern – parental consent, and the possibility of stigmatization of overweight children.

We obtained parental consent on an 'opt out' basis. We wrote to all parents telling them of the project and explaining our reasons for doing it. We explained that parents could withdraw their child from the lesson by completing and returning a tear-off slip (see Box 2).

Box 1 Lesson outline

The lesson plan is based on the concept of continuous and discontinuous data and how they can be plotted using line graphs and bar charts.

The introduction involves an explanation of the lesson by the teacher and an activity where the children organize themselves into 'living graphs'.

In the main part of the lesson the pupils move in groups between six 'stations' where a variety of measurements and recordings are taken. These include shoe size, eye colour, foot length, hand span and, of course, height and weight. The height and weight stations are manned by healthcare staff. The other recordings and measurements are done by the children themselves.

The data so recorded are used for plotting graphs – either then or in subsequent lessons. Dummy data on height and weight are given to the teacher to use for these purposes so allowing us to keep our measurements private.

Box 2 Parental consent letter

Dear parent

I am writing to tell you about a project that your child's school has agreed to help us with.

As you probably know, there is a lot of worry at the moment about the levels of obesity in our children. We would like to try and find out how serious this problem is in our area, that served by the North Birmingham Primary Care Trust.

We are working with seven schools across this area to run a year 5 lesson during which the children will be weighed and have their height measured.

This will be done in such a way that no child will be made to feel uncomfortable about their size and each child's weight will be kept private. The lesson will be based around number work and graph plotting – there will be no mention of obesity. The weighing and measuring will form only a small part of the lesson, which should be interesting and enjoyable for all.

The school nurse (and probably one or two other healthcare staff) will be present during the lesson, to help with the measuring.

Although we will take away the results these will be anonymous – your child will not be identifiable. We are just looking at numbers – how many children fall into each weight category, not at individuals.

I hope you will be happy for your child to take part in this lesson but if not you may ask for him/her to be withdrawn by completing and returning the slip below.

Finally, if you have a particular concern about your child's height and weight don't forget you may contact the school nurse for advice via the school.

To deal with the potential for stigmatization, we avoided an emphasis on weight. The lesson was specifically designed to be about numbers and graphs rather than health. Weighing was just one of a range of activities during the lesson. We also ensured that each child was weighed separately and the weight kept private from the rest of the class.

The lesson

We explained to the class teacher that the lesson plan was offered merely as a guide. They could freely change the lesson, or use only part of the plan if they wished so long as we had the chance to measure the children in a sensitive way.

One of us (K.R.) and a school nurse attended each lesson. In some cases, an additional link worker was also present.

At the beginning of the lesson, the children were given colourful cardboard wristbands on which was written their personal number (corresponding to the previously complied class list).

The class teacher led the lesson. At some point, the children were divided into groups that went around six 'stations' in turn – these were to measure and record shoe size, hand span, eye colour, foot length and, of course, height and weight. The healthcare staff measured each child's height and weight and recorded it against the number on a pre-prepared results sheet.

Weight was measured, and recorded to the nearest 0.1 kg, using a Salter digital scale, the same set being used in each of the seven lessons. The scales had been calibrated 1 month before the first lesson. The children wore light indoor clothing (shoes and jumper/sweatshirt were removed). Care was taken to keep the weights private – the other children in the group were asked to keep at a distance during weighing. The results sheet was kept covered.

Seca Leicester Portable Height Measures were used to measure height, recording this to the nearest 0.1 cm. The children removed their shoes and were measured in socks.

The healthcare staff in attendance helped the children with their other tasks as required. We felt it was important to be a useful part of the lesson.

The length of the lessons ranged from the usual 1-h numeracy lesson to, in two cases, the whole of the school afternoon (in one of these latter 60 children were measured). In several cases, our weighing and measuring was completed within half an hour and we withdrew quietly as the class teacher began leading the plenary section of the lesson.

At the end of the lesson, the class teacher kept the results sheets for eye colour, shoe size, foot length and hand span. They were given a set of 'dummy' results on height and weight while we took away our real results for these.

Anonymous data on each child's height, weight, age, gender and postal area were recorded and brought away for analysis.

Statistical methods

Each child's height and weight data were converted into a BMI value using the standard formula. We used standard UK BMI reference charts (Child Growth Foundation 1996) to compare the BMI with the reference ranges and to classify each child as normal, overweight and obese using the cut-off percentile points suggested by Cole and colleagues (2000). Further analysis was limited to frequency counts of cases in each category by gender group.

Evaluation

A few weeks after the lesson, we sent out a letter thanking the teachers, together with a questionnaire asking them to evaluate the method. Questionnaires were also sent to the school nurses.

Results

After three children were withdrawn by their parents, we had data on 252 children.

Total 20% (95% CI 15.1–25.3) of the children were overweight, and 7% (95% CI 4.3–11.1) obese (Fig. 1). There was a marked gender difference; among boys 15% were overweight and 5% obese; among girls 24% were overweight and 9% obese (Fig. 2) [Exact binomial 95% CI were calculated using the StatCalc program in Epi Info version 6 (Centers for Disease Control and Prevention, Atlanta, GA, USA)].

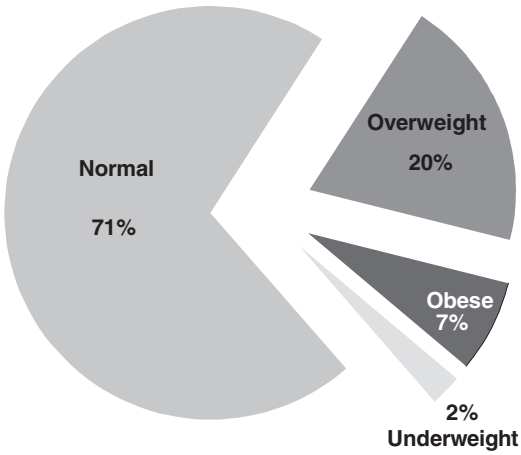

Figure 1. Percentage distribution of weight categories ($n = 252$).

Evaluation of the method

The brief questionnaire survey indicated that both teachers and nurses were happy with the method; the weighing was carried out sensitively and there was no subsequent instance of stigmatization of overweight children. The children enjoyed the lesson and all concerned would be happy to repeat it in future (Tables 1 and 2, Box 3). Teachers felt that the lesson could be easily adaptable for other age groups.

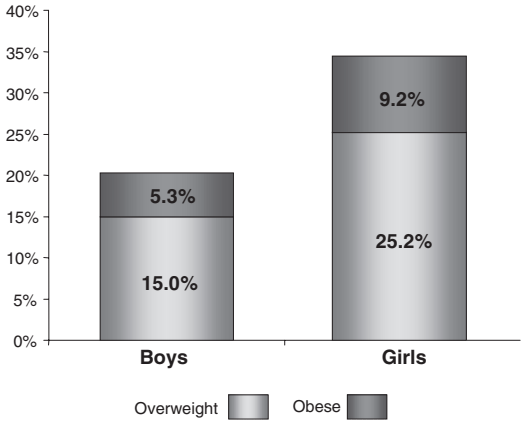

Figure 2. Proportion of overweight and obese children by gender (boys: $n = 133$; girls: $n = 119$).

Costs

Approximate development costs

SpR development and analysis time (15 days) – £1500
Educational advisor (half day per lesson plan) – £250

Staff costs per lesson

School nurse (half day per lesson) – £58
School nurse assistant (link worker, 2 h per lesson) – £30

Equipment costs

Height measure (Seca Leicester Portable Height Measure) – £55 each

Table 1. Class teachers' responses to evaluation questionnaire

Based on five questionnaires returned out of eight sent out to class teachers	Yes	No	Don't know
Did you clearly understand the aims of the project?	5	0	0
Was the lesson plan suitable for your class?	5	0	0
Did you feel the pupils were comfortable with the weighing?	5	0	0
Has the lesson led to any instances of stigmatization on the basis of weight within the class?	0	5	0
Do you think the children enjoyed the lesson?	5	0	0
Do you think the lesson could be adapted for other years within your school?	5	0	0
Would you be happy to repeat the lesson with another class in future?	5	0	0

Table 2. School nurses' responses to evaluation questionnaire

Based on four questionnaires returned out of seven sent out to school nurses	Yes	No	Don't know
Did you clearly understand the aims of the project?	2	1	1
Did you feel the pupils were comfortable with the weighing?	4	0	0
As far as you know has the lesson led to any instances of stigmatization on the basis of weight within the class?	0	4	0
Do you think the lesson could be adapted for other years within your school?	4	0	0
Do you feel the project was a good use of your professional time?	3	1*	0
Has the project been useful in creating better links between you and the school?	3	0	1
Have you received any negative comments from staff, parents or pupils about the project?	0	4	0
Would you be happy to repeat the lesson with another class in future	4	0	0

*The school nurse concerned commented that a link worker could easily carry out the lesson – a trained school nurse was not required.

Box 3 Quotes from the questionnaires:
'I was very happy with the whole process' – School nurse
'I am interested to see how the results will contribute to our Public Health role in schools' – School nurse
'The children seemed to have a great time' – School nurse
'This method meant I got into the school to meet staff and children' – School nurse
'Expanding the project would provide a clearer picture of the problem of obesity in children within the PCT' – School nurse
'Weight and height measurements were taken sensitively and at no extra effort to us as teachers' – Class teacher
'We were able to deliver our adapted lesson, and the children learnt through very practical activities – thank you!' – Class teacher

Scales (Salter digital) – approx. £50
Wristbands for pupils – £12 per 100

The costs of rolling out the project more widely would depend greatly upon how the method is used and especially upon how much healthcare staff time is needed.

Discussion

Our results were unremarkable. The prevalence we observed was similar to the national prevalence estimated in other studies. For example, the Health Survey for England estimates that in 2000 among 2–19-year-old children, 20.3% of boys and 26.6% of girls were overweight; and 4.8% of boys and 6.8% of girls were obese (Gregory & Lowe 2000). The wide age group reported in the health survey contrasts with the narrowly defined age group in our study, and so the two are admittedly not strictly comparable.

However, for the purposes of establishing a local baseline and monitoring progress toward the overall goal of halting the rise in obesity and hopefully reversing it, what matters is to study the same age group and use a reliable and consistent method.

Does the method work?

The major contribution to the literature of our project is the practical detail of how we went about getting the measurements.

The method we developed has proved simple to use and also low-cost. The major cost incurred was the time spent in development by the Specialist Registrar – a one-off cost. Recurring costs if the method were used again would be relatively small. Using a planned class activity meant that children did not have to be taken out of the classroom setting.

As this was a pilot demonstration project, we used school nurses and health workers. It is possible we feel for the method to be rolled out using just a health worker or by enlisting the help of School Learning Support Assistants or even parents with suitable training. If this method were to be more widely used, the way forward would probably be to encourage schools to adopt it as something they do themselves, perhaps as part of the Healthy Schools initiative. School nurses might then just act as co-ordinators for the schools in their charge. We understand that there is currently little capacity within the school nursing profession to take on all these routine measurements themselves.

The lesson plan we used was suitable for school pupils aged 9–10 years. We, and the teachers, believe that it would not be difficult to adapt the lesson plan for other primary school year groups because all are involved in measuring activities.

School nurses were concerned about dealing with cases of obesity that may be identified. We handled this by being clear about the primary purpose of the exercise – to make an estimate of the prevalence of obesity at the population level. It is

unlikely that classroom activity such as in this project would generate any new anxiety. The potential for bullying is a real one but we feel that it can be fully taken into account by sensitive handling of the weight measurement.

We were encouraged by the positive response of the school staff to the project and the method we piloted. There seems no reason why this project cannot be used more widely across the PCT and beyond. We now propose to roll out the method to primary schools in Birmingham. These data will provide a baseline measurement with which to monitor progress toward the government's target for tackling childhood obesity, and to help identify schools and areas where public health intervention should be particularly targeted.

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