WHAT IS ALREADY KNOWN ON THIS TOPIC

Hospital episode statistics have been used to compare activity rates and mortality between centres, but their reliability has been questioned

WHAT THIS STUDY ADDS

The congenital cardiac audit database is more accurate and complete than hospital episode statistics, but individual centres need further investment to improve completeness of data

The value of placing unit or surgeon specific mortality statistics in the public domain is in doubt, given the poor quality of data, imprecision of risk stratification, and confrontational media agenda

arena.[10] The public reporting of mortality statistics in isolation cannot increase the safety of cardiac surgery but may reduce mortality if the system discards high risk patients. We do not believe that surgeons wish to take this route, but many will follow their self preservation instinct.[11] Given the problems with data quality, the imprecision of risk stratification models, and the confrontational agenda in the media, we question the value of placing mortality statistics in the public domain.

We appreciate the role of the Thames Valley Strategic Health Authority, Oxford Radcliffe NHS Trust, and Roger Boyle in the work to resolve this problem. We thank P Aylin and officers of the congenital cardiac audit database for providing their data for the review.

Contributors: See bmj.com.
Funding: None.
Competing interests: None declared.
Ethical approval: Not needed.
Provenance and peer review: Non-commissioned; externally peer reviewed.

1 Bristol Royal Infirmary Inquiry. *Learning from Bristol: the report of the public inquiry into children's heart surgery at the Bristol Royal Infirmary 1984-1995*. Norwich: Stationery Office, 2001. (CM 5207.) Available at www.bristol-inquiry.org.uk/.
2 Schneider EC, Epstein AM. Influence of cardiac surgery performance reports on referral practices and access to care: a survey of cardiovascular specialists. *N Engl J Med* 1996;335:251-6.
3 Westaby S. League tables, risk assessment and an opportunity to improve standards. *Br J Cardiol (Acute Interv Cardiol)* 2002;9:5-10.
4 Aylin P, Bottle A, Jarman B, Elliot P. Paediatric cardiac surgical mortality in England after Bristol: descriptive analysis of hospital episode statistics1991-2002. *BMJ* 2004;329:825-9.
5 Gibbs J, Monro J, Cunningham D, Rickards A. Survival after surgery or therapeutic catheterisation for congenital heart disease in children in the United Kingdom: analysis of the central cardiac audit database for 2001. *BMJ* 2004;328:611-20.
6 Thames Valley Strategic Health Authority. *Report of Paediatric Cardiac Surgery Steering Group, appendix 8*. TVSHA, 2005.
7 Spiegelhalter DJ, Evans S, Aylin P, Murray G. Overview of statistical evidence presented to the Bristol Royal Infirmary inquiry concerning the nature and outcomes of paediatric cardiac surgical services at Bristol relative to other specialist centres from 1984 to 1995. September 2000. www.bristol-inquiry.org.uk/Documents/statistical%20overview%20report.pdf (accessed 15 Sep 2004).
8 Shahian DM, Silverstein T, Lovett AF, Wolf RE, Normand Sen T. Comparison of clinical and administrative data sources for hospital coronary artery bypass surgery report cards. *Circulation* 2007;115:1518-27.
9 Marshall EC, Spiegelhalter DJ. Reliability of league tables of in vitro fertilisation clinics: retrospective analysis of live birth rates. *BMJ* 1998;316:1701-5.
10 Green J, Wintfeld N. Report cards on cardiac surgeons: assessing New York State's approach. *N Engl J Med* 1995;332:1229-32.
11 Burack JH, Imprellizerri P, Homel P, Cunningham JN. Public reporting of surgical mortality: a survey of New York State cardiothoracic surgeons. *Ann Thorac Surg* 1999;68:1195-202.

Accepted: 11 June 2007

Preventing childhood obesity: two year follow-up results from the Christchurch obesity prevention programme in schools (CHOPPS)

Janet James,[1] Peter Thomas,[3] David Kerr[2]

[1]Bournemouth Diabetes and Endocrine Centre, Royal Bournemouth Hospital, Bournemouth, BH7 7DW
[2]Bournemouth Diabetes and Endocrine Centre and Centre of Postgraduate Medical Research and Education, Bournemouth University
[3]Centre of Postgraduate Medical Research and Education, Bournemouth University and Dorset Research and Development Support Unit, Poole Hospital

Correspondence to: J James
janet.james@rbch.nhs.uk

BMJ 2007;335:762-4
doi:10.1136/bmj.39342.571806.55

ABSTRACT

Objective To assess the long term effects of an obesity prevention programme in schools.
Design Longitudinal results after a cluster randomised controlled trial.
Setting Schools in southwest England.
Participants Of the original sample of 644 children aged 7-11, 511 children were tracked and measurements were obtained from 434 children three years after baseline.
Intervention The intervention was conducted over one school year, with four sessions of focused education promoting a healthy diet and discouraging the consumption of carbonated drinks.
Main outcome measures Anthropometric measures of height, weight, and waist circumference. Body mass index (BMI) converted to z score (SD scores) and to centile values with growth reference curves. Waist circumference was also converted to z scores (SD scores) .
Results At three years after baseline the age and sex specific BMI z scores (SD scores) had increased in the control group by 0.10 (SD 0.53) but decreased in the intervention group by −0.01 (SD 0.58), with a mean difference of 0.10 (95% confidence interval −0.00 to 0.21, P=0.06). The prevalence of overweight increased in both the intervention and control group at three years and the significant difference between the groups seen at 12 months was no longer evident. The BMI increased in the control group by 2.14 (SD 1.64) and the intervention group by 1.88 (SD 1.71), with mean difference of 0.26 (−0.07 to 0.58, P=0.12). The waist circumference increased in both groups after three years with a mean difference of 0.09 (−0.06 to 0.26, P=0.25).
Conclusions These longitudinal results show that after a simple year long intervention the difference in prevalence of overweight in children seen at 12 months was not sustained at three years.

INTRODUCTION

Numerous studies have been conducted with the aim of preventing obesity in children, many based in

schools.[1 2] A recent Cochrane review[3] considered 22 studies, most of which were school based and focused on multiple interventions. In most cases the interventions did not significantly affect the weight of the children. One reason might have been that most were too short in duration.

The Christchurch obesity prevention project in schools started in August 2001 and was completed over one school year. It was based in six schools in southern England and included children aged 7-11. The intervention discouraged children from consuming carbonated drinks and involved one hour of additional health education during each of the four school terms. The intervention is described in more detail elsewhere.[4] The original project produced a modest reduction in the number of carbonated drinks consumed and a significant reduction in the number of children becoming overweight or obese.[4] Further anthropometric measures were taken two years after completion of the original project (three years after baseline) to assess any longitudinal effects.

METHODS

Two years after completion of the original project one investigator took additional longitudinal measurements. She had also completed the original measurements and conducted the education programme. Because of lack of funding we were unable to collect further drink diaries at this time. We defined overweight and obesity using the 1990 British centile charts, in which children above the 91st centile are classified as overweight. In the original project, the children in the three year groups attended schools in Christchurch. We traced 511 children from the original sample and carried out measurements on 434, 67% of the original sample. See bmj.com.

Outcome measures

One investigator took anthropometric measures of height and weight. We converted body mass index (weight (kg)/(height (m)^2)) to z score (SD scores) and to centile values. The z score (SD score) accounts for the child's age and sex and represents the deviation compared with an average child of the same sex and age. Waist circumference was measured and converted to z scores (SD score). Our primary outcome measures were the change in BMI and z score and the prevalence of overweight.

Statistical methods

At three years, with a sample size of 434 and assuming an SD of 0.44 and an intracluster correlation coefficient of 0, the study had 90% power to detect differences of 0.14 between control and intervention groups. See bmj.com.

The original design was a cluster randomised controlled trial, with class being the cluster. Subsequently, because of the progression of children to different schools, the clusters have not remained intact and some children were lost to follow-up. Some clusters had few children in them, thus reducing the validity of using the orginal method of analysis for the follow-up data. We therefore analysed the interval scaled data in this paper using multilevel models to take into account variance within clusters. For binary data we implemented a logistic model. This has resulted in the 12 month analysis presented here not being identical to that in the original report.

RESULTS

In the original project we collected baseline anthropometric measures from 644 children (321 girls). Of these, 434 children (209 girls) were re-measured three years later. There was no significant difference in the baseline z scores (SD scores) between children in the control and intervention groups who were present or missing at the final measurements. The average age was 8.6 (range 7.0-10.9) at the start of the project and 11.6 (10.0-13.9) at the three year follow-up. The BMIs, centile z scores (SD scores), and waist circumference z scores (SD scores) at baseline, 12 months, and three year follow-up are shown on bmj.com.

The table shows the change in prevalence of overweight and obesity according to the 1990 British centile charts, with children above the 91st centile classed as overweight. At 12 months there was a significant difference between the control and intervention groups but three years after baseline the difference was smaller and no longer significant.

DISCUSSION

A simple 12 month school based intervention focused on reducing consumption of carbonated

Prevalence of overweight at 12 months and 3 years after baseline

	Control (%)	Intervention (%)	Odds ratio (95% CI)	P value	Risk difference* (95% CI)
Baseline (n=486)	20.6	17.4	0.79 (0.50 to 1.26)	P=0.33	3.2% (−4.23% to 10.6%)
After 12 months (n=474)	28.5	18.7	0.58 (0.37 to 0.89)	P=0.01	9.8% (1.83% to 17.8%)
After 3 years† (n= 434)	30.2	25.6	0.79 (0.52 to 1.21)	P=0.28	4.6% (−4.3% to 13.5%)

*Calculated assuming an intracluster correlation of 0.
†Primary outcome.

This article is an abridged version of a paper that was posted on bmj.com on 9 October 2007. Cite this version as: *BMJ* 9 October 2007, doi:10.1136/bmj.39342.571806.55 (abridged text, in print: *BMJ* 2007;335:762-4).

WHAT IS ALREADY KNOWN ON THIS TOPIC

The prevalence of childhood obesity is increasing

The UK government has set an ambitious target of halting the annual increase in childhood obesity by 2010

School based interventions show some success in prevention of obesity

WHAT THIS STUDY ADDS

The success of a school based intervention was not maintained two years after the end of the project

drinks resulted in significant differences in the proportion of overweight children in the control and intervention groups.[4] Two years after the completion of the study, however, the difference was no longer significant, and the number of overweight children had increased in both groups, although the prevalence was still higher in the control group. In the three year follow-up, the only difference approaching significance was for the change in centile z score. Given the lack of a trend at 12 months this may well be a chance finding. The study had sufficient power to detect a difference of 0.14 or more, but the observed difference was only 0.10. The study was originally powered to detect differences in consumption of carbonated drinks, and so we cannot rule out a type II error.

The original project was different from many other school based interventions in that the intervention was specific and promoted a healthy diet based on the balance of good health. It focused specifically on discouraging the consumption of carbonated drinks. Several recent studies have further confirmed the association between these drinks and obesity,[5-9] as has a systematic review and meta-analysis of 88 studies.[10] The role of these drinks as a causative agent of obesity is also recognised by the World Health Organization.[11] One reason suggested for this association may relate to the high glycaemic index and that they provide "empty" calories.[12] The physiological effect on satiety from energy ingested in liquid form is thought to be different from that from solid foods and this may in part be due to faster transit times and reduced gastric distension. Therefore the additional energy from these drinks may not be detected as easily by the body and individuals may not compensate for this additional energy by consuming less later.[13]

Limitations

A proportion of children were lost to follow-up; although 67% of the original cohort were measured at three years. Because of the natural progression of children at school, the original clusters did not remain intact and therefore we had to use a different method of analysis from the original study. We were also unable to measure any further changes in consumption of carbonated drinks, or the socioeconomic status and pubertal status of these children.

The original project provided hope that a simple intervention could be beneficial in preventing obesity, but our new results show no effect two years after the end of the intervention. It would be beneficial for the whole population to decrease consumption of soft drinks, as they have a high energy intake with little nutritional benefit.[10] Obesity is a complex condition, and specific interventions may ignore different interlinking influences.[14] It remains unclear whether specific interventions or those that focus on all aspects of diet and physical activity are the most successful. Perhaps the true impact of any school based intervention can be evaluated effectively only if the interventions are continuous.

We thank the headmasters, teachers, parents, and children at the participating schools. We also thank David Phillips for discussion and advice and Julia Knott for assistance with data entry.

Contributors: See bmj.com.
Funding: Internal resources within Bournemouth Diabetes and Endocrine Centre. JJ received a research scholarship from the Florence Nightingale Foundation (Band Trust Scholarship).
Competing interests: DK had a child attending one the schools involved in the original project.
Ethical approval: Dorset research and ethics committee approved the study.
Provenance and peer review: Not commissioned; externally peer reviewed.

1 Story M. School-based approaches for preventing and treating obesity. *Int J Obesity* 1999;23:43-51.
2 Sharma M. International school-based interventions for preventing obesity in children. *Obes Rev* 2006;7:261-9.
3 Summerbell CD, Waters E, Edmunds LD, Kelly S, Brown T, Campbell KJ. Interventions for preventing obesity in children. *Cochrane Database Syst Rev* 2005;(3):CD001871
4 James J, Thomas P, Cavan DA, Kerr D. Preventing childhood obesity by reducing consumption of carbonated drinks: cluster randomised controlled trial. *BMJ* 2004;328:1237-9.
5 Ebbeling CB, Feldman HA, Osganian SK, Chomitz VR, Ellenbogen SJ, Ludwig DS. Effects of decreasing sugar-sweetened beverage consumption on body weight in adolescents: a randomized controlled pilot study. *Pediatrics* 2006;117:673-80.
6 Tam CS, Garnett SP, Cowell CT, Campbell K, Cabrera G, Baur LA. Soft drink consumption and excess weight gain in Australian school students: results from the Nepean study. *Int J Obes* 2006;30:1091-3.
7 Smith West D, Bursac Z, Quimby D, Prewitt TE, Spatz T, Nash C, et al. Self-reported sugar-sweetened beverage intake among college students. *Obes Res* 2006;14:1825-31.
8 Rush E, Schutz Y, Obolonkin V, Simmons D, Plank L. Are energy drinks contributing to the obesity epidemic? *Asia Pac J Clin Nutr* 2006;15:242-4.
9 Mrdjenovic G, Levitsky DA. Nutritional and energetic consequences of sweetened drink consumption in 6 to 13-year-old children. *J Pediatr* 2003;142:604-10.
10 Vartanian LR, Schwartz MB, Brownell KD. Effects of soft drink consumption on nutrition and health: a systematic review and meta-analysis. *Am J Public Health* 2007;97:667-75.
11 Diet nutrition and prevention of chronic diseases. *World Health Organ Tech Rep Ser* 2003:916:1-149.
12 Ludwig DS, Peterson KE, Gortmaker SL. Relation between consumption of sugar-sweetened drinks and childhood obesity: a prospective, observational analysis. *Lancet* 2001;357:505-8.
13 Mattess RD. Dietary compensation by humans for supplemental energy provided as ethanol or carbohydrate in fluids. *Physiol Behav* 1996;59:179-87.
14 Jebb S, Steer T, Holmes C. *The "healthy living" social marketing initiative: a review of the evidence.* London: Department of Health, 2007.

Accepted: 2 August 2007