

differences in blood lipids, insulin, and leptin persist with increasing age these could be of public health importance. As the provision of school dinners has changed little in the past five years,¹ the differences could be of continuing relevance. However, the extent to which the differences reflect dissimilarities in the composition of school dinners and home provided school meals or other aspects of the dietary patterns and health behaviours of the two groups remains uncertain.

Despite these uncertainties, we can draw two general conclusions. Firstly, the lower mean folate concentration seen among pupils eating school dinners suggests that new initiatives likely to increase the folate content of school dinners would be appropriate.⁵ Secondly, the other differences seen suggest that the average health status of pupils eating school dinners is no worse—and may actually be better—than that of pupils eating meals provided from home. This suggests that efforts to improve the diet and nutrition of British children and adolescents will need to extend beyond school dinners to tackle overall dietary patterns and their societal determinants if they are to be successful.

We are grateful to the research team members and to the participating schools and pupils. We thank P M Ueland and H Refsum (department of pharmacology, University of Bergen) for the measurement of serum folate.

Contributors: PHW developed the idea for this report, conducted the study with assistance from DGC, and drafted the paper. CGO did the statistical analysis. NS provided analyses of leptin. All authors contributed to the final version of the paper. PHW is the guarantor.

Funding: This study was supported by a Wellcome Trust project grant (No 051187/Z/97/A). CGO is supported by the British Heart Foundation (project grant No PG/04/072).

What is already known on this topic

The content of school dinners has been a cause for concern

Little information is available on the health of school pupils who do and do not eat school dinners

What this study adds

Several markers associated with chronic disease risk were potentially more favourable in pupils who ate school dinners, although serum folate concentrations were also lower

Competing interests: None declared.

Ethical approval: Ethical approval was obtained from all relevant local research ethics committees.

- 1 Department for Education and Skills, Food Standards Agency. *School meals in secondary schools in England*. London: Department for Education and Skills, 2004. (Research report RR557.)
- 2 Owen CG, Whincup PH, Odoki K, Gilg JA, Cook DG. Infant feeding and blood cholesterol: a study in adolescents and a systematic review. *Pediatrics* 2002;110:597-608.
- 3 Whincup PH, Gilg JA, Owen CG, Odoki K, Alberti KG, Cook DG. British South Asians aged 13-16 years have higher fasting glucose and insulin levels than Europeans. *Diabet Med* 2005;22:1275-7.
- 4 Taylor SJ, Whincup PH, Hindmarsh PC, Lampe F, Odoki K, Cook DG. Performance of a new pubertal self-assessment questionnaire: a preliminary study. *Paediatr Perinat Epidemiol* 2001;15:88-94.
- 5 Department of Health. *Choosing health: making healthier choices easier*. London: Department of Health, 2004. (Public Health White Paper.)

(Accepted 8 September 2005)

doi 10.1136/bmj.38618.540729.AE

The broader impact of walking to school among adolescents: seven day accelerometry based study

Leslie M Alexander, Jo Inchley, Joanna Todd, Dorothy Currie, Ashley R Cooper, Candace Currie

How children travel to and from school may significantly influence their overall physical activity levels.^{1 2} We measured moderate to vigorous physical activity (MVPA) among adolescents and explored their means of travel to and from school.

Participants, methods, and results

We recruited four classes, each of about 30 pupils aged 13-14 years, from four schools in the Edinburgh area. We visited the classes three times: to introduce the study and distribute consent forms and information for pupils and parents or guardians; to allocate accelerometers (instruments used to measure vertical movement); and to collect accelerometers and issue questionnaires. Inclusion in the study required consent from pupils and primary guardians.

In spring 2004 we obtained objective measures of the children's activity with precalibrated accelerometers (MTI, Fort Walton, Florida; model 7164), which record activity accumulated each minute.³ We asked

the pupils to wear the accelerometers on their hip from waking until bedtime, except while showering, bathing, swimming, and participating in other water based activities. We used age specific cut-off points (on the accelerometer count) to calculate minutes of MVPA per pupil for weekdays (≥ 10 hours' data daily from 0500 to 2400); during school, including morning and lunch breaks; time outside school (defined as daily MVPA minus MVPA accrued at school, including travel time). Cut-off points were ≥ 1399 and ≥ 1547 per minute for ages 13 and 14 respectively.⁴

We collected data from the questionnaire responses about the children's main part of their journey to school (options were walking, car, bicycle, bus, train, or other). Responses to both questions reflected very good agreement after a 14 day retest ($K_w = 0.874$ and 0.836 respectively).

Public Health Sciences, Edinburgh University, Edinburgh EH8 9AG

Leslie M Alexander
honorary fellow

Child and Adolescent Health Research Unit, Edinburgh University

Jo Inchley
research fellow

Joanna Todd
research fellow

Dorothy Currie
senior statistician
Candace Currie
reader

continued over

BMJ 2005;331:1061-2

This article was posted on bmj.com on 17 August 2005: <http://bmj.com/cgi/doi/10.1136/bmj.38567.382731.AE>

Department of
Exercise and Health
Sciences, Bristol
University, Bristol
Ashley R Cooper
senior lecturer

Correspondence to:
L M Alexander
Leslie.Alexander@
ed.ac.uk

Mean number of minutes (daily) of moderate to vigorous physical activity (weekdays) among 13 and 14 year olds reporting their means of travel to and from school

Time period	Mean No of minutes			Difference between car, bus, or train and walking both ways (95% CI)
	Car, bus, or train both ways (n=47)	Walking one way (n=10)	Walking both ways (n=35)	
Entire weekday	97.2	113.1	123.1	25.9 (9.3 to 42.4)
School day	43.4	50.0	52.3	8.9 (1.2 to 16.6)
Morning break	3.7	4.5	4.2	0.5 (-0.3 to 1.4)
Lunch break	12.4	17.5	18.4	6.0 (2.5 to 9.5)
Outside school	53.8	63.1	70.8	17.0 (5.2 to 28.9)

Of the 30 accelerometers, two malfunctioned at each school, yielding a potential sample size of 112. Overall, 103 pupils (92%) participated in the study. Average age was 13.8 (standard deviation 0.27) years; 58 (57%) were boys. Of the 103 participating pupils, nine failed to report how they travelled and too few (n=2) reported cycling for us to include cycling in the analyses.

The 92 pupils accrued at least 10 hours of valid data on three (12 pupils (13%)), four (27 (29%)), or five (53 (58%)) days. Cohorts represent pupils who travelled both ways by car, bus, or train; those who walked both ways; and those who walked one way. Mean daily minutes of MVPA for each pupil represent total MVPA minutes divided by the number of days with valid data. Neither sex nor numbers of valid data days differed significantly between groups.

The table shows the amount of moderate to vigorous physical activity of the three different travel groups. Pupils who walked both ways accrued the most minutes of MVPA for every time period we examined, followed by those walking one way (table). Moderate to vigorous physical activity outside school hours was significantly higher among those pupils who walked both ways than among those using a car, bus, or train. In all, 87% (41/47) of the group using a car, bus, or train, accumulated an average of 60 or more minutes of MVPA on weekdays compared with 90% of those who walked one way and 100% of pupils who walked both ways.

Comment

Walking to school was associated with higher overall moderate to vigorous physical activity throughout the day compared with travelling by car, bus, or train. Similar results have been reported for 10 year old children,² although among 5 year olds, mode of travel to school did not significantly affect overall physical activity,⁵ suggesting that walking to school may be more effective for older children. Reasons for increased physical activity (not investigated) may include differences in appreciation of activity, and walking in the morning may stimulate further activity and social facilitation. Understanding these differences would help in promoting healthy ways to travel to school.

Contributors: LMA and JI conceived the study; LMA and CC secured funding. LMA, JT, JI, DC, ARC, Chris Roberts (health promotion division, Welsh National Assembly), Colin Fischbacher (public health medicine, Scottish Health Statistics), and Sonja Hunt (public health medicine, University of Edinburgh),

What is already known on this topic

Adolescents are less active than young children

In 10 year olds, walking to school seems to affect overall physical activity

What this study adds

Among adolescents, walking to and from school is associated with higher overall moderate to vigorous physical activity throughout the day, compared with travelling by car, bus, or train

all contributed to the planning and design of the study. LMA, AC, JI, and JT collected the data; DC, LMA, JI, and JT conducted data manipulation and analyses. LMA wrote the manuscript, and all authors supplied comments. LMA is the guarantor.

Funding: This work was funded from a grant by the Scottish Executive Health Department.

Competing interests: None declared.

Ethical approval: Ethical approval was obtained from the University of Edinburgh School of Education's ethics committee.

- 1 Tudor-Locke C, Ainsworth BE, Popkin BM. Active commuting to school. An overlooked source of children's physical activity? *Sports Med* 2001;31:309-13.
- 2 Cooper AR, Page AS, Foster LJ, Qahwaji D. Commuting to school: are children who walk more physically active? *Am J Prev Med* 2003;25:273-6.
- 3 MTI Health Services. *Actigraph users manual. Model 7164*. Fort Walton, Florida: MTI, 2005.
- 4 Freedson PS, Melanson E, Sirard J. Calibration of the Computer Science And Applications, Inc. accelerometer. *Med Sci Sports Exerc* 1998;30:777-81.
- 5 Metcalf B, Voss L, Jeffery A, Perkins J, Wilkin T. Physical activity cost of the school run: impact on schoolchildren of being driven to school (EarlyBird 22). *BMJ* 2004;329:832-3.

(Accepted 18 May 2005)

doi 10.1136/bmj.38567.382731.AE

Corrections and clarifications

Survival differences after stroke in a multiethnic population: follow-up study with the south London stroke register

We muddled a couple of references in this paper by Charles D A Wolfe and colleagues (*BMJ* 2005;331:431-3, 20 Aug). In the full version of this paper (on bmj.com) we got a reference number wrong in the second paragraph of the introduction and in the first paragraph of the methods: in these paragraphs only, reference 7 should read reference 5. The abridged version also contained a related reference error: reference 5 in the second paragraph of the introduction and in the first paragraph of the methods should have been omitted.

Tackling health inequalities in the enlarged European Union

We inadvertently changed the author's intended meaning of a sentence when we edited this editorial by Ilona Koupil (*BMJ* 2005;331:855-6, 15 Oct). The seventh paragraph should end: "... this research has yielded valuable information on the dynamics of health inequalities over time and across countries, showing that, although health inequalities are present to varying degrees in all societies, such inequalities are not immune to policy intervention."