

Factors associated with children being driven to school: implications for walk to school programs

Li Ming Wen^{1*}, Denise Fry¹, Chris Rissel¹, Helen Dirkis¹,
Angela Balafas¹ and Dafna Merom²

Abstract

In this study, we examined factors associated with children being driven to school. Participants were 1603 students (aged 9–11 years) and their parents from 24 public primary schools in inner western Sydney, Australia. Students recorded their modes of travel to and from school for 5 days in a student survey. Parents recorded their demographic data, their attitudes to travel, and their modes of travel to work, using a self-administered survey. An analysis of the two linked data sets found that 41% of students travelled by car to or from school for more than 5 trips per week. Almost a third (32%) of students walked all the way. Only 1% of students rode a bike and 22% used more than one mode of travel. Of those who were driven, 29% lived less than 1 km and a further 18% lived between 1 and 1.5 km from school. Factors associated with car travel (after adjusting for other potential confounders) were mode of parents' travel to work, parent attitudes, number of cars in the household, and distance from home to school. To be effective, walk to school programs need to address the link between parent journey to work and student journey to school.

Introduction

Driving instead of walking or cycling contributes not only to an unhealthy environment but also reduced opportunities for physical activity [1]. While many adults would remember walking or cycling to school, most children today are driven in cars despite the majority living within walking distance. There is overwhelming evidence that children are walking less and being driven more. Reflecting this, the 2000 Sydney Household Travel Report indicated that between 1991 and 1999, there was an increase in the share of trips to school by children as vehicle passengers (from 41% to 51%), while the share of walking trips decreased from 32% to 24% [2]. For children and adults, the average length of walking trips has steadily declined by 3% on average every year since 1991 [2]. Similarly, according to the 2001 US National Household Travel Survey, less than 15% of students between the ages of 5 and 15 walked to or from school and 1% cycled, compared with 48% of students walked or cycled to school in 1969 [3]. In the UK, between 1991/1993 and 2002, the proportion of primary school children walking to school declined from 60% to 51%, with a corresponding increase in those being taken by car from 29% to 41% [4].

One strategy to increase physical activity is to encourage children to go to and from school by walking, cycling and/or public transport and to reduce the number of children who are driven to school. The journey to and from school is an opportunity for children to walk regularly for 5 days a week. Walking has been recommended for its immediate potential benefit in the prevention of

¹Health Promotion Unit, Sydney South West Area Health Service, Level 9, King George V Building, Missenden Road, Camperdown, New South Wales 2050, Australia and

²Centre for Physical Activity and Health, University of Sydney, New South Wales, School of Public Health Australia

*Correspondence to: Li Ming Wen.

E-mail: lmwen@email.cs.nsw.gov.au

overweight and obesity [5, 6]. Developing a habit of walking instead of being driven short distances may help to form patterns of physical activity in childhood that may continue into adulthood [7]. Many children, especially primary school students, live within walking distance to their school and therefore walking to and from school is often possible. In a pilot project conducted in central Sydney in 2001, a student survey found that 80% of students lived within 1 km of the school, yet 47% of these students were driven to school [8].

A number of studies have examined factors that influence the mode of travel to and from school that primary school-aged children used [9–16]. Parental perceptions of safety, distance from home to school, limited access to public transport, increased out-of-area school choice, and time pressures are some factors which have influenced more parents to drive their children to and from school. Paradoxically, safety concerns can lead to increased road congestion when parents, in an effort to protect their own children from car traffic, drive them to school. This has the unintended consequence of increasing the traffic volume in a school's vicinity and adds to hazards [17, 18]. However, in most studies that examined the correlates or factors of the journey to school, information was collected from either the parent or the child. As a result, the information regarding the correlates of travel mode can be limited. For example, information related to socioeconomic status of families is not able to be collected from children, and studies of parents derived from samples of school students often have low response rates.

In recognition of the many health and environmental benefits of active commuting to school, the Central Sydney Walk to School Research program was initiated in late 2004, and was funded by the New South Wales (NSW) Health Department, as part of a health promotion research demonstration scheme. The program aims to increase the number of upper primary school students who walk to and from school by implementing a multi-strategic intervention with schools, students and their parents, as well as local councils to improve safety and amenity near these schools. In this article, we

report on the first part of the program, which is a study of the characteristics of students who are driven to or from school. We aimed to investigate factors that might be associated with students being driven to or from school in order to inform health promotion intervention strategies, using survey data collected from both students and parents. The study was approved by the ethics committees of Sydney South West Area Health Service and the NSW Department of Education and Training.

Methods

Design

Cross-sectional surveys were conducted with students and their parents from 24 schools. The students completed a travel survey over 5 days and their parents completed a questionnaire. The student and parent surveys were matched through a previously used anonymous record linkage technique [19] based on the first letter of the surname, class and year and birthday of student in order to meet privacy requirements for conducting surveys in schools.

Study participants and data collection

All public primary schools ($n = 61$) located in the inner west of Sydney were invited to participate in the study, and 24 schools volunteered. The schools varied in terms of size, socioeconomic status of their students and cultural mix. Some are located on busy roads and some have quiet surrounds.

In the 24 participating schools, all Year 4 and 5 students (aged 9–11 years, $n = 2047$) who were at school on the day of the survey completed the travel survey in class, supervised by their class teacher. As the completion of the surveys was a class activity, parental consent for each student was not required. Class teachers distributed to their students copies of the parent survey, along with letters of invitation with detailed information about the study, to take home to their parents. Parents completed the surveys at home, if they chose to participate, and returned their completed survey to

the class teacher. There were two reminders sent home with students. Teachers from the participating schools had taken part in a 1-day training course about the study and issues related to the data collection.

Measures

Modes of travel to and from school

Year 4 and 5 students recorded how they travelled to and from school in a travel survey for 5 consecutive school days. The reliability and validity of this travel survey had been tested in a pilot study [8], which found that the travel diary is reliable and valid. Students answered the questions, 'how did you get to school yesterday?' and 'how did you get home yesterday?' A series of options describing the modes of travel to and from school (e.g. walked all the way, walked and caught bus or train, or by car and so on) were listed and students selected one only.

Family demographic information was collected using a self-administered questionnaire from the parent or carer who was the person mainly responsible for their child's travel to school. This information covered age, gender, employment status, educational level and language mainly spoken at home. The parents were also asked about their attitudes to the issues related to their child walking to school and their own modes of travel to work. Parents' attitudes were assessed by asking their agreement to six statements related to walking to school, using a five-point Likert's scale from 'strongly agree' to 'strongly disagree'. These statements (presented word-for-word in Table II) cover the following domains: encouragement of walking to school, if the child likes to walk, the child's road safety skills, if there is convenient public transport, the perceived safety of their neighbourhood and if there are dangerous roads near their school. Parents who reported 'strongly agree', or 'agree' to the statement were recoded as 'having agreed to the statement', and then compared with the rest of other responses. Parents also recorded the estimated distance from their home to school and the distance from their home to their place of employment.

Analysis

Statistical analyses were carried out using the computer package SPSS Complex Samples Statistics (Version 14.0) [20]. This package incorporates the sample design into survey analysis and has been widely accepted to adjust for cluster sample design and unequal probability of selection to ensure that results were representative and that bias in estimates was reduced. Data analyses were only conducted for those students with a parent who had also completed a questionnaire.

Complex Samples Descriptive analysis was conducted to produce the population estimates in describing the characteristics of the study population. This procedure estimates variances by taking into account the sample design used to select the sample, including equal probability and probability proportionate to size methods using both replacement and without replacement sampling procedures.

The study outcome variable was whether students were driven to school or not, and the outcome was derived from recoding the modes of journey to or from school into a dichotomous variable. Students who reported being driven to or from school five times or more per week (out of 10 possible trips) were classified as 'car travellers' and the rest were classified as 'non-car travellers'.

Relationships between the study factors and the outcome factor (being car travellers) were examined using bivariate analyses (Pearson chi-square tests) and multiple logistic regression. The logistic regression models were conducted by using Complex Sample Logistic Regression to take into account the cluster design. Variables that were found to be associated with car travellers ($P = 0.1$) in bivariate analyses were entered into the multiple logistic regression model in order to determine the factors that are independently associated with the car travellers. All variables (except for six attitude variables) were entered in one step in the model, and variables were removed from the model using backward elimination, according to their statistical significance ($P > 0.05$) on the output. Each of the six attitude variables was entered into the final model one at a time. Adjusted odds ratios (ORs)

with 95% confidence intervals were then calculated as a measure of the strength of associations.

Results

Response rate

A total of 1966 Year 4 and 5 students completed a 5-day travel survey, which represented a response rate of 96%, and 1603 of their parents completed their questionnaires, a response rate of 79%. Student surveys without a matched parent survey were excluded from the study ($n = 363$).

Of the excluded students, 48% were boys and 52% were girls. Forty-six per cent were Year 4 students and 54% were Year 5 students. Forty-three per cent reported being driven to or from school at least five times per week. There were no statistically significant differences in gender, school year or proportion of students being driven to school between those remaining in the study and those excluded.

Characteristics of study participants

Table I shows the characteristics of the students and parents remaining in the study. Of these students, 47% were boys and 53% were girls. Mothers were mainly responsible for organizing the students' travel to school (79%). Thirty-seven percent of parents/carers were employed full time, 42% had a tertiary degree and 44% spoke a language other than English at home. Most of the parents/carers (82%) lived with a partner. A little more than half (54%) lived within 1 km of school, and 45% reported having more than one car in the household.

Modes of travel to and from school

Based on the students' travel survey, 41% of students were car travellers. Of these students, 89% were driven to or from school for 10 trips per week. Almost a third (32%) of students walked all the way to or from school for at least five trips per week. Only 1% of the students rode a bike, and 22% used more than one mode of travel to or from school. Among the car travellers, 29% lived less than 1 km from school and

a further 18% lived between 1 and 1.5 km from school. Percentages of students who walked or who went by car to or from school varied from school to school. For example, the percentage of students being driven to school ranged from 69% to 19%.

Factors associated with car users

Table I also lists family characteristics that were associated with car travel to or from school on bivariate analysis. There was a greater proportion of car travellers who lived more than 1 km from school, who were living with both parents or whose carers drove to work, compared with non-car travellers. The employment status of the survey respondent and number of cars available in the household were also significantly associated with car travellers. There were no statistically significant differences between car travellers and non-car travellers in terms of gender of students, the survey respondent's relation to the student, age or level of education of the parents/carers and language mainly spoken at home.

Table II shows that there were significant differences in parents' attitudes and their environmental perceptions of walking to school between parents who drove their child and those who did not. For example, compared with parents who did not drive their child to or from school, there was a lower proportion of parents of car travellers who agreed or strongly agreed with the statement, '*My child's school encourages the children to walk to school*' (38% vs 51%), and there was a higher proportion of parents of car travellers who agreed or strongly agreed with the statement, '*My child hasn't got the road safety skills needed to walk to school*' (34% vs 21%). There was also a significantly higher proportion of parents of car travellers who agreed with the statement, '*There are roads that are dangerous to cross on the way to school*', compared with those of non-car travellers (73% vs 58%).

The results of the multiple logistic regression are shown in Table III. After adjusting for other variables, factors that were found to be associated with being driven to school were the mode of parents' journey to work, parents' attitudes towards walking

Table I. Characteristics of the study population and their association with car travellers

Characteristics	Study population (<i>n</i> = 1603), Column % (weighted)	Car travellers (<i>n</i> = 658), Row % (weighted)	<i>P</i> -value (based on chi-square test)
Gender			
Girl	52.7	40.4	0.98
Boy	47.3	40.5	
Main carer for student's journey to/from school			
Mother	79.3	40.2	0.71
Father	20.3	41.4	
Other	0.5	38.7	
Age group of the main carer			
<30	3.5	33.9	0.26
30–39	35.3	39.0	
40–49	55.9	42.4	
50+	5.2	34.9	
Main language spoken at home			
English	55.9	39.6	0.49
Other	44.1	41.3	
Level of education			
Primary and some high school	11.7	37.3	0.77
Completed high school	21.3	39.9	
TAFE/diploma	25.0	41.3	
University/other tertiary degree	42.0	41.3	
Employment status			
Full time	36.9	43.7	0.01
Part time	27.1	40.7	
Home duties	23.5	41.3	
Others	12.5	29.9	
Living with partner			
Yes	82.2	41.7	0.02
No	17.8	34.0	
Distance to school (km)			
<0.5	29.2	10.6	<0.001
0.5–1	24.7	33.8	
1.1–1.5	12.9	55.5	
1.6–2	10.3	62.1	
2+	22.9	65.7	
No. of children in the household			
1	21.9	36.0	0.11
2	49.7	42.8	
≥3	28.5	40.0	
No. of cars in household			
0–1	54.7	30.1	<0.001
≥2	45.3	53.3	

Table I. Continued

Characteristics	Study population (<i>n</i> = 1603), Column % (weighted)	Car travellers (<i>n</i> = 658), Row % (weighted)	<i>P</i> -value (based on chi-square test)
Modes of travel to work of main carer			
Car	64.6	51.7	<0.001
Public transport	21.7	21.9	
Walk	7.1	13.2	
Others	6.7	34.7	
Distance to work of main carer (km)			
0–5	29.5	39.7	0.46
5.1–10	30.4	42.9	
10.1–20	27.5	41.3	
20+	12.6	48.6	

to school, number of cars available in the household and distance from home to school.

Children were less likely to travel to or from school by car if their parents used modes of travel to work other than a car. They were more likely to travel to or from school by car if their families had more than one car. In addition, as the distance from home to school increased, the adjusted odds of being driven to school also increased.

Logistic regression models were conducted for each of six attitudinal statements, which were included as independent variables. Agreement to the statement that *'I live in a safe neighborhood'* or that *'There are roads that are dangerous to cross on the way to school'* was no longer significantly associated with students being driven to schools. Among the rest of the statements, the statement, *'My child hasn't got the road safety skills needed to walk to school'*, explained the most variance (based on Pseudo R Squares). Therefore, it was included in the final model. For those parents who agreed with the statement, *'My child hasn't got the road safety skills needed to walk to school'*, they were significantly more likely to drive their children to school.

No associations were found between car travellers and non-car travellers in relation to the employment status of their parent/carer or whether the main

Table II. Agreement to the attitude statements between parents of car travellers and non-car travellers

Either strongly agree or agree to the following statement	Parents of car travellers (%)	Parents of non-car travellers (%)	P-value
My child's school encourages the children to walk to school	38.0	50.5	<0.001
My child doesn't like to walk	21.5	12.8	<0.001
There is convenient public transport close to school	41.0	50.7	<0.001
My child hasn't got the road safety skills needed to walk to school	34.5	21.0	<0.001
I live in a safe neighbourhood	51.2	58.7	0.004
There are roads that are dangerous to cross on the way to school	72.7	57.5	<0.001

^aThe P-value is based on a chi-square test.

Table III. Factors associated with students who are driven to school (car travellers)

Study variables	Car travellers			
	%	Adjusted OR ^a	95% CI	P-value
Distance to school (km)				
<0.5	10.6	1		
0.5–1	33.8	4.19	2.74–6.40	<0.001
1.1–1.5	55.5	7.80	4.45–13.69	<0.001
1.6–2	62.1	10.63	6.33–17.89	<0.001
2+	65.7	15.03	8.79–25.68	<0.001
Modes of travel to work of main carer				
Car	51.7	1		
Public transport	21.9	0.32	0.17–0.62	<0.001
Walk	13.2	0.18	0.07–0.46	<0.001
Others	34.7	0.63	0.29–1.40	0.20
No. of cars in household				
0–1	30.1	1		
≥2	53.3	2.09	1.45–3.02	<0.001
Agree to the attitude statement 'My child hasn't got the road safety skills needed to walk to school'				
Yes	52.4	1		
No	35.7	0.63	0.42–0.93	0.02
Employment status				
Full time	43.7	1		
Part time	40.7	0.78	0.55–1.08	0.14
Home duties	41.3	0.63	0.38–1.12	0.09
Others	29.9	0.58	0.31–1.08	0.06
Living with a partner				
Yes	41.7	1		
No	34.0	1.35	0.81–2.24	0.19

^aUsing Complex Sample Logistic Regression and adjusting for other variables in the table.

carer was living with a partner after adjusting for other confounders.

Discussion

The results of the study found that parents' attitudes towards walking to school and their modes of travel to work were associated with how their children travelled to and from school, as did distance from home to school, and the number of cars available in the household.

The strengths of this study include the very high response rate, the use of a validated travel survey over 5 days to measure children's mode of travel to school and the use of linked student and parent surveys to assess parents' attitudes towards walking to school and their own modes of travel to work. It demonstrates the value of linking broad-based parent information with students' travel surveys. This enables us to have a better understanding of what influences the student journey to and from school.

We acknowledge the need to exercise caution in making conclusions about causality based on cross-sectional surveys of this kind and even with broad information collected from both parents and students. No causal relationship can be concluded. A number of limitations of this study need to be noted. First, selection bias might have occurred, as the participating schools volunteered to be in the study. Second, data describing the many environmental factors specific to the participating schools were not able to be included due to lack of resources, despite several studies finding that some environmental factors are associated with walking [21–23]. Third, the attitudinal statements included in this study may not represent the full range of attitudes that might influence children's mode of travel to school. Finally, the study did not assess student attitudes and beliefs about active commuting to school.

The measurement of active travel is not straightforward, and different studies have used different approaches. For example, DiGiuseppi et al. [9] assessed the mode of travel on one day, whereas in the USA survey the question asked if subjects had done any active commuting (walking and cy-

cling and public transport) at least once a week in the past month [16]. Sleep et al. [24] collected data using a physical activity diary for every day of the week. In some studies, the question used in assessing the modes of journey to or from school was how the child usually or normally goes to and from school [13, 25]. However, the reliability or validity of these measures was not assessed in any of these studies. In relation to the methods of data collection, most studies on factors associated with the journey to or from school among primary school students either collected from students information with reasonably accurate estimates about their modes of travel to school, but little or limited data on other social demographics and parental influences, or collected data from parents only with reliable demographic information, but with limited measures of modes of travel to school (e.g. 1-day recall, or a usual pattern) and often with poor response rates.

While our findings may not be directly comparable to previous research due to the use of different measures, and the study population selected from one region of metropolitan Sydney, the findings of this study are consistent with other studies, which have concluded that distance from home to school was a key factor influencing students' journey to and from school [9, 24–26]. Other contributing factors which may explain the increase in car use for trips to school in Sydney in the past decade include the increased number of mothers joining the paid workforce and the possible convenience of dropping-off and picking-up children on the way to and from work [2]. Our study found that the parents carers' mode of travel to work is an independent factor associated with how their children travel to school, rather than the employment status of the parents/carers, which is more in line with the convenience hypotheses. A population-based representative sample of 800 parents of primary school children from NSW also found that parents' use of active travel (walking, cycling or public transport) to work was associated with their children regularly walking to and from school [26].

The findings of our study are consistent with other studies which suggested that parent perception

of the importance of physical activity, parents' individual history of transport to school as well as distance from school were the most significant factors determining children's involvement in walking to and from school [27, 28]. Timperio *et al.* [22] also found that the parental perception that there were few other children in the neighborhood and no traffic lights or pedestrian crossings for their child to use was negatively correlated with active commuting to schools. These findings were echoed by the findings of Kerr *et al.* [21] which suggested that parental concerns about the school environment were associated with active commuting to schools.

In a previous study, Carlin *et al.* [29] found that there was an inverse relationship between walking and socioeconomic measures. This was not evident in our study, as we did not find any associations between car travellers and language spoken at home, education level or the employment status of parents/carers. However, in our study, the number of cars in a household, which could be a proxy for economic status of the family, was found to be significantly associated with car travellers as a previous study suggested [9].

It is a public health concern that a substantial proportion of students who live within a short distance to school (<1.0 km) are driven to and from school regularly. Children who are generally driven to school have less opportunity to develop the habit of walking and to practice their road safety skills, which could lead to lower levels of physical activity. This pattern has been demonstrated in a recent study, which found that car-dependent children are less active overall [25].

Implications for walk to school programs

The relationships found in this study between students being driven to school and modes of travel to work of their parents have a number of important implications for developing effective walk to school programs. Walk to school programs need to acknowledge the link between parent journey to work and student travel to school. To do this, program components need to assist parents to walk to school with their children and then go to work by active travel (walking, cycling, or public transport). Spe-

cific program components in the implementation phase of our Program to address these issues include development of a Travel Access Guide (TAG) for each of our intervention schools. The TAGs provide specific information on how parents can travel with their children to school, and then onto their workplace by active travel. The TAGs have been distributed to parents along with bus and train route and timetable information relevant to their local areas.

Changes in several policy areas additional to the health portfolio may be considered to reduce car use. They could include greater investment in public transport to make it a more viable option for more people. Improved frequency and timeliness of services, greater connectivity between types of travel (e.g. bus and train) and better security would encourage more people to use public transport more often [30]. More pedestrian crossings, redirection of the carriage of heavy goods from road to rail, traffic calming, more bicycle paths and safer footpaths have all been suggested as policy initiatives to encourage more people to walk and cycle [31]. There is emerging evidence that several of these approaches can be effective [32, 33].

Other types of policy changes that could assist in reducing car use may be more flexible working hours, which could redistribute the number of commuters travelling during 'peak' times more evenly throughout the working day. General social changes needed to encourage more walking to and from school could be a greater sharing of child care tasks, particularly the 'get ready and off to school' routine, between mothers and fathers.

Schools also have a role in encouraging active travel by parents and students to and from school. Schools can use their own policies and procedures to manage car congestion near their entrances, to teach road safety skills and to encourage more walking [34]. Schools may give parents information on public transport options and recommend walking or cycling routes to the school. Strategies that reduce the convenience of driving to school and also increase safety for students, such as parking restrictions around the school, could be considered as a way of promoting walking to school. The significant variation in the rates of car travellers in our

participating schools indicates that program strategies and their implementation need to be tailored to the needs of each school and their communities.

Conclusions

Being driven to school was the main mode of travel for students in our study population. The factor most strongly associated with children being driven to school was their parents' car journey to work. A substantial proportion of students were driven to school even though they lived within a short distance from school. To be effective, walk to school programs need to acknowledge and address the link between parent mode of travel and student journey to school.

Funding

NSW Health Promotion Demonstration Research Grants Scheme 2005/07.

Acknowledgements

The authors wish to thank students and parents for their participation in this study. We also wish to thank teachers and principals from the participating schools for their time and support for this study. This study was a part of the Central Sydney Walk to School Research Program funded by the NSW Health.

Conflict of interest statement

None declared.

References

1. WHO Regional Office for Europe. *Charter on Transport, Environment and Health. Third Ministerial Conference on Environment and Health*. 1999. Available at: http://www.euro.who.int/document/peh-ehp/charter_transport.pdf. Accessed: 16 August 2007.
2. Transport Data Centre. *Household Travel Survey, Summary Report 2001*. Sydney, Australia: Sydney Statistical Division, NSW Department of Transport, 2001.
3. US Environmental Protection Agency. *Travel and Environmental Implications of School Siting*. Washington, DC: US Environmental Protection Agency, 2003. Available at: http://www.epa.gov/smartgrowth/pdf/school_travel.pdf. Accessed: 12 November, 2005.
4. Department for Transport. *National Travel Survey: 2004, Transport Statistics Bulletin*. London, UK: Department for Transport, 2005.
5. Hill A, Cambourne B. Walking to school—a sustainable environmental strategy to prevent childhood obesity. *Aust Epidemiol* 2002; **9**: 15–7.
6. 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.
7. Janz KF, Dawson JD, Mahoney LT. Tracking physical fitness and physical activity from childhood to adolescence: the muscatine study. *Med Sci Sports Exerc* 2000; **32**: 1250–7.
8. Zaccari V, Dirkis H. Walking to school in inner Sydney. *Health Promot J Austr* 2003; **14**: 137–40.
9. DiGuseppi C, Robert I, Leah L, Allen D. Determinants of car travel on daily journeys to school: cross sectional survey of primary school children. *Br Med J* 1998; **316**: 1426–8.
10. Jones P, Bradshaw R. *The Family and School Run: What would make a real difference? (Summary Report)*. London: AA Foundation for Road Safety Research, The University of Westminster, 2000.
11. Evenson KR, Huston SL, McMillen BJ *et al*. Statewide prevalence and correlates of walking and bicycling to school. *Arch Pediatr Adolesc Med* 2003; **157**: 887–92.
12. Timerio A, Crawford D, Telford A, Salmon J. Perceptions about local neighborhood and walking and cycling among children. *Prev Med* 2004; **38**: 39–47.
13. Fulton JE, Shisler JL, Yore MM. Active transport to school: findings from a national survey. *Res Q Exerc Sport* 2005; **76**: 352–7.
14. Black C, Collins A, Snell M. Australian Occupational Therapy Journal. *Encouraging walking: the case of journey-to-school trips in compact urban areas* 2001; **38**: 1121–41.
15. Harten N, Olds T. Patterns of active transport in 11–12 year old Australian Children. *Aust N Z J Public Health* 2004; **28**: 167–72.
16. Centers for Disease Control. Barriers to children walking and biking to school—the United States, 1999. *Morb. Mortal Wkly Rep* 2002; **51**: 701–4.
17. Mason C. Healthy people, places and transport. *Health Promot J Austr* 2000; **10**: 190–6.
18. Holt D, Taiyab N, Griffin E *et al*. School commuting the proper focus of pediatric injury prevention? *Pediatrics* 1999; **104**: 697.
19. Winchester L, Dobbins S, Rissel C *et al*. Anonymous record linkage using respondent-generated ID codes—a tool for health promotion research. *Health Promot J Austr* 1996; **6**: 52–4.
20. SPSS Inc. *SPSS Complex Samples Statistics (Version 14.0)*. Chicago, IL: SPSS Inc.,
21. Kerr J, Rosenberg D, Sallis JF *et al*. Active commuting to school: associations with environment and parental concerns. *Med Sci Sports Exerc* 2006; **38**: 787–94.
22. Timperio A, Ball K, Salmon J *et al*. Personal, family, social, and environmental correlates of active commuting to school. *Am J Prev Med* 2006; **30**: 45–51.
23. Hume C, Salman J, Ball K. Associations of children's perceived neighbourhood environments with walking and physical activity. *Am J Health Promot* 2007; **21**: 201–7.

24. Sleaf M, Warburton P. Are primary school children gaining heart health benefits from their journeys to school? *Child Care, Health Dev* 1993; **19**: 99–108.
25. Cooper AR, Page AS, Foster LJ *et al.* Commuting to school: are children who walk more physically active? *Am J Prev Med* 2003; **25**: 273–6.
26. Merom D, Tudor-Locke C, Bauman A *et al.* Active commuting to school among NSW primary school children: implications for public health. *Health Place* 2006; **12**: 678–87.
27. Ziviani J, Scott J, Wadley D. Walking to school: incidental physical activity in the daily occupations of Australian children. *Occup Ther Int* 2004; **11**: 1–11.
28. Weir LA, Etelson S, Brand DA. Parents' perceptions of neighborhood safety and children's physical activity. *Prev Med* 2006; **43**: 212–7.
29. Carlin JB, Stevenson MR, Roberts I *et al.* Walking to school and traffic exposure in Australian children. *Aust N Z J Public Health* 1997; **21**: 286–92.
30. Newman P, Kenworthy J. *Sustainability and Cities: Overcoming Automobile Dependence*. Washington, DC: Island Press, 1999.
31. Warren Centre for Sustainable Transport, University of Sydney. *Changing Travel Behaviour: Executive Summary*. NSW, Australia: University of Sydney, 2005.
32. Gebel K, King L, Bauman A *et al.* *Creating Healthy Environments: A Review of Links between the Physical Environment, Physical Activity and Obesity*. Sydney, Australia: NSW Health and NSW Centre for Overweight and Obesity, 2005.
33. Killoran A, Doyle N, Waller S *et al.* *Transport Interventions Promoting Safe Cycling and Walking—Evidence Briefing*. London, UK: National Institute for Clinical Excellence, 2006.
34. Orr N, Rissel C, Dirakis H. The evaluation of a simple intervention using traffic cones to reduce traffic hazards around schools at peak times. *Road Transp Res* 2005; **14**: 111–3.

Received on January 29, 2006; accepted on May 18, 2007