



Walking to school: frequency and predictors among primary school children in Dunedin, New Zealand

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Abstract

Aim To estimate the frequency of walking to school among primary school children and examine associated factors.

Method In-class survey of Years 1–6 children attending Dunedin primary schools, November 2004, and a take home, written questionnaire for parents / caregivers.

Results On study day, 34.5% of children walked to school and 36.8% intended to walk home. Overall, 1157 completed caregiver questionnaires were returned (68%) indicating that 47.5% of children walked to or from school less than three times per week. The strongest predictor of walking was proximity to school (<1 km OR 29.3, 1–2 km OR 7.7, 2–3 km OR 3.0, >3 km OR 1.00). Other predictors were not having a car in the household (OR 10.9), attending a (low socioeconomic) decile 2 to 4 school (2.35), having three or more adults in the household (1.85), being in a higher school year (1.72), having non-New Zealand European ethnicity (>1.41), having a parent who had walked to school (1.35), and being male (1.33).

Conclusions This study established a baseline for the percentage of Dunedin primary school children walking to school. Key potentially modifiable predictors of walking were proximity to school and not having a car in the household. These findings have implications for health, transport and educational policies.

Childhood obesity is a global problem that has increased dramatically over the last 25 years.^{1–6} The New Zealand Children's Nutrition Survey shows that 21% of New Zealand children are overweight and 10% are obese.⁷

Childhood obesity has numerous effects on both individuals and communities. Health consequences include diseases of the cardiovascular, gastrointestinal, respiratory, and endocrine systems. Neurological, orthopaedic, and psychological sequelae are also possible.^{8–11} The direct cost of obesity had been estimated to be between 2 and 7% of a country's annual health budget.¹²

Although the increase in childhood obesity is multifactorial,^{10,11} declining participation in physical activity is a major contributor. Attractive sedentary alternatives have drawn children away from discretionary physical activity, while the need for incidental physical activity has been reduced by energy saving devices such as remote controls.^{13–16}

Safety concerns are also restricting children's freedom to play and exercise outside the home.¹⁷ In New Zealand, more than one-third of children fail to achieve the recommended level of physical activity.¹⁸ Similar trends have been observed in other developed countries.^{19,20}

Walking to school provides children with a regular and convenient form of physical activity. This study seeks to estimate the prevalence of walking to and from school among Dunedin primary school children and identify major predictors of this activity.

Methods

Sample selection—Schools were identified from the Ministry of Education database.²¹ All 46 primary schools (Years 1–6 [primer 1 to standard 4]; ages 5–11) within a 10 km radius of the Dunedin city centre were contacted by telephone and invited to participate. Special schools (those catering solely for children with physical or intellectual disabilities) were excluded. Thirty-nine schools (85%) agreed to participate in the study.

Two year-levels were randomly selected at each participating school: one from Years 1–3 (age 5–8) and one from Years 4–6 (age 8–11). All children from the selected year levels at each school were surveyed by members of the research group. ‘Model’ classes (those with a mix of students from all year levels in one classroom) were excluded.

Procedures—Children were asked to raise their hands if they had either walked or been driven to school, or got to school by any other means of transportation on Tuesday 30 November 2004. Children were then asked how they expected to get home after school that day. In each case, the numbers of children were recorded on a data sheet. In addition, every child received a questionnaire to take home for their caregivers to complete and return to school. Extra copies were left for any children who were absent on the sampling day. The questionnaires were followed by reminder letters 5–6 days later. Completed questionnaires were collected from the schools approximately 10 days after distribution.

Instrument—The questionnaire requested demographic data and information about the number of days the child walked to/from school in a typical week. Questions included sex, age, and ethnicity of the child; number of adults in household; number of other children in household; distance from school (less than 1 km, 1–2 km, 2–3 km, more than 3 km); hours of physical activity per week (less than 1 hour, 1–2 hours, 2–3 hours, 4 hours or more); and whether the parent had walked to school as a child. Parents were asked to specify the number of days (out of 5) that the child walked to school and from school in a typical week.

Analysis—Data were analysed using SPSS 12.0 and SAS 8 software. A logistic regression model was used to predict walking on a given day/time with a random effect for schools (taking into account the cluster effects of schools) and accounting for the correlated nature of the 10 possible walking periods for each child.

Ethical approval—Departmental ethical approval was obtained, in accordance with the University of Otago Human Ethics Committee guidelines.

Results

On the sampling day, 1524 children were present and all participated in the classroom survey. Overall, 1703 questionnaires were distributed to caregivers; 1157 were returned, thus giving a response rate of 67.9%.

Proportion of children walking to school—From the classroom survey, 34.5% of children had walked to school and 36.8% anticipated walking home on the study day. Parents’ reports of how often their child walked to school in a typical week are presented in Table 1.

Table 1. Number of walking episodes per week and percentages of children walking to or from school in a typical week (caregivers' reports)

Walking episodes per week	Number of children (percentage)
8 or more	327 (28.9)
3 to 7	266 (23.5)
1 or 2	101 (8.9)
None	436 (38.6)

Predictors of walking behaviour—A logistic regression model was used to predict walking on a given day/time with a random effect for schools (taking into account cluster effects of schools) and accounting for the correlated nature of the 10 possible walking periods for each child. Of the 1157 caregivers' reports, 1006 provided full data and were included in the model. The model included sex, school year group, school decile group, distance to school group, ethnicity, number of adults in household, number of cars relative to adults (no cars, fewer cars than adults, same or more cars than adults), number of other children in household, physical activity group, whether the parent walked to school as a child, and presence of a walking school bus at school.

All variables were statistically significant ($p < 0.05$) except for the number of other children in the household and the existence of a walking school bus. These results are summarised in Table 2.

- The proportion of children walking dropped off sharply as distance from school increased. Those living within 1 km of school were almost 30 times more likely to walk than children living more than 3 km from school.
- Families without a car were 10 times as likely to walk as those with as many or more cars than adults in the household (OR 10.9, 95% CI 7.72–15.4).
- Boys were one-third more likely to walk than girls (OR 1.34, 95% CI 1.21–1.48).
- Children in Years 4 to 6 were 72% more likely to walk than younger children (OR 1.72, 95% CI 1.55–1.90).
- Those attending (socioeconomically disadvantaged) decile 2 to 4 schools were twice as likely to walk as those at higher decile schools (OR 2.35, 95% CI 1.34–4.13).
- Māori children and Pacific Island children were more likely to walk to school than NZ European children (ORs 1.51 and 2.69, respectively).

There was a U-shaped relationship between physical activity and the odds of children walking to school. Children who exercised for 2 to 4 hours per week were less likely to walk to school than those who exercised for less than 2 hours or more than 4 hours. Children with a parent who had walked to school as a child were 35% more likely to also walk (OR 1.35, 95% CI 1.16–1.58).

Table 2. Summary of logistic regression model for predictors of walking to school

Variable	Odds Ratio	95% CI
Gender		
Female	1	–
Male	1.33	1.21–1.48
School year		
1 to 3	1	–
4 to 6	1.72	1.55–1.90
Distance to school		
< 1 km	29.3	24.10–35.70
1 to 2 km	7.70	6.33–9.38
2 to 3 km	3.04	2.38–3.88
> 3 km	1	–
School decile		
2 to 4 (disadvantaged)	2.35	1.34–4.13
5 to 7	1	–
8 to 10 (advantaged)	1.05	0.66–1.69
Ethnicity		
NZ European	1	–
NZ Māori	1.51	1.28–1.79
Pacific Island	2.69	1.90–3.77
Other	1.41	1.18–1.69
Cars in household		
No cars	10.9	7.72–15.4
Fewer cars than adults	1.47	1.30–1.66
Equal or more cars than adults	1	–
Adults in household		
1	1	–
2	0.97	0.83–1.12
3 or more	1.85	1.46–2.35
Other children in household		
0	1.02	0.85–1.22
1 or 2	0.98	0.85–1.14
3 or more	1	–
Weekly physical activity		
Less than 1 hour	1.53	1.18–1.99
1 to 2 hours	1.64	1.36–1.99
2 to 3 hours	1	–
3 to 4 hours	0.93	0.78–1.11
More than 4 hours	1.32	1.15–1.52
Did parent walk to school?		
Yes	1.35	1.16–1.58
No	1	–
WSB* at school?		
Yes	1.47	0.94–2.33
No	1	–

*Walking school bus (WSB) consisting of adult volunteers walking a set route at a given time, collecting children along the way.

Discussion

This study indicates that 47.5% of Dunedin primary school children walked to/from school less than three times a week. Surveys from other cities in NZ and overseas have reported between 21% and 69% of children walk to school.²²⁻²⁶ However, comparison between studies is limited by area-specific variations that may impact on walking patterns. These include: climate, season, availability of public transport, topography, population density, and socioeconomic status.

Moreover, methodologies also vary considerably; sampling may include one or several schools, response rates differ, and the questionnaires themselves are often not comparable.

As with other studies in the US,²⁷ UK,²⁸ and Australia,²⁹ the distance from home to school had the greatest impact on whether the child walked to school. This finding may have implications for school zoning policies. Education policy in New Zealand allows children to attend the school of their choice with few restrictions.²¹

Recent closures of small schools may also encourage children to use motorised transport as they no longer have the option of attending a school within reasonable walking distance of their homes.

Boys were more likely to walk than girls. This may reflect a gender difference in activity levels³⁰ or safety concerns related to a perception that girls are more vulnerable than boys.

Children in Years 1 to 3 were less likely to walk than older children; this finding is also likely to be related to safety issues. Caregivers may be concerned that younger children have not fully developed the perceptual, cognitive, and motor skills to successfully avoid hazards that may be encountered on the journey to school.³¹ Indeed, the New Zealand Police recommend that children in Years 1 and 2 should not cross roads alone and (if possible) should walk to school accompanied by someone older.³¹

Attendance at a low-decile school and lesser car ownership were independently associated with a higher probability of walking. Indeed, other studies have also reported an association between high walking rates and low levels of a number of socioeconomic indicators.²⁴ This finding is likely to reflect the relatively high cost of motorised transport currently further exacerbated by high fuel prices.

Walking rates were lower among NZ European children when compared to other ethnicities. Higher walking rates have been reported in children from non-English speaking backgrounds.²⁴ This is of interest when placed in the context of childhood obesity within New Zealand; Pacific Island, and Māori have much higher rates of childhood obesity,⁸ yet appear to be participating in greater levels of incidental physical activity via walking to school.

There are several potential explanations for this apparent contradiction. First, the higher rate of incidental physical activity in this group may not be enough to outweigh other contributors to obesity, such as nutritional factors (e.g. consuming relatively large amounts of snacks containing high levels of fat and sugar).

Secondly, body mass index data were not collected, so we do not know whether individual Māori and Pacific Island children in our study were more overweight than their peers.

Finally, the observed effect may be due to confounding by socioeconomic status. School decile and car access were used as proxy indicators of socioeconomic status in this study, but these measures may be too crude to adequately control for socioeconomic factors.

Cooper et al³⁰ suggested that children who walk to school are more active throughout the day. However, this study has shown that a higher frequency of walking is associated with both the highest and lower physical activity groups.

A walking school bus (WSB) consists of adult volunteers who walk a set route at a given time, collecting children along the way.³² This study showed that WSBs had no effect on the proportion of children walking to school. This may be due to relatively few WSB routes in Dunedin and too few children taking part in each bus.

Identified constraints on the success of a WSB program include lack of parent volunteers, loss of key enthusiasts on the school staff, and loss of novelty value.³³

Conclusions

The increasing burden of obesity and the decline in physical activity have been recognised as major public health issues.¹² Walking to school provides children with a convenient and regular means of increasing energy expenditure.

Living a short distance from school was the strongest positive, potentially modifiable predictor for walking to school. Male gender, higher school year, non-NZ European ethnicity, and attending a low decile school were all associated with a significantly increased rate of walking.

Results from this study could inform and guide the development of health, transport, and education policies directed at increasing the proportion of children walking to school.

Competing interests: None known.

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