

# New South Wales Health Promotion Demonstration Research Grants Scheme



## THE CENTRAL SYDNEY WALK TO SCHOOL RESEARCH PROGRAM 2005-2007



Produced by:  
Centre for Health Advancement  
Population Health Division

NSW DEPARTMENT OF HEALTH  
73 Miller St  
North Sydney NSW 2060 Australia  
Tel. (02) 9391 9000  
Fax. (02) 9391 9101  
TTY: (02) 9391 9900  
[www.health.nsw.gov.au](http://www.health.nsw.gov.au)

This work is copyright. It may be reproduced in whole or part for study or training purposes subject to the inclusion of an acknowledgment of the source. It may not be reproduced for commercial usage or sale. Reproduction for purposes other than those indicated above requires written permission from the NSW Department of Health.

© NSW Department of Health 2009

Suggested citation: Fry D, Wen L M, Merom D, Dirkis H, Rissel C, Balafas A. *The Central Sydney Walk to School Research Program 2005-2007*. Sydney: NSW Department of Health, 2009.

This is the report of a project sponsored by the New South Wales Health Promotion Demonstration Research Grants Scheme funded by the NSW Department of Health. The project was conducted by the Health Promotion Service of Sydney South West Area Health Service.

SHPN (CHA) 090101  
ISBN 978-1-74187-369-6

Further copies of this publication can be obtained from the NSW Department of Health website at: [www.health.nsw.gov.au](http://www.health.nsw.gov.au)

Disclaimer: Content within this publication was accurate at the time of publication.  
September 2009

# Contents

Acknowledgments.....	ii
List of tables and figures.....	iv
Abbreviations and acronyms .....	v
Executive summary .....	vi
1 Introduction.....	1
2 Aims and objectives .....	5
3 The intervention.....	6
4 Research and evaluation methods .....	13
5 Results .....	17
6 Discussion.....	24
7 Conclusions and recommendations .....	29
References.....	31
List of appendices.....	34

## For copies of Appendices A-N, please contact:

Health Promotion with Schools team  
Health Promotion Service  
Sydney South West Area Health Service  
Level 9 Nth, KGV Building  
Missenden Rd Camperdown NSW 2050  
  
Ph: 02 9515 9055  
Email: [hpureception@email.cs.nsw.gov.au](mailto:hpureception@email.cs.nsw.gov.au)

# Acknowledgments

The Central Sydney Walk to School Research Program was funded by NSW Health through the NSW Health Promotion Demonstration Research Grants Scheme and conducted by the Health Promotion Service of Sydney South West Area Health Service. The project was carried out between 2004 and 2007.

This project has been supported by the following:

## **Project Management Team**

Li Ming Wen, Helen Dirkis, Chris Rissel, Angela Balafas (Health Promotion Service, Sydney South West Area Health Service) and Dafna Merom (Centre for Physical Activity and Health)

Project Officer: Denise Fry

## **Advisory committee**

### **Health Promotion Service, Sydney South West Area Health Service**

Chris Rissel, Li Ming Wen, Helen Dirkis, Angela Balafas

### **Centre for Physical Activity and Health**

Dafna Merom

### **Leichhardt Council**

Vera Zaccari (Road Safety Officer)

### **Department of Education and Training**

Paul Doorn (formerly Road Safety Consultant, Department of Education and Training)

Sandra Coppe (Road Safety Consultant, St George Region, Department of Education and Training)

Peter Crawshaw (Principal, Annandale North Public School, 2004-5)

Roger Rieger (Principal, Harcourt Public School, Campsie)

### **Federation of Parent and Citizens Associations**

Jennifer Barker

### **Centre for Health Advancement, NSW Department of Health**

Andrew Milat and Peta Lucas

### **Schools and NSW Department of Education and Training**

Sincere thanks to the NSW Department of Education and Training and to the 24 participating primary schools, especially principals, assistant principals, office and support staff, Year 4, 5 and 6 teachers, students and parents. Without the enthusiastic involvement of all these people, the program could not have taken place.

The schools were:

Abbotsford Public School  
Ashfield Public School  
Beverly Hills North Public School  
Birchgrove Public School  
Campsie Public School  
Camdenville Public School  
Concord Public School  
Dobroyd Point Public School  
Enfield Public School  
Five Dock Public School  
Glebe Public School  
Haberfield Public School  
Homebush Public School  
Lewisham Public School  
Marrickville Public School  
Newtown Public School  
Orange Grove Public School  
Petersham Public School  
Rozelle Public School  
Strathfield North Public School  
Strathfield South Public School  
Summer Hill Public School  
Tempe Public School  
Ultimo Public School

We wish to thank the following people and organisations for their valuable contributions to the program:

- Road Safety Officers, Traffic Engineers and other officers in the councils of Ashfield, Burwood, Canada Bay, Canterbury, City of Sydney, Leichhardt, Marrickville, and Strathfield who assisted with safety reviews of the schools and their vicinities, and with the provision of large-scale maps to schools
- Mr Sonny Cabalag of the State Transit Authority who kindly supplied multiple copies of bus route maps and timetables for distribution with the school Travel Access Guides, and City Rail which also supplied train timetables for the same purpose
- Staff members of the Health Promotion Service, Sydney South West Area Health Service at Camperdown who assisted, including Jeni Bindon who led the parent walks and Angela Balafas and Denise Barry for communication and design work
- Penny Biggins and Kim Paul for organisation, distribution, collection and processing of student and parent surveys, and for preparation of school specific reports
- McNair Ingenuity Research for data entry
- Professor Jennifer Peat for technical assistance with the data analyses.

# List of tables and figures

Table 1	Overview and sequence of program activities.....	7
Table 2	Schools and numbers of participating classes and students in the Walk to School (intervention) and the Healthy Lunch (control) groups .....	8
Table 3	Implementation of strategies for the Walk to School group in 2005 and 2006 .....	10
Table 4	Comparison of baseline characteristics of students who completed baseline and follow-up surveys.....	17
Table 5	Baseline patterns of travel to and from school in control and intervention groups .....	18
Table 6	Change in travel mode between baseline and follow-up in control and intervention groups (from student data) .....	19
Table 7	Change in percentage of students who walked all the way to school (all days and some days) in intervention and control groups from baseline to follow-up .....	19
Table 8	Change in percentage of students who walked all the way home (all days and some days) in intervention and control groups from baseline to follow-up .....	20
Table 9a	Change in the percentage of students who walked all the way to school in a usual week, from parent data (n=807) at follow-up, stratified by student age and distance from home to school. ....	21
Table 9b	Change in percentage of students who went to school by car in a usual week, from parent data (n=807) at follow-up, stratified by student age and distance from home to school.....	21
Table 10	Predictors (by multivariate analysis) of student non-car travel in 1,234 students following the intervention, based on student survey data .....	22
Figure 1	Evaluation design.....	13

# Abbreviations and acronyms

The following abbreviations and acronyms are used in this report:

CS	Central Sydney
CSAHS	Central Sydney Area Health Service
DET	NSW Department of Education and Training
HL	Healthy Lunch
LGA	Local Government Area
RCT	Randomised Controlled Trial
RTA	NSW Roads and Traffic Authority
SSWAHS	Sydney South West Area Health Service
TAG	Travel Access Guide
TDC	Transport Data Centre
WSB	Walking School Bus
WTS	Walk to School

# Executive summary

## Issue

The Central Sydney Walk to School Research Program was conducted in response to the ongoing decline in the percentage of school children who walk to and from school, and because of the significant health, social and environmental benefits that result from reduced car use and increased walking.

## Methods

The program was conducted by the Health Promotion Service of Sydney South West Area Health Service from 2004 to 2007. The program was a cluster randomised controlled trial which developed, implemented and evaluated a multi-component intervention to increase the number of upper primary school children who walked all or some of the way to and from school. More than 2,200 students (aged 10-12 years) and their parents in 24 public primary schools participated. Before and after the program's interlinked interventions, surveys were completed by students and their parents on how students travelled to school and from school.

The interventions consisted of education strategies for teachers, students and their parents (professional development for teachers, parent newsletters, classroom resources, development of a Travel Access Guide for each school, pedometer programs, and preparation for high school); and working with councils to identify and fix hazards to safety and walkability near participating schools and their vicinities.

## Results

The baseline survey found that car travel was the main mode of travel to and from school. There was a high variation from school to school in student travel patterns, and the factor most strongly associated with students travelling by car was their parents' car journey to work. The evaluation produced a mixed result, as the increase in walking found in the data reported by parents was not

found in the data reported by students. Follow-up survey results from the cohort of 807 parents (who completed baseline and follow-up surveys) found that the intervention had a positive effect (9.8% of students increased their walking,  $p=0.05$ ), but analysis of the data reported by students did not yield a similar result. For the journey to school, walking increased in some schools in the intervention and the control groups, with a large range in the rates of change (-14.3% to 20%). The program achieved limited improvements in making schools and their vicinities more suitable for active and safe travel.

## Conclusions

It is likely that key factors influencing how students travel to and from school are their parent's journey to work, availability and frequency of public transport, and safety and walkability of neighbourhoods. It was hard to discern an overall pattern in the results, due to the high variation in the percentages of students in the intervention and control schools who changed their travel mode. The research identified the strong influence of the parent's journey to work on their child's journey to school. Making environments more suitable for active and safe travel requires the involvement of additional agencies and improvements to physical infrastructure and public transport.

## So What?

A complex interaction of multiple social and local factors influences student and parent travel to school. Future active travel to school programs should include the parent journey to work. It is essential to collaborate with local councils and state public transport, roads, and environmental protection agencies that have the capacity to change the main determinants of travel to school. The impacts of climate change provide additional compelling reasons to develop effective active travel programs.



## SECTION 1

# Introduction

The Central Sydney (CS) Walk to School (WTS) Research Program, hereafter referred to as the WTS Program, was conducted in response to the ongoing decline in the percentage of school children who walk to and from school, and the lack of rigorous evidence on the effectiveness of programs established to increase active travel to and from school.<sup>1</sup> The project was conducted by the Health Promotion Service of Sydney South West Area Health Service (SSWAHS) from 2004 to 2007. In 2005 Central Sydney Area Health Service (CSAHS) was amalgamated with South West Sydney Area Health Service to become SSWAHS.

The WTS Program involved the development and implementation of a multi-component intervention that aimed to increase the number of upper primary school children (aged 10-12 years) who walked all or some of the way to and from school; and used a cluster randomised controlled trial (RCT) to evaluate the intervention's effectiveness.

Within the WTS Program, 12 schools were in the Walk to School (WTS) (intervention) group and 12 schools were in the Healthy Lunch (HL) (control) group. The program's interventions were designed to be sequential (so that initial strategies informed later strategies) and synergistic (making key strategies interactive to maximise their effects). The program's survey data on travel patterns were used to tailor and adjust the interventions for specific schools in response to their differing needs.

This Final Report describes the rationale for the WTS Program and reviews the impact of other interventions to increase safe and active travel to school. It describes the program's goals and objectives, research design and methods, and the interventions developed and implemented during 2005 and 2006.

This report contains an evaluation of the program's effectiveness, based on data analyses and results from the student and parent surveys, and other process data. The report ends with a discussion of the evaluation findings, and conclusions and recommendations.

## Rationale

Reduced use of cars and increased rates of walking can lead to health, environmental and social benefits for children and adults.<sup>2,3</sup> Contemporary public health research and policy recognises that transport systems and urban design at international, national, regional and local levels affect the health and safety of populations in terms of injuries due to road crashes, air pollution, traffic congestion and noise, insufficient levels of physical activity, access to essential goods and services and social exclusion of those without transport.<sup>4,5</sup>

Many adults remember walking or cycling to school, but today most primary school children travel to and from school by car, even though many of them live within walking distance of their school. From 1971-2003, the percentage of children aged five to nine years walking to school has been steadily decreasing, from 57.7 per cent in 1971 to 25.5 per cent in 1999-2003. The percentage of students travelling to school by car has been steadily increasing, from 22.8 per cent in 1971 to 47.8 per cent in 1999-2003.<sup>6</sup>

The NSW Schools Physical Activity and Nutrition Study conducted in 2004 found that while 70 per cent of secondary school students went to school by active travel (walking, cycling and/or public transport), in primary schools just over 20 per cent of Year 6 students, aged 11-12 years, walked to school every day of the school week, 20 per cent used public transport, 35 per cent travelled by car and the remaining percentage used more than one travel mode during the week.<sup>7</sup>

Travel patterns are often formed in childhood, with children learning what they perceive to be a 'normal' pattern from their parents.<sup>8</sup> The journey to and from school has been an opportunity for children to take their first independent journey in their own neighbourhood, and to do some physical activity regularly.

The National Guidelines on Physical Activity for Children recommend that children aged five to 12 years should spend at least 60 minutes a day doing moderate to vigorous physical activity.<sup>9</sup> While walking or cycling to and from school may help to meet these physical activity requirements, there is insufficient evidence on the effectiveness of interventions that aim to increase active travel.

Many factors are seen as inhibiting children walking to and from school, and their physical activity generally. Many parents believe that their children live in environments that are more dangerous than in previous times, and some parents are reluctant to let their children go to places independently due to fears of crime and of dangerous traffic.<sup>10,11</sup> These views reinforce children's dependence and restrict their mobility.<sup>12,13</sup> Such trends have a cumulative effect, particularly when parental concerns lead to more parents driving their children to school, thus increasing the traffic congestion and hazards around schools.<sup>14</sup>

The way that parents travel to work has a strong influence on how their children travel to school. An increased level of walking to school in children has been found to be independently associated with their parents' active travel journey to work.<sup>15</sup> Other studies have found an inverse association between students walking to school and their parents' perceptions that there is not enough time in the morning to walk with their children to school and to get to work on time,<sup>16</sup> and parents reporting limited access to public transport.<sup>17</sup>

Another factor that contributes to the increased number of students who go to school by car is their attendance at schools outside their local area, which usually means that schools are located more than a walkable distance from students' homes.<sup>8</sup> Two Australian studies have demonstrated that the level of walking to school sharply declines when distance from home to school, whether objectively measured<sup>17</sup> or self-reported,<sup>15</sup> exceeds 0.8km.

## Interventions to increase walking to and from school

In the last five years the number of health and transport interventions that aim to reduce car use and increase active travel has rapidly expanded.<sup>1</sup> Active travel is defined as walking, cycling and/or public transport, either separately or in combination.<sup>18,19</sup> Schools, like workplaces, generate a significant volume of weekday traffic. An increase in active travel to and from school may reduce traffic congestion near schools, and assist large numbers of children and their parents to increase their levels of physical activity. Since the start of the WTS Program, UK and several European countries have funded programs that aim to change the way students travel to and from school, from being driven to walking, cycling and/or public transport.<sup>20</sup>

Since 1998, the Ministry of Transport in the UK has funded more than 2,000 schools to employ travel advisors to develop and implement School Travel Plans. Some local government authorities have also built cycle routes and introduced infrastructure and traffic management changes designed to improve safety on school routes.<sup>21</sup> An evaluation of the impact of School Travel Plans in North London found that student travel patterns did not change at schools that had travel coordinators to implement the plans, and parental fears were not reduced.<sup>22</sup>

Since 1997 a number of US states have funded programs to improve the safety of school children walking and bicycling to school. The programs include funds for infrastructure, education and enforcement. The Safe Routes to School Program in California provided competitive funds to schools and other local organisations for educational programs and construction projects such as footpaths, traffic lights, pedestrian crossing improvements and bicycle paths. An evaluation of the program examined the relationship between changes to urban form and rates of walking and bicycle travel to school.<sup>23</sup> The study found that children who passed completed Safe Routes to School construction projects on their way to school were more likely to show increases in walking or bicycling to school than were children who did not pass such projects (15% compared to 4%).

In 2005 the US National Safe Routes to School Program was established with federal legislation and funds. The program is providing \$612 million over five years to State Departments of Transportation in the 51 states of the USA to improve the ability of students to walk and bicycle safely to school. Like the Californian program, the Federal Safe Routes to School Program includes capital funds for infrastructure and traffic management projects, as well as funds for school and community-based education.<sup>24</sup> States have been keen to participate, with 29 states providing additional funds for 686 schools in local or state-wide programs.<sup>25</sup> At this stage an evaluation of the effectiveness of this ambitious program is not available, but this program is of interest as it provides substantial funds for improving the safety and walkability of the physical environment of schools and their vicinities.

In Australia a number of programs aimed at increasing the numbers of students who walk or cycle to school have been funded by national and state agencies. Most of these projects have used education as their main strategy, and their budgets have not included funds to modify or improve physical environments.<sup>26</sup> These projects include the Travelsmart series of projects on active travel (including active travel to school), in several states and territories including ACT, WA, Vic, Qld and SA. These programs were cost-shared between the Australian Greenhouse Office in the Australian Department of Environment and Heritage, and participating state governments. A review of these programs found their evaluation methods to be generally weak.<sup>20</sup>

The Walking School Bus (WSB) is a strategy that has received broad publicity and wide implementation in Victoria. The Victorian Health Promotion Foundation allocated \$4.5 million from 2001-2010 to fund 60 councils to work with schools and parents to establish WSBs. The WSB is a way of supervising children walking to and from school. Children walk in a group with adults who act as a 'driver' at the front and a 'conductor' at the rear of the group. The 'bus' travels a set route and picks up passengers at designated stops on the way. An evaluation of the VicHealth funded program found that its reach was small, with each WSB coordinator working with three to four schools, and organising an average of three-and-a-half WSBs per school.<sup>27</sup>

VicHealth has calculated that the average number of children per WSB was nine-and-a-half, with less than six per cent of the student population in participating schools taking part in a WSB.<sup>28</sup>

These evaluation findings make it hard to judge the WSB strategy as either effective in changing how most students and parents travel to and from school, or cost-effective given the large amount of funds required to achieve a small effect. In addition, the WSB enables parents to continue to drive to work, and so does not necessarily reduce car use. On the basis of these findings, VicHealth decided not to fund WSB programs beyond 2010. VicHealth's new Streets Ahead program takes a different approach by aiming to increase children's independent mobility. This program has funded six councils to improve the walkability and safety of neighbourhoods in their municipalities.<sup>29</sup> While the WSB may be a useful strategy for some communities, it should not be the only approach used to increase active travel to school. Other strategies are needed.

In NSW an annual Walk Safely to School Day has been run since 2001 by the Pedestrian Council of NSW. The day is held on a Friday in April or May, and information and marketing strategies have been used to encourage parents to walk to school with their children. An evaluation of the program found that 28 per cent of all NSW primary schools participated in the day's activities. Two telephone surveys of parents of children aged five to 12 years indicated that of the surveyed children who usually travelled to school by car on a Friday, 6.2 per cent walked to school on Walk Safely to School Day in 2001, as did 11.3 per cent in 2002. However, it is unclear if parents and students would or could extend the change they made from one day of the year to their regular journey to school.<sup>30</sup>

In general these programs have either been low level awareness raising activities, or have engaged with a small percentage of the intended participants. Most programs have not been well evaluated and there are few examples of studies that use intervention and control groups. As yet it is still unclear to what degree school-based WTS interventions can increase the proportion of students who walk to and from school.

## **Previous work on active travel to school by Health Promotion Unit, Central Sydney Area Health Service**

From 2000 - 2003 the Health Promotion Unit of CSAHS worked with Leichhardt Council on active travel projects with primary schools in the Leichhardt local government area (LGA). These projects sought to reduce car trips to and from school and to increase the numbers of students walking.

In 2001 a pilot project with Forest Lodge Public School (involving all 243 students, aged five to 12 years) aimed to raise awareness about the benefits of walking, and increase the number of students who walked to school instead of being driven. Students completed travel diaries in class that collected baseline and follow-up data on how they travelled to and from school.

A series of interventions was used to encourage walking, including the mapping of home to school routes by students, newsletters to parents, development of a school travel policy and a road safety audit of the school and its vicinity conducted by Leichhardt Council. At the end of the project, the percentage of car trips had decreased by 3.4 per cent and the percentage of walking trips increased by 3.4 per cent. The project concluded a longer-term study with a control group was needed to better assess the effects of walk to school programs.<sup>31</sup>

The Health Promotion Unit and Leichhardt Council continued their collaboration during 2002 and 2003 by working with three primary schools in Annandale and with three closely located primary schools in Balmain. As a result, a Walk to School Partnership Agreement was developed between the Leichhardt Council and the Health Promotion Unit.<sup>32</sup>

The Health Promotion Unit concluded that a larger scale study with a rigorous design and evaluation was required to advance the work on active travel to and from school, and so the Unit collaborated with the NSW Department of Education and Training (DET), developed a study proposal and sought an external grant to fund it. The Research Ethics Committees of CSAHS and of DET approved the proposal.

## SECTION 2

# Aims and objectives

### Aims

To increase the percentage of upper primary school children (aged 10 to 12 years) who walked all or some of the way to school and/or from school, and to reduce the number of car trips taken to and/or from school by these students.

### Objectives

The objectives of the WTS Program were to:

- Establish a baseline measure of the ways in which upper primary school students in participating schools travelled to school and from school
- Explain the concept of active travel and its benefits to upper primary students and their parents in participating schools
- Encourage these students and their parents to go to and/or from school by active travel
- Improve participating students' road safety skills, independence and knowledge of their local area
- Work with local councils to identify and remedy possible hazards to safety and amenity in the vicinities of the schools
- Identify factors that encourage active travel to and from school, and those that act as a barrier to it
- Identify ways to sustain improvements in active travel to and from participating schools.

## SECTION 3

# The intervention

### Context

The WTS Program developed and implemented over two years a series of interventions with schools, students and their parents, and with local councils. It recruited participating schools during Term 4 2004, and began its research and intervention phases in Term 1 2005. A two-year intervention period was considered necessary to implement the series of interventions and to enable longer-term education and collaboration with other sectors to take place.

The WTS Program budget was a total of \$289,013 (GST exempt) for a period of three years. A project officer was employed to implement and coordinate the program. Other people in the Health Promotion Service at Camperdown, including the Health Promoting Schools Coordinator, the Communications Officer and the Research and Evaluation Coordinator also contributed significant amounts of their time to the program, as did other co-investigators.

The program was developed in the context of the Health Promoting Schools Policy Framework, which recommends that programs promoting health in schools take a comprehensive whole-of-school approach and include the curriculum, school organisation and environment, and partnerships with the community.<sup>33</sup>

The interventions for the program were designed to have multiple components and to be sequential and synergistic. Intervention strategies were designed for students, their parents, teachers and local councils. The demographic and travel data collected by the student and parent surveys throughout the program provided a detailed and ongoing picture of student travel patterns for each school. This school-specific information was used throughout the program to tailor and adjust interventions to meet the differing needs of the schools.

As the program evaluation was designed as a RCT, the 24 schools that volunteered to participate were placed by random allocation in either the WTS group (the intervention group), or in the HL group (the control group). The 12 schools in the WTS group received a

series of interlinked activities to encourage more walking and active travel to and from school during 2005 and 2006. During that time the 12 schools in the HL group (the control group) received a number of interlinked activities to promote healthy eating at school.

In 2005 the program focused on Year 4 and 5 students (aged 10 to 11 years), their teachers and their parents, and in 2006 on Year 5 and 6 students (aged 11 to 12 years) their teachers and their parents.

Children aged 10 to 12 years are at the developmental stage when it is both possible and necessary for them to learn to cross roads safely and to go to places independently. The NSW Roads and Traffic Authority (RTA) and the DET recommend in their advice to parents that children up to eight years old should hold an adult's hand when on the footpath, around traffic and when crossing the road, and children up to 10 years old should be supervised when around traffic and hold an adult's hand while crossing the road.<sup>34</sup> These recommendations are in the Road Safety Policy Statement Preschool to Year 12<sup>35</sup> and the Road Safety component of the Personal Development, Health and Physical Education curriculum of the DET.<sup>36</sup> All primary school children in NSW receive road safety education as part of this curriculum.

It was desirable and strategic for the WTS Program to focus on students in Years 4 to 6 (aged 10 to 12 years) and their parents, as parents generally decide how their children travel to and from school. It was considered important for the program's goals and interventions to be consistent with the RTA and DET recommendations on road safety for children.

Therefore, the program encouraged parents to walk with their children, and encouraged parents to decide when their children were ready and able to walk to school independently. In 2006, program activities included encouraging Year 6 students to develop independence, as a necessary skill for going to high school the following year. Table 1 gives an overview of the program and the sequence of its activities.

**Table 1: Overview and sequence of program activities.**

Time	Program Activity
<b>2004</b>	
October-December	Recruitment of 24 schools
December	Random allocation of 12 schools to the Walk To School (WTS) intervention group and 12 schools to the Healthy Lunch (HL) control group
<b>2005</b>	
February	Professional Development Session for Year 4 and 5 teachers from the 24 schools on the program's goals and components
March	Term 1 2005 (baseline) survey for Year 4 and 5 students in the WTS and HL groups, to establish baseline measures on how they travel to and from school  Term 1 2005 (baseline) survey for parents of Year 4 and 5 students in the WTS and HL groups to establish how students travel to school, and to collect demographic data. Parent surveys were translated into Chinese, Vietnamese and Korean
June-July	Schools and parents in the WTS and HL groups received a report of the overall Term 1 survey results with aggregated data, and a report for their school with school specific data
April-November	Intervention activities to encourage more walking and active travel for students and parents in the WTS group  Activities to encourage healthy eating in the HL group
November	Term 4 2005 survey on travel to and from school for Year 4 & 5 students in schools in the WTS group
December	Schools in the WTS group received reports on Term 4 2005 survey results, with data specific to their school
<b>2006</b>	
February	Professional Development for Year 5 and 6 teachers from WTS and HL groups
March	Term 1 2006 survey for Year 5 and 6 students in the WTS and HL groups
April-November	Intervention activities to encourage more walking and active travel for students and parents in the WTS group  Activities to encourage healthy eating in the HL group
September	Additional professional development for teachers from WTS and HL groups on student and parent surveys
November	Follow-up survey in Term 4 2006 for Year 5 and 6 students in the WTS and HL groups, to evaluate changes in how students travelled to and from school at the end of the program  Follow-up survey in Term 4 2006 for the parents of Year 5 and 6 students in the WTS and the HL groups
December	Interviews with Principals and/or teacher coordinators at WTS schools, to hear their experiences of the program
<b>2007</b>	
March-June	Follow-up survey data analysis and report writing. A report was written for each of the 24 schools, using survey data specific to each school
June	Each of the 24 schools received a report, with results from the Term 4 2006 (follow-up) student survey specific to their school. Parents of Year 6 students of the 24 schools also received copies of the school reports
June-December	Completion of data analysis and writing the program's Final Report and the Summary Report

## Recruitment to the program

With the exception of three schools that were part of previous programs, all public primary schools (n=61), located in the area of the (former) CSAHS were invited in October 2004 (at the start of Term 4), to participate in the program in 2005 and 2006. This area covered the LGAs of Leichhardt, Marrickville, Canterbury, Strathfield, Burwood, Ashfield, Canada Bay and parts of the City of Sydney.

The project officer telephoned principals to provide more information. The concept of random allocation of the participating schools into intervention and control groups needed particular explanation. By the first week of

December 2004, 24 schools had volunteered to take part. These schools anticipated they would have a total of about 1,970 Year 4 and 5 students in 2005, a number considered sufficient to deliver the required statistical power to evaluate the program.

A function was held on 8 December 2004 to welcome principals and teachers from the schools. At the function, the 24 schools were allocated randomly to either the intervention (WTS) group or the control (HL) group. Schools were allocated to the intervention or the control group in alternate order, as their names were pulled out of a hat. Principals and teachers were able to observe the process of random allocation at the function.

## Program participants

The 24 schools were diverse in terms of size (with total student enrolments ranging from 94 to 822) and in socio-economic status and cultural mix of students and

their families. Table 2 describes the schools and the number of classes and students in the program in 2005 and 2006. The schools were in suburbs with populations from high, middle to low socio-economic status.

**Table 2: Schools and numbers of participating classes and students in the Walk to School (intervention) and Healthy Lunch (control) groups.**

Schools	Council	No. of Classes		No. of Students	
		2005	2006	2005	2006
<b>Intervention Group</b>					
Ashfield	Ashfield	5	2	59	63
Beverly Hills North	Canterbury	7	7	194	191
Camdenville	Marrickville	3	2	73	54
Dobroyd Point	Ashfield	3	3	71	63
Enfield	Burwood	4	3	71	66
Five Dock	Canada Bay	6	3	73	70
Glebe	City of Sydney	2	2	36	34
Homebush	Strathfield	8	6	179	181
Lewisham	Marrickville	2	1	34	27
Marrickville	Marrickville	3	2	42	43
Newtown	City of Sydney	3	2	49	56
Strathfield South	Strathfield	9	10	213	210
<b>Total</b>		<b>55</b>	<b>40</b>	<b>1,094</b>	<b>1,058</b>
<b>Control Group</b>					
Abbotsford	Canada Bay	5	3	78	75
Birchgrove	Leichhardt	3	3	71	63
Campsie	Canterbury	9	5	134	139
Concord	Canada Bay	4	3	67	64
Haberfield	Ashfield	7	6	170	157
Orange Grove	Leichhardt	2	2	36	36
Petersham	Marrickville	2	2	47	48
Rozelle	Leichhardt	5	2	47	48
Strathfield North	Canada Bay	10	5	144	138
Summer Hill	Ashfield	8	10	230	267
Tempe	Marrickville	5	2	60	60
Ultimo	City of Sydney	3	3	80	79
<b>Total</b>		<b>62</b>	<b>46</b>	<b>1,164</b>	<b>1,174</b>
<b>Overall Total</b>		<b>117</b>	<b>86</b>	<b>2,258</b>	<b>2,232</b>

Note: Summer Hill Public School has two selective Year 5 and 6 classes, and many of these students live outside the school's local catchment area. The school has other Year 5 and 6 classes of students who live in the school's local catchment area.



In 2005, the WTS group of 12 schools had 1,094 Year 4 and 5 students and the HL group of 12 schools had 1,164, with an overall total of 2,258 student participants. In 2006 the WTS group had 1,058 Year 5 and 6 students and the HL group had 1,174, making an overall total of 2,232 student participants. The number of participating students in each of the schools ranged from 22 to 267. The number of classes of participating students per school ranged from one to 10. The number of teachers involved per school ranged from one to 12.

A total of 117 teachers in 2005 and 86 teachers in 2006 were directly involved in program activities, including surveys. About half the Year 5 and 6 teachers in 2006 had not been involved in the program in 2005. As the project officer needed an effective way to communicate with the upper primary teachers at the 24 schools, schools were asked to identify a teacher who would coordinate their school's activities, and the project officer communicated directly with this teacher.

The organisation of classes at the participating schools was varied and complex, as schools decide on class format and numbers due to factors specific to their school. In 2005, classes for Year 4 and 5 students in the 24 schools were organised in the following ways: Year 4 students only; Year 5 students only; and in composite classes of Year 3 and 4 students, of Year 4 and 5 students, and of Year 5 and 6 students. Two schools had composite classes containing students from Years 3, 4, and 5. In 2006, classes for Year 5 and 6 students in the 24 schools were organised in the following ways: Year 5 only; Year 6 only; and in composite classes of Year 4 and 5 students, and of Year 5 and 6 students.

The schools also varied in terms of the landscape, safety and amenity of their locations and their vicinities. Some schools were located on busy roads that are used by heavy traffic; other schools were surrounded by quiet leafy streets. The proximity, frequency and routes of public transport available near the 24 schools also varied.

## Initial visits to schools in 2004

All 24 participating schools were visited following their recruitment to the program in Term 4 2004. The project officer met the principal and key teachers to explain the program, and to hear their views on the travel and safety issues at the school. On site visits enabled the project officer to learn more about the geography, safety and amenity of each school and its vicinity.

A brochure describing the WTS Program's goals and components was developed for principals, teachers and parents (Appendix A), and sent to the 24 participating schools.

## Program Advisory Committee

A Program Advisory Committee was established whose main role was to advise the program team on program development and its implementation (Appendix B). Members included representatives from the NSW Department of Health, the DET, the Centre for Physical Activity and Health, local government, a principal from a public primary school that was not part of the program and the NSW Federation of Parent and Citizen Associations (Appendix C).

## Implementation of program interventions in 2005 and 2006

Table 3 summarises the program interventions and their implementation during 2005 and 2006 for the schools in the WTS group. Appendix D describes these program interventions and their implementation in more detail.

Program strategies for the WTS group were in two broad categories:

- Education and information strategies for teachers, students and their parents on the benefits of active travel and the options for active travel for school and work in their local area
- Working with local councils to modify the environment around the schools, to make these environments more conducive to active and safe travel.

**Table 3: Implementation of strategies for the WTS group in 2005 and 2006.**

<b>Strategies</b>	<b>Topics</b>	<b>Implementation</b>
<b>Teachers, students and parents</b>		
<b>Professional Development (PD) Days for teachers</b>	Introduction to the program and explanation of surveys	Teacher release funds were provided to schools. PD days were held in Feb 2005, Feb & Sept 2006
<b>Banners for schools</b>	Schools received large banners that publicised walking to school	Schools displayed the banners near their main gate in 2005 and 2006
<b>Walk Safely to School Day 2005 and 2006</b>	Schools organised a range of activities, such as healthy breakfasts, counting the walkers and parent involvement	Schools were sent suggestions on possible activities. Media releases to local newspapers were also made
<b>Footsteps newsletters for parents</b>	<p>2005: Introduction to program, surveys, the benefits of walking, overall results from Term 1 student &amp; parent surveys, the concept of active travel, cost of running a car vs. using public transport, getting to know your neighbours, climate change, kids using public transport, school specific results from the Term 1 &amp; Term 4 surveys, stranger danger, active travel in the holidays</p> <p>2006: Travel Access Guides (TAGs) for the 12 schools, School Student Travel Scheme, children's independence, Walk Safely to School Day, parent walks, the cost of petrol, pedestrian crossings, TAG launches by the Ministers for Education and Health, Term 1 2006 survey results, pedometers, getting ready for high school, using the Trip Planner, climate change, fathers walking to school with their children and Term 4 2006 survey results for each school</p>	Footsteps newsletters were included in school newsletters and distributed to parents monthly
<b>Home to school mapping exercise</b>	Most schools received from their local council a large scale map of the school, with a 1km and a 2km radius marked around it	Students marked their home to school routes on their maps, and discussed 'walkable distance' (see Appendix D for Teacher Notes)
<b>Term 1 2005 survey reports (overall and school-specific results) were written and sent to schools and parents of Year 4 and 5 students.</b>	The overall report contained aggregated data on travel patterns from all students in the program. The school-specific reports used data specific to each school.	The overall report (with aggregated data) and the school-specific reports were sent to all principals, teachers and parents. Parents and students received a thank you gift.
<b>Engagement with Parent and Citizen Associations (P &amp; C) at schools</b>	Information was sent to all P & Cs. Road safety and walkability issues specific to each school were discussed at meetings	The project officer attended meetings at 11 of the 12 schools
<b>Development of a Travel Access Guide (TAG) for each school, to encourage students and parents to go to and from school and work by active travel</b>	The TAG for each school contains a map of the school and its vicinity, with information on traffic lights, pedestrian crossings and nearby public transport	A TAG consultation group was established for each school, with parents, teachers and officers from local councils
<b>Fathers' Day activity</b>	Fathers were encouraged to walk with their children to and from school. Baseline surveys found most students were taken to and from school by their mothers, most of whom were in the workforce	Most schools hold a fundraising Fathers Day gift stall. A flyer was written and sent to schools, for students to take home to their fathers

Table 3 (cont'd): Implementation of strategies for the WTS group in 2005 and 2006.

Strategies	Topics	Implementation
<b>Teachers, students and parents</b>		
<b>Be Active Take Steps (BATS) pedometer program for three schools</b>	Pedometers and an associated classroom program were used to encourage more walking with 571 students in three schools	Pedometers were lent to students, and teachers were supplied with the BATS resources
<b>Parent walks</b>	The aim of the walks was to show parents not used to walking that a walk of about 1km is easy and pleasant	Walks were organised at six schools, with variable response
<b>Production of 'City of Canterbury: Your Public Transport Guide'</b>	This publication, produced by Canterbury Council, aimed to encourage more active travel in the LGA. It contains a map and detailed information on local public transport	The program gave some funds to this project, and copies were distributed to all parents at Beverly Hill North Public School to encourage more active travel
<b>Preparation for high school</b>	Year 6 students were encouraged, in class and via the 'Footsteps' newsletter, to develop road safety skills and independence	Students used the Trip Planner in class to plan their active journey to high school for next year
<b>Information on the Trip Planner (on the NSW public transport website)</b>	Planning active travel journeys, using the Trip Planner	Resource materials were developed and distributed to teachers
<b>Distribution of school TAGs and local public transport information to schools and parents</b>	Active travel information (from City Rail and Sydney Buses) for parents	Local bus and train routes & timetables were distributed with the TAGs to schools and parents
<b>TAG launches at seven schools, from March to August 2006</b>	The TAG launches encouraged discussion of the concept of active travel at school and broader community levels	TAGs were launched at the schools by the Ministers for Health and for Education, local Members of Parliament and mayors
<b>Follow-up survey results (with school-specific data) sent to schools</b>	Preliminary results of the Term 4 2006 (follow-up) surveys were tallied and sent to schools.	The project officer attended end of year assemblies at eight schools and presented their results
<b>Thank you gifts for parents and students</b>	Parents and students were thanked for completing the follow-up surveys	Parents received a notepad and students received a highlighter pen
<b>Councils</b>		
<b>Safety reviews of schools and their vicinities were conducted with council Road Safety Officers and/or Traffic Engineers, teachers and parents</b>	The purpose of the safety review of each school and its vicinity was to identify possible hazards to safe and active travel	Councils took different approaches to the reviews. Most were happy to conduct reviews, but some preferred to do their own reviews, or draw on previous work. Two councils preferred not to put findings in writing
<b>Work with councils to fix problems</b>	Councils were usually willing to consider improvements, but could not guarantee funds or priority for any needed infrastructure works (major or minor). Other improvements to infrastructure (eg traffic lights, pedestrian crossings) are the responsibility of the RTA	Negotiation processes required to make improvements and resolve problems were lengthy. The program did not have the time or resources to deal with these issues thoroughly, particularly in relation to 12 different school environments

## **Healthy Lunch (control) group - program interventions 2005 and 2006**

The original grant proposal had planned to support schools in the program's control group to implement the Fresh Tastes @ School canteen policy (supported by NSW Health and DET) at their school. Several HL schools either had no canteen or a part-time canteen with no manager, so a different strategy was needed.

Therefore, it was decided that interventions for the control group would have a broader focus on healthy eating at school. The strategies for the HL group of schools included provision of information to parents via a newsletter called Tastebuds, and a small grants program for schools. Each school in the HL group was eligible to apply for a 'Healthy Eating Grant' to support food-related activities as part of classroom learning on healthy eating. The grants were \$500 or \$1,000, depending on the school's size. Details of the small grants program, the Tastebuds newsletter and other activities for the HL group of schools are contained in Appendix E.

## **School-specific reports on survey results for WTS and HL schools**

### **Baseline survey results in 2005**

A finding of the baseline survey was the high variation in travel patterns from school to school (the Results section gives details). As the primary interest of each participating school was in how their own students travelled, a report was written using school-specific data on the baseline student survey results for each of the 24 schools in the intervention and the control groups.

Principals, Parent and Citizen Associations and parents of Year 5 and 6 students at the 24 schools received their school-specific reports over a period from June to September 2005. Reports for schools in the control group contained less detail than those for intervention schools. Appendix J is an example of these school-specific reports for which the principal of the school provided permission for inclusion. Schools valued this localised information.

### **Follow-up survey results in 2006**

Results from the 2006 follow-up surveys showed a high variation from school to school in student travel patterns. Preliminary results from the follow-up surveys, based on tallies of data specific to each school, were given to schools in December 2006, so that Year 6 (final year) students and their parents could receive this information before they left primary school.

In 2007 a detailed report on the 2006 survey results was written for each of the 24 schools, using school-specific data. The reports included data on student travel patterns to and from school from 2005 to 2006, and on parent travel patterns to work in both years. These reports were sent to school principals, teachers and Parent and Citizen Associations at all 24 schools. Appendix K contains one of these reports.

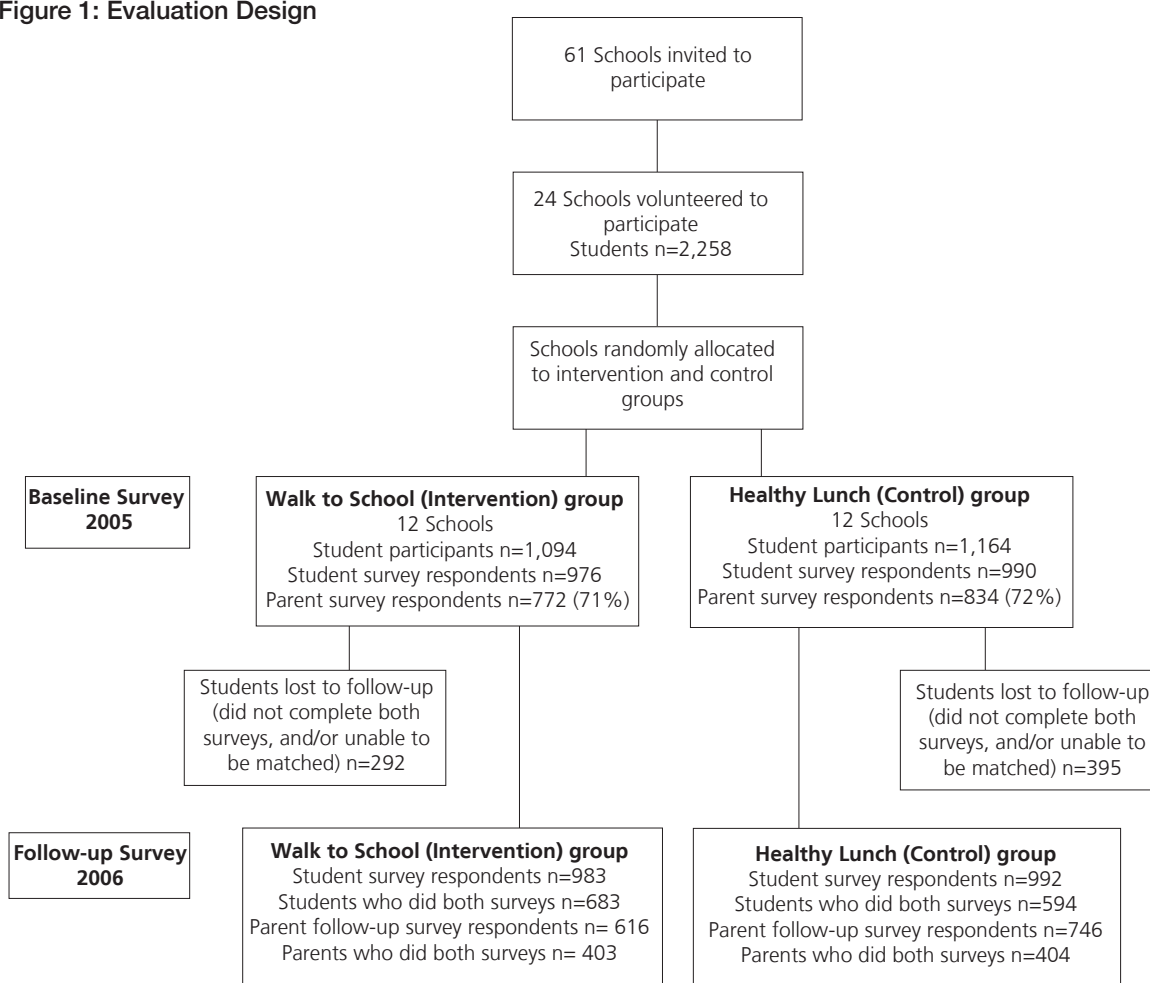
## SECTION 4

# Research and evaluation methods

The study design was a cluster RCT in which participating schools, rather than individual students, were allocated to the intervention or the control group. This is an appropriate design when an intervention is implemented at an organisational level and the organisation is the unit

of analysis.<sup>37</sup> Schools were allocated to the intervention or the control group in alternate order, as their names were pulled out of a hat. Figure 1 describes the evaluation design.

**Figure 1: Evaluation Design**



The evaluation sought to assess the effectiveness of the program's interventions to increase the percentage of upper primary school students who walked all or some of the way to and/or from school. The intervention was evaluated by comparing travel data from students and their parents in the intervention group with travel data

from students and their parents in the control group. The travel data came from a cohort of students who had completed both the baseline and follow-up surveys, and a cohort of parents who had completed both the baseline and follow-up surveys in the intervention and control groups.

## Sample size

The required sample size was calculated on the basis of the number of students in each school and data from the 2001 pilot study.<sup>31</sup> The program aimed to have 80 per cent power to detect average changes of eight per cent in binary outcome variables with a five per cent significance level, assuming an intra-class correlation coefficient of 0.01 and an average size of 70 children for each school. This is a design effect of 1.7.

## Survey participants and response rates

In 2005, a total of 2,258 students participated in the program (1,094 students in the WTS group and 1,164 in the HL group) and of these, 1,966 students completed baseline surveys (976 in WTS and 990 in HL) and 1,606 of their parents completed parent surveys (71% response rate).

In 2006, a total of 2,232 students participated in the program (1,058 students in the WTS group and 1,174 in the HL group) and of these 1,975 students completed follow-up surveys (a response rate of 88.5%). For the parent surveys, 1,362 parents completed follow-up surveys, giving a response rate of 69 per cent, which was higher in the HL control group (75%) than in the WTS intervention group (62.6%).

## Data matching processes

Baseline and follow-up data from each student who completed both surveys were matched through a previously used confidential record linkage technique.<sup>38</sup> This technique used a school code (added to each survey by the researchers) and information completed in the survey by students on the first letter of their first name, their year at school, their gender and their date of birth. This information was arranged to form a 'data string' of numbers and letters unique to each student.

Parent surveys contained the code number of the school attended by their child, and information completed by parents on the first letter of their child's first name, year at school, gender and date of birth. The resulting 'data string' was designed to match parent baseline surveys with their child's data. Social and demographic data in relation to each student (whose baseline and follow-up data were matched) were derived from their parent's baseline surveys.

## The student cohort and the parent cohort

After matching the surveys from students who had completed both baseline and follow-up surveys, 698 students were lost from the data set. A total of 1,277 students completed both the baseline and follow-up surveys (683 in the intervention and 594 in the control group, giving a follow-up rate of 65%). Comparisons were made between the main characteristics of students who remained in the study and of those lost to follow-up. There were no statistically significant differences in gender, student age, the distance from the student's home to their school and modes of travel to or from school between the two groups.

Students were lost to follow-up for several reasons, including students leaving and enrolling at the participating schools, students not completing both surveys due to absence on the day(s) of the surveys, and students whose baseline and follow-up surveys were unable to be matched by the matching technique used. Results from the Term 1 2006 student survey (Appendix M) found there were 160 students (55 in the WTS group and 105 in the HL group) who were newly enrolled at their schools in that year, and so had not completed baseline surveys in 2005.

The surveys from parents who had completed both baseline and follow-up surveys were also matched. The final parent cohort comprised 807 parents who completed both parent surveys. Of the 799 parents who were lost to follow-up (369 in intervention schools and 430 in control schools), 150 were parents of students who were new to their school in 2006, 245 parents had completed the baseline survey only, and 404 could not be matched with their child's survey data because their child's identifying indicator was not the same in both surveys.

The only significant difference between the final parent cohort and those lost to follow-up, in terms of socio-demographic characteristics, was a greater drop-out of fathers ( $p=0.01$ ). No differences were found in relation to student's travel mode at baseline, or for parents' travel mode to work. However, there were significant differences for distance from home to school, as more parents from the control group who lived closer to school ( $<1.5\text{km}$ ,  $p=0.01$ ) were lost to follow-up, whereas there was no difference in the drop out rate of parents in the intervention group in relation to distance from home to school.

## Data collection

Baseline data was collected from students and their parents in Term 1 2005 and follow-up data was collected from the same cohort of students and their parents in Term 4 2006. The methods and measures of data collection were identical at both time points.

## Student surveys

The baseline student survey was completed in March 2005 in class by all Year 4 and 5 students who were at school on the days of the survey, and the follow-up student survey was completed in October 2006 in class by all Year 5 and 6 students who were at school on the days of the survey. Survey completion was a class activity and was supervised by teachers, so parental consent for each student was not required. Students completed questions on five consecutive days (Monday, Tuesday, Wednesday, Thursday and Friday) in a school week, on how they had travelled to and from school on the previous (school) day. Appendices F and G contain the baseline and follow-up student surveys.

## Parent surveys

The baseline parent survey was for parents of the students participating in the program. The parent surveys were given by class teachers to Year 4 and 5 students to take home to their parents in 2005. The same process was used in 2006 for the follow-up parent survey for parents of Year 5 and 6 students. Detailed explanatory material was included with the parent surveys.

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 to parents with students. As several schools reported they had significant numbers of parents who did not speak and/or read English, the baseline parent surveys were translated into Chinese, Vietnamese and Korean and distributed to these schools and parents. Appendices H and I contain the baseline and follow-up parent surveys.

## Family and demographic information

Family and demographic information was collected from the parent survey, which was completed by the parent or carer who had main responsibility for the child's travel to school. The parent survey included questions on the parent's attitudes towards their child walking to school and the parent's mode of travel to work.

## Main outcome measures

### Student mode of travel, as reported by students

The baseline and follow-up student surveys contained questions which students completed on five consecutive school days in a week on how they travelled to and from school on each of those days. The reliability and validity of this student survey had been tested in the pilot study.<sup>31</sup>

Students answered the questions 'how did you get to school yesterday?' and 'how did you get home yesterday?' by selecting one of eight options that described different modes of travel to and from school and their possible combinations (for example, walked all the way, walked part of the way, went by car, went by bus or train, rode a bike).

Data from the student surveys on how students travelled to and from school for five days were used to compute whether students walked all the way all days, walked all the way some days, walked some of the way some days or whether they travelled by car only on all days. The number of students who reported using public transport with no walking or riding their bicycle was small and was categorised as 'other'.

### Student mode of travel, as reported by parents

In the parent survey, parents recorded how their child travelled to and from school for 10 trips in a usual school week. Parents answered the question 'In a usual school week, how many mornings does your child go to school by each of the following ways?' There was a similar question on how their child travelled from school to home for five afternoons in a usual school week. To avoid categories with small numbers, the data were recoded as zero, one to four, and five days.

Data on number of days in a usual school week that students travelled to and from school by each mode of travel (as reported by the 807 parents who completed baseline and follow-up surveys) were used to calculate increases or decreases in the number of walking and/or car-only trips to school by students.

## Methods of analysis

Data were analysed using the computer package SPSS for Windows 14.0. Descriptive analyses were conducted to describe the characteristics of the study population. For primary analyses, the percentage of students with each mode of travel in the intervention and the control group was computed and analyses were conducted. To adjust for the design effect of cluster randomisation, data were then summarised for each school.<sup>39</sup>

The percentage of students with each mode of travel was computed for each school and the mean percentage and standard deviation for each group was then calculated. Independent t-tests were used to test for differences in mean proportions between the intervention and the control groups, using Simple Interactive Statistical Analysis (SISA).<sup>40</sup> Although the percentages by school within each group were not always normally distributed, independent t-tests were used because they are robust to departures from normality when the group sizes are equal.<sup>41</sup> In these analyses, the unit of analysis was the number of schools (n=24) and not the number of students (n=1,277) and therefore the 95 per cent confidence intervals were inflated and statistical power was reduced.

Multivariate modelling methods were used to analyse student travel modes (as reported by parents) and to compute the within-school intra-class correlation coefficient (ICC) for each outcome, using one-way analysis of variance. The F value was then used to compute the design effect. The average cluster size was 51. Chi-square values from contingency tables were then adjusted for the design effect and P values were re-estimated using a statistical function in Excel.

Logistic regression modelling was used to predict non-car use in the follow-up data (as reported by parents), in order to determine the predictors that were independently related to non-car use. A forwards selection process was used, so that predictor variables were tested in the model in order of their unadjusted association with the outcome variable, and only the predictors with a P value <0.1 were retained. Adjusted odds ratios (ORs) with 95 per cent confidence intervals (CI) were calculated as a measure of the strength of associations. Wald values from the logistic regression model were then adjusted for the design effect and P values were re-estimated using statistical functions in Excel. Days with missing values were ignored, so that all students were included in the analyses, and the final classification of data reflected the students' main modes of travel over the five day data collection period.

## Qualitative evaluation

Interviews were conducted with principals and teacher/coordinators at the schools in the WTS group, to gather their views on the program's implementation at their school. Appendix L contains a list of the questions that guided the interviews.



## SECTION 5

# Results

### Baseline characteristics of students who completed both surveys

Table 4 describes and compares the baseline characteristics of students in the intervention and control groups who completed the baseline and follow-up surveys.

In general, the demographic characteristics of the survey respondents in the intervention and control groups were similar. Although the differences between the two groups were statistically significant in relation to age of children at home and to parent's level of education, the absolute percentage difference between the groups was small.

**Table 4: Comparison of baseline characteristics of students who completed baseline and follow-up surveys.**

Characteristics	Control group (n=594)	Intervention group (n=683)	P value
	%	%	
Year 4 students (2005)	45.1	49.0	
Year 5 students (2005)	54.9	51.0	0.16
Female students	51.9	56.5	0.10
Size of school attended by students:			
Small (150 or less students)	3.2	3.8	0.80
Medium (approx 350)	38.4	37.3	
Large (500 or more)	58.4	58.9	
Distance from student's home to school:			
< 1 km	52	51.7	0.78
>1 km	47.4	48.3	
Main language spoken at home:			
English	66.5	62.8	0.09
Not English	33.5	37.2	0.09
Parent who completed survey was female	82.7	80.2	0.33
Age of parent:			
<40 years	33.8	39.4	0.08
40 years	66.2	60.6	
% of parents with children in the following age groups at home:			
0-4 yrs	12.8	18.4	0.02
5-9 yrs	65.5	67.3	0.55
10-12 yrs	68.6	60.5	0.01
13-17 yrs	29.1	30.3	0.53
Parent's highest level of education:			
High school	28.6	34.8	0.02
Technical	24.8	27.6	
University	46.7	37.6	
Parent employed	66.3	65.2	0.72
% of parents employed who work outside home	93.8	93.3	0.77
Partner employed	83.7	85.3	0.53

## How did students travel to school and from school?

To describe how students travelled to school and from school at baseline, a comparison of the mean

percentages of modes travelled by students in the intervention and control groups was made. This data came from the student surveys. The results are presented in Table 5.

**Table 5: Baseline patterns of travel to and from school in control and intervention groups.**

Travel mode	Control group		Intervention group	
	Mean %	(SD)	Mean %	(SD)
<b>Morning home to school journey</b>				
Walk all the way all days	17.3	(11.7)	23.9	(11.9)
Walk all the way some days	29.2	(8.9)	22.8	(12.4)
Car all the way all days	30.9	(12.8)	30.4	(14.4)
Car all the way some days	34.4	(11.0)	27.1	(10.9)
Car part way, walk part way some days	5.9	(6.3)	3.5	(4.5)
<b>Afternoon school to home journey</b>				
Walk all the way all days	12.8	(9.9)	12.2	(5.3)
Walk all the way some days	34.2	(10.5)	33.3	(8.8)
Car all the way all days	10.9	(6.2)	10.2	(8.9)
Car all the way some days	44.7	(16.8)	45.1	(18.8)
Car part way, walk part way some days	2.4	(2.9)	2.7	(3.3)
Public transport some days	8.8	(5.7)	8.0	(4.4)

Note: As these categories are not mutually exclusive, the percentages do not total 100.

For the morning journey, 6.6 per cent more students reported 'walking all the way all days' in the intervention group at baseline, and 6.4 per cent fewer students reported 'walking all the way some days' compared to the control group. However, these differences were not statistically significant. The percentage of students reporting they travelled 'by car all the way to school all days' in a school week was similar in the two groups, but 7.3 per cent fewer students in the intervention group reported they travelled 'by car all the way to school all days'. The travel patterns for the afternoon journey home were very similar for both groups. About 80 per cent of students in the program were taken to and from school by their mothers.

## Changes in travel mode to school and from school

Table 6 describes changes in travel mode to school and from school, from baseline to follow-up, using data from the student surveys.

Overall, there were some positive changes in both groups. For the morning journey from home to school, there was a 4.6 per cent increase in students who reported 'walk all the way some days' and 8.3 per cent

reduction in students who reported 'car use all the way all days' in the intervention group. However, the percentage reporting 'walk all the way all days' decreased by 3.5 per cent in this group. In the control group, those reporting 'walk all the way all days' increased by 5.5 per cent and those reporting 'car use all the way all days' decreased by 11.3 per cent.

Data reported by students showed that from 2005 to 2006 there was an increase in walking on all days and in walking on some days of the week, for six of the 12 schools in the intervention group (range 2.2% to 17.1%), and for eight of the 12 schools in the control group (range 2.1% to 20%).

For the afternoon journey from school to home, the differences between the groups were smaller, although eight per cent of the intervention group decreased their use of 'car all the way some days' compared to only 2.4 per cent of the control group.

However, when the data were analysed in this way with the school as the unit of analysis, there were no statistically significant differences in mean percentages of changes in mode of travel to or from school from baseline to follow-up between the intervention and the control groups.

**Table 6: Change in travel mode between baseline and follow-up, in control and intervention groups (from student data).**

Travel mode	Difference between baseline & follow-up				Mean % difference between intervention and control group (95% CI)	P value
	Control Group		Intervention Group			
	Mean %	(SD)	Mean%	(SD)		
<b>Morning journey to school</b>						
Walk all the way all days	5.5	(25.4)	-3.5	(22.1)	-9.0 (-28.0, 10.0)	0.36
Walk all the way some days	0.3	(18.2)	4.6	(24.9)	4.3 (-13.2, 21.8)	0.64
Car all the way all days	-11.3	(21.1)	-8.3	(21.7)	3.0 (-14.1, 20.1)	0.73
Car all the way some days	-1.3	(23.7)	3.4	(24.1)	4.7 (-14.4, 23.8)	0.63
Car part way, walk part way some days	0.6	(9.4)	2.8	(8.7)	2.2 (-5.0, 9.4)	0.56
Public transport some days	3.5	(10.9)	1.6	(11.0)	-1.9 (-10.7, 6.8)	0.67
<b>Afternoon journey home</b>						
Walk all the way all days	-1.5	(17.0)	1.6	(13.3)	3.1 (-9.1, 15.3)	0.63
Walk all the way some days	5.8	(16.2)	1.7	(20.7)	-4.1 (-19.0, 10.8)	0.6
Car all the way all days	-6.2	(12.7)	-2.9	(13.6)	3.3 (-7.2, 13.8)	0.54
Car all the way some days	-2.4	(29.8)	-8.0	(34.8)	-5.6 (-31.5, 20.3)	0.67
Car part way, walk part way some days	-0.5	(5.0)	0.1	(5.8)	0.6 (-3.7, 4.9)	0.79
Public transport some days	1.1	(12.2)	1.3	(9.4)	0.2 (-8.5, 8.9)	0.97

## Variations from school to school

Tables 7 and 8 describe data from the student surveys on changes from baseline to follow-up in the percentage of students from each school who 'walked all the way' (all days and some days in a usual week) to school and to home, and the total mean change. There was high variation in travel patterns from school to school at baseline (Tables 7 and 8) and at follow-up.

Schools have been denoted by alphabetical letter to protect their privacy, as required by the conditions approved by the DET's Ethics Committee.

The table shows increases and decreases in walking rates in schools in both the intervention and in the control groups. For the morning journey the range of change was 17.1 per cent to -14.3 per cent for intervention schools and 17.6 per cent to -2.8 per cent for control schools.

**Table 7: Change in percentage of students who walked all the way to school (all days and some days) in intervention and control groups from baseline to follow-up.**

Schools in intervention group					Schools in control group				
School	N	2005	2006	Difference	School	N	2005	2006	Difference
		%	%				%	%	
A	22	59.1	50	-9.1	M	34	41.2	58.8	17.6
B	35	37.2	54.3	17.1	N	25	44	56	12
C	47	36.1	38.3	2.2	O	74	62.1	60.8	-1.3
D	48	37.5	45.9	8.4	P	34	41.2	38.2	-3
E	121	42.2	36.3	-5.9	Q	48	37.5	39.6	2.1
F	143	30.1	28	-2.1	R	19	42.1	57.9	15.8
G	50	30	44	14	S	87	40.2	39.1	-1.1
H	138	37.7	34.8	-2.9	T	138	29.7	33.4	3.7
I	24	54.2	58.4	4.2	U	46	63.1	62.2	2.1
J	14	64.3	50	-14.3	V	28	53.6	57.2	3.6
K	12	83.3	75	-8.3	W	36	47.2	44.4	-2.8
L	29	48.2	58.6	10.4	X	25	56	76	20
Mean	56.9	46.7	47.8	1.1	Mean	49.5	46.5	52.2	5.7
All	683				All	594			

Table 8 describes the afternoon journey home and changes in the percentage of students walking all the way for schools in the intervention and control groups. Again, there was a large variation in both groups. The range of the rates of change in walking to school for the intervention schools was -16.7 per cent to +20.7 per cent, and for the control schools -12.0 per cent to +24.0

per cent. Overall, there were very similar increases (+3.4% and +4.3%) in both groups. There seems to be no consistent pattern to suggest that a low level of walking at baseline (<50%) was associated with more schools increasing their walking, and/or a high level at baseline (>50%) was associated with a decline.

**Table 8: Change in the percentage of students who walked all the way home (all days and some days) in intervention and control groups from baseline to follow-up.**

Intervention group					Control group				
School	N	2005	2006	Difference	School	N	2005	2006	Difference
		%	%				%	%	
A	22	54.6	59.1	4.5	M	34	53	58.8	5.8
B	35	48.5	51.4	2.9	N	25	56	44	-12
C	47	38.3	38.3	0	O	74	62.2	58.1	-4.1
D	48	43.8	52.1	8.3	P	34	32.3	41.2	8.9
E	121	44.7	35.6	-9.1	Q	48	37.5	45.8	8.3
F	143	24.5	27.3	2.8	R	19	52.6	52.6	0
G	50	34	40	6	S	87	42.5	49.4	6.9
H	138	41.3	42.7	1.4	T	138	29.7	36.9	7.2
I	24	45.8	58.3	12.5	U	46	52.1	52.2	0.1
J	14	50	57.1	7.1	V	28	57.2	53.5	-3.7
K	12	75	58.3	-16.7	W	36	36.2	47.2	11
L	29	44.8	65.5	20.7	X	25	52	76	24
Mean	56.9	45.4	48.8	3.4	Mean	49.5	46.9	51.3	4.3
All	683				All	594			

## Changes in travel mode to school, using data from parents

Changes in travel mode for the morning journey to school were assessed by calculating increases or decreases in the number of morning journeys in a usual school week that students made by walking or by car, using baseline and follow-up data reported by parents.

Tables 9a and 9b describe increases and decreases at follow-up in the percentage of students who walked all the way to school and who went by car only in a usual week. This data has been stratified by student age and the distance between their homes and schools.

**Table 9a: Change in the percentage of students who walked all the way to school in a usual week, from parent data (n=807) at follow-up, stratified by student age and distance from home to school**

Student walking trips to school	Control		Intervention		Difference % (95% CI)	P value
	Mean %	(SD)	Mean %	(SD)		
All students						
Increased	19.0	(8.3)	28.8	(13.8)	9.8 (0.7, 18.9)	0.05
Decreased	28.9	(10.1)	22.4	(7.3)	-6.5 (-13.6, 0.6)	0.09
Year 5 students (10-11 years old)						
Increased	17.5	(7.8)	19.9	(15.9)	2.4 (-7.6, 12.4)	0.65
Decreased	34.4	(13.8)	27.4	(18.5)	-7.0 (-20.1, 6.1)	0.31
Year 6 students (11-12 years old)						
Increased	19.3	(13.4)	38.9	(25.2)	19.6 (3.5, 35.7)	0.03
Decreased	23.8	(17.1)	18.7	(16.9)	-5.1 (-18.7, 8.5)	0.47
<1km from home to school						
Increased	17.1	(12.5)	22.7	(14.7)	5.6 (-5.3, 16.5)	0.32
Decreased	28.8	(16.6)	31.0	(14.6)	2.2 (-8.9, 13.3)	0.70
>1km from home to school						
Increased	27.7	(24.1)	42.8	(30.1)	15.1 (-6.7, 36.9)	0.19
Decreased	22.8	(14.2)	14.2	(27.7)	-8.6 (-26.2, 9.0)	0.36

**Table 9b: Change in percentage of students who went to school by car in a usual week, from parent data (n=807) at follow-up, stratified by student age and distance from home to school**

Student car trips to school	Control		Intervention		Difference % (95% CI)	P value
	Mean %	(SD)	Mean %	(SD)		
All students						
Increased	16.8	(8.4)	10.9	(9.4)	-5.9 (-13.0, 1.2)	0.12
Decreased	32.1	(10.9)	41.5	(17.7)	9.4 (-2.4, 21.2)	0.14
Year 5 students (10-11 years old)						
Increased	21.7	(10.1)	12.0	(14.6)	-9.7 (-19.7, 0.3)	0.07
Decreased	25.0	(13.9)	37.9	(24.5)	12.9 (-3.0, 28.8)	0.12
Year 6 students (11-12 years old)						
Increased	13.3	(13.7)	10.4	(8.1)	-2.9 (-11.9, 6.1)	0.53
Decreased	38.2	(13.7)	44.2	(18.8)	6.0 (-7.2, 19.2)	0.38
<1km from home to school						
Increased	20.9	(11.3)	12.4	(10.8)	-8.5 (-17.3, 0.3)	0.07
Decreased	27.8	(17.3)	37.8	(22.1)	10.0 (-5.9, 25.9)	0.23
>1km from home to school						
Increased	12.8	(11.2)	3.8	(4.8)	-9.0 (-15.9, -2.1)	0.02
Decreased	36.7	(21.5)	52.4	(29.7)	15.0 (-5.0, 36.4)	0.15

On the morning journey to school, 28.8 per cent of students in the intervention group increased their number of walking trips in a usual week, compared with 19 per cent in the control (p=0.05). This increase was even more significant in Year 6 students of the intervention group with an absolute difference of 19.6 per cent between the groups (p=0.03).

In regard to car travel, 41.5 per cent of students in the intervention group decreased their number of car trips to

school in a usual week, as did 32.1 per cent in the control group. However, this difference was not statistically significant. After stratifying for distance from home to school, the percentage of students who increased their number of car trips was significantly lower in the intervention group than that in the control group (3.8% vs. 12.8%) among students living less than 1km from school. These positive findings were not found in the follow-up data on afternoon trips from school to home.

## Predictors of non-car use following the intervention

To predict the factors that determined student travel by methods other than car, logistic regression was applied

to follow-up data collected from students. Table 10 shows the factors that were found to predict student travel by methods other than car.

**Table 10: Predictors (by multivariate analysis) of student non-car travel in 1,234 students following the intervention, based on student survey data.**

Predictor	% non-car users exposed to predictor	% non-car users not exposed to predictor	Unadjusted OR (95%CI)	Adjusted OR (95% CI)	P value	Adjusted P value
Walk to school group	45.1	37.6	1.37 (1.09, 1.72)	1.60 (1.08, 2.22)	0.02	0.53
Home to school distance < 1km	59.7	25.0	4.44 (3.48, 5.66)	4.27 (3.08, 5.93)	<0.0001	<0.0001
Student at a school with high access* to public transport vs. school with medium/low access*	36.3	53.2	0.50 (0.39, 0.64)	0.43 (0.28, 0.66)	<0.0001	0.19
Student at a school with medium access* to public transport vs. school with high/low access*	44.3	37.8	1.31 (1.04, 1.65)	0.64 (0.41, 1.01)	0.053	0.65
Student travelled by ways other than car in 2005	64.7	28.3	4.65 (3.29, 6.56)	4.11 (2.83, 5.98)	<0.0001	0.002

\* Participating schools were classified as having high, medium or low access to public transport, depending on the availability, proximity and frequency of public transport near the school. Information on distance from home to school was obtained from parent surveys matched to their child's survey data.

The strongest predictors of students' non-car travel at follow-up were distance from home to school, access to public transport, and if students did not travel by car at baseline. After accounting for these factors, the odds ratio of students in the intervention group not travelling by car was 1.6 compared to the control group. After adjustment for clustering, the factors that remained significant predictors of non-car use at follow-up were distance from home to school and non-car use at baseline.

## Qualitative evaluation

Interviews were conducted with principals and/or teacher coordinators at 11 of the 12 schools in the intervention group. In general, principals and teacher/coordinators supported the program and its goals. At several schools teachers and principals said they thought that reaching and influencing parents was the key strategy for effective active travel to school programs, as parents made the decisions about how their children travelled to and from

school. Several interviewees stated that at their schools, engagement with parents was a general issue, and cited lack of English language skills and long hours in the paid workforce as barriers to parent involvement.

Schools with significant numbers of parents who did not speak and/or read English noted that the translated parent surveys (into Chinese, Vietnamese and Korean) were appreciated by parents. Some schools had community liaison officers who translated parts of the Footsteps newsletters and distributed this material to parents.

When asked which aspects of the program worked best at their school, a majority of interviewees listed the Footsteps newsletter for parents and the TAGs developed for the schools. The home to school mapping exercise was also mentioned very positively in several interviews. Interviewees from the three schools that had been lent pedometers as part of the Be Active Take Steps component of the program<sup>42</sup> emphasised that their students enjoyed using the pedometers and the associated activities.

When asked to identify the factors that assisted the school in implementing the program, a majority of interviewees described the importance of continuity of teachers. Three principals said that their teacher/coordinators had been at their school for a long time and their excellent relationships with fellow teachers and parents helped the program to run smoothly. Interviewees from two schools mentioned that staff changes and having relieving teachers were barriers to effective implementation. All interviewees stated that running the program over two years was a strength, as it enabled teachers involved in 2005 to mentor other teachers the following year, and students to develop and extend their skills in relation to road safety and independence as they matured.

Several interviewees described the physical environments around their schools as not conducive to active and safe travel. Several principals had raised these issues with their local council and the RTA. At some schools, principals and teachers said their local councils were keen to do what they could to improve the environments, but others described less positive experiences. Several schools had tried to have additional pedestrian crossings or traffic lights installed, but had not been successful.

In general, all interviewees stated their experience of the program had been positive, and all schools planned to distribute their TAG at Kindergarten Orientation sessions and to newly enrolled students and their parents.

# Discussion

## Strengths of the WTS Program

The strengths of the WTS Program included:

- Rigorous evaluation, including a control group, baseline and follow-up surveys, and data analyses that took account of the cluster design
- Data on student travel patterns were collected from students and from their parents before and after the program
- The intervention activities aimed to reach parents, because they decide how their children travel to and from school, compared to most other active travel or WTS programs that focus on students, via the school curriculum
- The program was able to produce overall and localised survey findings on student travel patterns, using aggregated data and school-specific data
- Schools were given timely and localised feedback on their survey results. A baseline and a follow-up report was written for each of the 24 schools, based on data specific to their school, and these reports were distributed to principals, teachers and parents
- All 24 of the participating schools stayed in the program for the two-year study period, which can be seen as a reflection of the program's acceptability
- The development of a TAG for each of the 12 intervention schools was an innovation, as was the distribution of the TAG with local public transport route and timetable information to individual parents
- The program had multiple potential benefits, including increased physical activity, improved air quality, reduced car use and associated traffic congestion around schools, which motivated several groups (such as school principals, students, parents and local councils) to be involved.

## Variations in changes in student travel

Analyses of aggregated data from the student surveys did not yield a significant intervention effect. The results of the data from the student surveys showed that students in both the intervention and control groups increased their walking and reduced their car travel. This shift may be partly explained by the greater independence that children develop (and expect to have) as they mature, particularly between the ages of 10-12 years.

There were variations in increases in walking from school to school in the intervention and the control groups. Data reported by students showed that from 2005 to 2006 there was an increase in walking on all days, and on some days of the week for six of the 12 schools in the intervention group (range 2.2% to 17.1%), and for eight of the 12 schools in the control group (range 2.1% to 20%).

Four schools in the intervention group and three schools in the control group showed larger increases in walking, from 8.4 per cent to 20 per cent, but analysis of aggregated data diminished the demonstration of these local effects.

These results demonstrate a high degree of heterogeneity, which suggests that the pattern of travel for each school is influenced, at least in part, by factors that operate at the local level. This high variation in travel patterns is reflected in data analysed and published in 2008 by the NSW Transport Data Centre. This data is on how people travel to workplaces in different geographic areas of Sydney, and has been derived by the NSW Transport Data Centre from the 2006 Census.<sup>43</sup> For example, the proportions of people travelling by car to workplaces located in the Sydney Central Business District, the Ultimo/Pyrmont area, the University of Sydney/Royal Prince Alfred Hospital at Camperdown and Burwood (all areas included in the WTS Program) were 16 per cent, 45 per cent, 37 per cent and 75 per cent respectively.



There were differences between intervention and control schools that may have contributed to the variations in walking and driving rates. These included students leaving and joining schools, access to and frequency of public transport, and traffic conditions near schools.

Analysis of data reported by parents in response to the question 'how does your child travel to school in a usual week' found a significant intervention effect in the intervention group. The proportion of students in the intervention group who increased the days they walked in a usual week was higher than the proportion that decreased their walking, whereas in the control group it was the other way around.

The increase in walking in the intervention group was greater than the increase in the control group, the difference being 9.8 per cent. The decrease in walking in the intervention group was smaller than the decrease in the control group, the difference being 6.5 per cent.

The decrease in number of days travelled by car was greater in the intervention group than the decrease in the control group, the difference being 9.4 per cent.

However, the differences between the groups were not statistically significant. As the program explicitly aimed to increase walking to and from school, it is possible that some parents felt obligated to give 'the right answer' and so reported increased walking. These differences could also be explained by possible discrepancies between modes of travel in a usual week (as reported by parents) and modes of travel in one specific week (as reported by students).

## Methodological issues

### Survey response and follow-up rates

The follow-up rate for students was moderate (65%). The possibility that student survey data was biased due to numbers lost at the 2006 survey was checked. No major differences were found between students who completed the follow-up surveys and those who did not, in terms of socio-demographic characteristics, distance from their home to school or travel mode measured at baseline.

The overall response rate to the baseline parent survey was very good (71%), and the response rate for the follow-up parent surveys in 2006 was slightly less (69%). The wide range of response rates for the parent follow-up survey from the 24 schools (from 35% to 87%) may have influenced the results.

## Sample size

The sample size was calculated to enable eight per cent difference in any travel mode to be detected, whereas the differences observed were smaller, which reduced the power. Further, the design effect was larger (2.6) than that anticipated (1.7) indicating large variability within each school, which further compromised the statistical power.

## Balanced distribution of factors across intervention and control groups

Since the unit of randomisation was the participating school and not individual students, balanced distributions of major factors known to influence travel mode between the intervention and control groups could not be ensured. There was a higher proportion of students in the intervention group who walked all the way all days at baseline, thus creating a 'ceiling' on the percentage of students who could increase their number of walking trips.

## Measurement issues

Part of the explanation for the lack of a strong effect could be associated with issues of measurement. The program collected data from students on their actual travel to and from school for five consecutive school days and data from parents on their child's travel for five morning and five afternoon trips in a usual week. It is possible that different results may have been obtained if data on actual travel over five days had been collected from parents, but this would have required additional resources and may have resulted in a lower parent response rate.

It was important for the WTS Program's surveys to collect data on the pattern of students' travel within a week, as previous research had found that many students travel by more than one mode throughout the school week. In NSW, 20.2 per cent of students regularly went to and from school by active travel when all 10 trips in a school week were considered, as did 33.3 per cent when at least five trips were considered, and 42.3 per cent if one trip was considered.<sup>15</sup>

The actual travel patterns of students in a specific week (the data collected in the student surveys) may not be the same as the usual pattern in a typical week (the data collected in the parent surveys). In addition, data on students' travel patterns in a specific week at the end of a two-year intervention may not be sufficiently sensitive or comprehensive to reflect the overall effect of the intervention.

From 2005 and 2006 a number of class teachers changed within schools, which may have influenced the teachers' supervision of the student surveys. About half of the 86 Year 5 and 6 teachers in the program (intervention and control schools) in 2006 had not been involved in the program in 2005. Some teachers who supervised classes during the week of the survey were relieving teachers. This may explain why some students in some classes did not record data for all five days.

It is possible that the survey results may have been influenced by the weather. Baseline surveys were conducted in March 2005 and follow-up surveys in October 2006, when similar temperatures could be expected. However the RCT design meant that weather that may have discouraged walking at the time of both surveys would have equally affected students from intervention and control schools.

## **Contextual issues and the effectiveness of the intervention**

### **Intensity of the intervention**

The implementation of this program included a series of tailored interventions for the 12 intervention schools, a series of interventions on healthy eating for the 12 control schools, and the organisation and coordination of surveys in 24 schools for more than 2,200 students and their parents, requiring the involvement of 117 teachers in 2005 and 86 teachers in 2006. About half of the teachers involved in 2006 had not been part of the program in 2005. The program's schedule and scale, including its extensive evaluation components, may have meant that the intervention activities for the WTS schools were not as intensive as needed.

### **Extended implementation of a complex program**

The 24 schools were diverse in relation to their size, class organisation, socio-economic and cultural mix of students, location and access to public transport, and therefore the intervention and evaluation components of the program took place, in effect, in 24 different settings.

To facilitate working with 24 schools, the project officer asked each school to nominate a teacher who could coordinate information and activity for that school, and work with other teachers and classes in the program.

This created an extended 'chain of implementation' for the program, which brought additional complexity to its coordination and assessment of its reach. Inevitably the extent and intensity of each school's involvement depended to a degree on the enthusiasm and ability of their teacher/coordinator. These teacher/coordinators had between one to 10 other teachers to work with, according to the size of their school. About half of the 86 teachers involved in the program in 2006 (intervention and control groups) were involved in the program's implementation for the full two-year period.

The interest and commitment of the school principals was also a critical factor, and the extent to which schools were involved in other major projects.

## **Other influences beyond the intervention**

Parents and teachers at schools in the control group may have been influenced by other programs and initiatives to increase walking and to reduce car use, thus diluting the program's effect in the intervention schools. In NSW, the Pedestrian Council of NSW runs Walk Safely to School Day each year, and schools, including those in the control group, are encouraged to participate by local councils and the NSW Department of Education.

All primary school children in NSW learn about the benefits of physical activity as part of the Personal Development, Health and Physical Education Key Learning Area. The curriculum for Stage 3 (Year 5 and 6 students) includes the benefits of accumulated physical activity.

Widespread public debate during 2005 and 2006 on climate change and the need to reduce greenhouse gas emissions may have influenced some parents in the control schools to reduce their car trips and/or walk with their children. During this time the cost of petrol increased, as did the number of passengers using Sydney Buses.<sup>44</sup>

## Individual and family factors

The program's results indicate that it is difficult to modify some of the factors that influence active travel to school, even with significantly more resources than those available to this program. This program adopted an organisation-based approach and tailored the interventions to the differing needs of students and parents in the schools.

Decisions about the way children travel to school are influenced by many factors, including some specific to individuals (for example the child's involvement in other activities, their preferences), some reflect family situations (for example employment, extent to which responsibilities are shared between both parents), and some are linked to the local physical environment (such as traffic congestion, road safety, walkability, access to public transport).

## Schools and their vicinities

To address road safety issues, the program worked with councils to identify problems and to improve the physical environments of the 12 intervention schools. The program's safety reviews of schools and their vicinities identified physical hazards or barriers to active and safe travel. After the reviews, councils facilitated some adjustments to improve safety in the environments around some schools.

However, it proved difficult for the program to make the environments around all the intervention schools more conducive to active and safe travel. The negotiation processes needed to resolve problems were lengthy, and in retrospect it was clear that the program did not have sufficient resources and time to deal with these issues thoroughly, particularly in relation to 12 different school environments. As well, the program was without specific funds for infrastructure works or the capacity to negotiate changes with the RTA and public transport agencies.

Previous work on active travel to school conducted by the Health Promotion Unit of CSAHS had been done with officers from one council. These people were highly aware of active and safe travel issues, and were keen to improve environments if they had the capacity and funds to do so. It is possible that these conditions were not present to the same degree in other councils.

These issues of capacity may have compromised the success of the intervention in schools where the safety of the physical environment and/or the lack of access to public transport may have deterred parents and students from active travel.

Making the physical environments around schools and their vicinities more conducive to active and safe travel is a demanding task. In NSW there is complex and divided jurisdiction between the multiple agencies responsible for improving safety, walkability and amenity of schools and their vicinities. These agencies include the RTA, councils, public transport bodies, police, and schools.<sup>45</sup>

The process of improving environments for active and safe travel is therefore complicated. There is currently no multi-sectoral forum where these key agencies can discuss active travel issues.<sup>46</sup> To achieve effective collaboration between these disparate agencies would require high level commitment, policy innovation and additional resources.

Local and state governments need to develop more systematic approaches to making the environments of schools and their vicinities more conducive to active and safe travel. An example is the City of Sydney Council's decision on 27 August 2007 that their Local Area Traffic Management Schemes will identify and implement safety improvements including traffic management measures around schools and on identified walking routes to those schools.<sup>47</sup> The City East Local Area Traffic Management Scheme, approved in May 2008, included a Safe Routes to School audit of all schools in the area and a recommendation to implement its findings.<sup>48</sup>

Some schools in NSW are using the issue of climate change as a framework to address sustainability issues, including travel to and from school, through the School Environment Management Plans, required by the DET.<sup>49</sup>

## Sharing responsibilities for travel to school between parents

In NSW, the increased number of mothers in the paid workforce and the need to drop off and pick up children on the way to and from work has been seen as a major factor in the decline in walking to school.<sup>50</sup> The WTS Program's baseline survey showed that for about 80 per cent of participating students, mothers took their children to and from school, even though about two-thirds of these mothers were in the full or part-time paid workforce.<sup>51</sup> Another study has found that if the father was responsible for taking the child to school the child was more likely to walk regularly.<sup>16</sup> A US study with similar findings has concluded that policy makers could encourage both parents to share the task of taking their children to school to address time constraints.<sup>52</sup>

The WTS Program's Fathers' Day activity conducted in 2005 and 2006 aimed to encourage greater sharing of responsibility between parents by suggesting fathers walk with their children to and from school. As the program did not collect any data on the extent of implementation of these activities at school level or on their impact, it is not possible to comment on their effects. Future programs could explore a more equal sharing of responsibilities between mothers and fathers, and encourage fathers to take their children to and from school by active travel.

## Parents' journey to work

The WTS Program's baseline survey confirmed that children were more likely to be driven to school if the parent taking them to school went to work by car.<sup>51</sup> Parent journey to work is a difficult factor to change. It was anticipated that only a small percentage of parents in the WTS Program would or could be able to change from car travel to active travel, but it was thought worthwhile to encourage parents to try.

The development of a TAG for the 12 WTS schools was a strategy to encourage parents to go to work by active travel after taking their children to school. The TAGs and local bus and train timetable and route information were distributed to parents at the 12 schools from March to July in 2006, and this may have been too late in the year to influence the travel patterns of students and parents. The TAGs may have a role in influencing student and parent travel patterns, if schools distribute their TAGs to new parents when their children enrol at school.

It may be more strategic to increase active travel to work among employees through workplace-based programs. In a 2004 systematic review by Ogilvie, six out of 22 interventions aimed to reduce car travel to work, and none of these interventions included children's travel to school.<sup>18</sup> The majority of the workplace interventions focused on costs (such as financial incentives for not using cars, free bus passes, free bikes), and only one study demonstrated statistically significant effects. This Californian program included incentives for employees to choose cash in lieu of an employer-provided parking subsidy and it produced a (statistically significant) shift of one per cent from car use to active travel.<sup>53</sup>

In general, few active travel programs have focused on trips that include more than one destination, for example the home-school-work journey. In Australia, government tax policies on fringe benefits enable many employers to provide selected employees with significant incentives for car travel.<sup>54, 55</sup>

## SECTION 7

# Conclusions and recommendations

The WTS Program's data from parent surveys showed that its intervention to increase walking to and from primary school had a positive effect, but this same effect was not found in the data from student surveys. The high variation in rates of walking and car travel from school to school meant it was hard to discern an overall pattern within and between the intervention and control schools. Given the variation from school to school, it is probable that programs tailored to meet local needs will have a stronger impact than uniform programs.

The WTS Program found that parent journey to work has a major influence on the student journey to school, and so needs to be a focus of active travel to school programs. It is likely that other influential factors are location and hours of parent employment, availability and frequency of public transport, and walkability and safety of the physical environments around schools.

It is often assumed that students should be the main focus and schools the most obvious and appropriate organisational settings for active travel to school programs.<sup>26</sup> This is despite evidence that parents generally decide how their children will travel to school.<sup>16</sup> International and Australian experience shows that schools and their larger organisations (such as DET) do not have the funds, capacity or policy goals to address the main determinants of travel to and from school.<sup>20, 56</sup>

To be effective, active travel to school programs need to address the complex interaction of the multiple factors that influence travel to school and to work. Schools are indispensable partners in active travel to school programs, but it is more likely that agencies responsible for public transport, health, roads and road safety, and environmental protection, and local government have greater capacity to make the changes required for increased active travel. Coordinated workplace and school active travel programs may also have benefits.

Further active travel programs require collaboration with these key state and local government agencies and funds to make environments more conducive for active and safe travel. In the UK and USA governments have funded large scale active travel programs with significant budgets for physical infrastructure works, including cycling and walking paths.<sup>57, 58</sup> The City of Sydney Council has allocated \$77 million to build a 55km network of separated cycleways in its area during 2009-2013.<sup>59</sup>

Since the WTS Program was funded, the Australian and NSW governments have acknowledged the impact of climate change and its far-reaching implications for population health, transport, urban design and the economy.<sup>60,61</sup> The effects of climate change provide compelling reasons for the development of active travel programs and other communication, health and social change programs to reduce greenhouse gas emissions.<sup>62,63,64</sup> The NSW Government has policies that support a widespread shift in the population from car use to active travel.<sup>65</sup> Such a shift requires significant expansion and upgrading of public transport systems,<sup>66</sup> a less central role for cars in economic and social life,<sup>67</sup> and the participation of young people. Walking to and from school can provide children with experiences of active travel in their early years, and set a foundation for them to continue to travel in this way in their adolescence and adulthood.

The findings of the WTS Program and more recent initiatives can inform the development of future active travel programs to schools, workplaces and other destinations.

## Recommendations

- Programs should be funded for at least two years, to accord with the long-term planning processes of schools.
- More resources are required for complex, large scale programs (such as the WTS Program), to implement interventions at a sufficiently intensive level and to organise the program's research and evaluation components.
- Programs need to be tailored in response to local circumstances, including the variation in travel patterns from school to school.
- Research and evaluation designs for active travel programs need to anticipate and allow for the complex interaction of factors that influence travel. Evaluation measures should have sufficient capacity to assess the wider impact of their interventions.
- Active travel programs should work with geographic clusters of schools and/or workplaces to maximise the benefits of reduced car use and traffic congestion and of improvements to safety and walkability of environments.
- Active travel to school programs should not focus on schools and students alone. Programs need to involve key state and local government agencies such as the RTA, public transport organisations and local councils with the capacity to increase active travel to school and work. Collaboration between these sectors is particularly necessary if schools and their vicinities are to become more conducive to active and safe travel.
- Future programs should aim to increase active travel (defined as walking, cycling and/or the use of public transport, either separately or in combination) rather than having a specific focus on walking or cycling. This more general approach is suitable for adults, young people and children. The inclusion of public transport in the definition of active travel broadens its applicability and makes active travel a practical option for more people (for example parents in the paid workforce and families living more than one kilometre from school and/or work).
- Future programs should focus on the parent journey to work and linked trip journeys (trips that have more than one destination), particularly the home-school-work journey. This could be done by running coordinated and/or simultaneous programs with workplaces and schools linked by public transport corridors.

# References

1. Davison K, Werder J, Lawson C. Children's Active Commuting to School: Current Knowledge and Future Directions. *Preventing Chronic Disease*. July 2008; 5(3).
2. World Health Organisation. *Charter on Transport, Environment and Health*. Geneva; 1999.
3. Leyden K. Social Capital and the Built Environment: the importance of walkable neighbourhoods. *Am J Public Health*. 2003; 93(9):1546-1551.
4. Dora C, Phillips M, editors. *Transport, Environment and Health*. Copenhagen: World Health Organisation Regional Office for Europe; 2000.
5. Frumkin H. *Urban Sprawl and Public Health: designing, planning and building for healthy communities*. Washington DC: Island Press; 2004.
6. van der Ploeg H, Merom D, Corpuz G, Bauman A. Trends in Australian children travelling to school 1971-2003: burning petrol or carbohydrates? *Prev Med*. 2008; 46(1):60-62.
7. Booth M, Okely AD, Denney-Wilson E, Hardy L, Yang B, Dobbins T. *NSW Schools Physical Activity and Nutrition Survey (SPANS) 2004: Summary Report*. Sydney: NSW Department of Health; 2006.
8. DiGiuseppi C, Robert I, Leah Li, Allen D. Determinants of car travel on daily journeys to school: cross sectional survey of primary school children. *Brit Med J*. 1998; 316:1426-1428.
9. Department of Health and Ageing. *Australia's Physical Activity Recommendations for 5-12 year olds*. Canberra: DHA; 2004.
10. Tranter P, Pawson E. Children's access to local environments: a case study of New Zealand. *Local Environment*. 2001; 6(1):27-48.
11. Roberts I. Why have child pedestrian death rates fallen? *Brit Med J*. 1993; 306:1737-1739.
12. Tranter P, Malone K. *Out of bounds: Insights from children to support a cultural shift towards sustainable and child-friendly cities*. Proceedings of the National Conference of the State of Australian Cities, Sydney; 2003.
13. Cairns S, Sloman L, Newson C, Anable J, Kirkbride A, Goodwin P. *Smarter Choices – changing the way we travel*. Report to Department for Transport, London; 2004.
14. Bradshaw R, Jones P. *The Family and the School Run: What Would Make a Real Difference?* Scoping Report to AA Foundation for Road Safety Research, London: University of Westminster; 2000.
15. Merom D, Tudor-Locke C, Bauman A, Rissel C. Active commuting to school among NSW primary school children: implications for public health. *Health and Place*. 2006; 12:678-687.
16. McDonald N. Household interactions and children's school travel: the effect of parental work patterns on walking and biking to school. *Journal of Transport Geography*. 2008; 16(5):324-331.
17. Timperio A, Ball K, Salmon J, Roberts R, Giles-Corti B, Simmons D, et al. Personal, family, social and environmental correlates of active commuting to school. *Am J Prev Med*. 2006; 30(1):45-51.
18. Ogilvie D, Egan M, Hamilton V, Pettigrew M. Interventions to promote walking and cycling as an alternative to using cars: a systematic review. *Brit Med J*. 2004; 329:763-6.
19. Mason C. Transport and Health: en route to a healthier Australia? *Med J Australia*. 2000; 172:30-232.
20. UrbanTrans. *School Travel Plans: International Research Summary*. Report for Australian Government Department of Environment, Water, Heritage and the Arts; March 2008.
21. Department for Education and Skills and Department of Transport. *Travelling to School: an action plan*. United Kingdom; 2003.
22. Rowland D, DiGiuseppi C, Gross M, Afolabi E, Roberts I. A randomised controlled trial of site-specific advice on school travel plans. *Arch Dis Child*. 2003; 88:8-11.

23. Boarnet M, Anderson C, Day K, McMillan T, Alfonzo M. Evaluation of the California Safe Routes to School legislation: Urban form changes and children's active transportation to school. *Am J Prev Med.* 2005; 28(2):143-140.
24. Centre for Health Training. *Safe Routes to School: Practice and Promise.* US National Highway Traffic Safety Administration; 2004 [cited 7 May 2009]. Available from: <http://drusilla.hsrc.unc.edu/cms/downloads/SafeRoute2Schlo.pdf>.
25. Safe Routes to School National Partnership. *Safe Routes to School: 2007 State of the States Report.* 2007 [cited 30 April 2009]. Available from: [http://www.saferoutespartnership.org.media/file/rpt\\_SRS.2007.pdf](http://www.saferoutespartnership.org.media/file/rpt_SRS.2007.pdf).
26. Australian Greenhouse Office. *Evaluation of Australian Travelsmart Projects in ACT, South Australia, Queensland, Victoria and Western Australia 2001-2005.* Canberra: Report to Australian Greenhouse Office, Department of Environment and Heritage; 2006.
27. VicHealth. *It's more than just walking! The value-adding impact of the Walking School Bus program on local environments and communities.* Melbourne: Victorian Health Promotion Foundation; 2007 [cited 30 April 2009]. Available from: <http://www.vichealth.vic.gov.au/~media/ProgramsandProjects/PhysicalActivity/Attachments/Its%20more%20than%20just%20walking%20publication%20final%20Aug07.ashx>.
28. VicHealth. *Walking School Bus Snapshot Data Information Sheet November 2007.* Melbourne, Victorian Health Promotion Foundation; 2007 [cited 30 April 2009]. Available from: <http://www.vichealth.vic.gov.au/~media/ProgramsandProjects/PhysicalActivity/Attachments/WSB%20more%20files/WSB%20Snapshot%202005-2007.ashx>.
29. VicHealth. *Streets Ahead: supporting children to get active in their neighbourhoods.* Victorian Health Promotion Foundation; 2008 [cited 30 April 2009]. Available from: <http://www.vichealth.vic.gov.au/~media/ProgramsandProjects/PhysicalActivity/Attachments/streets%20ahead%20FINAL.ashx>.
30. Merom D, Rissel C, Mahmic A, Bauman AE. Process evaluation of the New South Wales Walk Safely to School Day. *Health Promotion Journal of Australia.* 2005; 16(2):100-106.
31. Zaccari V, Dirkis H. Walking to School in Inner Sydney. *Health Promotion Journal of Australia.* 2003; 14(2):140-143.
32. Health Promotion Unit, Central Sydney Area Health Service. *Walk to School Partnership Agreement.* Camperdown; 2003.
33. NSW Health. *Health Promotion with Schools. A policy for the health system.* Sydney; 2003.
34. Roads and Traffic Authority. *Road Safety 2010. A framework for saving 2000 lives by 2010 in NSW.* Sydney; 2005.
35. Department of Education. *Road Safety Education Policy Statement: Preschool to Year 12 1995.* Sydney: NSW Department of Education. Available from: <http://www.det.nsw.edu.au/policies>.
36. Board of Studies of NSW. *Personal Development, Health and Physical Education Kindergarten – Year 6 Syllabus.* Sydney; 1999.
37. Ukoumunne O, Gulliford M, Chinn S, Sterne J, Burney P. Methods for evaluating area-wide and organisation-based interventions in health and health-care: a systematic review. *Health Technol Asses.* 1999; 3(5).
38. Winchester L, Dobbins S, Rissel C, Bauman A. Anonymous record linkage using respondent-generated ID codes - a tool for health promotion research. *Health Promotion Journal of Australia.* 1996; 6(2):52-54.
39. Kerry SM, Bland JM. Analysis of a trial randomised in clusters. *Brit Med J.* 1998; 316-354.
40. Uitenbroek, DG. *SISA – Binomial.* 1997 [cited 12 May 2009]. Available from: <http://www.quantitativeskills.com/sisa/distributions/binomial.htm>.
41. Kerry SM, Bland JM. Trials which randomise practices: How should they be analysed? *Fam Pract.* 1998; 15:80-83.
42. Centre for Health Promotion. *Be Active Take Steps: Pedometer Activities for Schools.* Adelaide: Women's and Children's Hospital; 2004.
43. Transport Data Centre. *Transfigures: Employment and Commuting in Sydney's Centres, 1996-2006.* Sydney: NSW Ministry of Transport; 2008.
44. Transport Data Centre. *2005 Household Travel Survey Summary Report.* Sydney: NSW Ministry of Transport; 2007.
45. PPM Consultants. *Active Travel to School in NSW: Issues and Opportunities.* A report commissioned by the NSW Travelsmart Schools Program Steering Committee (SSWAHS) 2007.



46. Fry D. *NSW Travelsmart Schools Program 2006-2007 Summary Report*. Camperdown: Health Promotion Service, Sydney South West Area Health Service; 2008.
47. City of Sydney Council Cultural and Community Services Committee. *Item 3 Walking to School*. 2007 [cited 4 May 2009]. Available from: <http://www.cityofsydney.nsw.gov.au>.
48. Council of the City of Sydney. *City East Local Area Traffic Management Plan 2008*. [cited 4 May 2009]. Available from: <http://www.cityofsydney.nsw.gov.au>.
49. NSW Department of Education and Training. *Environmental Education Policy for Schools*. Sydney: 2006 [cited 30 April 2009]. Available from: [http://www.det.nsw.edu.au/polics/curriculum/schools/envir\\_educ/PD20020049.shtm](http://www.det.nsw.edu.au/polics/curriculum/schools/envir_educ/PD20020049.shtm).
50. Transport Data Centre. *Household Travel Survey Summary Report*. Sydney: NSW Department of Transport; 2001.
51. Wen L, Fry D, Rissel C, Dirkis H, Balafas A, Merom D. Factors associated with children being driven to school: implications for walk to school programs. *Health Educ Res*. 2008; 23(2):325-334.
52. Salmon J, Salmon L, Crawford D, Hume C. Associations Among Individual, Social, and Environmental Barriers and Children Walking and Cycling to school. *Am J Health Promot*. 2007; 22(2):107-113.
53. Shoup DC. Evaluating the effect of cashing out employer-paid parking. *Transp Policy*. 1997; 4(4):201-216.
54. National Preventative Health Strategy. *Submission to the Review on Australia's Future Tax System*. 2008 [cited 5 May 2009]. Available from: <http://www.taxreview.gov.au/submissions>.
55. Public Transport Users Association. *A tax system for sustainable transport*. Submission to the Review on Australia's Future Tax System. 2008 [cited 5 May 2009]. Available from: <http://www.taxreview.gov.au/submissions>.
56. Wen L M, Fry D, Merom D, Rissel, Dirkis H, Balafas A. Increasing active travel to school: are we on the right track? A cluster randomised trial from Sydney, Australia. *Prev Med*. 2008; 47(6):612-618.
57. Sustrans. *Travel Actively: Walking and cycling for health and wellbeing*. Summary of projects 2008. [cited 30 April 2009]. Available from: <http://www.sustrans.org.uk>.
58. Safe Routes to School National Partnership. *Safe Routes to School 2009 Policy Report*. March 2009 [cited 30 April 2009]. Available from: <http://www.saferoutespartnership.org/media/file/SRTS-09FinalPolicy.pdf>.
59. City of Sydney Council. *Draft Corporate Plan and Budget 2010 -2013*. [cited 18 May 2009]. Available from: <http://www.cityofsydney.nsw.gov.au/Council/OnExhibition/DraftCorporatePlan.asp>.
60. Garnaut R. *The Garnaut Climate Change Review: Report to Commonwealth, State and Territory Governments of Australia*. Melbourne: Cambridge University Press; 2008.
61. NSW Government. *NSW Greenhouse Plan Executive Summary*. Sydney: NSW Greenhouse Office; 2005.
62. Woodcock J, Banister D, Edwards P, Prentice AM, Roberts I. Energy and Transport. *Lancet*. 2007; 370(9592):1078-88.
63. Moser S, Dilling L, editors. *Creating a Climate for Change: Communicating climate change and facilitating social change*. Cambridge University Press, 2007.
64. Stott R. What should we do about climate change? *Brit Med J*. 2006; 333:983-984.
65. NSW Government. *A New Direction for NSW - The NSW State Plan*. Sydney; 2006.
66. Newman P, Beatley T, Boyer H. *Resilient Cities. Responding to Peak Oil and Climate Change*. Washington: Island Press; 2009.
67. Woodcock J, Aldred R. Cars, corporations and commodities: Consequences for the social determinants of health. *Emerging Themes in Epidemiology*. 2008 [cited 30 April 2009]; 5:4. Available from: <http://www.ete-online.com/contents/5/1/4>.

# List of appendices

## For copies of these Appendices, please contact:

Health Promotion with Schools team  
Health Promotion Service  
Sydney South West Area Health Service  
Level 9 Nth, KGV Building  
Missenden Rd Camperdown NSW 2050  
Ph: 02 9515 9055  
Email: [hpureception@email.cs.nsw.gov.au](mailto:hpureception@email.cs.nsw.gov.au)

**Appendix A** Explanatory brochure for schools and parents

**Appendix B** Project Advisory Committee Terms of Reference

**Appendix C** Project Advisory Committee Membership 2005 -2007

**Appendix D** Program interventions and their implementation for schools in the Walk to School (intervention) group 2005 and 2006

- Index of Appendix D components
- Detailed description of program interventions and their implementation
- Teacher Professional Development Days 2005 and 2006
- Teacher Briefing Notes for Student Surveys
- Footsteps newsletters 2005 and 2006
- Media Release Walk Safely to School Day 3 May 2005
- Home to School Mapping Exercise
- Fathers' Day materials 2005 and 2006
- Travel Access Guides
- Launch of Travel Access Guides
- Active Travel and the Trip Planner – notes for teachers
- Be Active Take Steps materials
- Parent walks
- Media articles

## **Appendix E** Program interventions for schools in the Healthy Lunch (control) group 2005 and 2006

- Index of Appendix E components
- Program interventions for schools in the Healthy Lunch group, 2005 and 2006
- Tastebuds parent newsletters 2005
- Tastebuds parent newsletters 2006
- Media report

## **Appendix F** Baseline Student Survey Term 1 2005

## **Appendix G** Follow-up Student Survey Term 4 2006

## **Appendix H** Baseline Parent Survey Term 1 2005

## **Appendix I** Follow-up Parent Survey Term 4 2006

## **Appendix J** School-specific report with baseline survey results

## **Appendix K** School-specific report with baseline and follow-up survey results

## **Appendix L** Interview Questions for Principals and/or teacher coordinators

## **Appendix M** Student Survey Term 1 2006

## **Appendix N** Publications and Presentations

Wen LM, Fry D, Rissel C, Dirkis H, Balafas A, Merom D. Factors associated with children being driven to school: implications for walk to school programs. *Health Educ Res.* 2008; 23(2):325-334.

Wen LM, Fry D, Merom D, Rissel C, Dirkis H, Balafas A. Increasing active travel to school: are we on the right track? A cluster randomised controlled trial in Sydney, Australia. *Prev Med.* 2008; 47(6): 612-618.

Wen LM, Kite J, Merom D, Rissel C. Time spent playing outdoors after school and its relationship with independent mobility: a cross-sectional survey of children aged 10-12 years in Sydney, Australia. *International Journal of Behavioural Nutrition and Physical Activity.* 2009; 6:15. doi:10.1186/1479-5868-6-15.

Fry D. *Linked trips and active travel.* Presentation to On Your Bike Conference, NSW Department of Environment and Climate Change, Newcastle: July 2008.

Fry D. *Active Travel to School – how you can support it.* Presentation to NSW Sustainable Schools Expo, Campbelltown. NSW Department of Education; September 2008.

Fry D. *Active Travel to School.* Presentation to NSW Health Promotion Symposium, Sydney; November 2008.







