The TRavel Environment and Kids (TREK) Study…15 years on

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About PATREC

The Planning and Transport Research Centre (PATREC) is a collaboration between the Government of Western Australia and local universities, constituted to conduct collaborative, applied research and teaching in support of policy in the connected spaces of transport and land use planning. The collaborating parties are: The University of Western Australia, Curtin University, Department of Transport, Main Roads Western Australia, Western Australian Planning Commission and the Western Australian Local Government Association.

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Executive Summary

Fewer Australian children walk and bike ride to school than ever before, underscoring the urgency to increase active school transport (AST). Increased AST would have health, environmental and economic benefits. In Perth, Western Australia (WA), the decline in AST prompted a call to action across multiple government agencies to counter this trend. The purpose of this project (TREK2 School study) was to update and expand key indicators from the 2007 "TRavel Environment and Kids" study (TREK), led by Prof Billie Giles-Corti, conducted in Perth, focusing on the walkability around Perth metropolitan schools, parental perceptions of neighbourhood safety and latent demand for walking and cycling to school. The findings provide a solid foundation of evidence tailored to the Perth area to guide future AST strategies. This includes identifying schools and neighbourhoods that require the most attention in terms of connectivity, safety interventions, and efforts to alleviate parental worries.

Aim and objectives:

The aim of this project was to create an evidence base to inform targeted interventions to increase active school transport in primary and secondary school students in Perth. The specific objectives of this project were as follows:

- **Objective 1.** Review current international evidence on AST interventions and their effectiveness.
- **Objective 2.** Assess the walkability of the immediate environment surrounding all Perth schools in 2021, and whether it differs by Socio Economic Status (SES) and school type (i.e. primary, secondary and K-12).
- **Objective 3A.** Investigate AST prevalence, latent demand for AST, barriers of AST (including parental/child perceived safety concerns), enablers of AST and attitudes towards AST in primary and secondary school children attending Perth schools located in the most and least walkable school neighbourhoods.
- **Objective 3B.** Investigate changes over time (2007 vs 2021) in AST prevalence, latent demand for AST, barriers of AST (including parental/child perceived safety concerns), enablers of AST and attitudes towards AST in primary school children attending Perth schools located in the most and least walkable school neighbourhoods.
- **Objective 4.** Use the research findings from Objectives 1-3 to determine what behavioural and infrastructure-based interventions are needed to increase AST in Perth school children.

Key Findings

Built environment

The TREK2School study assessed the walkability of 651 schools in the Perth metropolitan area, considering factors of neighbourhood connectivity and traffic exposure, and found:

- The majority of Perth schools are situated in neighbourhoods with disconnected street networks. Increasing the connectivity of streets surrounding schools is important to maximise the number of children with the potential to use more active travel to school.
- 74 per cent of Perth schools do not meet the WA Planning Commission (WAPC) target for pedestrian connectivity, limiting the potential for students to walk, wheel or ride to school.
- Primary schools in low socio-economic status (SES) areas are the most poorly connected, with only 9.6 per cent meeting the WAPC target. Neighbourhoods surrounding higher SES schools were significantly more walkable than low or medium SES schools.
- Modifying the built environment to support active travel (safe crossings; paths on both sides of the road; pedestrian cut-throughs; modal filters) and reduce traffic speed (speed humps; raised platforms; narrow lanes; chicanes) increases potential for walking, riding and scooting.

Parent and student behaviour and perceptions

The TREK2School study surveyed 771 year 5 and 6 students, 450 secondary school students and 877 of their parents about their behaviours and perceptions around travel to school. The survey included questions about how students usually travel to and from school and their preferred mode, as well as exploring barriers and what could enable more walking and riding, and found:

- More than half of all primary school students are driven to school most days of the week, even though 65 per cent live within 2km of their school.
- Despite most students stating they would prefer to walk, ride or scoot to school, a concerning finding is the large increase in primary school students preferring to be driven to school (from 1 in 10 in 2007 to 1 in 4 in 2023).
- Half of primary school students reported they must cross a busy road if they walk or ride a bike to school, and a third would not feel safe crossing the road near their school.
- About two in five high school students said they would not feel safe crossing the road near their school.
- Parental concerns about aspects of road safety have increased since 2007:
  - Children have to cross busy roads (up 44 per cent)
  - Lack of safe crossings (up 41 per cent)
  - Amount of traffic around schools (up 30 per cent).
- Both students and parents reported that active travel infrastructure would help them/their child walk or ride to school more often. The actions they rated most highly to support walking and riding to school were:
  - More safe crossings
  - Paths on both sides of the road
  - Separated/protected bike paths.
- Both parents and students supported school-based actions to encourage walking and riding, such as:
  - Bike education
  - Regular active travel days
  - Incentives for students who walk or ride.

Challenges

The process of obtaining approval to undertake research in public schools took longer than expected and conditions of approval affected the methodology used. This impacted student and parent participation rates and so the generalisability of the findings. Greater participation in surveys is likely if opt-out consent, incentives and promotional activities could be included. A mapping activity designed to collect unique location-specific data on safety issues was proposed but not included due to privacy concerns.

Key Project Outputs

Presentations

- Gannett A, Hooper P, Saunders J, Trapp GSA. Exploring student and parent preferences for active school transport interventions, Environmental Design Research Association Conference, Portland, USA, June 2024.
- Gannett A, Hooper P, Saunders J, Trapp GSA. TREK2School Project Update and School Walkability Web Portal Demo, Western Australian Active Travel to School Working Group, May 2024.
- Gannett A, Hooper P, Saunders J, Trapp GSA. Exploring student and parent preferences for active school transport interventions, Australasian Society for Behavioural Health and Medicine, Adelaide, February 2024.

- Gannett A, Hooper P, Saunders J, Trapp GSA. TREK2School Project Update with the Liveable Neighbourhoods Design Review Team, Department of Planning, Lands and Heritage, February 2024.
- Gannett A, Hooper P, Saunders J, Trapp GSA. A review of the international scientific literature on active school transport interventions, Australasian Transport Research Forum, Perth, Australia, December 2023.
- Gannett A, Hooper P, Saunders J, Trapp GSA. TREK2School Project Overview, Cancer Council Western Australia, October 2023.
- Gannett A, Hooper P, Saunders J, Trapp GSA. Walkability across Perth subregions, Telethon Kids Institute Bike to Work Event, October 2023.
- Gannett A, Hooper P, Saunders J, Trapp GSA. Inequitable distribution of school walkability, Perth, Western Australia, Livable Cities Conference, New York, USA, June 2023.
- Gannett A, Hooper P, Saunders J, Trapp GSA. TREK2School Project Overview, Western Australian Bike Riding Reference Group Meeting, March 2023.
- Gannett A, Hooper P, Saunders J, Trapp GSA. TREK2School Project Overview, BEACHES Project Partner Meeting, March 2023
- Gannett A, Hooper P, Saunders J, Trapp GSA. Socio-economic patterns of walkability, Asia-Pacific Society for Physical Activity Annual Conference, Melbourne, Australia, November 2022.
- Gannett A, Hooper P, Saunders J, Trapp GSA. TREK2School Project Update, Western Australian Active Travel to School Working Group meeting, 2022.
- Gannett A, Hooper P, Saunders J, Trapp GSA. TREK2School Project Overview, Western Australian Active Travel to School Working Group Meeting, 2021.
- Gannett A, Hooper P, Saunders J, Trapp GSA. TREK2School Project Overview, WA Department of Transportation Travel Behaviour Change Team Seminar Series, 2021.

Written reports and manuscripts

- Gannett A, Hooper P, Saunders J, Trapp GSA. Interim Report - TREK2School: Creating an evidence base to inform targeted interventions to increase active school transport in primary and secondary school students in Perth, Western Australia, 2024.
- Gannett A, Hooper P, Saunders J, Trapp GSA. Investigating the walkability of primary, secondary and K-12 schools across metropolitan Perth, Western Australia, GeoJournal, 2024.
- Gannett A, Hooper P, Saunders J, Trapp GSA. A review of the international scientific literature on active school transport interventions, Australasian Transport Research Forum Proceedings, Perth, Australia, 2023.
- Gannett A, Hooper P, Saunders J, Trapp GSA. TREK2School: The walkability of schools located in the Perth Metropolitan Area: preliminary findings report, Telethon Kids Institute, UWA, 2022.
- Gannett A, Hooper P, Saunders J, Trapp GSA. TREK2School: A review of the international scientific literature on active school transport interventions, Telethon Kids Institute, UWA, 2022.
- Gannett A, Hooper P, Saunders J, Trapp GSA. Project Plan - TREK2School: Creating an evidence base to inform targeted interventions to increase active school transport in primary and secondary school students in Perth, Western Australia, 2022.

Awards

- Gannett A. Winner - National iMOVE video competition
- Gannett A. Stan and Jean Perron Top-up Scholarship Award ($40,000)
- Gannett A. Friends of Telethon Kids Institute Travel Award ($2,500)
- Gannett A. Population Health Congress Scholarship, Public Health Association of Australia ($525)

Other

- School Walkability Web Portal shared with Steering Committee
- Internships for 4 undergraduate students through the UWA McCusker Centre for Citizenship

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1. Background

1.1. Declining rates of AST

Studies within Australia have documented a decline in AST among students over the past 40 years (Figure 1) (1–3). Current estimates of AST prevalence in Australia vary widely and there is a lack of consistent monitoring and comparable national data (4). Estimates of current AST rates in Australia range from 19-53% for primary school students and 28-45% for secondary school students (5).

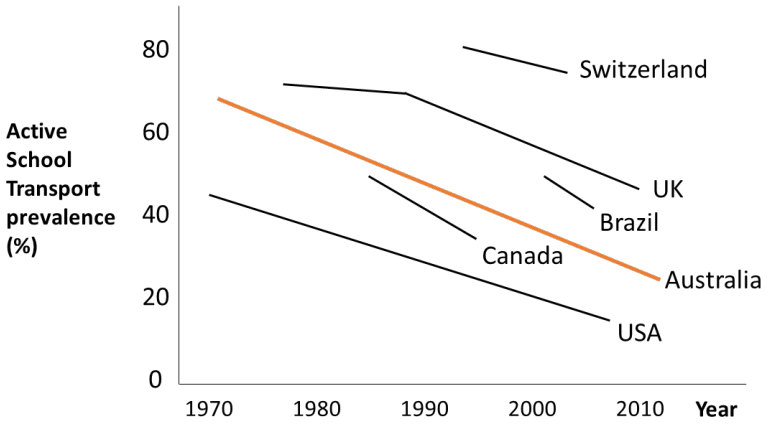

Figure 1. Global declining prevalence of AST (6)

In Perth, Western Australia, rates of AST are among the lowest of all capital cities within Australia and internationally. The 2007 TREK Project conducted a comprehensive assessment of AST in Perth primary school children and found that only 28% used AST 3 or more days a week (7). More up-to-date data is needed to understand trends in Perth AST among primary and secondary school students.

1.2. Why focus on AST in Perth?

Perth is a city with a population of 2.1 million people characterised by a low population density (346 people per km2) and conventionally designed neighbourhoods with large block sizes and low network connectivity (8,9). These characteristics have perpetuated dependency on private motor vehicles and discouraged more active forms of transport such as walking, cycling and public transport use (10,11). Car ownership among Perth residents has also increased significantly over the past 20 years, thus continuing reliance on motor vehicle transport (12).

School travel constitutes an estimated 18.4% of morning peak traffic in the Perth metropolitan area, accounting for about 250,000 car trips on Perth roads daily (13). These school car trips produce approximately 386,000 tonnes of carbon dioxide over the course of a year (13,14). The annual economic cost of car travel to school in Perth is currently over $186 million, consisting of travel time, vehicle operating costs and road crashes (13). Given the unique context of Perth, initiatives to increase AST are warranted and need to be informed by a robust empirical evidence base.

1.3. The 2007 TREK Project

In 2005-2008 Professor Billie Giles-Corti led a National Health and Medical Research Council funded research grant in partnership with the WA Department of Transport (DOT). This research grant funded the Transport, Environment, and Kids (TREK) project, hereafter referred to as the 2007 TREK Study,

to investigate AST among government primary school students in years 5-7. The 2007 TREK Study is still the most comprehensive AST project conducted in Perth to-date. Beginning in 2005, TREK consisted of two phases: (1) creating a school walkability index to examine the walkability within a 2km radius surrounding all Perth government primary schools (n=238); and (2) conducting a cross-sectional survey of year 5-7 children and their parents attending 12 of the most walkable and 12 of the least walkable schools in Perth to assess AST prevalence, travel preferences and the individual, social and environmental factors associated with AST (15).

1.3.1. Key findings of the 2007 TREK Study

The 2007 TREK Study found that the walkability (i.e., high pedestrian connectivity and low traffic exposure) of the neighbourhood surrounding government primary schools in Perth was lower in low socioeconomic status (SES) areas compared to high SES areas. It also found that more than half (51%) of Perth government primary schools were below the recommended target for pedestrian connectivity set by the WA Planning Commission. Additionally, 7% of Perth government primary schools were surrounded by high traffic volumes, with schools located in low SES areas more likely to be surrounded by high traffic volume roads. Walkability of the neighbourhood surrounding Perth government primary schools was found to be a significant correlate of AST, with students 7.4% more likely to regularly use AST if they attended a school located in a highly walkable neighbourhood compared to students attending a school located in a low walkable neighbourhood (11).

The 2007 TREK survey results showed a strong latent demand for AST: 45% of students wanted to cycle to school, but only 17% of boys and 7% or girls cycled to school regularly, and 39% of students wanted to walk to school, but only 31% of girls and 24.4% of boys walked to school regularly (15). Parents/carers underestimated their child's preference for walking or cycling to school, meaning fewer parents/carers perceived that their child's preferred mode of transport was walking or cycling than what the actual preferred mode of transport was for each child. Parent-perceived urban design factors such as busy traffic, crossing a busy road, distance, steep hills and a lack of safe crossings and footpaths were negatively associated with AST (7,16).

1.3.2. Changes since the TREK study

Significant built environment and cultural changes have occurred in Perth over the past 15 years since the 2007 TREK Study. Mobile phone use has increased dramatically among parents/carers and students and has potential to influence AST by alleviating safety concerns (17). COVID-19 may also have impacted AST prevalence by shifting parent/carer working patterns or changing perceptions of public transport safety (21,29). Understanding if and how parent and student perceptions about AST may have shifted as a result of these factors may help guide AST interventions in Perth.

Since the 2007 TREK Study, more than 40 new government primary schools have been built in Perth. In 2022-2023, another five new primary schools and one new secondary school are scheduled to be built to meet increased demand (18). With the school-aged population of Perth expected to increase from 400,000 to 490,000 students over the next decade, increased vehicle traffic will present safety issues both for drivers and pedestrians in addition to increased environmental and infrastructure costs (13). The scope of the 2007 TREK Study did not include secondary schools, but according to the WA Planning Commission and the WA Department of Planning, Lands, and Heritage's report, 'Perth@3.5 million sub-regional plan', up to 32 new high schools will be required in the metropolitan area over the coming decades (19). Therefore, more information about school walkability, AST prevalence, student AST preferences, and parent and student perceptions about AST are needed at secondary schools in Perth. The data from the 2007 TREK Study continues to be valuable to city and transport planners, but the metrics are now outdated to inform future AST interventions in Perth. The DOT have expressed a need for updated and expanded metrics on school walkability, prevalence of AST, preferences for AST, and parent and student concerns about AST to meet key policy objectives and to help inform current and future initiatives to increase AST around Perth (13).

1.4. Project Objectives

The overall aim of this project was to create a robust evidence base to inform future AST interventions which are specific to the Perth context through the identification of Perth schools and neighbourhoods with the greatest need for connectivity improvements, safety treatments, and programs to address parental concerns, as well as any other insights for increasing the rates of walking and riding to school.

The objectives of the research were to:

- Objective 1. Review current international evidence on AST interventions and their effectiveness.
- Objective 2. Assess the walkability of the immediate environment surrounding all Perth schools (n=655) in 2021, and whether it differs by Socio Economic Status (SES) and school type (i.e. primary, secondary and K-12).
- Objective 3A. Investigate AST prevalence, latent demand for AST, barriers of AST (including parental/child perceived safety concerns), enablers of AST and attitudes towards AST in primary and secondary school children attending Perth schools located in the most and least walkable school neighbourhoods.
- Objective 3B. Investigate changes over time (2007 vs 2021) in AST prevalence, latent demand for AST, barriers of AST (including parental/child perceived safety concerns), enablers of AST and attitudes towards AST in primary school children attending Perth schools located in the most and least walkable school neighbourhoods.
- Objective 4. Use the research findings from Objectives 1-3 to determine what behavioural and infrastructure-based interventions are needed to increase AST in Perth school children.

This final report is organised by Project Objective. Objectives 1 and 2 are included in the current report, but these were originally submitted to the Department of Transport and iMOVE as part of Milestone 2 on 29 April 2022. The background, method, and preliminary results for Objectives 3A and 3B are combined in the current report. Objective 4 is presented as a summary of the key findings from Objectives 1-3.

2. Objective 1: Review of international evidence on AST

2.1. Introduction

2.1.1. Active School Transport

Active School Transport (AST) includes any active mode of travelling to or from school, the most common being walking or riding a bike. AST represents one of the key contributors to overall physical activity in children (20,21). Other health benefits of AST in children include improved emotional health (22), increased social health (23), improved cognition (24,25) and increased independence (26). Furthermore, reductions in car use associated with AST lead to reduced traffic congestion, improved pedestrian safety, improved air quality, reduced noise pollution, and increased community liveability (27,28). Economic benefits of AST include reductions in costs associated with traffic (i.e. road crashes and travel time) and health (13). Thus, the more students that use AST, the more health, environmental, and economic benefits are realised.

2.1.2. Declining rates of AST

Concerningly, Western countries have experienced consistently declining rates of AST over the past 40 years (3,6). For example, rates of AST have declined by 23% from 1975-2012 in the UK (6) and by 38% from 1969-2001 in the US (29). These declines are mirrored by increased rates of students being driven to school (27). Furthermore, the Global Physical Activity Report Card evaluated children's active transport prevalence (which include AST) across 47 countries and awarded an average score of D+ (meaning that less than 50% of students are using active transport), showing that there is considerable room for improvement (30).

Current estimates of AST prevalence in Australia vary widely and there is a lack of consistent monitoring and comparable data nationally (4). For example, estimates of current AST prevalence in Australia range from 19-53% for primary school students and 28-45% for secondary school students (5). Nevertheless, studies conducted in New South Wales, South Australia and Victoria have documented a decline in AST among students over the past 40 years (1–3). For example, self-reported frequency of walking and cycling to and from school per week declined significantly between 1985 and 2001 in Victoria (2). In New South Wales, self-reported prevalence of walking to school among children ages 10-14 years decreased from 44.2% in 1971 to 21.1% in 2003, while prevalence of driving to school increased from 12.2% to 47.8% over the same time period (3). In South Australia, the proportion of students who reported cycling to school 3 or more times per week decreased between 1985 and 2013 from 24.7% to 5.1% for males aged 10-12 years and from 12.6% to 3.8% for females aged 10-12 years (1).

In Perth, Western Australia, rates of AST appear to be among the lowest of all capital cities within Australia and internationally, with only 28% of Perth primary school students reporting regularly using AST (defined as 6 trips or more per week) in 2007 (15). More recently, preliminary household travel survey data from 2018 found only 20% of Perth students use AST (14). These low rates of AST are despite the majority of Perth students living less than one kilometre away from school (31).

2.1.3. How can we increase AST?

Addressing the declining rates of AST requires a theoretical understanding of the factors influencing AST behaviour. The dominant theory of health behaviour is Bronfenbrenner's ecological model, which posits that a series of proximal processes ranging from family members up to neighbourhood and school environments and government policies influence an individual child's behaviour (32). Various individual, social, environmental, and policy factors have been cited in the scientific literature to be associated with AST (33–35). As such, it is important that future AST interventions target these influencing factors (Figure 2).

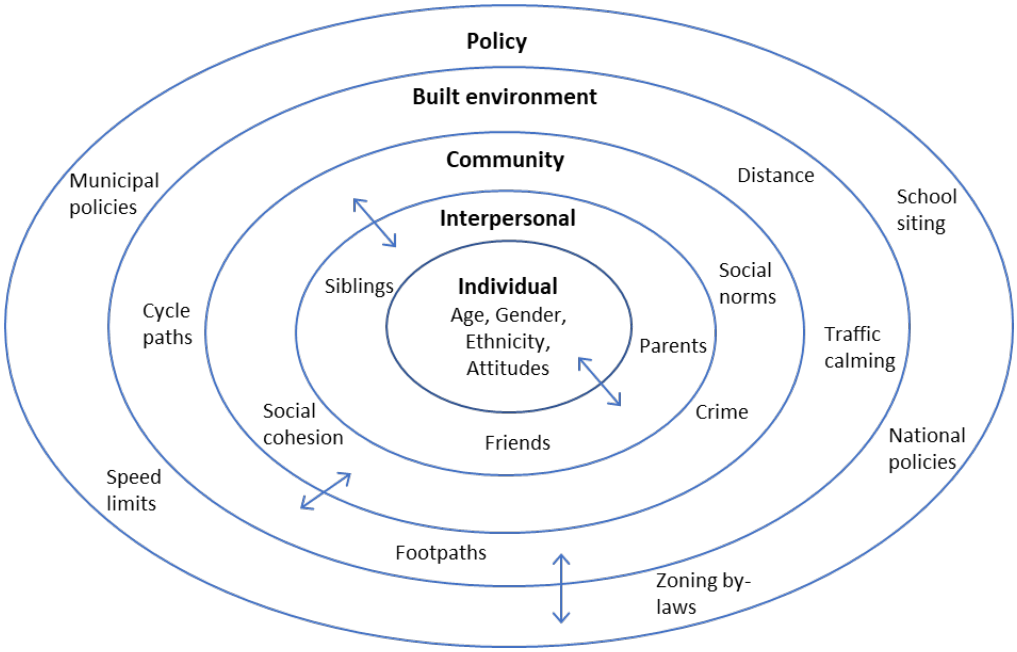

Figure 2. Ecological model showing factors influencing AST (36)

A large number of interventions aiming to increase AST have been conducted worldwide, with mixed results. Understanding what interventions have been trialled and which ones have been successful will help to inform future AST policy and practice. Additionally, understanding how well these interventions have been evaluated will help inform best practice for future AST interventions in Australia.

2.1.4. Aim and Objectives

The aim of this report is to review the international scientific literature to identify and describe what AST-related interventions have been performed worldwide, how well have they been evaluated and how effective have they been at increasing AST.

2.2. Method

2.2.1. Search process

The literature search was conducted in January 2022 using the Pubmed and Web of Science databases. The Boolean search terms used for each database included:

(((adolescen* OR child OR children OR youth OR student* OR pupil OR pupils) AND (bike OR bikers OR biking OR bicycle* OR cycle OR cycling OR cyclist* OR commute* OR commuting OR transportation OR travel*)) AND (intervention* OR implement* OR evaluat* OR change OR pilot OR project OR environment* OR engineer* OR encourage* OR planning OR impact OR “walk to school” OR “Safe Routes to School” OR “walking school bus” OR “walking school bus” OR “walking school buses”)) AND (school) OR (review)

To identify relevant articles, all titles and abstracts were initially screened by two members of the research team independently. From this initial short-list, the full text version of each article was then reviewed to ensure it met inclusion criteria. Any discrepancies between the two reviewers were discussed and resolved by consensus.

2.2.2. Inclusion criteria

The following criteria was used to select relevant articles:

- A focus on an AST intervention (note: interventions focusing on active transport to kindergarten or university were not included)
- Inclusion of at least one outcome measure (e.g., AST/active transportation, physical activity)

2.2.3. Data extraction

The following information was extracted from each relevant article:

- Location (i.e., country) of the intervention.
- The sample or target population (if reported)
- Intervention classification based on category labels used in previous AST research developed from the Active Living by Design Community Action Model (37,38): Preparation (e.g. school travel planning), Promotions (e.g. walk or cycle to school days), Programs (e.g. walking school buses), Policies (e.g. parking planning), and Physical (e.g. new footpaths, bike racks) (39). Interventions could be classified as more than one category if multiple components were incorporated.
- The research method/s used to collect evaluation data (e.g., questionnaires, accelerometers)
- The results of the intervention (as they relate to AST participation)
- The effectiveness of the intervention (i.e., whether it increased AST or physical activity levels)
- Effect size of the intervention was classified as “trivial”, “small”, “moderate”, “large”, or “very large” using Cohen’s d measure of effect size (40) (if reported).
- Quality of the intervention was classified as “weak”, “moderate” or “strong” using the Effective Public Health Practice Project (EPHPP) Quality Assessment (QA) Tool (if reported) (41).

2.3. Results

2.3.1. Search results

We identified 8 review papers that had been published previously on this topic – Table 1 (i.e., 8 literature reviews detailing what AST interventions have been conducted to date internationally). Between them, they contained a total of 58 articles covering 56 AST interventions (after removing duplicates and articles that did not meet the inclusion criteria).

We identified a further 11 articles covering 11 AST interventions that had not been included in the 8 review papers (primarily because the 8 review papers only covered up to the year 2017 and our search was performed in 2022).

All 67 AST interventions are summarised individually in Appendix A.

Table 1. Previously published literature reviews of active school transport interventions included in the present review

First author surname and year published	Title of the published literature review	Number of articles and interventions reviewed
Schönbach et al 2020 (42)	Strategies and effects of school-based interventions to promote active school transportation by bicycle among children and adolescents: a systematic review *(includes all articles published between* 2000 – 2019)	9 articles (covering 7 interventions)
Jones et al 2019 (43)	Interventions promoting active transport to school in children: A systematic review and meta-analysis *(includes all articles published prior to 2018 that focused on school-aged children (4 to 11 years)*	17 articles (covering 17 interventions)
Buttazzoni et al 2018 (44)	Active School Travel Intervention Methodologies in North America: A Systematic Review *(includes all articles published between January 2010 – March 2017 that focused on school-aged children and adolescents (5-19 years))*	22 articles (covering 22 interventions)
Larouche et al 2018 (45)	Effectiveness of active school transport interventions: a systematic review and update *(includes all articles published between February 2010 – October 2016 that focused on school-aged children and adolescents (5-18 years))*	27 articles (covering 30 interventions)
Villa-Gonzalez et al 2018 (38)	Systematic review of interventions for promoting active school transport *(includes all articles published* between February 2010 – December 2016 that focused on school-aged children and adolescents (5-18 years)	23 articles (covering 23 interventions)
Pang et al 2017 (46)	Promoting active travel to school: A systematic review (2010-2016) *(includes all articles published between* 2010 – 2016)	30 articles (covering 16 interventions)
Smith et al 2014 (47)	Walking School Buses as a Form of Active Transportation for Children—A Review of the Evidence *(includes all articles published between Feb 1, 2010-Oct 15 2016 that focused on walking school buses)*	12 articles (covering 12 interventions)
Chillon et al 2011 (37)	A systematic review of interventions for promoting active transportation to school *(includes all articles published prior to January 2010 that focused on school-aged children and adolescents (6-18 years)*	14 articles (covering 13 interventions)

2.3.2. Location of AST interventions

A summary of the countries where the 67 identified AST interventions took place is shown in Table 2. Most AST interventions were conducted in the USA (39%, n=26), followed by Australia (12%, n=8) and New Zealand (10%, n=7).

Table 2. Locations of AST interventions by country

Country	Intervention n (%)
USA	26 (39%)
AUS	8 (12%)
NZ	7 (10%)
Canada	6 (9%)
UK	6 (9%)
Spain	3 (4%)
Belgium	2 (3%)
Denmark	2 (3%)
Norway	2 (3%)
China	1 (1%)
Germany	1 (1%)
Ireland	1 (1%)
Netherlands	1 (1%)
Sweden	1 (1%)

2.3.3. Sample or target population of AST interventions

Table 3 summarises the age groups that the 67 identified AST interventions targeted. The majority of interventions (63%) targeted primary school students only, followed by a combination of both primary and secondary school students (28%). Only 9% of interventions targeted secondary school students. Note: Primary school students included up to Year 6 (or 12 years old if Year group was not reported) and secondary school students included Year 7 up to Year 12 (or 13 years old to 18 years old if Year group was not reported).

Table 3. Sample or target population of AST interventions

Sample/target population	Intervention n (%)
Primary school students only	42 (63%)
Secondary school students only	6 (9%)
Primary and secondary students	19 (28%)

2.3.4. Intervention classification

The classification and main components of the 67 identified AST interventions are summarised in Table 4. Program and promotion based AST interventions were the most common (both 63%), followed by physical (45%) and preparation (27%). Only six AST interventions were classified as policy (9%). Among the intervention main components, curriculum-based interventions were most common (27%, n=18), followed by awareness campaigns (21%, n=14).

Table 4. AST intervention classification and main components

Classification[a] (n, %)	Intervention	Main component[a] n (%)	Intervention article references
Program (n=42, 63%)	Curriculum-based	18 (27%)	(48–66)
	Walking School Bus	10 (15%)	(48,67–75)
	Bike skills and safety training	7 (10%)	(76–82)
	Bike Train	2 (3%)	(67,83)
	Drop-off zones	3 (4%)	(74,84,85)
	Crossing guards	2 (3%)	(81,86)
Promotion (n=42, 63%)	Awareness Campaign	14 (21%)	(55–59,62,63,70,83,86–89)
	Special Event Days	13 (18%)	(58,61–63,67,70,75,85,90–94)
	Competition/Incentives	12 (18%)	(23,49,56,57,65,67,87,89,95–97)
	Grant Program	2 (3%)	(64,87)
	Participatory parent mapping (Our Voice)	1 (1%)	(98)
Physical (n=30, 45%)	Traffic calming (devices and signage)	9 (13%)	(62,63,81,94,97,99–102)
	Shared path	7 (10%)	(60,75,81,101–104)
	Bike storage	5 (7%)	(60,87,94,101,102)
	Pedestrian crossings	8 (12%)	(57,61–63,89,99,100,104)
	Bike repair station	1 (1%)	(105)
Preparation (n=18, 27%)	Safe Routes to School	10 (15%)	(60,65,75,89,97,98,102,104,106,107)
	School Travel Planning	6 (9%)	(61–63,108–110)
	School planning	2 (3%)	(74,88)
Policy (n=6, 9%)	Whole-school physical activity policy	1 (1%)	(111)
	Complete Streets resolution	2 (1%)	(75,107)
	Restriction of school choice	1 (1%)	(112)
	Prohibiting on-site parking for drop-offs	2 (3%)	(62,63)

[a] Percentages do not add up to 100% because some interventions had multiple components

2.3.5. Research method/s used to evaluate AST intervention

The research method/s used to evaluate the 67 identified AST interventions are summarised in Table 5. Student self-report surveys were the most common method used for measuring AST participation (46%, n=31) followed by parent surveys (31%, n=21).

Table 5. Method of collecting data about AST participation among peer-reviewed articles

Research method used in intervention evaluation	Intervention[a] n (%)
Student self-report survey	31 (46%)
Parent survey	21 (31%)
Observation	11 (16%)
Accelerometers or pedometers	10 (15%)
Hands-up survey in classroom	10 (15%)
Travel diaries	6 (9%)
Physical activity test	3 (4%)
Radiofrequency tags	1 (1%)

[a]Does not add up to 100% because some studies used multiple methods for collecting data about AST participation or physical activity

2.3.6. Effectiveness of the intervention

The overall effectiveness of the 67 identified AST interventions is summarised in Table 6. Around two thirds (64%) of the interventions reported an increase in AST, walking, cycling or physical activity, whilst one third (34%) of the interventions had no effect on AST or physical activity.

Table 6. Results related to AST prevalence or frequency

Effect of the intervention on AST	Interventions n (%)
Increase in AST	28 (42%)
Increase in walking only	7 (10%)
Increase in cycling only	4 (6%)
Increase in physical activity	4 (6%)
No positive effect on AST or physical activity	23 (34%)
Not reported	1 (1%)

2.3.7. Effect size of the intervention

The overall effect size was reported using Cohen's d for 36 of the interventions (Table 7). Over half (58%) of the effect sizes reported were considered trivial. Only 3 interventions (8%) had an effect size of large (51,55,73).

Table 7. Effect size of AST interventions

Effect size (Cohen's d)	Interventions n (%)
Trivial	21 (58%)
Small	11 (31%)
Moderate	1 (3%)
Large	3 (8%)

2.3.8. Quality of the intervention

Quality was reported using the EPHPP quality assessment tool for 48 of the interventions (Table 8). Over three quarters of the interventions (81%) received a rating of weak.

Table 8. EPHPP global quality rating as reported by existing reviews of AST interventions

Quality rating	Interventions n (%)
Weak	39 (81%)
Moderate	2 (4%)
Strong	7 (15%)

2.4. Conclusion

This report summarised the research findings from 69 international peer-reviewed articles covering 67 AST interventions. To date, most AST interventions have been conducted in the USA and targeted primary school students only. Program and promotion-based AST interventions were the most common, followed by physical and preparation. Among the intervention main components, curriculum-based interventions were most common, followed by awareness campaigns. Whilst over half of the AST interventions reported an increase in AST and/or physical activity, the overall effect size of AST interventions was mostly trivial or small.

With over 80% of AST evaluations rated as weak in terms of quality, it is important that future studies employ a robust evaluation design. It is also important to note that this report was only able to identify AST interventions reported in the scientific peer-reviewed literature. Thus, there maybe other AST interventions that have been conducted and reported on outside of the peer-reviewed literature and are therefore not captured in this report.

3. Objective 2: Walkability around schools

A manuscript reporting on the results from Objective 2 was published in the academic journal GeoJournal in February 2024.

3.1. Introduction

Active School Transport (AST) includes any active mode of travelling to or from school, the most common being walking or riding a bike. AST represents one of the key contributors to overall physical activity in children (20,21). Other health benefits of AST in children include improved emotional health (22), increased social health (23), improved cognition (24,25) and increased independence (26). Furthermore, reductions in car use associated with AST lead to reduced traffic congestion, improved pedestrian safety, improved air quality, reduced noise pollution, and increased community liveability (27,28). Economic benefits of AST include reductions in costs associated with traffic (i.e. road crashes and travel time) and health (13). Thus, the more students that use AST, the more health, environmental, and economic benefits are realised.

Concerningly, fewer students walk and cycle to school than ever before (30), with several Australian studies documenting a steady decline in AST over the past 40 years (1–3). In Perth, Western Australia, rates of AST appear to be among the lowest of all capital cities within Australia and internationally, with only 28% of Perth primary school students reporting to regularly used AST (defined as 6 trips or more per week) in 2007 (15). More recently, preliminary household travel survey data in Perth from 2018 shows that only 20% of students use AST (14) despite the majority of students living less than one kilometre away from school (31). Clearly, there is considerable room for improvement in Perth student's AST.

A built environment that is supportive of AST is fundamentally important to encourage the consistent use of AST (15,34). Indeed, the 2007 TREK Study showed that school neighbourhood walkability in Perth (defined as high levels of pedestrian connectivity and low traffic volume exposure within a 2km radius of a school) was a significant predictor of AST, with students 7.4% more likely to regularly use AST (more than 6 times per week) if they attended a school located in a highly walkable neighbourhood compared to students attending a school located in a low walkable neighbourhood (11). Concerningly, school walkability was found to be socio-economically patterned, whereby primary schools located in low socioeconomic status (SES) areas had significantly lower walkability scores than primary schools located in high SES areas. This finding is consistent with a national study that measured the walkability within 1km of 7,133 Australian primary schools (113). Since the 2007 TREK Study, more than 40 new government primary schools have been built in Perth (114), warranting an update and expansion of the measurement of school walkability to include all schools (e.g., primary, secondary and K-12, government and non-government). In fact, there appear to be no studies in Australia that have assessed the walkability of secondary schools nor how walkability varies across socioeconomic gradients by school type (i.e., government vs non-government). Understanding how many and which type of schools are sited within unwalkable neighbourhoods is important to inform future built environment and behavioural interventions to support AST in Perth.

The aims of this part of the study, therefore, were to: (1) assess the walkability of all schools located in the Perth metropolitan area (n=651) in 2021; and (2) investigate whether school walkability differs by school socioeconomic status (low vs medium vs high) and school type (primary vs secondary vs K-12; government vs non-government). All spatial data layers detailing the walkability assessment results were made available to the WA Department of Transport and have also been provided in the form of an online web portal to spatially visualise the research results.

3.2. Method

3.2.1. School selection and location mapping

The names and addresses of all Perth metropolitan schools were identified using the WA Department of Education's, "Current list of Western Australian Schools" for 2021 (114) and geocoded in ArcGIS Pro (version 2.7.0) (115). Schools sites were mapped using the Landgate cadastre data layer (LGATE-217) (116). The centroid of each school cadastre was used as the access point location for each school. The following schools were excluded from analysis: Community Kindergartens, Education Support Centres, Specialist service schools (i.e. residential colleges, detention centres), schools not located in the Greater Metropolitan Perth statistical area (e.g. Christmas Island School), re-engagement schools, or schools that have subsequently closed (i.e. Riverlands Montessori). Schools were classified as being government or non-government based on the classifications outlined in the 2021 "Current list of Western Australian Schools". "Primary" schools had students in Year 6 or below. "Secondary" schools had students in Years 7 and above (to year 12). "K-12" schools had students across primary and secondary year groups.

3.2.2. School SES

The Index of Community Socio-Educational Advantage (ICSEA) score for each school in 2021 obtained from the MySchool website profile (117) was used to measure school SES (118). The ICSEA score provides a measure of relative advantage or disadvantage of the overall student community within each school and is based on student family background data, such as parent occupation, parent education, school geographic location and proportion of Indigenous students. Schools were separated into tertiles based on their ICSEA scores and classified as "High" (scores 1073-1237), "Medium" (scores 1010-1072) or "Low" (scores 653-1009) SES.

3.2.3. School walkability indices

The walkability within a 2km radius of all Perth schools (n=651) was assessed in a Geographical Information System (GIS). The School walkability index consisted of two components: (1) pedestrian connectivity; and (2) road traffic exposure, and replicated the methodology used in the 2007 TREK Study (11). This methodology is also consistent with walkability indices in other active transport studies involving children (7,119,120) and adults (121).

Pedestrian connectivity

Pedestrian connectivity is a measure of how well the routes that pedestrians can travel along, such as roads and pathways, are connected. It is an important component of 'walkability' impacting route directness and the overall distance required to travel to school (Figure 3) (122,123).

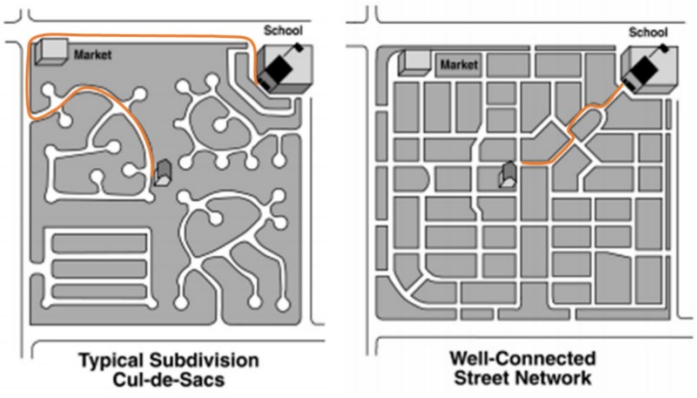

Figure 3. Examples of how pedestrian connectivity can impact walkability (32)

Pedestrian connectivity is expressed as a ratio of the pedestrian network area to the maximum possible area within a defined Euclidean (straight line/as the crow flies) distance. Pedestrian connectivity was calculated using a three-step procedure within GIS. First, a 'walkable service area' polygon was generated extending from the school point 2km along the pedestrian network in all directions. The area of each walkable service area was calculated. To determine the pedestrian network, the most recent version of the Open Street Map "roads" data layer (124) was used. This data layer contains roads (obtained from MainRoads), pathways and cut throughs (e.g., laneways and cut throughs through parks). Freeways and freeway entrance ramps were excluded from the layer due to pedestrian access limitations. Second, a Euclidean distance circular buffer was created using a 2km "as-the-crow-flies" buffer around the perimeter of each school cadastre, and the area within this buffer computed (referred to as the 'circular buffer area'). Figure 4 shows an example of a 'walkable service area' and a 'circular buffer area' surrounding a school. A buffer distance of 2km is considered a valid threshold for AST to capture the school catchment area and is aligned with previous studies (11,125). All 2km 'circular buffer areas' were clipped to major water bodies (>0.5 km2) using the Localities (LGATE_234) and Wetlands (DBCA_019) data layers due to these areas being inaccessible by pedestrians (i.e The Swan River, The Indian Ocean, Herdsman Lake, etc.) (126,127). Finally, the pedestrian connectivity score was calculated as the ratio of the 'walkable service area' divided by the 'circular buffer area'. A pedestrian connectivity score closer to 1 indicates a more connected street network.

The Western Australian Planning Commission (WAPC) has set a pedestrian connectivity score of >0.60 as the target for a walkable catchment area, meaning a minimum of 60% of the maximum possible 2km area around a school is accessible within a 2km walk or cycle (128).

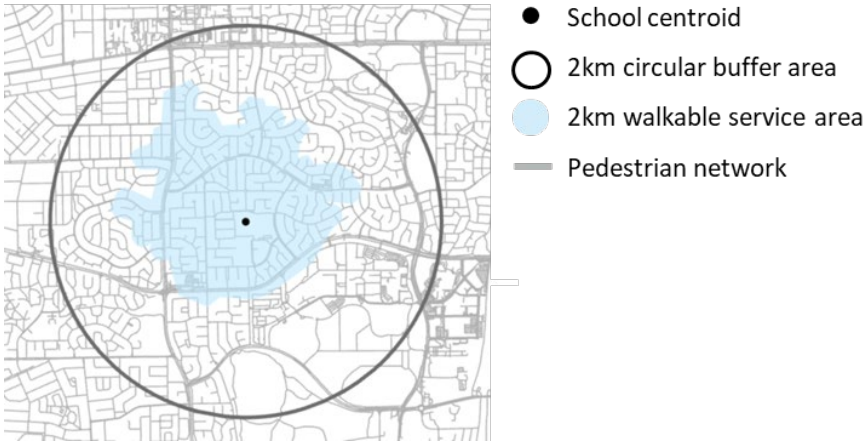

Figure 4. Example of the 2km 'circular buffer area' and 2km 'walkable service area' along the pedestrian network surrounding a school

Traffic Exposure

Traffic exposure is an important component of walkability. Exposure to high volumes of traffic can negatively impact AST by increasing safety concerns of both parents and children (129). In the UK, Panter et al. found a significant negative relationship between having a main road on the route between home and school and walking to school (123). Similarly, high traffic exposure along the school route has been shown to be negatively associated with AST in cross-sectional studies of Melbourne (130) and Perth school children (11) aged 10-12 years.

Traffic exposure was defined using the most current version of the Main Roads WA's Functional Road Hierarchy data layer (131). Within this dataset, roads are classified as either Primary Distributors (>15,000 vehicles/day), District Distributors (>6,000 vehicles/day), Local Distributors (<6,000 vehicles/day), and Access Roads (<3,000 vehicles/day) (132). Traffic exposure was calculated as the ratio of kilometres of Primary, District, and Local Distributor roads to kilometres of Access Roads (roads

suitable for bicycles and pedestrians) within the 2km 'walkable service area' of each school. This replicates the way traffic exposure was measured in the 2007 TREK Study and provides an indicator of how suitable the roads around the school are for walking and cycling. Figure 5 displays an example of traffic exposure surrounding a school.

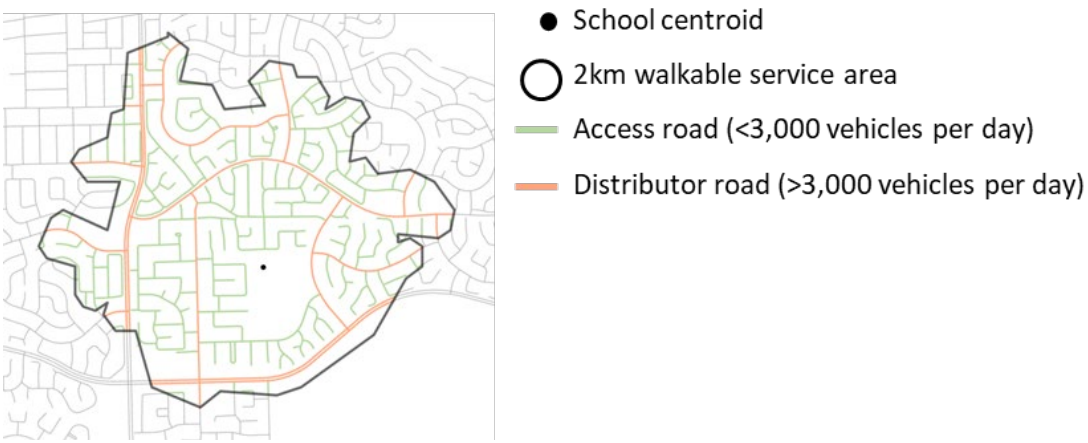

Figure 5. Example of how school traffic exposure is calculated based on Main Roads WA's 5unctional Road Hierarchy (131) within the 'walkable service area' of a school

Overall Walkability Score

The pedestrian connectivity and traffic exposure ratio scores were combined to create a walkability score for every Perth school (11). The pedestrian connectivity ratios were collapsed into deciles (1 = least pedestrian connectivity and 10 = most pedestrian connectivity). Traffic exposure ratios were collapsed into deciles and reverse-coded so that (1 = most traffic exposure and 10 = least traffic exposure) (11). The overall walkability score was the sum of the pedestrian connectivity and the traffic exposure deciles, resulting in a total walkability score ranging from 2 (least walkable) to 20 (most walkable).

3.2.4. Statistical Analysis

All spatial analysis was conducted using ArcGIS Pro (version 2.7.0) and all data analyses were conducted in R (version 4.1.2) using the tidyverse package (115,133,134). Descriptive statistics (mean, standard error, and proportion) were used to describe the proportion of schools that meet the Western Australian Planning Commission's target pedestrian connectivity ratio of 0.60 as well as pedestrian connectivity and traffic exposure ratios and walkability scores. Statistical tests (one way ANOVAs with post-hoc comparisons with Tukey's adjustment) were used to investigate any significant differences in: (a) pedestrian connectivity ratios; (b) traffic exposure ratios; and (c) walkability scores; by school SES and school type (i.e., primary/secondary/K-12, government/non-government). Odds ratios were used to compare the proportion of schools that met the WAPC pedestrian connectivity score target walkability scores by school SES and school type (i.e., primary/secondary/K-12, government/non-government). Schools that did not have an ICSEA score (n=10) (i.e. new schools or schools with small student populations where not enough data are available) were excluded from analyses involving SES as a measure.

3.3. Results

Appendix B presents the pedestrian connectivity, traffic exposure and overall walkability results for all Perth schools (n=651).

3.3.1. Pedestrian connectivity

Overall (all schools combined)

- The mean pedestrian connectivity ratio across all schools was 0.51, which is below the 0.60 target for a walkable catchment area set by the WAPC.
- Ratios across all schools ranged from 0.08 to 0.80
- One quarter of schools (26.2%) met the WAPC target for a walkable catchment area.

School Type

- Pedestrian connectivity did not significantly differ between primary schools (mean 0.52, range 0.09-0.80), secondary schools (mean 0.51, range 0.20-0.72), and K-12 schools (mean 0.49, range 0.08-0.73).
- Among primary schools, 26.9% met the WAPC target, compared to 26.4% of secondary schools and 21.8% of K-12 schools; however, there were no significant differences in the proportion of primary vs secondary vs K-12 schools that met the WAPC target for a walkable catchment area.
- Government school pedestrian connectivity (mean 0.51, range 0.09- 0.76) was not significantly different from non-government school pedestrian connectivity (mean 0.52, range 0.08-0.80).
- Non-government schools had a significantly higher odds of meeting the WAPC target for a walkable catchment area than government schools (32.7% versus 23.0%; OR 1.63, 95% CI 1.13, 2.35).
- Non-government primary schools had a significantly higher odds of meeting the WAPC target for a walkable catchment area than government primary schools (39.4% versus 23.4%; OR 2.1, 95% CI 1.3, 3.4).
- Non-government secondary schools had a significantly higher odds of meeting the WAPC target for a walkable catchment area than government secondary schools (41.4% versus 20.8%; OR 2.7, 95% CI 1.1, 6.8).

SES

- Overall, high SES schools had significantly higher pedestrian connectivity ratio scores (mean 0.58, range 0.17 – 0.80) compared with both medium (mean 0.49, range 0.08 - 0.73, P<.001) and low SES schools (mean 0.48, range 0.09 - 0.68, P<.001).
- High SES primary schools had significantly higher pedestrian connectivity scores (mean 0.59, range 0.19- 0.80) compared with medium SES schools (mean 0.50, range 0.17 – 0.69, P<.001) and low SES schools (mean 0.48, range 0.09 – 0.68, P<.001).
- High SES secondary schools had significantly higher pedestrian connectivity scores (mean 0.59, range 0.42 – 0.71) compared with medium SES schools (mean 0.50, range 0.20 – 0.72, P=.007) and low SES schools (mean 0.49, range 0.25 - 0.67, P<.001).
- High SES schools also had a significantly higher odds of meeting the WAPC target for a walkable catchment area than medium SES schools (52.1% versus 17.1%, OR 5.3, 95% CI 3.4,8.2) and low SES schools (52.1% versus 10.3%, OR 9.5, 95% CI 5.7,15.9).
- Medium SES schools had a significantly higher odds of meeting the WAPC target for a walkable catchment than low SES schools (17.1% versus 10.3%, OR 1.8, 95% CI 1.0,3.2).
- High SES primary schools had a significantly higher odds of meeting the WAPC target than medium SES primary schools (54.0% versus 17.9%, OR 5.4, 95% CI 3.2, 9.1) and low SES primary schools (54.0% versus 9.6%, OR 11.0, 95% CI 5.9, 20.5).

- Medium SES primary schools had a significantly higher odds of meeting the WAPC target than low SES primary schools (17.9% versus 9.6%, OR 2.1, 95% CI 1.0, 4.1).
- Among secondary schools, high SES secondary schools had a significantly higher odds of meeting the WAPC target than medium SES secondary schools (68.2% versus 18.8%, OR 9.3, 95% CI 2.6, 32.8) and low SES secondary schools (68.2% versus 14.0%, OR 13.2, 95% CI 4.0, 43.8).

3.3.2. Traffic exposure

Overall (all schools combined)

- The mean traffic exposure ratio for all schools combined (n=651) was 0.52 and ranged between 0.09 and 3.54.
- Half of all Perth schools (51.4%) had a traffic exposure ratio of 0.50 or less, meaning that the length of low traffic roads (<3,000 vehicles per day) was more than twice the length of the high traffic roads (>3,000 vehicles per day).

School Type

- Secondary schools (mean 0.58, range 0.16-2.34) had significantly higher traffic exposure ratio scores than primary schools (mean 0.50, range 0.09-1.65, P=.026).
- Non-government schools (mean 0.58, range 0.13-3.54) had significantly higher traffic exposure ratio scores than government schools (mean 0.50, range 0.09-1.42, P<.001)
- Non-government secondary schools had significantly higher traffic exposure ratio scores (mean 0.80, range 0.32-2.34) compared with non-government primary schools (mean 0.52, range 0.20-1.65, P<.001) and government secondary schools (mean 0.49, range 0.16 – 1.07, P<.001)

SES

- For all schools combined (n=651), there were no statistically significant differences in traffic exposure by level of school SES.
- Low SES secondary schools were found to have significantly lower traffic exposure ratio scores (mean 0.51, range 0.16 – 0.99) compared with high SES secondary schools (mean 0.75, range 0.32 – 2.34, P=.015).

3.3.3. Overall school walkability scores

Overall (all schools combined)

- For all schools combined (n=651), the mean school walkability score was 11, ranging from 2-20.

School Type

- No significant differences in walkability scores were found when comparing primary (mean 11.2, range 2-20), secondary (10.6, range 2-20) and K-12 schools (10.6, range 2-19).
- No significant differences were found when comparing government school walkability (mean 10.9, range 2-20) and non-government school walkability (mean 11.1, range 2-20).

SES

- On average, High SES schools had a significantly higher walkability score (mean 12.4, range 3-20) than medium SES (mean 10.5, range 2-20, P<.001) and low SES (mean 10.1, range 2-20, P<.001) schools.
- High SES primary schools had a significantly higher walkability score (mean 13.0, range 3-20) than medium SES primary schools (mean 10.5, range 2-19, P<.001) and low SES primary schools (mean 10.1, range 2-20, P<.001).

3.3.4. School Walkability Webmap

The school walkability scores have also been made available via a webmap which can be accessed at the following link:

https://uwa.maps.arcgis.com/apps/webappviewer/index.html?id=522c3cc473034fb79bbf9d246054ed70

The webmap allows the user to choose which walkability characteristics of schools they would like to view, including overall school walkability, traffic exposure ratio, pedestrian connectivity ratio, and WAPC connectivity target. Schools can also be viewed by type (i.e. primary, secondary, K-12, government, non-government) and SES level. Other layers that are available are the school intake areas, the WAPC activity centres, the walkable service areas for each school, pedestrian crossings, the Main Roads road hierarchy, and local government boundaries. Some examples of layers that can be viewed are included in Figure 6, Figure 7, and Figure 8. The webmap has been used by the WA Department of Planning, Lands and Heritage in their process of reviewing the Livable Neighbourhoods Design Guidelines (128).

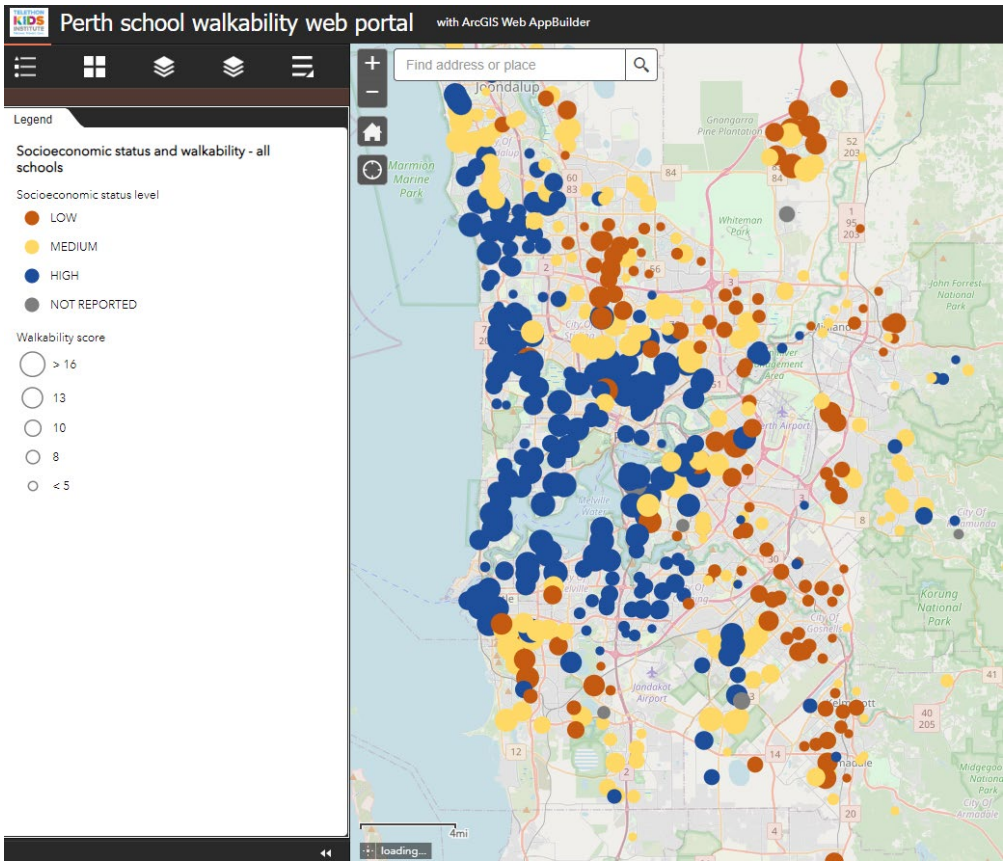

Figure 6. Webmap displaying school walkability (identified by colour) and socioeconomic status (identified by circle size)

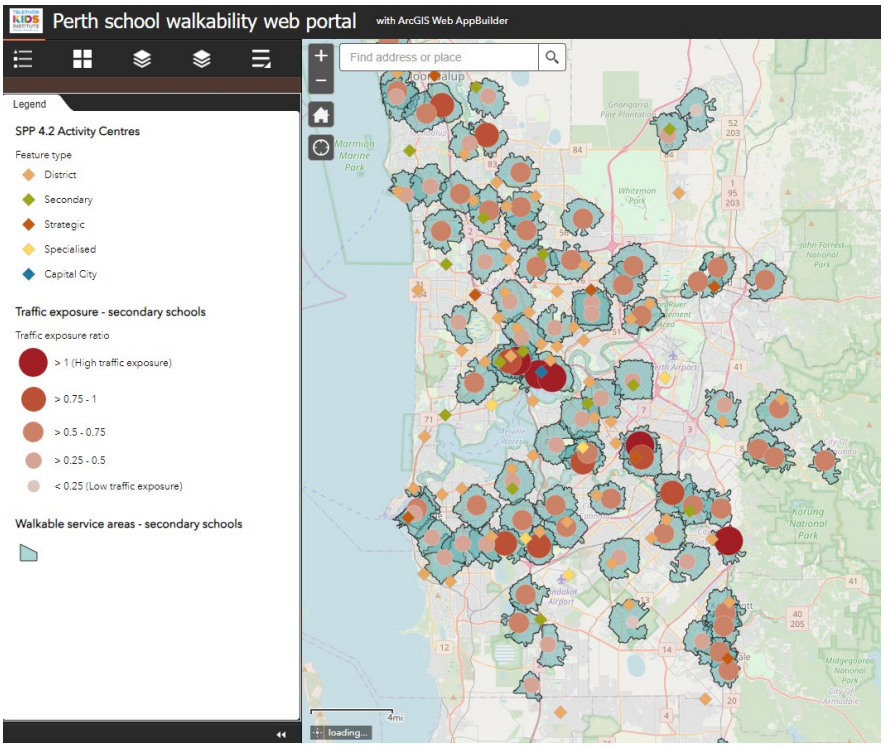

Figure 7. Webmap displaying traffic exposure ratios and walkable service areas for secondary schools along with WAPC activity centres.

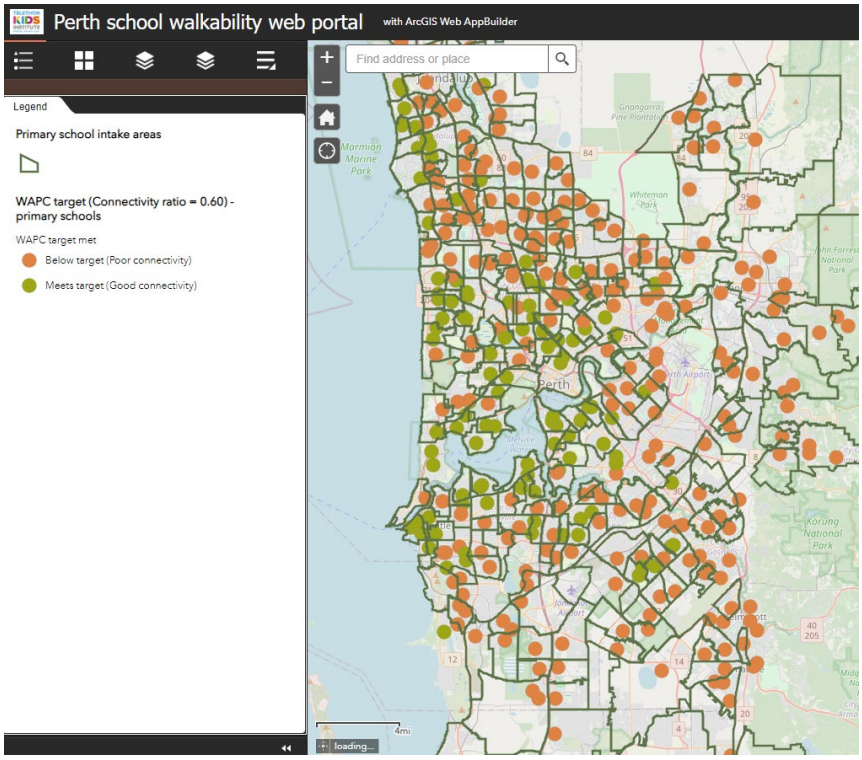

Figure 8. Webmap displaying primary schools meeting the WAPC target (connectivity ratio ≥0.60) and intake areas.

3.4. Conclusion

This study assessed the walkability of all schools located in the Perth metropolitan area (n=651) in 2021 and whether it differed by school socioeconomic status (low vs medium vs high) and school type (primary vs secondary vs K-12; government vs non-government). We found that a large proportion of Perth schools are surrounded by street networks that are disconnected, reducing the potential for more children to walk or cycle to school. Nearly one third of schools had connectivity ratios just below the WAPC's target ratio, showing that even minor connectivity improvements could benefit school neighbourhoods. Neighbourhoods surrounding higher SES schools were significantly more walkable than low or medium SES schools. No significant differences in walkability scores were found when comparing school type. Overall, the results highlight the importance of modifying the built environment in order to increase opportunities for children use an active form of transport to school. Increasing the connectivity of streets surrounding schools is important to maximise the number of children who have the potential to walk to school. However, this needs to be combined with siting future schools away from busy roads to reduce traffic exposure as well as reducing traffic speeds.

4. Objectives 3A and B: AST characteristics and change

4.1. Introduction

Numerous individual (e.g., age, gender, SES, car ownership), social (e.g., parent concerns, disapproval), and environmental (e.g., distance, traffic, footpaths) factors influence AST prevalence (125,135,136). AST participation peaks in early adolescence (10-12 years), but declines later in adolescence (129,137,138). However, few studies have evaluated factors influencing AST among adolescents [see reviews (45,135)]. Distance is another crucial element influencing AST; however, the acceptable range for the distance between home and school may differ by age, with older children capable of walking longer distances. Additionally, these thresholds may shift over time, as students today tend to travel shorter distances (125,139). Understanding which individual, social, and environmental factors are currently associated with AST in Perth and which may have shifted over time would help to identify up-to-date interventions that are best suited to increasing AST.

Safety concerns have consistently been shown to impact AST in Australia. A cross-continental review of environmental characteristics associated with AST found a positive relationship between perceived traffic safety and both walking and cycling to school in Australia (140). In Brisbane, AST was positively linked to parent-reported safe walking paths (137), while in Melbourne, parent reports of factors like few children around, no streetlights, and lack of crossings negatively correlated with AST participation in children aged 5-6 and 10-12 years (130). The 2007 TREK Study in Perth revealed that parents of non-AST users identified high traffic volume, crossing busy roads, and inadequate crossings/footpaths as safety concerns (15). They were also three times as likely to report that their child needed to cross a busy road on their route to school compared to parents of AST-users (15). Little is known about how these concerns may change over time or across subpopulations (age groups, and between parents/carers and students). In Perth, no study has comprehensively evaluated safety concerns among adolescents, how adolescent concerns may differ from those of younger students, or if safety concerns have changed over time among primary school students.

Significant built environment and cultural changes have occurred in Perth over the past 15 years that may have an impact on AST. For example, the increase in mobile phone use among parents and students has potential to influence AST by alleviating safety concerns (17), and shifting work patterns may also impact AST prevalence (141,142).

Existing studies in Australia have evaluated trends over time for frequency of AST use and correlates (3,143,144), but have not measured comprehensive environmental, social and individual factors at multiple timepoints. Understanding which individual, social and environmental factors are currently associated with AST in Perth would help to identify up-to-date interventions that are best suited to increasing AST.

In summary, few AST studies have been conducted with adolescents and no comprehensive study in Perth has evaluated individual, social, and environmental factors impacting AST among secondary school students. In addition, no study in Australia has evaluated shifts in individual, social and environmental factors related to AST over time. Given there are established differences in the factors impacting AST prevalence between children and adolescents, more research is needed to inform the types of interventions needed to increase AST in different age groups.

The objectives of this part of the study were to:

- Investigate AST prevalence, latent demand for AST, barriers of AST (including parental/child perceived safety concerns), enablers of AST and attitudes towards AST in primary and secondary school children attending Perth schools located in the most and least walkable school neighbourhoods.

- Investigate changes over time (2007 vs 2021) in AST prevalence, latent demand for AST, barriers of AST (including parental/child perceived safety concerns), enablers of AST and attitudes towards AST in primary school children attending Perth schools located in the most and least walkable school neighbourhoods.

4.2. Method

4.2.1. Data collection

Data collection was conducted in April-October 2023. For participating primary schools, an online self-report survey was completed by the school principal, Year 5 & 6 students and their parent/carer. For participating secondary schools, an online self-report survey was completed by the school principal, Year 7-12 students and their parent/carer.

Approval to conduct the TREK2School Study was obtained from the University of Western Australia Human Research Ethics Committee (ROAP Application Approval 2021/ET000413) and the WA Department of Education.

4.2.2. Survey instruments

A total of six online surveys were developed for the TREK2School Study:

1. Primary school student survey
2. Primary school parent/carer survey
3. Primary school principal survey
4. Secondary school student survey
5. Secondary school parent/carer survey
6. Secondary school principal survey

See Table 9 for a detailed list of survey items for each of the surveys. Survey items were focused around seven themes:

1. Transport mode
2. Socio-Demographic Factors
3. Individual level factors
4. Social level factors
5. Environmental level factors
6. Policy level factors
7. Perceived interventions needed at the school to increase AST

Most survey items replicated the 2007 TREK Study (15) to allow for comparison over time. Survey items that were newly developed are denoted by a footnote in Table 9.

The survey items were piloted with a convenience sample of n=21 secondary school students to ensure clarity and comprehension.

Table 9. Summary of constructs on the student, parent and principal surveys

Construct	Principal Survey	Parent/Carer Survey	Student Survey
Transport mode		Child's usual mode of transport to and from school	Usual mode of transport to and from school
Socio-Demographic Factors	Years worked at current school [1] Current position at the school [1]	- Age - Gender - Education - Occupation - Address - Car ownership - Adult home after school most days - Parent/carer transport mode for work	- Year level - Age - Gender
Individual level factors	- Student/parent commitments get in the way of walking/cycling to school - Perceives students prefer to drive to school - Perceives students have too much to carry	- Parent is confident in child's ability to walk/ride to school - Parent perceives child's preference is to walk/cycle to school - Parent's awareness of AST programs and activities (e.g. Your Move, Walk to School Days) - Parent supports the school encouraging students to walk/cycle to school - Parent thinks the school supports students walking/cycling to school [2] - Child's use of mobile phones during AST and impact on perceived safety [1] - Parent is fearful about children walking/riding in neighbourhood - Parent perceives high likelihood of their worst fears happening - Parent perceives AST is boring for child - Parent perceives AST makes child too hot and sweaty - Parent perceives child has too much to carry - Child doesn't know the way to school - Parent perceives it is not convenient for child to walk/cycle to school - Other commitments get in the way of their child walking/cycling to school	- Bike and scooter ownership / helmet use - Walking/cycling is preferred school travel mode - Thinks walking/cycling to school is cool - Confident in ability to use AST without an adult - Thinks their school supports walking/cycling - Has a provisional driver's license [1,3] - Perceives walking/cycling to school is boring - Perceives walking/cycling makes them too hot and sweaty - Doesn't know the way to school - Has too much to carry - Has scheduling commitments before/after school - Perceives it not to be convenient to walk/cycle to school - Mobile phone use during active commute, and impact on perceived safety [1]

Social level factors	- How cool students think it is to walk or cycle to school - Student/parent fear of stranger danger	- Parent perceives other parents allow their child to walk/cycle to school - Parent perceives they would experience disapproval from others (i.e., family, school, friends, peers) if they allowed their child to walk/ride to school [2] - Other children's behaviour - Perceives child is afraid of encountering bullies on the way to/from school - Risk of crime (e.g. getting assaulted, robbed) on the way to/from school	- Friends think it is cool to walk or ride to school - Friends walk or cycle to school - Friends live in same neighbourhood - Other children don't walk or cycle to school - Fear of encountering bullies when using AST - Fear of being a victim of crime when using AST
Environmental level factors	- School commute time - Distance from home to school - Steep hills en-route to school - Lack of bike/scooter storage at school - Traffic/busy roads en-route to school - Having to cross a busy road en-route to school - Road crossings are unsafe - Not enough footpaths - Students think that driver behaviour near school is poor - Level of shade en-route to school - Presence/absence of crossing guards	- Impact of COVID-19 on their family/child's AST habits [1] - Walking school bus operates in neighbourhood[2] - Child participates in Walking school bus[2] - School commute time - Distance from home to school - Steep hills en-route to school - Lack of bike/scooter storage at school - Traffic/busy roads en-route to school - Having to cross a busy road en-route to school - Road crossings are unsafe - Not enough footpaths - Poor driver behaviour - Level of shade en-route to school	- School commute time - Distance from home to school - Steep hills en-route to school - Lack of bike/scooter storage at school - Traffic/busy roads en-route to school - Having to cross a busy road en-route to school - Road crossings are unsafe - Not enough footpaths - Poor driver behaviour - Level of shade en-route to school - Presence/absence of crossing guards - Perceived safety in the area around school - Perceived safety in their home neighbourhood
Policy level factors	- School's current and past participation in Walking School Bus program [2] - School's participation in active transport programs (e.g. Your Move) - School encouragement for walking and cycling - School minimum age limits for AST [2] - School policy on students enrolling from outside of intake area [1]		

Perceived interventions needed at the school to increase AST	- Built environment interventions (e.g. crossing and footpath improvements) [1] - Educational interventions (e.g. bike education program) [1] - School policy interventions (e.g. More school support for walking and cycling) [1] - Positive incentives (e.g. student competitions or prizes for walking/riding) [1] - School programs and events (e.g. Walk to School Day, Your Move) [1]	- Built environment interventions (e.g. crossing and footpath improvements) [1] - Educational interventions (e.g. bike education program) [1] - School policy interventions (e.g. More school support for walking and cycling) [1] - Positive incentives (e.g. student competitions or prizes for walking/riding) [1] - School programs and events (e.g. Walk to School Day, Your Move) [1]	- Built environment interventions (e.g. crossing and footpath improvements) [1] - Educational interventions (e.g. bike education program) [1] - School policy interventions (e.g. More school support for walking and cycling) [1] - Positive incentives (e.g. student competitions or prizes for walking/riding) [1] - School programs and events (e.g. Walk to School Day, Your Move) [1]

1 Measure new for TREK2School Study; 2 Measure only included in primary school version; 3 Measure only included in secondary school version

4.2.3. School selection

2007 school selection

The methods used to select schools for the 2007 TREK Study are described fully elsewhere (15).

2023 school walkability and socio-economic status (SES)

The methodology of the school neighbourhood walkability measure is described in full as part of Objective 2. All Perth primary and secondary government schools were categorised as either high or low walkable and high, medium or low SES. School-level SES was determined by the 2021 Index of Community Socio-Educational Advantage (ICSEA) score (https://www.myschool.edu.au/). ICSEA is based on student family background data (i.e. parent occupation, parent education, school geographic location, and proportion of Indigenous students) and provides a measure of relative advantage or disadvantage of the overall student community within each school.

2023 primary school selection

The 25 Perth government primary schools that participated in the 2007 TREK Study were invited to participate in the 2023 TREK2School Study. If a 2007 TREK Study school did not agree to participate, a non-2007 TREK Study government primary school within the same stratification (walkability and SES) was randomly selected and contacted until a total of 23 government primary schools was obtained for the 2023 TREK2School Study.

2023 secondary school selection

Secondary schools were randomly selected following stratification by walkability and SES. If a selected school did not agree to participate, another government secondary school within the same stratification (walkability and SES) was randomly selected and invited. Nine Perth government secondary schools agreed to participate in the 2023 TREK2School Study.

2023 school response rates

A total of n=84 primary schools and n=64 secondary schools were invited to participate. The final number of schools that consented to participate were n=23 primary schools (27% response rate) and n=9 secondary schools (14% response rate).

2023 school recruitment

Initial contact with schools was made by calling the school and emailing information about the study to the school principal. One week after initial contact, a follow up email was sent to the school principal. Each school was offered an in-person principal information session to describe the project and answer any questions. Principals who agreed to have their school participate in the TREK2School Study were asked to complete and return the Principal Participant Consent Form to the research team.

4.2.4. Participant selection

2007 Participant selection

The recruitment methods used to select students in 2007 are described in detail elsewhere (15). The 2007 TREK Study included students in Years 5-7 (prior to Year 7 students being shifted to secondary school). However, to allow for direct comparison to 2023, only data from students in Year 5 and 6 from 2007 were included in this report.

2023 participant selection

Whilst our aim was to invite all students and their parent/carer in Years 5-6 at each participating primary school and all students and their parent/carer in Years 7-12 at each participating secondary school, some schools were not able to accommodate this. Below is a breakdown of which year groups were invited within participating schools.

- All Years 5-6 students and their parent/carer at 23 primary schools
- All Years 7-12 students and their parent/carer at 6 secondary schools
- All Year 7-10 students and their parent/carer at 1 secondary school
- Two classes per year level for Years 7-11 and their parent/carer at 1 secondary school
- Students attending an afternoon student club and their parent/carer at 1 secondary school

2023 participant recruitment

Parents and students were required to actively consent to participate. A parent/carer and child study information sheet and consent form were distributed to all invited students to read with their parent/carer. Schools had the option of sending a follow-up reminder email or text message to parents/carers once per week for two weeks after the study information and consent form was distributed. Parents were allowed to participate in the TREK2School Study without their child participating and vice versa.

4.2.5. Data collection

2007 data collection

The data collection procedure used in 2007 is described in detail elsewhere (15).

2023 principal survey

School principals from each participating school were asked to complete a 15-minute online principal survey at a convenient time, following the return of a signed principal consent form.

2023 parent survey

Participating parents/carers were asked to complete an online survey. The link to access the online parent survey was emailed to parents/carers of all students in Years 5-12 who indicated on the consent form that they would like to participate. For parents/carers who had multiple children attending the same school participating, the survey instructions stated that they only needed to complete a survey for their youngest participating child at the school. The research team contacted any parents who had not completed the survey with at least two reminders via email and at least one phone call.

2023 student survey

Participating students were asked to complete an online survey during class time under teacher supervision. Participating students were advised that they could withdraw at any time, the survey was not mandatory, and their responses would not impact their academic performance. Students who did not have parent/carer permission to participate completed other classwork during this time. The Project Coordinator offered to be at the schools on the day of the survey to provide additional support for teachers administering the survey, which occurred at n=4 schools (2 primary and 2 secondary). The research team asked parents of students who were not able to complete the survey in school to have their child complete the survey at home and were sent two reminders via email.

4.2.6. Data analysis

All data analyses were conducted using R (version 4.0) (145). Descriptive statistics (mean and proportion) were computed for demographic information; AST prevalence; student preferences for AST; and individual, environmental and social factors associated with AST and stratified by school type (primary and secondary) and by timepoint (2007 and 2023), where applicable. Data were only included from Year 5 and 6 students from 2007 to allow for direct comparison to data from Year 5 and 6 students from 2023.

4.3. Results

4.3.1. Characteristics of participating schools

Table 9 displays the characteristics of participating schools in TREK and TREK2School including SES level, school walkability score, pedestrian connectivity level, traffic exposure level, and whether the school was participating in the 'Your Move' program.

2007 TREK Primary school sample

- There was an even representation high and low walkable primary schools in 2007.

2023 TREK2School Primary school sample

- The 2023 sample of primary schools had more representation from high SES schools.
- There was an even representation high and low walkable primary schools in 2023.
- The 2023 primary schools had higher representation from high traffic schools.

TREK2School Secondary school sample

- There was an even representation high and low walkable primary schools in 2007.
- The secondary schools had higher representation from high traffic schools.

Table 10. Characteristics of participating schools

	TREK (2007)	**TREK2School (2023)**	
School characteristic	**Primary Schools n (%)**	**Primary Schools** n (%)	**Secondary Schools** n (%)
Total number of schools	25	23	9
SES			
Low	9 (36%)	8 (34.8%)	4 (44.4%)
Medium	8 (32%)	3 (13.0%)	2 (22.2%)
High	8 (32%)	12 (52.2%)	3 (33.3%)
Walkability			
Low	12 (48%)	11 (47.8%)	4 (44.4%)
High	13 (52%)	12 (52.2%)	5 (55.6%)
Pedestrian Connectivity			
Low	12 (48%)	11 (47.8%)	4 (44.4%)
High	13 (52%)	12 (52.2%)	5 (55.6%)
Traffic Exposure			
Low	13 (52%)	9 (39.1%)	3 (33.3%)
High	12 (48%)	14 (60.9%)	6 (66.7%)

School participates in the 'Your Move' program			
Yes	NA	8 (34.8%)	4 (44.4%)
No	NA	15 (65.2%)	5 (55.6%)

4.3.2. 2023 Participant recruitment summary

Table 11 displays the participant recruitment for each 2023 TREK2School participating primary and secondary school. The recruitment summary for the 2007 TREK is described elsewhere (15).

Table 11. Participant recruitment summary for 2023 TREK2School Study

School ID	School SES level	School Walkability	School participated in 2007 TREK Study	School participates in the 'Your Move' program	Total students invited n	Student surveys completed n (%)	Parent surveys completed n (%)
Secondary Schools							
1	Low	Low	N/A	No	522	34 (6.5%)	24 (4.6%)
2	Low	High	N/A	Yes	902	50 (5.5%)	35 (3.9%)
3	Medium	High	N/A	Yes	103	45 (43.7%)	22 (21.4%)
4	Low	Low	N/A	No	848	33 (3.9%)	38 (4.5%)
5	Low	Low	N/A	Yes	1085	56 (5.2%)	46 (4.2%)
6	Medium	Low	N/A	No	1245	71 (5.7%)	55 (4.4%)
7	High	High	N/A	No	2062	42 (2.0%)	40 (1.9%)
8	High	High	N/A	No	280	52 (18.6%)	66 (23.6%)
9	High	High	N/A	Yes	1263	67 (5.4%)	70 (5.5%)
Secondary School Total					***8,310***	***450 (5.4%)***	***396 (4.8%)***
Primary Schools							
10	High	Low	No	Yes	65	2 (3.1%)	9 (13.8%)
11	High	Low	No	No	92	28 (30.4%)	27 (29.3%)
12	Low	High	No	Yes	90	11 (12.2%)	9 (10%)
13	Medium	High	Yes	Yes	96	34 (35.4%)	18 (18.8%)
14	Low	Low	Yes	No	97	22 (22.7%)	10 (10.3%)
15	High	Low	No	Yes	134	46 (34.3%)	39 (29.1%)
16	High	Low	Yes	No	188	116 (61.7%)	45 (23.9%)
17	Low	High	No	No	104	25 (24.0%)	15 (14.4%)
18	Low	Low	Yes	No	74	18 (24.3%)	10 (13.5%)
19	High	Low	Yes	No	126	28 (22.2%)	25 (19.8%)
20	High	Low	Yes	No	123	31(25.2%)	32 (26.0%)
21	High	Low	No	Yes	88	51 (58.0%)	28 (31.2%)
22	High	High	Yes	No	100	20 (20.0%)	16 (16.0%)
23	Low	Low	Yes	No	89	50 (56.2%)	26 (29.2%)
24	Low	Low	Yes	Yes	46	18 (39.1%)	9 (19.6%)
25	High	High	Yes	No	85	23 (27.1%)	20 (23.5%)
26	High	High	No	Yes	99	19 (19.2%)	18 (18.2%)
27	Medium	High	No	No	188	27 (14.4%)	22 (11.7%)

28	Low	High	No	No	103	13 (12.6%)	11 (10.7%)
29	High	High	No	No	78	2 (2.6%)	8 (10.3%)
30	High	High	No	No	109	55 (50.5%)	44 (40.4%)
31	Low	Low	No	No	106	38 (35.8%)	22 (20.8%)
32	Medium	High	No	Yes	109	94 (86.2%)	18 (16.5%)
Primary School Total					***2,389***	***771 (32.3%)***	***481 (20.1%)***
All Schools Total					**10,699**	**1,221 (11.4%)**	**877 (8.2%)**

4.3.3. Participant demographics

Table 12 displays the demographics of the student participants in TREK and TREK2School including their year level, age, gender, and distance between home and school.

2007 TREK Primary school student sample

- There was an even representation of male and female students in 2007 among primary school students.
- In 2007, one-third (33.7%) of primary school students lived within 1km walking distance of school and 43.2% lived within a 1km-3km cycling distance to school.

2023 TREK2School Primary school student sample

- There was an even representation of male and female students in 2023 among primary school students.
- In 2023, one-third (32.2%) of primary school students lived within 1km walking distance of school and 43.2% lived within a 1km-3km cycling distance to school.

TREK2School Secondary school student sample

- There was an even representation of male and female students at secondary schools.
- Half (51.6%) of all secondary students lived within 3km of school.

Table 12. Student participant demographic information

	TREK (2007)	**TREK2School (2023)**	
	Primary school students n (%)	**Primary school students** n (%)	**Secondary school students** n (%)
Total number of students	915	771	450
Gender			
Female	459 (50.2%)	400 (51.9%)	192 (42.7%)
Male	456 (49.8%)	354 (45.9%)	236 (52.4%)
Non-binary	NA	7 (0.9%)	14 (3.1%)
Prefer not to say	NA	10 (1.3%)	8 (1.8%)
Year level			
5	388 (42.4%)	389 (50.5%)	-
6	527 (57.6%)	382 (49.5%)	-
7	-	-	116 (25.8%)
8	-	-	106 (23.6%)
9	-	-	81 (18.0%)
10	-	-	80 (17.8%)

11	-	-	51 (11.3%)
12	-	-	16 (3.6%)
Age Mean (SD)	10.5 (0.530)	10.5 (0.573)	13.9 (1.53)
Distance to school			
<1km	308 (33.7%)	248 (32.2%)	22 (4.9%)
1-2km	280 (30.6%)	255 (33.1%)	106 (23.6%)
2-3km	115 (12.6%)	78 (10.1%)	104 (23.1%)
3-4km	66 (7.2%)	33 (4.3%)	57 (12.7%)
4-5km	31 (3.4%)	22 (2.9%)	36 (8.0%)
>5km	54 (5.9%)	65 (8.4%)	124 (27.6%)
Missing data[1]	61 (6.7%)	70 (9.1%)	1 (0.2%)
Distance to school (km) Mean (SD)	1.99 (2.22)	2.22 (3.01)	4.52 (4.33)

1 Missing values have been included in this table because some survey items were completed by these students. Each table in this report shows the total number of respondents who completed each question.

Table 13 displays the demographics of parent/carer participants in TREK and TREK2School, including their gender, education level, and car ownership of parent participants.

2007 TREK parent of primary school student sample

- Most parent participants were female (84.6%) in 2007 at primary schools in 2007.
- Most (71.3%) parent participants worked in 2007, and of these two-thirds (71.8%) drove themselves to work.

2023 TREK2School parent of primary school student sample

- Most parent participants were female (78.4%) in 2023 at primary schools
- Parent participants were highly educated in 2023 at primary schools.
- Most (74.8%) primary school parent participants worked in 2023, and of these two-thirds (65.7%) drove themselves to work.

TREK2School parents of secondary school student sample

- Most parent participants were female (77.8%) in 2023 secondary schools.
- Parent participants were highly educated in 2023 at secondary schools.
- Most (76.3%) secondary school parent participants worked in 2023, and of these two-thirds (64.6%) drove themselves to work.

Table 13. Parent participant demographic information

	TREK (2007)	**TREK2School (2023)**	
	Parents of primary school students n (%)	**Parents of primary school students** n (%)	**Parents of secondary school students** n (%)
Total number of parents	833	481	396
Gender			
Female	705 (84.6%)	377 (78.4%)	308 (77.8%)
Male	104 (12.5%)	60 (12.5%)	59 (14.9%)
Prefer not to say/Non-binary	-	3 (0.6%)	6 (1.6%)
Missing[1]	24 (2.9%)	41 (8.5%)	23 (5.8%)
Parent age			
<35	118 (14.2%)	23 (4.8%)	9 (2.3%)

35-40	240 (28.8%)	63 (13.1%)	35 (8.8%)
40-45	248 (29.8%)	151 (31.4%)	91 (23.0%)
45-50	137 (16.4%)	116 (24.1%)	103 (26.0%)
50-55	37 (4.4%)	34 (7.1%)	70 (17.7%)
>55	11 (1.3%)	7 (1.5%)	21 (5.3%)
Missing/prefer not to say	42 (5.0%)	87 (18.1%)	67 (16.9%)
Parent education level			
Secondary school or less	377 (45.2%)	49 (10.1%)	53 (13.4%)
Trade or Certificate/Diploma	271 (32.5%)	127 (26.4%)	101 (25.5%)
Bachelor degree or higher	152 (18.2%)	257 (53.4%)	209 (52.8%)
Prefer not to say	1 (0.1%)	7 (1.5%)	10 (2.5%)
Missing	32 (3.8%)	41 (8.5%)	23 (5.8%)
Parent work			
Work for wage, payment or profit	594 (71.3%)	360 (74.8%)	302 (76.3%)
Unpaid or no work (i.e. home duties, student, retired)	209 (25.1%)	72 (15.0%)	56 (14.1%)
Prefer not to say	-	7 (1.5%)	15 (3.8%)
Missing	30 (3.6%)	42 (8.7%)	23 (5.8%)
Parent transport mode to work			
Do not work or study outside the home	134 (16.1%)	32 (6.7%)	20 (5.1%)
Public transport	59 (7.1%)	67 (13.9%)	53 (13.4%)
Drive self	598 (71.8%)	316 (65.7%)	256 (64.6%)
Driven by someone else	30 (3.6%)	10 (2.1%)	11 (2.8%)
Walk	49 (5.9%)	16 (3.3%)	34 (8.6%)
Bike	26 (3.1%)	16 (3.3%)	24 (6.1%)
Prefer not to say	-	1 (0.2%)	2 (0.5%)
Number of cars in the household			
0	11 (1.3%)	3 (0.6%)	2 (0.5%)
1	230 (27.6%)	92 (19.1%)	104 (26.3%)
2	429 (51.5%)	282 (58.6%)	178 (44.9%)
3	102 (12.2%)	39 (8.1%)	52 (13.1%)
4+	28 (3.3%)	16 (3.3%)	27 (6.9%)
Prefer not to say	-	6 (1.2%)	10 (2.5%)
Missing	33 (4.0%)	43 (8.9%)	23 (5.8%)

1 Missing values have been included in this table because some survey items were completed by these parents. Each table in this report shows the total number of respondents who completed each question.

4.3.4. How students travel to school

Table 14 displays the results of how students in TREK and TREK2School travelled to school. This included their usual mode of transport to and from school (defined as 1 or more trips per week), and their preferred mode of transport to and from school.

2007 TREK Primary school student sample

- The usual mode of transport to school was in the car (72.9% of students in 2007)
- Less than 1 in 10 (9.6%) of primary school students in 2007 would prefer to drive to school
- Two thirds (60.7%) of primary school students walked and one third (29.2%) of primary school students biked to school in 2007

2023 TREK2School Primary school student sample

- The usual mode of transport to school was in the car (75.9% of students in 2023)
- One quarter (24.3%) of primary school students in 2023 would prefer to drive to school
- Half (47.7%) of primary school students in 2023 walked to school at least once per week
- One third (31.9%) of primary school students biked to school

TREK2School Secondary school student sample

- The usual mode of transport to school was in the car (58.6% of students)
- 40.3% of secondary school children walked to school and 15.4% of secondary school children biked to school
- While 41.9% of secondary school students usually took a bus to school, only 10.0% of secondary school students would prefer to travel by bus to school

Table 14. Usual mode of transport to and from school (defined as 1 or more trips per week), and preferred mode of transport to and from school for primary and secondary school students

	TREK (2007)		**TREK2School (2023)**			
	Primary school students n (%) n=915		**Primary school students** n (%) n=771		**Secondary school students** n (%) n=450	
	Usual mode of transport to and from school n (%)[1]	**Preferred mode of transport to and from school** n (%)	**Usual mode of transport to and from school** n (%)[1]	**Preferred mode of transport to and from school** n (%)	**Usual mode of transport to and from school** n (%)[1]	**Preferred mode of transport to and from school** n (%)
Car	667 (72.9%)	88 (9.6%)	585 (75.9%)	187 (24.3%)	263 (58.6%)	178 (39.6%)
Bus	42 (4.6%)	11 (1.2%)	33 (4.3%)	19 (2.5%)	188 (41.9%)	45 (10.0%)
Train	(<1.0%)	9 (1.0%)	6 (0.8%)	6 (0.8%)	90 (20.0%)	23 (5.1%)
Walk	555 (60.7%)	323 (35.3%)	368 (47.7%)	247 (32.0%)	181 (40.3%)	107 (23.8%)
Bike	267 (29.2%)	436 (47.7%)	246 (31.9%)	246 (31.9%)	69 (15.4%)	64 (14.2%)
Scooter	19 (2.1%)	9 (1.0%)	77 (10.0%)	32 (4.2%)	16 (3.6%)	11 (2.4%)
Other	-	25 (2.8%)	-	34 (4.4%)	-	21 (4.7%)

1 These columns may not add up to 100% as some students may travel to and from school by more than one mode for 1 or more trips per week

Table 15 displays the mode of transport between the bus stop or train station and home for secondary school students in TREK2School who took the bus or train at least once per week.

TREK2School Secondary school student sample

- Among students who took the train, the majority walked or took the bus to the train station.
- Among students who took the train, the majority walked to the bus stop.

Table 15. Usual mode of transport to and from the bus and train among secondary students who travel to and from school by bus or train at least once per week

	Usual mode of transport to and from the train station n (%)[1]	**Usual mode of transport to and from the bus stop** n (%)[1]
Total number of students who travel to and from school by bus or train at least once per week	66	179
Usual mode of transport taken to get to the bus stop/train station		
Car	15 (22.7%)	28 (15.6%)
Walk	29 (43.9%)	120 (67.0%)
Bike/scooter	3 (4.5%)	5 (2.8%)
Bus	38 (57.6%)	22 (12.3%)

1 These columns may not add up to 100% as some students may travel to and from the bus or train by more than one mode of transport

4.3.5. Perceptions about walking to school

Table 16 displays the results relating to student perceptions of walking to school in TREK and TREK2School.

2007 TREK Primary school student sample

- Two thirds (65.4%) of primary school students in 2007 would not feel safe walking to school without an adult.
- One third (35.1%) of primary school students in 2007 would feel safer being driven to school compared to walking.

2023 TREK2School Primary school student sample

- Half (51.7%) of primary school students in 2023 would not feel safe walking to school without an adult.
- One third (36.7%) of primary school students in 2023 would feel safer being driven to school compared to walking

TREK2School Secondary school student sample

- Fewer than half (41.5%) of secondary school students would feel safer being driven to school compared to walking

Table 16. Student perceptions about walking to school

	Percentage who agree [1]		
	TREK (2007)	TREK2School (2023)	
	Primary school students n (%) n=915	Primary school students n (%) n=768	Secondary school students n (%) n=448
Safety and Independence			
I feel safer being driven to school than walking there	321 (35.1%)	282 (36.7%)	186 (41.5%)
I would feel safe walking to school without an adult present	317 (34.6%)	371 (48.3%)	287 (64.1%)
I am sure that I could walk to school without an adult present	677 (74.0%)	544 (70.8%)	-
I think walking to school is cool	476 (52.0%)	257 (33.5%)	91 (20.3%)
Convenience			
It takes too much time to walk to school	167 (18.3%)	211 (27.5%)	223 (49.8%)
Walking to school is easier for me than being driven	366 (40.0%)	192 (25.0%)	88 (19.6%)
Social Influence			
My friends think it is cool to walk to school	278 (30.4%)	140 (18.2%)	57 (12.7%)
My friends like to walk to get places	353 (38.6%)	211 (27.5%)	132 (29.5%)
My school would like students to walk to school	609 (66.6%)	322 (41.9%)	143 (31.9%)

1 Measured on a 5-point Likert-type scale coded 1 = strongly disagree and 5 = strongly agree then recoded into agree – yes (agree, strongly agree) or no (strongly disagree, disagree, neither, don't know/does not apply to me)

Table 17 displays the results relating to perceptions of walking to school among parents of primary school students in TREK and TREK2School.

2007 TREK parent of primary school student sample

- Most (83.0%) parents were confident that their child would be able to walk to school without an adult.
- Less than one in five (19.0%) of parents thought other parents would allow their child to walk to school without an adult.
- Half (51.0%) of parents would worry that something might happen if they allowed their child to walk to school without an adult

2023 TREK2School parent of primary school student sample

- Most (83.1%) parents were confident that their child would be able to walk to school without an adult.
- One third (30.7%) of parents thought other parents would allow their child to walk to school without an adult.
- Less than half (43.7%) of parents would worry that something might happen if they allowed their child to walk to school without an adult

Table 17. Primary school parent perceptions about walking to school

	Percentage who agree	
	TREK (2007)	**TREK2School (2023)**
	Parents of primary school students n (%) n=833	**Parents of primary school students** n (%) n=462
Parents of children in my child's class would allow their child to walk to school with other children, without an adult present [1]	158 (19.0%)	142 (30.7%)
It is irresponsible for parents to let their child walk to school with other children, without an adult present [2]	93 (11.2%)	26 (5.6%)
If I allowed my child to WALK to school with other children but without an adult present [2]		
Other parents would disapprove	104 (12.5%)	50 (10.8%)
The school principal would be concerned	64 (7.7%)	26 (5.6%)
Teachers at the school would be concerned	59 (7.1%)	27 (5.8%)
Members of my family would be concerned	200 (24.0%)	102 (22.1%)
I would worry that something might happen	425 (51.0%)	202 (43.7%)
I am confident that my child has/would have the ability to walk to school with other children, without an adult present [2]	691 (83.0%)	384 (83.1%)

1 Measured on a 5-point Likert-type scale coded 1 = none would and 5 = all would then recoded into allow- yes (many would, most would, all would) or no (none would, some would, Don't know/does not apply to me')

2 Measured on a 5-point Likert-type scale coded 1 = strongly disagree and 5 = strongly agree then recoded into agree- yes (agree, strongly agree) or no (strongly disagree, disagree, neither).

Table 18 displays parent of primary school students level of support for their child being encouraged to walk to school in TREK and TREK2School.

2007 TREK parents of primary school student sample

- Most parents were supportive or very supportive of their child being encouraged to walk to school

2023 TREK2School parents of primary school student sample

- Most parents were supportive or very supportive of their child being encouraged to walk to school

Table 18. Level of support for their child being encouraged to walk to school indicated by parents of primary school students

	TREK (2007)	TREK2School (2023)
	Parents of primary school students n (%) n=833	**Parents of primary school students** n (%) n=477
Very supportive	391 (46.9%)	251 (52.6%)
Supportive	246 (29.5%)	119 (24.9%)
Not very supportive		39 (8.2%)
Not supportive at all	73 (8.8%)	6 (1.3%)
Does not apply/live too far away	122 (14.6%)	62 (13.0%)

4.3.6. Perceptions about riding a bike to school

Table 19 displays student perceptions about riding a bike to school in TREK and TREK2School.

2007 TREK Primary school student sample

- Over half (58.8%) of primary school students would not feel safe biking to school without an adult.
- One third (30.8%) of students would feel safer being driven to school compared to biking.

2023 TREK2School Primary school student sample

- Over half (53.4%) of primary school students would not feel safe biking to school without an adult.
- Fewer than half (39.2%) of students would feel safer being driven to school compared to biking.

TREK2School Secondary school student sample

- Fewer than half (38.7%) of secondary school students would feel safer being driven to school compared to biking.

Table 19. Student perceptions about riding a bike to school

	Percentage who agree/strongly agree[1]		
	TREK (2007)	TREK2School (2023)	
	Primary school students n (%) n=915	Primary school students n (%) n=768	Secondary school students n (%) n=447
Safety and Independence			
I feel safer being driven to school than riding a bike there	282 (30.8%)	301 (39.2%)	173 (38.7%)
I would feel safe riding a bike to school without an adult present	377 (41.2%)	358 (46.6%)	255 (57.0%)
I am sure that I could bike to school without an adult present	689 (75.3%)	529 (68.9%)	-
I think riding a bike to school is cool	517 (56.5%)	280 (36.5%)	110 (24.6%)
Convenience			
It takes too much time to ride a bike to school	86 (9.4%)	98 (12.8%)	125 (28.0%)
Riding a bike to school is easier for me than being driven	423 (46.2%)	243 (31.6%)	94 (21.0%)
Social Influence			
My friends think it is cool to ride a bike to school	407 (44.5%)	217 (28.3%)	79 (17.7%)
My friends like to ride a bike to get places	501 (54.8%)	305 (39.7%)	124 (27.7%)
My school would like students to ride a bike to school	479 (52.3%)	316 (41.1%)	156 (34.9%)

1 Measured on a 5-point Likert-type scale coded 1 = strongly disagree and 5 = strongly agree then recoded into agree – yes (agree, strongly agree) or no (strongly disagree, disagree, neither, don't know/does not apply to me).

Table 20 displays perceptions about biking to school among parents of primary school students in TREK and TREK2School.

2007 TREK parents of primary school student sample

- Most (70.2%) parents were confident that their child would be able to bike to school without an adult.
- Less than one quarter (15.1%) of parents thought other parents in would allow their child to bike to school without an adult.
- Half (54.6%) of parents would worry that something might happen if they allowed their child to bike to school without an adult.

2023 TREK2School parents of primary school student sample

- Most (76.1%) parents were confident that their child would be able to bike to school without an adult.
- One third (26.2%) of parents thought other parents would allow their child to bike to school without an adult.
- Half (45.1%) of parents would worry that something might happen if they allowed their child to bike to school without an adult.

Table 20. Primary school parent perceptions about their child riding a bike to school

	Percentage who agree	
	TREK (2007)	**TREK2School (2023)**
	Parents of primary school students n (%) n=833	**Parents of primary school students** n (%) n=461
Parents of children in my child's class would allow their child to ride a bike to school with other children, without an adult present [1]	126 (15.1%)	121 (26.2%)
It is irresponsible for parents to let their child ride a bike to school with other children, without an adult present [2]	101 (12.1%)	32 (6.9%)
If I allowed my child to ride a bike to school with other children but without an adult present: [2]		
Other parents would disapprove	96 (11.5%)	48 (10.4%)
The school principal would be concerned	69 (8.3%)	24 (5.2%)
Teachers at the school would be concerned	65 (7.8%)	25 (5.4%)
Members of my family would be concerned	207 (24.9%)	107 (23.2%)
I would worry that something might happen	455 (54.6%)	208 (45.1%)
I am confident that my child has/would have the ability to ride a bike to school with other children, without an adult present [2]	585 (70.2%)	351 (76.1%)

1 Measured on a 5-point Likert-type scale coded 1 = none would and 5 = all would then be recoded into allow- yes (many would, most would, all would) or no (none would, some would, Don't know/does not apply to me')

2 Measured on a 5-point Likert-type scale coded 1 = strongly disagree and 5 = strongly agree then recoded into agree-yes (agree, strongly agree) or no (strongly disagree, disagree, neither).

Table 21 displays parent of primary school students' level of support for their child being encouraged to bike to school in TREK and TREK2School.

2007 TREK parents of primary school student sample

- Most parents were supportive or very supportive of their child being encouraged to bike to school

2023 TREK2School parents of primary school student sample

- Most parents were supportive or very supportive of their child being encouraged to bike to school

Table 21. Level of support for their child being encouraged to bike to school indicated by parents of primary school students

	TREK (2007)	TREK2School (2023)
	Parents of primary school students n (%) n=833	**Parents of primary school students** n (%) n=477
Very supportive	271 (32.5%)	213 (44.6%)
Supportive	247 (29.7%)	137 (28.7%)
Not very supportive	-	63 (13.2%)
Not supportive at all	205 (24.6%)	17 (3.6%)
Does not apply/live too far away	106 (12.7%)	47 (9.9%)

4.3.7. Perceptions about school and neighbourhood

Table 22 displays student perceptions about the area surrounding their school in TREK and TREK2School.

2007 TREK Primary school student sample

- Nearly half (46.7%) of primary school students in 2007 agreed that they would have to cross a busy road on the way to school.
- One quarter (25.7%) of primary school students did not agree that they would feel safe crossing the road near their school.

2023 TREK2School Primary school student sample

- Nearly half (49.2%) of primary school students in 2023 agreed that they would have to cross a busy road on the way to school.
- One third (33.2%) of primary school students in 2023 did not agree that they would feel safe crossing the road near their school.

TREK2School Secondary school student sample

- Over two thirds (69.6%) of secondary school students agreed that they would have to cross a busy road on the way to school.
- 41.4% of secondary school students did not think that they would feel safe crossing the road near their school.

Table 22. Student perceptions about the area surrounding their school

	Percentage who agree[1]		
	TREK (2007)	TREK2School (2023)	
	Primary school students n (%) n=915	Primary school students n (%) n=768	Secondary school students n (%) n=448
There is a lot of traffic outside my school	283 (30.9%)	274 (35.8%)	288 (64.4%)
I have to cross a busy road if I walk or ride a bike to school	427 (46.7%)	377 (49.2%)	311 (69.6%)
I would feel safe crossing the road near my school	680 (74.3%)	512 (66.8%)	262 (58.6%)
I feel safe in the pick up area at my school	673 (73.6%)	546 (71.3%)	297 (66.4%)
There are safe places to leave bikes at my school	708 (77.4%)	625 (81.6%)	319 (71.4%)

1 Measured on a 5-point Likert-type scale coded 1 = strongly disagree and 5 = strongly agree then recoded into agree – yes (agree, strongly agree) or no (strongly disagree, disagree, neither, don't know/does not apply to me).

Table 23 displays student perceptions about their neighbourhood in TREK and TREK2School.

2007 TREK Primary school student sample

- In 2007, one third (36.9%) of primary school students were worried about strangers in their neighbourhood.
- Most (69.9%) primary school students have friends in their neighbourhood.

2023 TREK2School Primary school student sample

- In 2023, one quarter (26.9%) of primary school students were worried about stranger in their neighbourhood.
- Most (63.8%) primary school students have friends in their neighbourhood.

TREK2School Secondary school student sample

- Half (51.0%) of secondary school students have friends in their neighbourhood.

Table 23. Student perceptions about their neighbourhood

	Percentage who agree[1]		
	TREK (2007)	**TREK2School (2023)**	
	Primary school students n (%) n=915	**Primary school students** n (%) n=766	**Secondary school students** n (%) n=447
There is a lot of traffic in my neighbourhood	196 (21.4%)	162 (21.1%)	125 (28.0%)
I am worried about strangers in my neighbourhood	338 (36.9%)	206 (26.9%)	93 (20.8%)
My neighbourhood is a nice place to walk around	672 (73.4%)	594 (77.5%)	307 (68.7%)
My neighbourhood is friendly	630 (68.9%)	571 (74.5%)	254 (56.8%)
You often see people out on walks in my neighbourhood	709 (77.5%)	612 (79.9%)	321 (71.8%)
I have many friends in my neighbourhood	640 (69.9%)	489 (63.8%)	228 (51.0%)

1 Measured on a 5-point Likert-type scale coded 1 = strongly disagree and 5 = strongly agree then recoded into agree – yes (agree, strongly agree) or no (strongly disagree, disagree, neither, don't know/does not apply to me).

Table 24 displays parent perceptions of their neighbourhood in TREK and TREK2School.

2007 TREK parent of primary school student sample

- In 2007, 43.0% of parents of primary school students agreed that there is a lot of traffic in their neighbourhood.

2023 TREK2School parent of primary school student sample

- In 2023, 57.1% of parents of primary school students agreed that there is a lot of traffic in their neighbourhood.

TREK2School parents of secondary school student sample

- In 2023, 59.0% of parents of secondary school students agreed that there is a lot of traffic in their neighbourhood.

Table 24. Parent perceptions about their neighbourhood

	Percentage who agree[1]		
	TREK (2007)	**TREK2School (2023)**	
	Parents of primary school students n (%) n=833	**Parents of primary school students** n (%) n=443	**Parents of secondary school students** n (%) n=376
I often see adults walking in our neighbourhood	755 (90.6%)	413 (93.2%)	333 (88.6%)
I often see children walking in our neighbourhood	655 (78.6%)	374 (84.4%)	322 (85.6%)
Our neighbourhood is friendly	603 (72.4%)	363 (81.9%)	286 (76.1%)
There is a lot of traffic in our neighbourhood	358 (43.0%)	253 (57.1%)	222 (59.0%)
Our neighbourhood is a nice place to walk around	622 (74.7%)	373 (84.2%)	291 (77.4%)
Drivers near the school often exceed the speed limit	516 (61.9%)	210 (47.4%)	192 (51.1%)

1 Measured on a 5-point Likert-type scale coded 1 = strongly disagree and 5 = strongly agree then recoded into two categories: disagree (strongly disagree, disagree, neither) or agree (agree, strongly agree)

4.3.8. Barriers to walking and cycling to school

Table 25 displays the perceived environmental, psychosocial and safety barriers to walking and cycling to school among students and parents in TREK and TREK2School.

2007 TREK parent of primary school student sample

- The main environmental barriers in 2007 were: having to cross busy roads, a lack of safe crossings and the volume of traffic near the school.
- In 2007, 14.5% of parents of primary school students agreed that their child has a lot to carry

TREK2School Secondary school student sample

- Over half (57.0%) of secondary school students agreed there were no safe crossings.
- Over half (53.8%) of secondary school students agreed that there is a lot of traffic near the school.
- 67.3% of secondary school students agreed that it was more convenient to drive on the way to somewhere else.

2023 TREK2School parent of primary school student sample

- Over half (58.8%) of parents of primary school students agreed that their child would have to cross a busy road on the way to school.
- In 2023, 35.9% of parents of primary school students agreed that their child has a lot to carry
- Two thirds (65.0%) of parents of primary school students agreed that there is a lot of traffic near the school.

TREK2School parents of secondary school student sample

- 37.5% of parents of secondary school students agreed that it was more convenient to drive on the way to somewhere else.
- Over half (53.5%) of parents of primary school students agreed that their child would have to cross a busy road on the way to school.
- Two thirds (63.0%) of parents of secondary school students agreed that there is a lot of traffic near the school.

Table 25. Parent and student perceptions about barriers to walking and cycling to school

	Percentage who agree [1]			
	TREK (2007)	TREK2School (2023)		
Perceived barrier to walking or biking to school	**Parents of primary school students** n (%) n=833	**Secondary school students** n (%) n=446	**Parents of primary school students** n (%) n=454	**Parents of secondary school students** n (%) n=376
Environment				
There are steep hills	82 (9.8%)	120 (26.9%)	69 (15.2%)	42 (11.2%)
The school is too far away	207 (24.9%)	207 (46.4%)	126 (27.8%)	162 (43.1%)
There are not enough footpaths	124 (14.9%)	76 (17.0%)	110 (24.2%)	103 (27.4%)
Would have to cross a busy road	340 (40.8%)	-	267 (58.8%)	201 (53.5%)
There are no safe crossings	244 (29.3%)	254 (57.0%)	188 (41.4%)	142 (37.8%)
There is a lot of traffic near the school	413 (49.6%)	240 (53.8%)	295 (65.0%)	237 (63.0%)
The route is boring along the way	-	202 (45.3%)	23 (5.1%)	45 (12.0%)
The route does not have good lighting along the way	-	45 (10.1%)	-	-
Planning/Psychosocial				
It involves too much planning ahead to bike	-	129 (28.9%)	81 (17.8%)	56 (14.9%)
No other children walk or bike	-	99 (22.2%)	99 (21.8%)	85 (22.6%)
Too hot and sweaty to walk or bike	-	200 (44.8%)	187 (41.2%)	142 (37.8%)
It is not considered cool to walk or bike	-	91 (20.4%)	186 (41.0%)	142 (37.8%)
Have a lot to carry	121 (14.5%)	195 (43.7%)	163 (35.9%)	216 (57.4%)
It is more convenient to drive on the way to somewhere else	321 (38.5%)	300 (67.3%)	229 (50.4%)	141 (37.5%)
Do not know the way to school	17 (2.0%)	-	41 (9.0%)	22 (5.9%)
Other commitments don't allow it	194 (23.3%)	-	175 (38.5%)	119 (31.6%)
Have commitments before school	-	-	76 (16.7%)	64 (17.0%)
Have commitments after school	188 (22.6%)	-	207 (45.6%)	155 (41.2%)
Safety				
It is unsafe because of crime to walk or bike	-	86 (19.3%)	70 (15.4%)	67 (17.8%)
Get bullied, teased, harassed along the way	-	26 (5.8%)	28 (6.2%)	60 (16.0%)
There is nowhere to leave a bike safely	-	-	32 (7.0%)	67 (17.8%)
There are stray dogs along the way	-	41 (9.2%)	34 (7.5%)	39 (10.4%)

1 Measured on a 4-point likert scale coded 1=Strongly disagree and 4=Strongly agree then recoded into two categories: disagree (somewhat disagree, strongly disagree, not applicable) and agree (somewhat agree, strongly agree)

4.3.9. Perceived fears related to walking or riding a bike among parents

Table 26 displays the perceived fears and likelihood of each fear happening among parents for their child walking or cycling to school in TREK and TREK2School.

2007 TREK parent of primary school student sample

- In 2007, 79.4% of parents of primary school students were fearful of their child being taken by a stranger

- In 2007, 74.8% of parents of primary school students were fearful of their child being hurt by a stranger
- In 2007, the majority (57.6%) of parents of primary school students were fearful of their child being injured while walking
- In 2007, three quarters (77.6%) of parents of primary school students were fearful of their child being injured while riding a bike

2023 TREK2School parent of primary school student sample

- In 2023, 56.8% of parents of primary school students were fearful of their child being taken by a stranger
- In 2023, 54.7% of parents of primary school students were fearful of their child being hurt by a stranger
- In 2023, the majority (58.6%) of parents of primary school students were fearful of their child being injured while walking
- In 2023, three quarters (75.9%) of parents of primary school students were fearful of their child being injured while riding a bike

TREK2School parents of secondary school student sample

- In 2023, 53.1% of parents of secondary school students were fearful of their child being taken by a stranger
- In 2023, 57.0% of parents of secondary school students were fearful of their child being hurt by a stranger
- In 2023, the majority (56.8%) of parents of secondary school students were fearful of their child being injured while walking
- In 2023, three quarters (69.0%) of parents of secondary school students were fearful of their child being injured while riding a bike

Table 26. Parent perceived fears and perceived likelihood of events happening while child is walking or biking to school

	TREK (2007)		TREK2School (2023)			
	Parents of primary school students		Parents of primary school students		Parents of secondary school students	
	Percentage who were fearful[1] n (%) n=833	**Percentage who think it is likely[2]** n (%) n=833	**Percentage who were fearful[1]** n (%) n=461	**Percentage who think it is likely[2]** n (%) n=456	**Percentage who were fearful[1]** n (%) n=384	**Percentage who think it is likely[2]** n (%) n=382
Be approached on the street by a stranger	679 (81.5%)	148 (17.8%)	309 (67.0%)	57 (12.5%)	244 (63.5%)	72 (18.8%)
Be taken by a stranger	661 (79.4%)	94 (11.3%)	262 (56.8%)	26 (5.7%)	204 (53.1%)	17 (4.5%)
Be bullied by children the same age	452 (54.3%)	174 (20.9%)	198 (43.0%)	47 (10.3%)	231 (60.2%)	83 (21.7%)
Be bullied by older children or teenagers	534 (64.1%)	217 (26.1%)	250 (54.2%)	67 (14.7%)	252 (65.6%)	99 (25.9%)
Be hurt by a stranger	623 (74.8%)	97 (11.6%)	252 (54.7%)	32 (7.0%)	219 (57.0%)	35 (9.2%)
Be injured in an incident when walking	480 (57.6%)	109 (13.1%)	270 (58.6%)	64 (14.0%)	218 (56.8%)	46 (12.0%)
Be injured in an incident when riding a bike	646 (77.6%)	191 (22.9%)	350 (75.9%)	102 (22.4%)	265 (69.0%)	76 (19.9%)
Be bitten by a dog	367 (44.1%)	91 (10.9%)	136 (29.5%)	32 (7.0%)	120 (31.3%)	25 (6.5%)
Get involved in shoplifting	130 (15.6%)	20 (2.4%)	34 (7.4%)	8 (1.8%)	69 (18.0%)	13 (3.4%)
Get involved with graffiti or vandalism	105 (12.6%)	17 (2.0%)	29 (6.3%)	8 (1.8%)	59 (15.4%)	10 (2.6%)
Get lost on the way to school	104 (12.5%)	22 (2.6%)	58 (12.6%)	22 (4.8%)	55 (14.3%)	18 (4.7%)
Cross the road unsafely	385 (46.2%)	103 (12.4%)	244 (52.9%)	81 (17.8%)	170 (44.3%)	58 (15.2%)
Engage in smoking/vaping	131 (15.7%)	17 (2.0%)	33 (7.2%)	10 (2.2%)	91 (23.7%)	21 (5.5%)
Take the day off school	92 (11.0%)	19 (2.3%)	30 (6.5%)	11 (2.4%)	67 (17.4%)	18 (4.7%)

1 Measured on a 5-point Likert-type scale coded 1=not at all fearful and 5 = extremely fearful strongly agree then recoded into two categories: not fearful (not at all fearful, not very fearful) and fearful (somewhat fearful, very fearful, extremely fearful)

2 Measured on a 5-point Likert-type scale coded 1= very unlikely and 5 = very likely then recoded into two categories: not likely (very unlikely, unlikely, unsure) and likely (likely, very likely)

4.3.10. Mobile phone usage and AST

Figure 9 displays the students in TREK2School who have a mobile phone.

2023 TREK2School Primary school student sample

- Among students who have a mobile phone, 60.8% (n=308) of primary school students have their phone with them on their journey to school.

TREK2School Secondary school student sample

- Among students who have a mobile phone, 96.6% (n=399) of secondary students have their phone with them on their journey to school.

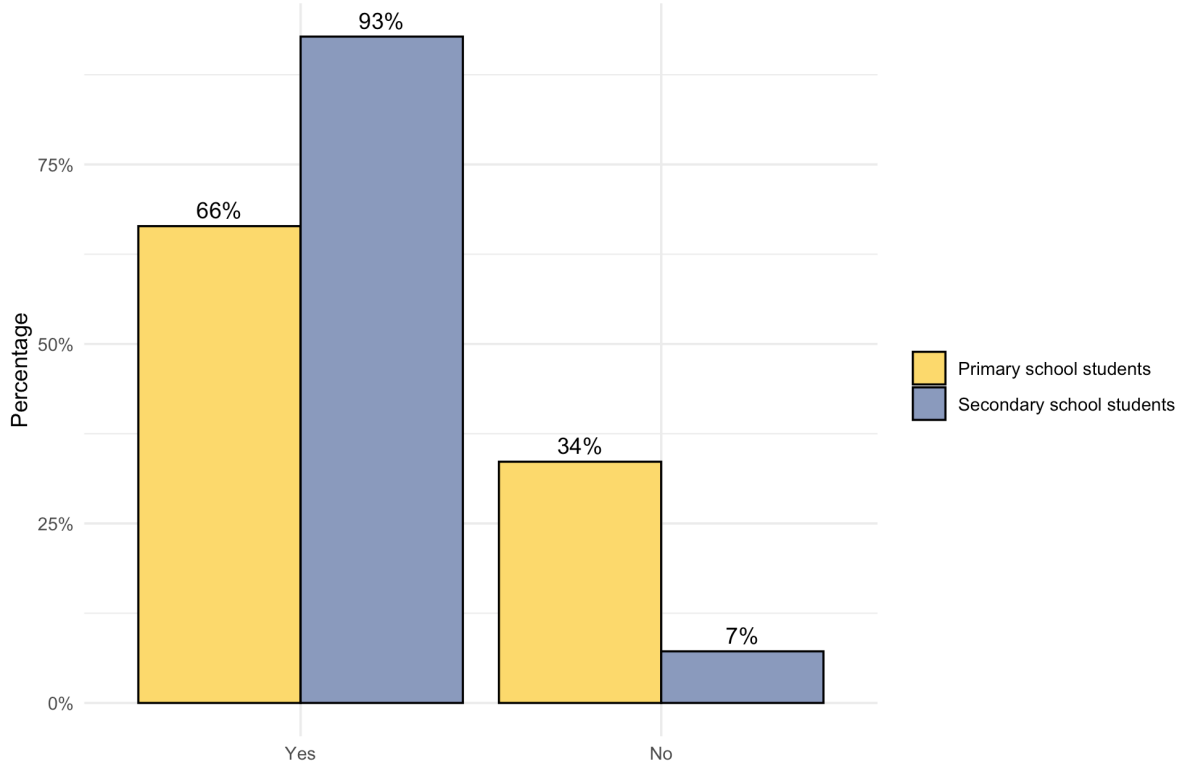

Figure 9. Student mobile phone ownership

Table 27 displays the safety perceptions among students (and their parent/carer) who have a mobile phone with them on their journey to school.

2023 TREK2School Primary school student sample

- Most (67.9%) primary school students use their phone to notify their parent that they got to school.
- Most (81.8%) primary school students feel safer that they have a phone with them on their journey to school.

TREK2School Secondary school student sample

- Most (61.9%) secondary school students use their phone to notify their parent that they got to school.
- Most (87.7%) secondary school students feel safer that they have a phone with them on their journey to school.

2023 TREK2School Parent of primary school student sample

- Most (61.0%) parents of primary school students agree that their child uses their phone to notify them that they got to school.
- Most (64.4%) parents of primary school students track their child's location to make sure that they got to school safely.
- Nearly all (96.6%) of parents of primary school students feel safer that their child has a phone with them on their journey to school.

TREK2School Parent of secondary school student sample

- Half (52.8%) of parents of secondary school students agree that their child uses their phone to notify them that they got to school.
- Half (49.6%) of parents of secondary school students track their child's location to make sure that they got to school safely.
- Nearly all (97.1%) of parents of secondary school students feel safer that their child has a phone with them on their journey to school.

Table 27. Mobile phone usage when journeying to school

	Percentage who agree [1]			
	Primary school students n (%) n=308	**Secondary school students** n (%) n=399	**Parents of primary school students** n (%) n=118	**Parents of secondary school students** n (%) n=339
Student uses phone to notify parent that they got to school safely	209 (67.9%)	247 (61.9%)	72 (61.0%)	179 (52.8%)
Parent tracks location to make sure they got to school safely	125 (40.6%)	168 (42.1%)	76 (64.4%)	168 (49.6%)
Feel safer having phone with them on their journey to school	252 (81.8%)	350 (87.7%)	114 (96.6%)	329 (97.1%)

1 Reference values of 'No' and 'Not sure'

Table 28 displays the results related to mobile phones among students who do not have a mobile phone with them on their journey to school.

2023 TREK2School Primary school student sample

- Among students who did not have a phone on their journey, most students would feel safer if they had a mobile phone with them on their journey to and from school, either to call someone if they got into trouble (73.9% agreed) or to notify their parent that they got to school (86.0% agreed).

TREK2School Secondary school student sample

- Among students who did not have a phone on their journey, most students would feel safer if they had a mobile phone with them on their journey to and from school, either to call someone if they got into trouble (71.7% agreed) or to notify their parent that they got to school (80.4% agreed).

Table 28. Journeying to school without a mobile phone

	Percentage who would feel safer [1]			
	Primary school students n (%) n=456	**Secondary school students** n (%) n=46	**Parents of primary school students** n (%) n=327	**Parents of secondary school students** n (%) n=40
Would feel safer if had phone on journey to school to call someone if they got into trouble	337 (73.9%)	33 (71.7%)	235 (71.9%)	26 (65.0%)
Would feel safer if student had phone to notify parent that they got to school safely	392 (86.0%)	37 (80.4%)	235 (71.9%)	20 (50.0%)

1 Reference values of 'No' and 'Not sure'

4.3.11. Interventions

Table 29 displays the results related to how many parents were aware of existing interventions in Perth aimed at increasing participation and/or safety of students walking, riding bikes/scooters, or taking public transport to and from school.

2023 TREK2School parent of primary school student sample

- Ride2School Day was recognised by half (47.1%) of parents of primary school students.
- Your Move was recognised by 11.2% of parents of primary school students.

TREK2School parents of secondary school student sample

- Ride2School Day was recognised by half (56.2%) of parents of secondary school students.
- Your Move was recognised by 9.2% of parents of secondary school students.

Table 29. Parent awareness of existing interventions related to active school transport

	Percentage who were aware of each intervention	
	Parents of Primary School Students n (%) n=456	**Parents of Secondary School Students** n (%) n=381
Your Move	51 (11.2%)	35 (9.2%)
Safe Routes to School	13 (2.9%)	22 (5.8%)
Connecting Schools	2 (0.4%)	8 (2.1%)
Challenges and Choices	4 (0.9%)	6 (1.6%)
Smart Steps	5 (1.1%)	9 (2.4%)
Keys4Life	48 (10.5%)	124 (32.5%)
Safe Active Streets	12 (2.6%)	29 (7.6%)
Walking School Bus	49 (10.7%)	41 (10.8%)
Ride2School Day	215 (47.1%)	214 (56.2%)
Walk Safely to School Day	139 (30.5%)	114 (29.9%)
None of these	130 (28.5%)	79 (20.7%)

Table 30 displays the interventions selected by students and parents when asked to select the “Top 5” interventions that would help them walk or bike to school more often or improve their journey to school while walking or cycling.

2023 TREK2School Primary school student sample

- Half (48.0%) of primary school students selected that they dedicated bike paths separated from the road.
- “More safe crossing” and “Paths on both sides of the road” were selected among the top interventions by at least 50% of students.

TREK2School Secondary school student sample

- Half (55.8%) of secondary school students selected that they would like more frequent bus and train services.
- “More safe crossing” and “Paths on both sides of the road” were selected among the top interventions by at least 50% of students.

2023 TREK2School parent of primary school student sample

- “More safe crossing” and “Paths on both sides of the road” were selected among the top interventions by at least 50% of parents.

TREK2School parents of secondary school student sample

- “More safe crossing” and “Paths on both sides of the road” were selected among the top interventions by at least 50% of parents.
- Over half (54.4%) of parents of secondary school students selected “Dedicated bike paths separated from the road”.

Table 30. Proportion of primary and secondary school students and parents of primary and secondary school students who selected each intervention among their "Top 5"

	Primary school students n (%) n=765	**Secondary school students** n (%) n=443;	**Parents of Primary School Students** n (%) n=436	**Parents of Secondary School Students** n (%) n=373
Built Environment Changes				
More traffic slowing improvements near the school	255 (33.3%)	158 (35.7%)	129 (29.6%)	98 (26.3%)
More safe crossings near the school	465 (60.8%)	246 (55.5%)	296 (67.9%)	227 (60.9%)
Kerb ramps on every path within the school catchment area	173 (22.6%)	84 (19.0%)	92 (21.1%)	62 (16.6%)
Paths on both sides of every road within the school catchment area	407 (53.2%)	234 (52.8%)	218 (50.0%)	193 (51.7%)
Dedicated bike paths separated from the roads	367 (48.0%)	183 (41.3%)	198 (45.4%)	203 (54.4%)
Locked bike and scooter storage at school	293 (38.3%)	144 (32.5%)	112 (25.7%)	111 (29.8%)
More trees/shade	289 (37.8%)	199 (44.9%)	77 (17.7%)	106 (28.4%)
Policy Changes				
Drop-off zones located at a walkable distance to the school	211 (27.6%)	121 (27.3%)	117 (26.8%)	134 (35.9%)
Temporary closure of roads to vehicles around the school during school drop off/pick up time	106 (13.9%)	52 (11.7%)	30 (6.9%)	33 (8.8%)
Flexible parent/carer working arrangements	-	-	117 (26.8%)	90 (24.1%)
Paid student parking at school	-	47 (10.6%)	-	7 (1.9%)
Public Transport				
More frequent bus/train services	220 (28.8%)	247 (55.8%)	80 (18.3%)	155 (41.6%)
More convenient bus/train stops	321 (42.0%)	203 (45.8%)	65 (14.9%)	111 (29.8%)
School-Based Programs and Services				
Free bike repair at school	183 (23.9%)	111 (25.1%)	76 (17.4%)	77 (20.6%)
School provides shared bikes and scooters for students to use for free	106 (13.9%)	54 (12.2%)	23 (5.3%)	39 (10.5%)
Education programs	209 (27.3%)	93 (21.0%)	177 (40.6%)	113 (30.3%)
Specified days where the school encourages students to walk or ride to school	233 (30.5%)	74 (16.7%)	129 (29.6%)	81 (21.7%)
A guide distributed to students and parents/carers on accessing the school by bus, train, walking, and cycling	109 (14.2%)	70 (15.8%)	39 (8.9%)	60 (16.1%)
Prizes/rewards/incentives for students who walk/cycle to school	283 (37.0%)	164 (37.0%)	126 (28.9%)	90 (24.1%)
Walking School Bus	71 (9.3%)	-	113 (25.9%)	
Community Awareness Initiatives				
Public awareness about the importance of students walking and cycling to school	157 (20.5%)	73 (16.5%)	90 (20.6%)	84 (22.5%)
Student-led group to encourage more cycling and walking among other students	101 (13.2%)	31 (7.0%)	-	-

Parent-led group to encourage more cycling and walking among students	-	-	43 (9.9%)	28 (7.5%)
Other	22 (2.9%)	15 (3.4%)	16 (3.7%)	29 (7.8%)

5. Objective 4: Interventions needed to increase AST

5.1. Key Findings from Objective 1

The literature review conducted to meet Objective 1 analysed 69 peer-reviewed articles on active school transportation (AST) interventions, covering a total of 67 interventions. The majority of these interventions were conducted in the United States and focused on primary school students exclusively. Although over half of the AST interventions reported an increase in AST and/or physical activity, the overall effect size of these interventions was mostly trivial or small.

In the quality assessment, more than 80% of the AST evaluations were rated as weak. Future studies should employ more robust evaluation designs. Some characteristics of studies with a “strong” quality rating were comparison groups, large samples (i.e. multiple schools or age groups), and reliable AST measures (50,96,102,111). Some strategies to improve confidence in the results of the evaluation could include randomisation of the intervention (i.e. by school or students if possible) and using valid and reliable measures for AST participation.

The most common types of AST interventions classified by the Active Living by Design Community Action Model were program and promotion, followed by physical and preparation interventions. The most frequent components of AST interventions were curriculum-based, followed by awareness campaigns. Interventions with multiple classifications can target individual, social, and environmental factors related to AST participation. For example, combining classroom activities, parent involvement, and built environment changes had a large effect size for one intervention (55). Safe Routes to School programs aim to target individual, social, and environmental factors as well, but schools vary in how many and which types of interventions they implement and how effectively they increase AST (65). Given the overall results in this review of effect size and study quality, there is not enough evidence to provide conclusive recommendations for what combination of intervention components is most effective, but there is a need to trial more strategic and comprehensive interventions at schools.

This review only includes AST interventions reported in the scientific peer-reviewed literature. Therefore, other AST interventions conducted and reported on outside of the peer-reviewed literature were not included. Despite this limitation, the report provides valuable insights into the effectiveness and quality of AST interventions. Overall, this review highlights the need for further research and evaluation to develop effective strategies to promote AST and physical activity.

5.2. Key Findings from Objective 2

The analysis of school walkability conducted to meet Objective 2 found the majority of Perth schools were surrounded by street networks that are disconnected. Nearly three quarters of Perth schools (73.9%) had pedestrian connectivity ratios below the WAPC’s target ratio for a walkable catchment area. Nearly one third of schools had connectivity ratios slightly below the target set by WAPC, suggesting small improvements could enhance school neighbourhoods. There were no significant differences in walkability scores based on school type (primary, secondary, K-12; government, non-government).

This study found evidence of a socio-economic gradient in school neighbourhood walkability, whereby neighbourhoods surrounding high SES schools were significantly more walkable than low or medium SES schools.

This study found non-government schools had significantly more traffic exposure than government schools. Given this was the first study to evaluate walkability of all non-government schools, there are no other studies to compare this finding to. Reasons for this difference require further investigation but might relate to the different WA policies regarding how and when non-government schools are sited.

Overall, the results highlight the importance of modifying the built environment to increase the walkability of school neighbourhoods in order to increase the opportunities for children to use an active form of transport to school. Existing schools located in neighbourhoods with poor pedestrian connectivity and/or high traffic volume should be retrofitted with interventions to improve their walkability. Built environment interventions to improve pedestrian connectivity in existing neighbourhoods are associated with increased AST (60,101). Examples include cut-throughs (i.e. paths though parks or between houses), footpaths on both sides of the road, pedestrian underpasses/overpasses, and pedestrian crossings. Interventions to reduce traffic speed and volume are also associated with increased AST. Examples include speed humps, speed limit signage, chicanes, changing the appearance of the road surface (i.e. painting speed limits, brick surfaces instead of pavement), narrowing traffic lanes, temporary road closures to vehicles surrounding the school, and reducing parking availability (to disincentivise driving). Results from this study indicate that connectivity improvements should be prioritised around low-SES schools. Students in low SES areas often rely on active transport to school, so making these areas more walkable is particularly important (146,147)

To avoid expensive retrofits of existing neighbourhoods, it is more efficient to plan future neighbourhoods to have higher street connectivity and to site schools away from high traffic roads. Supportive policies are crucial to facilitate the placement of schools in walkable areas. An example of a supportive policy to reduce traffic exposure is evident in New South Wales and Victoria policies that explicitly prohibit the location of schools on arterial (high-traffic) roads (148,149) In contrast, the current policy in Western Australia mandates that at least one street frontage of secondary schools should be an arterial road (150). Aligning WA policy with policies in other states may benefit school walkability.

In conclusion, this study found a large proportion of Perth schools are surrounded by street networks that are disconnected, reducing the potential for more children to walk or cycle to school. The results highlight the importance of modifying the built environment surrounding existing schools to increase opportunities for active school transport, particularly in low and medium socio-economic areas. Moreover, future neighbourhoods need to ensure that new schools are sited away from high traffic roads and in areas with high pedestrian connectivity.

5.3. Key Findings from Objective 3A and 3B

5.3.1. 2007 TREK2School primary school student sample

The 2007 TREK study student population showcased a balanced gender representation. Regarding proximity to school, a significant portion of the students lived close by, with 33.7% within a 1km walking distance and 43.2% within a 1km to 3km cycling distance. Despite the proximity to school and only 10% of students choosing driving as their preferred mode of transport, the predominant mode of transportation was by car, with 72.9% of students being driven to school at least once per week. A majority of students engaged in walking (60.7%) to school at least once per week, and about one third (29.2%) cycled to school at least once per week.

Safety concerns were prevalent among the students; 65.4% agreed that they would not feel safe walking and 58.8% agreed that they would not feel safe biking to school without adult supervision. One third of students agreed that they would feel safer driving to school than walking (35.1%) or biking (30.8%). These concerns were underpinned by the fact that nearly half of the students (46.7%) had to cross busy roads on their route to school, and one in four (25.7%) felt unsafe crossing these road near their school. One third of the students (36.9%) of students were worried about strangers in their neighbourhood, although most (69.9%) had friends in their neighbourhood, which may contribute to feelings of safety.

5.3.2. 2007 TREK parent of primary school student sample

A significant majority of the 2007 TREK parent participants were female (84.6%), and a substantial portion (71.3%) were employed, with most of them (71.8%) driving to work. This suggests a potential influence on the choice of transportation for their children, as 72.9% of students were driven to school.

Parental confidence in their children's ability to travel independently was high despite their own anxieties; 83% believed their children could walk and 70.2% believed they could bike to school without adult supervision. However, only 19% thought other parents in their child's class would let their children walk to school without an adult and 15.1% thought other parents in their child's class would let their children bike to school without an adult. Moreover, about half of the parents expressed worry something might happen if their children were to walk (51%) or bike (54.6%) alone.

Concerns about traffic and environmental barriers were prevalent. For example, 43% noted traffic in their neighbourhoods. Other barriers noted by parents were busy roads, unsafe crossings, and traffic volume around schools. Safety fears were significant: 79.4% of parents were fearful of their child being abducted, 74.8% feared harm from strangers. Concerns about injury were also high, with 57.6% worrying about injury while walking and 77.6% about injury while biking.

5.3.3. 2023 TREK2School Primary school student sample

The 2023 TREK2School results from primary school students builds upon the results from the 2007 TREK primary school students. In 2023, primary school participants were evenly represented by gender representation. Similar to in 2007, students continued to show a significant number living close to school, with 32.2% within a 1km walking distance and 43.2% within a cycling distance of 1km-3km. However, car travel remained the predominant mode of transportation, with 75.9% of students regularly commuting by car, despite a notable portion of students, 24.3%, expressing a preference for driving.

Active commuting was fairly common, with nearly half (47.7%) walking to school at least once a week and a third (31.9%) cycling. Yet, safety concerns were significant; 51.7% of students felt unsafe walking and 53.4% felt unsafe biking without an adult. Concerns about traffic were highlighted by 49.2% of students needing to cross busy roads on the way to school, and 33.2% felt unsafe crossing roads near their school.

Technology may enhance student safety perceptions, as evidenced by; 60.8% of students who owned mobile phones (or similar devices) carried them during their school journeys. The majority used their phones to inform parents upon reaching school (67.9%), and 81.8% felt safer having their phones with them. Among those without a phone, a substantial number believed having one would enhance safety, either to contact someone in an emergency (73.9%) or to notify their parent that they arrived at school (86.0%).

Students also suggested infrastructure improvements to enhance safety, with half selecting dedicated bike paths and at least 50% advocating for more safe crossings and paths on both sides of the road. These insights underline the ongoing challenges and opportunities in ensuring safer and more enjoyable journeys to school for primary school students in Perth.

5.3.4. 2023 TREK2School parent of primary school student sample

The 2023 TREK2School results from parents of primary school students highlights continuing trends in transportation behaviours and safety concerns from the 2007 TREK Study. A significant majority of the parent participants were female (84.6%), and most (71.3%) were employed, with most of them (71.8%) commuting to work by car.

Overall, parents were confident in their children's ability to travel to school independently. For example, 83.1% believed their child could walk and 76.1% felt they could bike without an adult. Despite this, a third (30.7% for walking and 26.2% for biking) felt that other parents in their child's class would not allow their children to walk or bike to school without an adult. Just under half of parents worried about potential incidents if their children walked to school without an adult (43.7%) or biked to school without an adult (45.1%).

Traffic concerns were similar among parents in 2007 and 2023. For example, in 2023 with 57.1% of parents agreed that there was a lot of traffic in their neighbourhood and 65% agreed that their was a lot of traffic around their child's school. Similarly, 58.8% reported that their child had to cross a busy road on their way to school. Other parental safety concerns for the journey to school included over half of the parents expressed fear of their children being taken by a stranger (56.8%), hurt by a stranger (54.7%), being injured while walking (58.6%) and being injured while biking (75.9%).

The integration of technology in ensuring safety was apparent for parents of primary school students, as most parents of children who had a mobile phone (or similar device) reported that their children used phones to notify them upon reaching school (61%) and to track their location (64.4%). The vast majority (96.6%) felt safer with their child having a phone on their journey to school.

AST intervention program awareness varied among the parents, with 47.1% recognising Ride2School Day, suggesting good engagement with promoted school initiatives, and 11.2% were aware of the Your Move program. Infrastructure improvements like more safe crossings and paths on both sides of the road were highlighted as top priorities by at least 50% of the parents, underlining the demand for increased safety measures along routes to school.

5.3.5. TREK2School Secondary school student sample

The 2023 TREK2School results for secondary school students provides the first comprehensive information about transportation habits and perceptions among secondary students in Perth. Participants were equally represented by gender. Half of secondary school students lived within a 3km cyclable distance to school. The most common mode of transportation was by car, used by 58.6% of students at least once per week. Fewer secondary school students walked (40.3%) or biked (15.4%) at least once per week. Public transport was also widely used among secondary school students, with 41.9% of students taking a bus at least once per week and 20.0% taking a train at least once per week. However, only 10% of students selected the bus as their preferred mode of transport to school. Among the students who used public transport, most walked to the bus stop and walked or took a bus to the train station, underpinning the importance of these journeys for AST.

Safety concerns were evident, with 69.6% of students agreeing that they needed to cross a busy road between their home and school. These concerns were related to the 41.4% of secondary school students who agreed that they would not feel safe crossing the road near their school. Traffic was a notable issue, with 53.8% stating there was heavy traffic near the school, and 57% reported a lack of safe crossings. However, fewer than half of secondary school students would feel safer being driven to school compared to walking (41.5%) or biking (38.7%).

Mobile phones may also enhance perceptions of safety among secondary school students, as a vast majority (96.6%) of those owning mobile phones carried them on their school journeys. Among these students, most (61.9%) used their phone to notify their parent that they got to school and most (87.7%) felt safer that they had a phone with them on their journey to school. For the minority of secondary school students who did not have a phone on their journey, most agreed that they would feel safer if they had a mobile phone with them on their journey to and from school, either to call someone if they got into trouble (71.7%) or to notify their parent that they got to school (80.4%).

Regarding public transport services, half of the students expressed a desire for more frequent bus and train services. Infrastructure improvements were also highlighted as a priority, with more than half of the

students selecting safer crossings and paths on both sides of the road among their top interventions, reflecting a strong demand for better pedestrian and cyclist infrastructure to enhance their safety on the journey to school.

5.3.6. TREK2School parents of secondary school student sample

The 2023 TREK2School Study results for parents of secondary school students provides a detailed look at perceptions about AST among parents of adolescents in Perth. Most parent participants were female (77.8%) and highly educated, with a significant majority (76.3%) employed, and of these, two-thirds (64.6%) drove to work. Driving to work related to the result that 37.5% of parents agreed that it was more convenient to drive their child to school on the way to somewhere else.

Traffic was a major concern for parents, with 59.0% agreeing that there was a lot of traffic in their neighbourhoods and 63.0% agreeing that there was a lot of traffic around their child's school. These perceptions reflect broader parental concerns about safety on school commutes. More than half of the parents (53.5%) recognised that their children had to cross a busy road on their way to school. Other parental safety concerns for the journey to school included their fears: 53.1% were worried about their child being taken by a stranger, 57.0% about harm from strangers, 56.8% about being injured while walking, and 69.0% about being injured while biking.

Mobile phones may play a role in mitigating fears, with nearly all parents (97.1%) feeling safer knowing their child had a mobile phone during their journey to school. About half of the parents reported that their children used phones to confirm safe arrival at school (52.8%) and a similar percentage (49.6%) tracked their children's locations for safety.

Parents were aware of some AST initiatives like Ride2School Day (56.2%), and recognition of the Your Move program (9.2%). Infrastructure improvements were clearly preferred by parents, with a majority selecting safer crossings, dedicated bike paths separated from roads, and paths on both sides of the roads among their top preferred interventions.

5.4. Overall summary and conclusion

The 2007 TREK and 2023 TREK2School studies offer comprehensive insights into the transportation behaviours and safety perceptions of primary and secondary school students and their parents in 2007 and 2023. In 2007, primary school students predominantly travelled by car despite living close to school. Safety concerns were high among both students and parents, with fears of traffic and stranger danger. While most parents believed their children could travel independently by foot or bike, the actual willingness to let them do so was much lower, reflecting a gap between confidence and actual practice.

By 2023, the patterns persisted, but with even higher car usage among primary school students. Safety concerns remained a major issue, now partly mitigated by the widespread use of mobile phones among students, enhancing perceived safety. Secondary school data mirrored these concerns about traffic and personal safety. Parents' fears about their children's safety along the journey to school remained substantial across both time points and educational levels, influencing the demand for improved infrastructure such as safer crossings and dedicated paths.

Overall, these findings underscore the complex interplay among individual, social and environmental factors affecting AST over time and between primary and secondary school students. These results highlight the consistent demand for safer, more convenient transportation options that target the needs of primary and secondary school students and their parents, suggesting a need for ongoing attention to infrastructure and safety interventions.

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Appendix A: Literature review of active school transport interventions results

Table 27. Summary of active school transport interventions included in the literature review for Objective 1 (n=67)

Citation	Location	Participants	Intervention	Classification	Method	Results	Effect size	Quality
Boarnet et al. 2005 (101,151)	USA	Students aged 8-11 years et 10 schools	California's 'Safe Routes to School' programs funded built environment projects including sidewalk improvements, traffic calming, speed reduction projects, bike facilities, traffic control devices and traffic diversion improvements.	Physical	Data was collected by observation pre-intervention and after construction of the projects over 2-day periods. Travel data was also collected through parent surveys.	Students who passed a project on their way to school were more likely to use AST compared to students who did not pass a project (15% vs 4%, P<.01). Parent data showed an 11% increase in AST after the projects were built.	Trivial	Weak

Borrestad et al. 2012 (82)	Norway	53 students aged 10-13 years	Students were encouraged to cycle to school every day through 6, fortnightly, 30-minute educational sessions delivered during school hours. Additionally, informational letters were sent to parents.	Program	Students were randomly allocated to the intervention group (who received the educational sessions) or the control group. All students completed a survey asking about commuting behaviour and a test for aerobic capacity at the start and end of the 12-week intervention period.	More students started cycling to school in the intervention group (69.2%) compared to within the control group (40.8%).	Trivial	Weak
Buckley et al. 2013 (90)	USA	238 students aged 5-11 years	A designated AST day in Spring encouraged students to use AST on that specific day through promotional resources, incentives, and prizes.	Promotion	Observation data of students' AST was collected one week before the event, the day of the event, one day a week later and one day two weeks after the event. Another school with no event day was used as the control. Students and parents completed surveys.	On the event day AST with an accompanying parent increased by 333% compared to the day a week before event (P<.001). An increase in AST was sustained after 2 weeks relative to the control school (P=.009).	N/A	Weak

Buliung et al. 2011 (152)	Canada	1,489 students aged 4- 14 years at 12 schools	Community stakeholders along with an external trained facilitator setup a 'School Travel Planning' action plan for each participating school. Schools varied in the interventions that they implemented, but most schools used educational programs, special event days, and low-cost capital improvement projects (i.e. painting pedestrian crossings on roads)	Preparation Program Promotion Physical	AST rates were measured using hands-up classroom surveys at the start and the end of the one-year intervention period.	AST increase at follow-up from 43.8% to 45.9% from student reported data.	Trivial	Weak
Bungum et al. 2014 (91)	USA	1,336 students aged 5-11 years at two schools	'Nevada Move Day' is a one-day event where students at participating schools are encouraged to actively commute.	Promotion	Observation was used to measure AST rates at the intervention school and control school pre-intervention, post-intervention and one week after the event day.	On event day, AST increased from 10.3% to 17.90% compared to the control school which stayed the same. However, at one-week follow up AST rates at both schools returned to baseline.	Small	Weak

Buttazzoni et al. 2019 (108)	Canada	Students in kindergarten-Year 8 (ages 3-14 years) at 13 schools	Two-year multi-component 'School Travel Planning' were implemented at schools. Although the specific interventions strategies used were not specified, the general 'School Travel Planning' categories are education, encouragement, enforcement and engineering.	Preparation	Parents of all students and students in Years 4-8 completed surveys. Two surveys were conducted, one as a baseline and one two years later during the same month with a different group of students and parents. The survey measured commuting behaviours.	After controlling for age, gender, and distance from school there were no significant changes to total AST trips (to and from school) from baseline to follow up. Similarly, there were no significant changes in car trips.	N/A	N/A
Christiansen et al. 2014 (81)	Denmark	1,014 students aged 11-14 years	A multi-component school-based intervention involved physical projects, including traffic calming (i.e. speed humps) and building a shared path separated from traffic. Other components of the intervention included crossing guards at intersections near the school and cycle skills training using bikes provided for the students.	Physical Program	Matched schools were randomly assigned to control or intervention. Pre- and post-intervention AST rates were measured through surveys and transport diaries over a two-year period of the intervention.	There was no difference between AST rates pre- and post- intervention. However, AST rates were high at baseline (86%).	Trivial	Moderate

Coombes and Jones 2016 (95)	UK	80 students aged 8-10 years at 2 primary schools	'Beat the Street' is an intervention that incorporates gamification components where students earn points and compete against one another on their walk to/ from school.	Promotion	This pilot study was conducted with students at two schools, one that had the intervention for 9 weeks and the other that had no changes to school activities. Participants wore accelerometers for 7 days at baseline, mid-intervention (after 7 weeks), and after 20 weeks. Participants also completed travel diaries while wearing the accelerometers.	Weekly AST increased by 10% at the intervention school whereas it decreased by 7% at the control school (P=.056).	Small	Weak

Crawford and Garrard 2013 (94)	AUS	479 students aged 10-12 years at 16 schools	A multi-component intervention that incorporated infrastructure improvements of bicycle storage and raised pedestrian crossings. Other components of the intervention included special event days (i.e. 'Ride2School Day'), and mapping of Safe Routes to School. The intervention was trialled at two schools in Phase 1 and then expanded in Phase 2.	Physical Program Promotion	Phase 1: A pilot test was conducted where two schools received the intervention and one school did not have any changes. Pre- and post-intervention AST was measured using observations, hands-up surveys and interviews with program staff over the one-year period. Phase 2: Pre- and post-intervention AST rates were measured using parent and student surveys over the 6-month intervention period.	Phase 1: AST rates increased by 8.8% at one intervention school (P<.001) with no significant change at the control school or the other intervention school. Phase 2: Parent-reported data showed an increase in the proportion of students using AST at least once a week. Student data reported a decrease in AST which was statistically insignificant compared to baseline data.	Trivial	Weak

Cuffe et al. 2012 (96)	USA	7 primary schools	A school-based incentive program where students' AST during a one-week prize period to enter a lottery to win a ten-dollar cash prize. Additionally, students could also win prizes based on their cumulative AST throughout the year.	Promotion	AST data was collected by radiofrequency identification tags attached to helmets and other forms of AST. The period of data collection varied from 1-4 years.	Approximately 30% of students participated in the intervention. During prize periods AST participation increased at each school by 17.6-20.4%.	N/A	Strong
Donnellan et al. 2020 (103)	NZ	All classes from Years 3-8 (8-12 years old) at 4 schools (3 primary, 1 intermediate).	A 2.3 km shared pedestrian and bike path protected from traffic was built to link the town centre to suburbs.	Physical	A repeat cross-sectional evaluation of the impacts of the share path on AST. Commuting method was measured using hands up surveys in classrooms every day for 5 days, at least once pre-path (twice for two schools) and once post path implementation.	3 out of 4 schools had a small increase (3%, 2% and 6%) in AST in the four months between pre and post evaluation. ATS decreased by 8% for the fourth school. Car transport increased for 2 schools (2% and 7% increase) and decreased for 2 (4%, 6%) from pre to post-shared path.	N/A	N/A

Ducheyne et al. 2014 (79)	Belgium	135 students aged 9- 10 years	Weekly 45-minute cycle training sessions over a 4-week period aimed at improving students' cycling skills and encourage their uptake of cycling.	Program	Randomised controlled trial with pre-, post- and 5-months follow-up of cycling to school rates through parent surveys.	There was no statistically significant difference in the rate of students cycling to school pre-, post- and at 5-months follow-up of the intervention.	Small	Weak
Duncan et al. 2011 (49)	NZ	8 classes of Year 5-6 students (ages 9-11 years) at two schools	All students received a homework booklet containing questions and tasks related to physical activity and healthy eating. The intervention consisted of in-class learning and a six-week homework schedule. Students who completed the homework each week received wristbands. Students also received other resources, including recipe cards, water bottles, frisbees, and educational videos.	Program Promotion	Half of the classes (n=4) received the intervention while the other classes (n=4) did not receive any intervention. All participants wore pedometers for 4 days prior to the intervention and after it was completed. Participants also kept travel diaries during the study period.	There was no significant effect of the intervention on AST participation.	N/A	N/A

Elinder et al. (88)	Sweden	813 students in Years 2, 4, and 7 from 18 schools	This intervention aimed to improve healthy eating, physical activity, self-esteem, and healthy weight in students. Participating schools completed a self-assessment of school health policies which was used to create individual school action plans. The action plans included training sessions concerning good health practices for school staff, and informational meetings for parents.	Preparation Promotion	Half of the schools (n=9) participated in the intervention and half were used as a control group (n=9) with no changes. A health behaviours survey was sent home to all children at the baseline and after 2 years that collected data on diets and physical activity (including AST).	There were no significant changes to physical activity (including active transport) at the intervention schools.	N/A	N/A
Faulkner et al. 2014 (111)	Canada	856 students aged 10-12 years old	School-based policies that aim to increase student's physical activity through community partnerships, the physical and social environment as well as instruction and programs.	Policy	Multiple cross-sectional study design with measures of physical activity through student self-report surveys, parent surveys and accelerometers.	Schools that supported AST and had written policies/ practices for physical activity were significantly associated with physical activity (P=.031).	N/A	Strong

Goodman et al. 2016 (78)	UK	3,336 students aged 10-11 years old	The 'Bikeability' cycle training scheme teaches students cycling skills and cycling road safety over the course of four 2-hour sessions led by trained instructors. Participants must bring their own bikes, but shared bikes are provided to students who do not own a bike.	Program	National data was used to identify the intervention group as schools who had underwent Bikeability prior to the cycling behaviour survey and the control group as schools who completed the survey prior to Bikeability and compared results.	There was no significant difference in the proportion of students cycling to/ from school at intervention and control schools.	Trivial	Weak
Grydeland et al. 2013 (66)	Norway	2,165 Year 6 students (11-12 years old) from 37 schools	The intervention was aimed at increasing physical activity through a range of resources provided to schools, students and parents. The intervention included active transport promotional campaigns and pedometers for students to be more aware of their activity levels.	Promotion	Schools were randomly allocated to receive the intervention (n=12 schools) or to receive no intervention (n=25 control schools). Accelerometers were used to measure physical activity over 5 consecutive days before the intervention and after 20 months at all schools.	In-school physical activity (which included commute times to and from school) did not increase significantly at the intervention schools.	N/A	N/A
Gutierrez et al. 2014 (86)	USA	Students aged 5-17 years	New crossing guards positioned at intersections located adjacent or within a block distance of school entrance and an AST awareness campaign.	Program Promotion	Control schools matched to intervention schools. And pre- and post- intervention data collection of AST rates through observation.	The number of pedestrians and cyclists did not change following the intervention (P>.05).	Trivial	Weak

Hatfield et al. 2019 (80)	AUS	Students in Years 4-8 at 4 schools	'Safe Cycle' is an eight-week cycling education program with lessons delivered once per week.	Program	All schools received the intervention. Pre-intervention, post-intervention and follow-up AST was measured using self-report surveys.	Moderate increased proportion of students reported riding to school at follow-up period compared to pre-intervention (P=.057)	N/A	N/A
Heelan et al. 2009 (68)	USA	3 primary schools	A 'Walking School Bus' led by a paid staff member was implemented for two years at two schools. Stops along the route were located within 1.6km of the school.	Program	Self-reported mode of transport to school was measured at 6 timepoints over two years at the two intervention schools and one control school.	Prevalence of walking to school was 27% higher at the intervention schools compared to the control school.	Trivial	Weak
Heinrich et al. 2011 (107)	USA	Year 1 and Year 4 students at 13 schools	Citizen-based committees were organised to lead planning initiatives. Complete Streets policy resolutions and Safe Routes to School interventions were planned at each school.	Preparation Policy	Baseline AST participation data was collected using observation before and after school, hands-up surveys in the classroom, and parent surveys.	Follow-up data had not been collected at time of publication, so unable to determine impact of the intervention on AST.	N/A	N/A

Henderson et al. 2013 (89)	USA	658 students aged 5-10 years	A 'Safe Routes to School' program was implemented that included curriculum lessons delivered by the health teachers, parent and student promotional materials (i.e. newsletters, designated weekly walk to school days, pedestrian crossings, and prizes for participating in AST.	Preparation Promotion Physical Program	Parent surveys were administered pre- and post- intervention to identify AST rates.	Parents surveys found that morning AST on most days increased from 18% in 2008 to 42% in 2010 (P<.0001). However, there was no significant change in afternoon AST pre- and post-intervention.	Trivial	Weak
Hinckson and Badland 2011 (62)	NZ	13,631 students aged 5-12 years from 33 primary schools	Individual 'School Travel Plans were implemented at each school by a trained facilitator. Although specific interventions varied at each school, common interventions included in-school road safety educational programs, awareness campaigns for parents, designated walk and cycle to school days, pedestrian crossings, and traffic calming measures. A policy intervention was prohibiting on-site parking for student drop-offs.	Preparation Programs Promotion Physical Policy	AST participation was measured pre- and post- intervention through hands-up surveys over the two-year intervention period.	After 'School Travel Plans' implementation mean AST rates increased from 34.9 to 40.8%	Trivial	Weak

Hinckson et al. 2011 (63)	NZ	57,096 students aged 5-10 from 56 primary schools	Individual 'School Travel Plans' were implemented at each school by a trained facilitator. Although specific interventions varied at each school, common interventions included in-school road safety educational programs, awareness campaigns for parents, designated walk and cycle to school days, pedestrian crossings, and traffic calming measures. A policy intervention was prohibiting on-site parking for student drop-offs.	Preparation Programs Promotion Physical Policy	AST rates were assessed pre-intervention and at 1-, 2- and 3-year follow up through student surveys.	Overall AST increased by the third year of 'School Travel Plans' implementation when compared to pre-intervention levels (40.5% to 42.2%), [OR=2.65, 95% CI=1.75–4.02].	Trivial	Weak
Hoelscher et al. 2016 (106)	USA	Students aged 9-10 years	'Safe Routes to School', a comprehensive, federally funded program designed to increase AST through infrastructure and non-infrastructure strategies.	Physical Preparation	A serial cross-sectional sample compared AST rates of schools with awarded infrastructure projects, schools with awarded non-infrastructure projects and control schools.	Intervention schools (both schools near infrastructure changes and schools with non-infrastructure changes) had higher rates of morning AST (P=.024 and .013 respectively) compared to control schools.	Small	Moderate

Holeva Eklund et al. 2019 (105)	USA	776 students in Years 6-8 at 3 schools	'Fix-it bike stations' were implemented on the grounds of all 3 schools. The stations included a bike rack to hold the bike in place while fixing, several tools and an air pump.	Physical	An online survey was delivered to students in class prior to the fix-it-station installation, and then again 7-12 months after the stations had been installed. The survey collected data on current levels and barriers to AST, and for the post-installation survey, also included knowledge and use of the stations.	There was no change to the number of students riding to school after the implementation of the fix-it-stations. There was a small increase in the number of students walking to school although it does not say if this is significant.	N/A	N/A
Hunter et al. 2015 (23)	UK	3,817 students aged 9- 13 years	Students participated in an international walk to school competition called 'Beat the Street' to win points over a 4-week period.	Promotion	Uncontrolled pre- and post- intervention evaluation of the international walk to school competition over a 4-week period.	A high proportion of students (95%) participated in the intervention. Initially AST increased but gradually declined from 29% in the first week to 12% in the fourth week.	Trivial	Weak

Isensee et al. 2018 (56)	Germany	1,020 students aged 12-16 at 29 schools	Program implemented over 12 weeks within the schools. Involves each student receiving a pedometer, and being encouraged to self-monitor, goal-set and support each other. Students record their steps on an account and compete in class competitions. Classes also participated in four lessons on the class competitions and other physical activity information.	Program Promotion	Schools were randomly selected as intervention (n=18 schools) or control (n=12 schools). Measures were taken at baseline, post-intervention and at a one year follow up date. Students were surveyed on their level of physical activity and their active transport. A running test was also conducted to collect data on cardiorespiratory fitness.	Duration of active commuting increased for the intervention group but not the control group (P<.001).	N/A	N/A
Jordan et al. 2008 (92)	USA	4 primary schools	The 'Gold Medal Schools' program is designed to increase physical activity and healthy eating among students. The program includes 'Walk to School Days'. Schools are awarded for their level of engagement with the program.	Promotion	Student and parent surveys were used to collect data at baseline and after 1 year. Two schools participated in the program (intervention schools) and two schools did not (control).	There were no significant differences between control and intervention students' rate of AST participation. Control school AST participation increased significantly from baseline to follow-up.	N/A	Weak

Kong et al. 2009 (69)	USA	Students aged 5-11 years	Implementation of a 'Walking School Bus' along with four other health themes emphasised during ways by medical students.	Program	Pre- and post-intervention AST rates were measured over a ten-week period.	Students' physical activity increased from a mean of 4.3 days per week to 5.3 days per week (P=.08).	N/A	Weak
Lambe et al. 2017 (57)	Ireland	1,457 Year 5 and 6 students at 21 primary schools	Two towns were awarded funding to improve active travel. Town 1 implemented improved walking and biking paths in addition to an active travel campaign which rewarded students for using AST during campaign weeks. Town 2 implemented new shared paths, cycle lanes, and pedestrian crossings. Town 2 also implemented several events and campaigns within schools.	Physical Promotion	A repeat cross-sectional study with two intervention towns and one control town. A self-report survey was given to all Year 5 and 6 students. Data was collected in class at the baseline, and again after two years.	There was no significant effect of the intervention on AST participation to or from school.	N/A	N/A
Livingston et al. 2011 (50)	USA	1,564 students aged 5-10 years	'WalkSafe' is an educational program that teaches students and teachers about pedestrian safety.	Program	Pedestrian knowledge was assessed through standardised tests pre- and post- intervention. Pedestrian behaviour was assessed through direct observation pre- and post- intervention.	There was no significant effect of the intervention on AST participation.	N/A	Strong

Malakellis et al. 2017 (64)	AUS	656 students ages 12-16 years from 6 secondary schools	Intervention schools received $50,000 to improve physical activity environment at the school (e.g. improving cafeteria and gymnasiums) and held education sessions (e.g. presentations from professional sportspeople), control schools received $5,000 for their participation. The intervention started with a 2-day workshop to identify the needs at each school with key personnel from the schools (principals, health teachers, students).	Program Promotion	3 schools received the intervention, 3 schools did not receive the intervention, baseline measures taken in 2012 and follow-up measures 2 years later. One of the intervention schools specifically focused on active travel to and from school. Physical activity and active transport measured using the Adolescent Behaviours, Attitudes and Knowledge Questionnaire.	The intervention schools decreased prevalence of AST participation among students from baseline (76.2%) to follow-up (71%), but the decrease was not significant (P=.143).	N/A	N/A

Mammen et al. 2014 (110)	Canada	55 primary schools, students aged 6-14 years	'School Travel Plans' were implemented at a national level in Canada. All participating schools created planning documents specific to their school. The specific interventions used at each school were not reported, but 'School Travel Plans' in general encourage engineering, education, enforcement, encouragement, and policy interventions.	Preparation	AST rates were assessed pre- and post-intervention through hands-up surveys.	At the national level AST rates did not significantly change pre- and post-intervention. However, AST rates varied greatly at the school level with 21 schools increasing morning AST rates and 23 schools increasing afternoon AST rates.	Trivial	Weak
Mammen et al. 2014 (109)	Canada	106 primary schools	'School Travel Plans' were implemented at a national level in Canada. All participating schools created planning documents specific to their school. The specific interventions used at each school were not reported, but 'School Travel Plans' in general encourage engineering, education, enforcement, encouragement, and policy interventions.	Preparation	A cross-sectional retrospective parent survey was conducted one year after the intervention had been implemented. Parents were asked how the intervention changed their child's habits for usual mode of transport to/from school.	17% of parents reported fewer driving trips to/from school because of the intervention. The majority of these parents replaced driving trips with AST.	N/A	N/A

Mandic et al. 2018 (76)	NZ	117 female students in years 9 -13 (aged 12-18) from two secondary schools	Students from two schools completed a 'Cycle Skills Training' intervention, teaching cycling fundamentals and control. All students completed 3-5 hours of a beginner level traffic-free 'Cycle Skills Training' component within the school. Based on cycling competency, some students went on to complete a 6-8 lessons on-road, and some completed advanced traffic-free training.	Program	Surveys were conducted with two groups: 'Cycle Skills Training' with and without on-road training. Students completed a pre-survey prior to the first training session and a post-survey after the last session collecting data on demographics, cycling habits, and cycling knowledge.	There was no significant effect of the intervention on cycling to or from school.	N/A	N/A
Mandic et al. 2018 (77)	NZ	429 children aged 10-12 (years 5-7) from 3 schools (2 primary, 1 intermediate).	Students from three schools completed a 'Cycle Skills Training' intervention, teaching cycling fundamentals and control. All students completed a traffic-free 'Cycle Skills Training' component within the school consisting of 3-5 lessons. In addition, a portion of the students (n=164) went on to complete further advanced traffic-free training, and a portion (n=265) went on to complete on-road cycling training.	Program	The study used pre- and post- intervention surveys collecting data on student knowledge of road rules, cycling skills and cycling behaviours. There was also a practical assessment of student cycling post-intervention.	Cycling to school increased for those who participated in the advanced traffic-free training (10.6%) and on-road training (12.5%) but did not change significantly for those who just completed the lessons in school.	N/A	N/A

Mathews et al. 2010 (85)	AUS	12 secondary schools (mean age 14.6 years)	AST interventions varied at the participating schools, but some schools attempted to implement AST drop-off zones where parents could drop their child at a location away from the school and the child walks the rest of the way. One school participated in 'Ride2School' day.	Program Promotion	Intervention schools (n=5) received the intervention while control schools (n=7) did not have any changes to routine school activities. Self-report surveys with students were used to measure physical activity behaviour.	The intervention had no effect on AST. The drop-off zone policies failed to be implemented at the intervention schools due to the majority of students arriving by bus. The regional locations of the schools limited options for AST.	N/A	N/A

McDonald et al. 2013 (60)	USA	14 schools with students in Years 1-8	Schools participated in the Safe Routes to School Program. The schools varied in which aspects of the intervention that they implemented. All schools incorporated an educational component of the intervention. Some schools also had built projects (covered bike parking and footpaths).	Physical Preparation Program	Schools with no Safe Routes to School program (n=5) were compared to schools with a Safe Routes to School program (n=9 intervention schools). At all schools, data about AST was collected from students using hands-up surveys to report for three days within the week how they travelled to school and how they planned to travel home from school. Travel data was also collected from parents using national survey data asking parents what their child's usual mode of transport is to and from school.	Having more interventions was associated with greater increases in AST participation. Walking to school increased by 20% at schools with three interventions (including education). Walking and biking increased at a school with covered bike storage along with education.	N/A	Weak

McDonald et al. 2014 (65)	USA	Approx. 65,000 students aged 6-15 years from 801 schools	'Safe Routes to School', a comprehensive, federally funded program designed to increase AST through infrastructure and non-infrastructure strategies. Although schools varied in the types of interventions implemented, more than half of the schools had educational interventions (i.e. road safety training) and encouragement (i.e. incentives to generate enthusiasm about AST)	Preparation Promotion Program	Data from student hands-up surveys and parent surveys was compiled from a national database and used to measure AST participation. Matched control and intervention schools' AST rates were assessed pre- and post-intervention over a 5-year period in states where the 'Safe Routes to School' data was most complete.	Schools with Safe Routes to School programs exhibited a 1.1% (P=.002) increase in AST with each year of participation in the program, thus suggesting that length of school engagement with the intervention may increase AST participation.	Trivial	Weak
McKee et al. 2007 (51)	UK	60 students aged 5-14 years	'Travelling Green' is a 10-week school-based project that incorporates curriculum materials and children and family resources to increase students' active travel to school.	Program	Utilised quasi-experimental design to assess students' route and distance travelled to school as well as their mode of transport pre- and post- intervention.	The intervention group increased their mean distance travelled to school by walking from 198 to 772 m (389% increase). Whereas the mean distance by the control group walked increase from 242 to 285 m (17% increase).	Large	Weak

McMinn et al. 2012 (52)	UK	166 students aged 8-9 years	'Travelling Green' is a 6-week school-based project that aims to increase active commuting to school through lessons and goal setting activities.	Program	Students' steps and moderate-vigorous physical activity pre- and post- intervention through accelerometers, surveys and travel diaries.	Commuting to school steps and moderate to vigorous physical activity were not significantly different between the control and intervention schools pre- and post- intervention.	Trivial	Weak
Mendoza et al. 2009 (70)	USA	Students aged 5-11 years at 3 primary schools	A 'Walking School Bus' program was run by a part-time coordinator and parent volunteers over the course of one year in a low-income primary school. Intervention schools received the 'Walking School Bus' program along with promotional material about pedestrian safety and weekly walk to school days. Control schools only received information about preferred walking routes.	Program Promotion	The intervention was conducted over one year. AST participation was measured using hands-up surveys at the intervention school (n=1) and control schools (n=2) asking students how they travelled to school at baseline, after 1 month, after 6 months, and after 1 year.	The intervention school increased their proportion of students walking from 20% to 25%, whereas the control schools saw a decrease from 15% to 7%.	Small	Weak

Mendoza et al. 2011 (71)	USA	149 students aged 9-10 years	'Walking School Bus' program where adult volunteers walk with students on their route to school.	Program	Pilot cluster randomised controlled trial matched schools and randomly assigned pairs to control or intervention and assessed students' daily moderate-vigorous physical activity and AST rates pre- and post- intervention through surveys and accelerometry.	Intervention students increased their daily moderate-vigorous physical activity from 45 minutes to 48.8 minutes. Compared to control students whose moderate-vigorous physical activity decreased from 46.1 minutes to 41.3 minutes over the 5-week period.	Small	Weak
Mendoza et al. 2017 (153)	USA	54 students aged 9-11	Research staff led 'Bicycle Trains' to bring students to and from school.	Program	Matched schools were randomly assigned to receive the "Bicycle Train" (intervention) or not (control). Students' cycling trips to school and daily minutes of moderate to vigorous physical activity were measured using surveys and accelerometers.	Intervention students had a mean increase of 12.8 minutes of daily moderate to vigorous physical activity (95% CI=8.5, 17.2) when compared with control students.	N/A	Weak
Merom et al. 2005 (93)	AUS	717 primary schools with students aged 5-12 years	'Walk Safely to School Day' is a designated day in which students at participating schools are encouraged to walk.	Promotion	Cross-sectional post event surveys were completed by parents and participating schools completed voluntary evaluation forms.	On the event day an additional 31% of students walked to school.	Trivial	Weak

Ming Wen et al. 2008 (55)	AUS	1,996 students aged 10-12 years	Multi-component intervention that aims to increase students' AST through classroom activities, development of school travel access guides, parent newsletters and improving environments.	Program Promotion	Schools were randomly assigned to as control or intervention and AST rates were assessed through student and parent surveys over the two-year intervention period.	More students in the intervention group (28.8%) increased their weekly number of walking trips to school compared to students in the control group (19%) (P=.05).	Large	Weak
Østergaard et al. 2015 (97)	Denmark	2,401 students aged 9-11 years	Structural changes were built near schools to increase cycling to school. Interventions included changes to road surfaces, signposting and traffic regulations. Additional interventions to increase school cycling motivation used incentives.	Physical Promotion	Utilising quasi experimental design, control and intervention schools' cycling to/ from school rates were assessed pre- and post-intervention after a one-year period.	Intervention had no effect on the number of cycling trip to/from school when comparing control and intervention groups (P=.463).	Trivial	Weak

Perez Martin et al. 2018 (48)	Spain	55 primary students from 1 primary school	'Walking School Bus' program involved paid staff to lead the program. Parents could track the location of the walking school bus and communicate with the walking school bus leaders by using a mobile phone application. Educational information about walking school buses was delivered in the classroom by teachers.	Program	The 'Walking School Bus' program was conducted for 14 weeks. Child's mode of travel to and from school were measured using a parent survey prior to and following the intervention.	There was a higher shift in mode of transport to school among student participants living 1,500-2,000m away from the school.	N/A	N/A
Ragland et al. 2014 (102)	USA	Students aged 5-18 years	California's 'Safe Routes to School' programs funded sidewalk improvements, traffic calming, speed reduction projects, bike facilities, traffic control devices and traffic diversion improvements.	Physical	Schools near Safe Routes to School projects were compared to control schools without Safe Routes to School projects. AST was measured using parent surveys.	Living within 250ft of an infrastructure project increased the probability of participating in AST.	N/A	Strong

Rodriguez et al. 2019 (98)	USA	Two primary schools	'Our Voice' was implemented alongside the 'Safe Routes to School' program. Our Voice allowed parents to use a discovery tool to document relevant environmental barriers and facilitators of walking routes.	Promotion	AST rates were compared between a school with 'Safe Routes to School' only and a school with 'Safe Routes to School' and 'Our Voice' over a 12-month period. Teachers surveyed students about their AST participation over three days at the beginning and of the school year.	The school that implemented Our Voice alongside the Safe Routes to School program saw an increase of AST from 5.3% to 30% whereas the Safe Routes to School alone school saw a decrease of AST from 17.7% to 15%.	N/A	N/A
Rothman et al 2021 (99)	Canada	66 primary and secondary schools	Infrastructure changes around schools, including boards that advise drivers of their current speed and the speed limit, flashing school crossing beacons, painted school signs on pavement, and pedestrian crossings.	Physical	Pre and post intervention study design with intervention schools (n=21) and matched control schools (n=45). AST behaviour and driving behaviour around the school measured by trained observers.	AST increased by 5% (OR=1.22, 95% CI=0.97-1.54) at intervention schools.	N/A	N/A

Rowland et al. 2003 (74)	UK	21 primary schools	Multi-component intervention, including 'Walking School Bus' and drop-off zones where students can be dropped and escorted the rest of the way. Intervention schools also created school travel plans to fit the needs of their school.	Program Preparation	Parent survey administered 2 months after the intervention was completed at all intervention (n=10) and control (n=10) schools. The results were compared to baseline data taken at the same schools during a previous year.	There were no differences in AST participation between the intervention and control schools.	Small	Weak
Sahlqvist et al. 2019 (87)	AUS	715 primary school students	Local councils could apply for up to $10,000 in funding to run a campaign to encourage AST participation among students. The four-week promotional campaign involved promotional activities, engagement activities (e.g., free breakfast); and local initiatives to support ongoing AST (e.g., installing bike racks at schools).	Promotion Physical	A list service company and Facebook campaign were used to recruit parents from across Victoria. Parent surveys used to collect data about AST participation before, during, and after the 4-week intervention period.	A greater proportion of students who participated in the campaign engaged in any AST during (OR=2.49) and after (OR=1.62) the intervention compared to non-participants, and more frequently participated in AST during (OR=1.60) and after (OR=1.45).	N/A	N/A

Sayers et al. 2012 (72)	USA	77 students from 3 primary schools	This 'Walking School Bus' is run by community volunteers who meet students along scheduled routes to school.	Program	Students wore accelerometers for 7 days of data collection.	There was no difference in physical activity levels between 'Walking School Bus' participants and non-participants.	Small	Weak
Sevil et al. 2019 (59)	Spain	210 students at two secondary schools	Multi-component intervention designed to increase healthy behaviour (i.e. healthy eating, meeting physical activity guidelines) composed of curricular activities (workshops, weekly tutorials) and extra-curricular activities (e.g. sporting events, family info sessions).	Program Promotion	Active commuting to school was measured using a self-report survey measure that classifies students who use AST both to and from school as active commuters	AST significantly increased for the intervention school compared to the control school.	N/A	N/A
Singh et al. 2009 (53)	Netherlands	1,108 adolescents (Ages 12-14 years) at 18 schools	An 11-week classroom educational program consisting of lessons on physical activity and biology. The aim of the intervention was to improve physical activity and healthy eating.	Program	Schools were randomly allocated as intervention schools (n=10) or control schools (n=8). Intervention schools received the education program while control schools did not change their lessons. Physical activity was measured at baseline, after 8 months, after 12 months, and after 20 months.	No effect on AST, but over 90% of students in the sample already biked to and from school.	N/A	N/A

Sirard et al. 2008 (73)	USA	11 students aged 8-11 years	'Walking School Bus' program involves adult volunteers walking with students on their route to school.	Program	A randomised controlled trial design where students' physical activity levels were assessed pre- and post-intervention over a two-month period.	Intervention students significantly increased their amount of moderate to vigorous physical activity before school. However, no significant between group differences were detected for the change in moderate to vigorous physical activity averaged over weekdays.	Large	Weak
Sirard et al. 2015 (73)	USA	25,500 students aged 5-14 years	Policy changes from a full school choice model to a model where parents can choose schools within their home zone.	Policy	Utilised quasi-experimental design with rates of AST were collected pre- and post-intervention through daily observations on tally by research staff.	Policy change resulted in an overall of decrease 1.45 km in distance to school however had no statistically significant effect on AST rates.	Trivial	Weak

Smith et al. 2020 (100)	NZ	Students in Years 5-8 at two schools	Infrastructure changes to areas identified to have the most potential for change based on community consultation. The changes included additional school zone signage, a pedestrian crossing light, additional pram ramps with tactile paving, speed humps, and pedestrian refuge islands.	Physical	Cameras were used around the schools to measure traffic speed, traffic volume, and pedestrians before and after the intervention.	Overall decrease in the prevalence of students who walk to school and corresponding increase in the proportion of students using a car to get to school from pre-test to post-test.	N/A	N/A
Staunton et al. (67)	USA	7,609 students Year 1-Year 8 at 21 schools	Multicomponent intervention including walk and bike to school days, a frequent rider miles competition, classroom education about pedestrian safety, walking school buses, and bike trains.	Program Promotion	Hands-up surveys were conducted at the start and end of each school year for three years while the intervention was implemented.	Additional schools joined the program each year. Survey results indicated that the proportion of students walking, biking, and carpooling increased while the proportion of students driving alone decreased.	Small	Weak

Stewart et al. 2014 (104)	USA	1,410 schools with students aged 5-18 years	Evaluation of 'Safe Routes to School', a comprehensive, federally funded program designed to increase AST through infrastructure and non-infrastructure strategies. Although intervention components varied at the schools, all schools that had data about AST participation conducted at least one infrastructure project, the most common being footpath improvements and pedestrian crossings.	Preparation Physical	AST rates were measured pre- and post- intervention. Measures of AST varied for schools, but typically consisted of hands-up surveys or observation.	At the school level, overall AST increased from 12.8% to 19.8% (P<.001); walking increased from 8.8% to 13.3% (P<.001); and cycling did not increase significantly.	Trivial	Weak
TenBrink et al. 2009 (64)	USA	4 primary schools	Multi-component 'Safe Routes to School' intervention wherein a task force of community leaders was set up to implement changes. Interventions included a 'Complete Streets" policy resolution for the city, 'Walk to School Days', a 'Walking School Bus' and building footpaths.	Physical Promotion Program Policy Preparation	Safe Routes to School surveys were conducted each school year to assess the number of students walking to school.	Overall increase in percentage of students walking and biking to school.	Small	Weak

Vanwolleghem et al. 2014 (73)	Belgium	119 students aged 6-12 years	A drop off spot is located 500-800m from school, where parents drop students off and they walk to/from school with a supervisor.	Program	AST rates were measured pre- and post- intervention over the one-week period. Parents, teachers and principals completed intervention feasibility surveys throughout the intervention.	The intervention tripled mean walking trips to and from school per week (P<.001).	Moderate	Weak
Villa-González et al. 2016 (43) and Villa-González et al. 2017 (104)	Spain	494 students aged 8-11 years	6-month school based educational program about the environmental characteristics around school, road safety and appropriate street behaviour.	Program	Schools were non-randomly assigned to control or intervention with pre- and post-intervention and 6-month follow up measurements of AST rates and health-related fitness through surveys and fitness tests respectively.	At 6-month follow-up the mean number of AST trips per week increased by 0.6 at the intervention school whereas it decreased by 0.4 at the control school (P=.019).	Trivial	Weak
Xu et al. 2015 (47)	China	1,108 student aged 9-10 years	Multi-component interventions compromising of classroom curriculum, school environment support, family involvement and fun program/ events aimed at changing lifestyle behaviours to reduce/ prevent childhood obesity.	Program Promotion	Randomised controlled trial with pre- and post-intervention measurements of students' lifestyle behaviours.	Participating students at intervention schools were more likely to change from sedentary modes of transport to AST (OR=2.24, 95% CI=1.47-3.40) compared to control schools.	Small	Weak

Zaccari and Dirkis 2003 (83)	AUS	243 students aged 5-12 years	The 'Walk to School' program incorporated mapping routes to school, road safety audits, banner painting, travel diaries, newsletters, media involvement and general school assemblies to raise awareness of and increase AST.	Promotion	School transport modes were compared pre- and post- intervention over the 4-week period through surveys.	Morning AST increased by 6% (from 33% to 39%) over the 4-week period. Afternoon AST did not change over the 4-week period.	Trivial	Weak

Appendix B: School walkability analysis results

Table 28. Pedestrian connectivity, traffic exposure and walkability of Perth schools in 2021 (n=651)
Note: Bolding denotes a significant difference was found. The significant differences are described in the footnotes.

	PEDESTRIAN CONNECTIVITY					TRAFFIC EXPOSURE			OVERALL WALKABILITY
	Schools (n)	**% that meet WAPC target**	**Pedestrian connectivity mean ± SE (range) [a]**	**Pedestrian connectivity categories**	**Pedestrian connectivity distribution within each category (%)**	**Traffic exposure mean ± SE (range) [b]**	**Traffic exposure categories**	**Traffic exposure distribution within each category (%)**	**Overall walkability mean ± SE (range) [c]**
ALL SCHOOLS COMBINED	651	26.1	0.51 ± 0.005 (0.08-0.80)	<0.30 >0.30-0.40 >0.40-0.50 >0.50-0.60 >0.60-0.70 >0.70-1.00	5.4 10.8 26.1 31.6 23.0 3.1	0.52 ± 0.01 (0.09-3.54)	<0.25 0.25-0.5 0.5-0.75 0.75-1.00 >1	6.6 44.9 39.2 6.9 2.5	11 ± 0.16 (2-20)
PRIMARY SCHOOLS ONLY	458	26.9	0.52 ± 0.006 (0.09-0.80)	<0.30 >0.30-0.40 >0.40-0.50 >0.50-0.60 >0.60-0.70 >0.70-1.00	5.2 9.2 26.6 32.1 23.6 3.3	**0.50 ± 0.009 (0.09-1.65)[d]**	<0.25 0.25-0.5 0.5-0.75 0.75-1.00 >1	7.2 45.0 40.6 5.9 1.3	11.2 ± 0.20 (2-20)
SECONDARY SCHOOLS ONLY	106	26.4	0.51 ± 0.011 (0.20-0.72)	<0.30 >0.30-0.40 >0.40-0.50 >0.50-0.60 >0.60-0.70 >0.70-1.00	1.9 18.9 23.6 29.2 24.5 1.9	0.58 ± 0.032 (0.16-2.34)	<0.25 0.25-0.5 0.5-0.75 0.75-1.00 >1	3.8 42.5 39.6 9.4 4.7	10.6 ± 0.38 (2-20)
K-12 SCHOOLS ONLY	87	21.8	0.49 ± 0.015 (0.08-0.73)	<0.30 >0.30-0.40 >0.40-0.50 >0.50-0.60 >0.60-0.70 >0.70-1.00	10.3 9.2 26.4 32.2 18.4 3.4	0.57 ± 0.045 (0.13-3.54)	<0.25 0.25-0.5 0.5-0.75 0.75-1.00 >1	6.9 47.1 31.0 9.2 5.7	10.6 ± 0.47 (2-19)
ALL GOVERNMENT SCHOOLS	440	23.0	0.51 ± 0.005 (0.09- 0.76)	<0.30 >0.30-0.40 >0.40-0.50 >0.50-0.60 >0.60-0.70 >0.70-1.00	5.0 11.1 28.8 32.0 20.0 3.0	0.50 ± 0.009 (0.09-1.42)	<0.25 0.25-0.5 0.5-0.75 0.75-1.00	8.0 44.1 41.4 5.2	10.9 ± 0.19 (2-20)

							>1	1.4	
ALL NON-GOVERNMENT SCHOOLS (I.E., INDEPENDENT AND CATHOLIC)	211	**32.7** [e]	0.52 ± 0.009 (0.08-0.80)	<0.30 >0.30-0.40 >0.40-0.50 >0.50-0.60 >0.60-0.70 >0.70-1.00	6.2 10.0 20.4 30.8 29.4 3.3	**0.58 ± 0.025 (0.13-3.54)** [f]	<0.25 0.25-0.5 0.5-0.75 0.75-1.00 >1	3.8 46.4 34.6 10.4 4.7	11.1 ± 0.31 (2-20)
ALL NON-GOVERNMENT PRIMARY SCHOOLS	99	**39.4**[g]	0.55 ± 0.012 (0.17-0.80)	<0.30 >0.30-0.40 >0.40-0.50 >0.50-0.60 >0.60-0.70 >0.70-1.00	4.0 9.1 17.2 30.3 35.3 4.0	0.52 ± 0.020 (0.20-1.65)	<0.25 0.25-0.5 0.5-0.75 0.75-1.00 >1	2.0 50.5 37.4 8.1 2.0	11.9 ± 0.43 (2-20)
ALL NON-GOVERNMENT SECONDARY SCHOOLS	29	**41.4**[h]	0.53 ± 0.02 (0.25-0.69)	<0.30 >0.30-0.40 >0.40-0.50 >0.50-0.60 >0.60-0.70 >0.70-1.00	3.4 17.2 10.3 27.6 41.4 0.0	**0.80 ± 0.10 (0.32-2.34)**[i, j]	<0.25 0.25-0.5 0.5-0.75 0.75-1.00 >1	0.0 31.0 34.5 20.7 13.8	9.7 ± 0.92 (2-18)
ALL GOVERNMENT PRIMARY SCHOOLS	359	23.4	0.51 ± 0.006 (0.09 – 0.76)	<0.30 >0.30-0.40 >0.40-0.50 >0.50-0.60 >0.60-0.70 >0.70-1.00	5.6 9.2 29.2 32.6 20.3 3.1	0.50 ± 0.010 (0.09-1.42)	<0.25 0.25-0.5 0.5-0.75 0.75-1.00 >1	8.6 43.5 41.5 5.3 1.1	11.0 ± 0.22 (2-20)
ALL GOVERNMENT SECONDARY SCHOOLS	77	20.8	0.51 ± 0.012 (0.20 – 0.72)	<0.30 >0.30-0.40 >0.40-0.50 >0.50-0.60 >0.60-0.70 >0.70-1.00	1.3 19.5 28.6 29.9 18.2 2.6	0.49 ± 0.019 (0.16 – 1.07)	<0.25 0.25-0.5 0.5-0.75 0.75-1.00 >1	5.2 46.8 41.6 5.3 1.3	10.8 ± 0.40 (3-20)
HIGH SES SCHOOLS	211	**52.1**[k,l]	**0.58 ± 0.01 (0.17 – 0.80)**[m.n]	<0.30 >0.30-0.40 >0.40-0.50 >0.50-0.60 >0.60-0.70 >0.70-1.00	1.4 3.3 15.6 27.5 44.1 8.1	0.55 ± 0.02 (0.25-2.34)	<0.25 0.25-0.5 0.5-0.75 0.75-1.00 >1	0.5 48.8 40.3 7.6 2.8	**12.4 ± 0.29 (3-20)**[o,p]

MEDIUM SES SCHOOLS	216	**17.1[q]**	0.49 ± 0.01 (0.08-0.73)	<0.30 >0.30-0.40 >0.40-0.50 >0.50-0.60 >0.60-0.70 >0.70-1.00	6.9 14.3 29.6 31.9 16.2 0.9	0.53 ± 0.02 (0.11-3.54)	<0.25 0.25-0.5 0.5-0.75 0.75-1.00 >1	9.3 44.4 37.5 5.1 3.7	10.5 ± 0.28 (2-20)
LOW SES SCHOOLS	214	10.3	0.48 ± 0.01 (0.09-0.68)	<0.30 >0.30-0.40 >0.40-0.50 >0.50-0.60 >0.60-0.70 >0.70-1.00	6.5 14.0 33.2 36.0 10.3 0.0	0.51 ± 0.01 (0.09-1.29)	<0.25 0.25-0.5 0.5-0.75 0.75-1.00 >1	9.3 41.6 39.7 8.4 0.9	10.1 ± 0.27 (2-20)
HIGH SES PRIMARY SCHOOLS	150	**54.0[r,s]**	**0.59 ± 0.008 (0.19- 0.80)[t,u]**	<0.30 >0.30-0.40 >0.40-0.50 >0.50-0.60 >0.60-0.70 >0.70-1.00	1.3 3.3 12.0 29.3 44.7 9.3	0.51 ± 0.012 (0.25 – 1.26)	<0.25 0.25-0.5 0.5-0.75 0.75-1.00 >1	0.7 52.7 40.7 5.3 0.7	**13.0 ± 0.34 (3-20)[v,w]**
MEDIUM SES PRIMARY SCHOOLS	145	**17.9[x]**	0.50 ± 0.01 (0.17 – 0.69)	<0.30 >0.30-0.40 >0.40-0.50 >0.50-0.60 >0.60-0.70 >0.70-1.00	5.5 11.0 32.4 33.1 17.9 0.0	0.51 ± 0.018 (0.11 – 1.65)	<0.25 0.25-0.5 0.5-0.75 0.75-1.00 >1	8.3 41.4 41.4 6.2 2.8	10.5 ± 0.33 (2-19)
LOW SES PRIMARY SCHOOLS	156	9.6	0.48 ± 0.01 (0.09 – 0.68)	<0.30 >0.30-0.40 >0.40-0.50 >0.50-0.60 >0.60-0.70 >0.70-1.00	7.1 12.8 35.9 34.6 9.6 0.0	0.49 ± 0.015 (0.09 – 1.29)	<0.25 0.25-0.5 0.5-0.75 0.75-1.00 >1	11.5 40.4 41.0 6.4 0.6	10.1 ± 0.32 (2-20)
HIGH SES SECONDARY SCHOOLS	22	**68.2[y,z]**	**0.59 ± 0.019 (0.42 – 0.71)[aa,bb]**	<0.30 >0.30-0.40 >0.40-0.50 >0.50-0.60 >0.60-0.70 >0.70-1.00	0.0 0.0 18.2 13.6 63.6 4.5	**0.75 ± 0.114 (0.32 – 2.34)[cc]**	<0.25 0.25-0.5 0.5-0.75 0.75-1.00 >1	0.0 36.4 36.4 13.7 13.7	11.5 ± 0.75 (4-18)
MEDIUM SES SECONDARY SCHOOLS	32	18.8	0.50 ± 0.021 (0.20 – 0.72)	<0.30 >0.30-0.40 >0.40-0.50 >0.50-0.60 >0.60-0.70 >0.70-1.00	3.1 28.1 18.7 31.2 15.6 3.1	0.56 ± 0.052 (0.21 – 1.78)	<0.25 0.25-0.5 0.5-0.75 0.75-1.00 >1	6.3 43.8 40.6 3.1 6.2	10.4 ± 0.73 (2-20)

LOW SES SECONDARY SCHOOLS	50	14.0	0.49 ± 0.013 (0.25 - 0.67)	<0.30 >0.30-0.40 >0.40-0.50 >0.50-0.60 >0.60-0.70 >0.70-1.00	2.0 2.0 3.0 34.0 14.0 0.0	0.51 ± 0.028 (0.16 – 0.99)	<0.25 0.25-0.5 0.5-0.75 0.75-1.00 >1	4.0 46.0 38.0 12.0 0.0	10.3 ± 0.58 (2-19)
HIGH SES K-12 SCHOOLS	8[dd]	35.9	0.55 ± 0.02 (0.16 -0.73)	<0.30 >0.30-0.40 >0.40-0.50 >0.50-0.60 >0.60-0.70 >0.70-1.00	2.6 5.1 28.2 28.2 30.8 5.1	0.59 ± 0.049 (0.32 – 2.10)	<0.25 0.25-0.5 0.5-0.75 0.75-1.00 >1	0.0 41.0 41.0 12.8 5.1	11.0 ± 0.74 (3-19)
MEDIUM K-12 SCHOOLS	39	12.8	0.45 ± 0.025 (0.08 – 0.73)	<0.30 >0.30-0.40 >0.40-0.50 >0.50-0.60 >0.60-0.70 >0.70-1.00	15.4 15.4 28.2 28.2 10.2 2.6	0.54 ± 0.087 (0.13 – 3.54)	<0.25 0.25-0.5 0.5-0.75 0.75-1.00 >1	15.4 56.4 20.5 2.6 5.1	10.7 ± 0.69 (2-17)
LOW SES K-12 SCHOOLS	39	0.0	0.47 ± 0.055 (0.19 - 0.58)	<0.30 >0.30-0.40 >0.40-0.50 >0.50-0.60 >0.60-0.70 >0.70-1.00	25.0 0.0 0.0 75.0 0.0 0.0	0.69 ± 0.096 (0.32 – 1.11)	<0.25 0.25-0.5 0.5-0.75 0.75-1.00 >1	0.0 37.5 25.0 25.0 12.5	8.6 ± 1.19 (2-12)

a. A pedestrian connectivity ratio closer to 1 = a more connected neighbourhood
b. A traffic exposure ratio closer to or greater than 1= greater exposure to traffic
c. Pedestrian connectivity and reverse traffic exposure scores collapsed into deciles (reverse traffic exposure reverse coded so that 10=high walkability 1=low walkability) and summed together
d. Primary schools had significantly lower traffic exposure than secondary schools (*P*=.026)
e. Non-government schools had a significantly higher odds of meeting the WAPC target than government schools (*OR* 1.6, 95% CI 1.13,2.35)
f. Non-government schools had a significantly higher traffic exposure than government schools (*P*<.001)
g. Non-government primary schools had a significantly higher odds of meeting the WAPC target than government primary schools (*OR* 2.1, 95% CI 1.3, 3.4)
h. Non-government secondary schools had a significantly higher odds of meeting the WAPC target than government secondary schools (OR 2.7, 95% CI 1.1, 6.8)
i. Non-government secondary schools had a significantly higher traffic exposure than non-government primary schools (*P*<0.001)
j. Non-government secondary schools had significantly higher traffic exposure than government secondary schools (*P*<.001)
k. High SES schools had a significantly higher odds of meeting the WAPC target than medium SES schools (*OR* 5.3, 95% CI 3.4,8.2)
l. High SES schools had a significantly higher odds of meeting the WAPC target than low SES schools (*OR* 9.5, 95% CI 5.7,15.9)
m. High SES schools had significantly higher mean pedestrian connectivity than medium SES schools (*P*<.001)
n. High SES schools had significantly higher mean pedestrian connectivity than low SES schools (*P*<.001)
o. High SES schools had significantly higher overall walkability than medium SES schools (*P*<.001)
p. High SES schools had significantly higher overall walkability than low SES schools (*P*<.001)
q. Medium SES schools had a significantly higher odds of meeting the WAPC target for a walkable catchment than low SES schools (*OR* 1.8, 95% CI 1.0,3.2)
r. High SES primary schools had a significantly higher odds of meeting the WAPC target than medium SES primary schools (*OR* 5.4, 95% CI 3.2,9.1)
s. High SES primary schools had a significantly higher odds of meeting the WAPC target than low SES primary schools (*OR* 11.0, 95% CI 5.9,20.5)

t. High SES primary schools had significantly higher pedestrian connectivity than medium SES primary schools (*P*<.001)
u. High SES primary schools had significantly higher pedestrian connectivity than low SES primary schools (*P*<.001)
v. High SES primary schools had significantly higher overall walkability than medium SES primary schools (*P*<.001)
w. High SES primary schools had significantly higher overall walkability than low SES primary schools (*P*<.001)
x. Medium SES primary schools had a significantly higher odds of meeting the WAPC target than low SES primary schools (*OR* 2.1, 95% CI 1.0, 4.1)
y. High SES secondary schools had a significantly higher odds of meeting the WAPC target than medium SES secondary schools (*OR* 9.3, 95% CI 2.6, 32.8)
z. High SES secondary schools had a significantly higher odds of meeting the WAPC target than low SES secondary schools (*OR* 13.2, 95% CI 4.0, 43.8)
aa. High SES secondary schools had significantly higher pedestrian connectivity than medium SES secondary schools (*P*=.007)
bb. High SES secondary schools had significantly higher pedestrian connectivity than low SES secondary schools (*P*<.001)
cc. High SES secondary schools had significantly higher traffic exposure than low SES secondary schools (*P*=.015)
dd. Low statistical power for high SES K-12 schools (n=8) meant that pairwise statistical comparisons could not be made