

Active transport: Children and young people

An overview of recent evidence

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1 Introduction

Children are designed to be active. Physically active children are healthier, happier and more socially connected than children who have more sedentary lifestyles (US Department of Health and Human Services 2008; WHO 2008). Children and young people who are physically active are more likely to be active adults, resulting in health benefits across the life course (Troost et al 2002; Kjonniksen et al 2008).

In recent decades, substantial changes in Australian lifestyles, urban environments and transportation systems have led to changed physical activity patterns among children. Active transport, in particular, has declined dramatically in countries such as the US, UK and Australia, where car travel has become the predominant form of personal mobility (Salmon et al 2005; van der Ploeg et al 2008).

A growing number of industrialised countries such as Germany, Denmark, the Netherlands and Japan have successfully reversed unsustainable and unhealthy increases in rates of driving children to school and other local destinations (see Table 1). Some cities and municipalities in the UK, US, and Canada have also achieved relatively high rates of active travel (Pucher et al 2010 in press). Similar changes and benefits can be achieved in Australia.

This report provides a summary of:

- Children's participation in physical activity
- Active transport and children's physical activity
- Active transport and children's health
- Prevalence and trends in young people's rates of active travel to school and other local destinations
- Correlates of children's and young people's active travel
- Interventions aimed at increasing children's and young people's rates of active travel (principally to school, which has been the focus of nearly all active travel interventions for children)
- Future directions for promoting active travel for children and young people in Australia.

Active transport refers to travel between destinations by walking, cycling, or other non-motorised modes (National Public Health Partnership (NPHP) 2001). In this report, the generic term 'children' is used to refer to children and young people, and the generic term 'travel to school' refers to travel to and from school.

2 Children's participation in physical activity

A substantial number of Australian children are insufficiently active to achieve the health benefits of physical activity.

The Australian Department of Health and Ageing recommends that children should accumulate at least 60 minutes (and up to several hours) of moderate to vigorous physical activity (MVPA) every day (Department of Health and Ageing 2004). Based on data from the 2007 Australian Children's Nutrition and Physical Activity Survey, 32% of Australian children aged 9-16 years met the guidelines for MVPA (ie accumulated at least 60 minutes of MVPA on each of the four days sampled), while 58% achieved this level of MVPA on most (ie three or more) of the four days sampled (Department

of Health and Ageing 2008). Girls are less likely to meet the guidelines than boys, and MVPA declines with age, particularly for older girls. For girls aged 14-16, only 13% met the 'all four days' recommended MVPA level, and 33% met the 'most days' level.

Pedometer data showed that the majority of Australian children aged 9-16 do not meet the recommended number of steps per day (15,000 for boys and 12,000 for girls); with the number of steps per day declining rapidly with age (only 13% of boys aged 14-16 years and 16%¹ of girls aged 14-16 met the recommended number of steps) (Department of Health and Ageing 2008).

The recommended physical activity guidelines can be achieved through various combinations of play, recreation, physical education activities, sport, and active transport. Active transport has the potential to make a substantial contribution to children's daily physical activity (see Section 3). Active transport is also well placed to address inequalities in physical activity participation in terms of age, gender, and socio-economic status. In countries with high rates of walking and cycling for transport, active travel tends to be a 'habit of daily life' across the population, including population groups that are less likely to participate in organised sport and exercise programs (Garrard 2008 Appendix B). There are some indications that this is also the case in Australia (see below), suggesting that fostering active transport may be a more equitable and inclusive form of physical activity promotion than organised sport and exercise programs.

Data from the Australian Children's Nutrition and Physical Activity Survey indicate that, in contrast to sport and play, active travel tends to increase with age, and has similar participation rates for girls and boys at most age levels (Figure 1). Similar findings have been reported internationally. In a large UK study, Year 10 females were 6.5 times more likely to meet recommended levels of physical activity if they actively commute to school (Smith 2008).

Recent reviews have reported that lower household income and parental education levels are generally associated with higher rates of active travel among children (Sirard and Slater 2008; Pont et al 2009). Spallek et al (2006) reported similar relationships for walking to school among 871 Brisbane families with children aged 4-12 years. A Melbourne study, however, reported variable relationships between socio-economic position and active travel according to age, gender and data collection period (2001 and 2004) (Ball et al 2009). Variable findings in the Melbourne study, few of which were statistically significant, may be due to small study numbers (542 children) and relatively low levels of active travel to school.

¹ The higher percentage for girls is due to the lower recommended number of steps for girls.

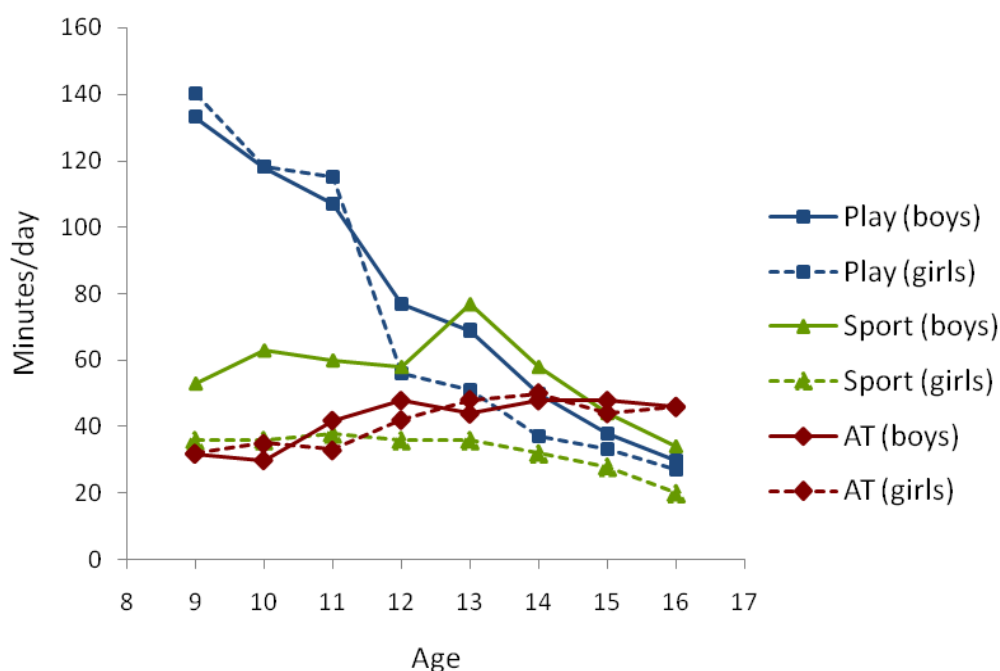


Figure 1: Age and gender-related patterns in MVPA and some of its components [free play, sport, and active transport (AT)].

(Source: Department of Health and Ageing 2008)

3 Active transport and children’s physical activity

Children who actively commute to school have higher levels of physical activity and improved cardiovascular fitness compared with children who do not walk or cycle to school (Davison et al 2008).

The 2007 Australian Children’s Nutrition and Physical Activity Survey, which collected data from a total of 4,487 participants aged 2-16 years or their caregivers, reported that children aged 9-16 years participated in active travel (all destinations) for an average of about 45 minutes per day (Department of Health and Ageing 2008). The study report did not provide a breakdown of the time spent on active travel to school and other destinations, but data from NSW suggest that commuting to and from school comprises about half of young people’s total active travel time² (Booth et al 2006).

Pedometer studies indicate that girls who actively commute to school undertake more weekday steps than those who do not (Duncan et al 2008) and that children in countries with high rates of active travel undertake more steps per day than Australian children. In a study in south eastern Sweden, which has relatively high rates of active travel to school, 90% of girls and 67% of boys aged 7-9 years met the recommended number of steps per day (12,000 for girls and 15,000 for boys) (Raustorp and Ludvigsson 2007). In comparison, in Australia, 50% of girls and 32%³ of boys aged 5-8 meet the recommended number of steps (Department of Health and Ageing 2008). In a study in Izegem, Belgium, young people aged 12-18 years averaged 12,741 steps per day (van Dyck et al

² Young people in NSW spent a median daily time of between 20 minutes (year 6) and 30 minutes (year 10) walking to and from school (Booth et al 2006).

³ The lower percentage for boys is due to the higher recommended number of steps per day for boys (15,000).

2009), compared with an average of 10,095 steps per day for Australian young people aged 14-16 (Department of Health and Ageing 2008).

Active travel to school is also associated with higher levels of active travel to other neighbourhood destinations. In a study of 1,643 9-15 year-olds in South Australia, young people who actively commuted to school were 30% more likely to actively commute to other neighbourhood destinations. These data suggest additional energy expenditure benefits beyond active trips to and from school (Dollman and Lewis 2007).

There has been some debate about whether higher levels of active travel occur at the expense of other forms of physical activity, and whether it is children who are already active who choose to use active forms of travel. Neither of these scenarios appears to be the case (Davison et al 2008), suggesting that efforts to increase children's active travel are likely to result in net gains in children's levels of physical activity and in the proportion of children achieving recommended levels of physical activity.

4 Active transport and children's health

A mode shift from motorised transportation (principally being driven by car) to active transport improves children's health by:

- increasing levels of physical activity (and associated physical, psychological and social health benefits)
- helping children maintain healthy weight
- reducing injury due to motor vehicle crashes
- reducing the environmental health damage caused by excessive car use (eg air and noise pollution, global warming)
- reducing inequalities in children's health associated with physical activity, obesity, and motor vehicle crash injuries.

While contributing to substantial health benefits, active transport, in common with other forms of physical activity such as sport and play, also carries a risk of injury. Because walking and cycling are alternative forms of transport, pedestrian and cyclist injuries are often compared with risk of injury as a car passenger. A recent comparative analysis of 30 OECD countries found highly variable traffic crash fatality rates for young people aged 0-16 years. Fatality rates varied by country, travel mode (walking, cycling, car passenger), measures of traffic exposure (fatalities per population, number of trips, or distance travelled), road safety policies, and a range of socio-demographic factors (Christie et al 2004; Christie et al 2007).

Absolute risk of fatality is low for all modes of travel in most countries, including Australia which has 1.69 child car passenger fatalities per 100,000 child population (ranked 21st⁴ out of 26 OECD countries); 0.86 child pedestrian fatalities per 100,000 child population (ranked 13th); and 0.39 child cyclists fatalities per 100,000 child population (ranked 13th). Based on these data, an Australian child is nearly twice as likely to be killed as a car passenger than as a pedestrian, and more than four times as likely to be killed as a car passenger than as a cyclist (Christie et al 2004).

These absolute levels of risk are relatively low; however, *relative* risks based on traffic exposure (ie relative fatality rates per trip or per kilometre travelled) result in a different pattern of risks by travel mode. Exposure-based relative risks are generally higher for pedestrians and cyclists than for car

⁴ Japan is ranked first (ie safest), with a fatality rate of 0.37 per 100,000 child population; with Turkey ranked 26th (4.03 per 100,000). Australia, the US and NZ have among the highest fatality rates for child car passengers (21st, 23rd and 24th respectively) (Christie et al 2004).

passengers, but with large variations between countries. Countries with high levels of active transport generally have low pedestrian and cyclist fatality rates (Figures 2 and 3). Figures 2 and 3 are for the OECD countries that were able to provide data on child walking and cycling distances. Australian data are not included in Figures 2 and 3 because national data on child walking and cycling are not available. However, based on related data, Australia is likely to be similar to the US, UK and NZ.

Figures 2 and 3 also indicate low levels of absolute risk based on distance walked or cycled. Even in the current traffic environments in US and NZ, one fatality occurs for about 10 million kilometres walked or cycled, decreasing to one for about 100 million in the high active travel countries.

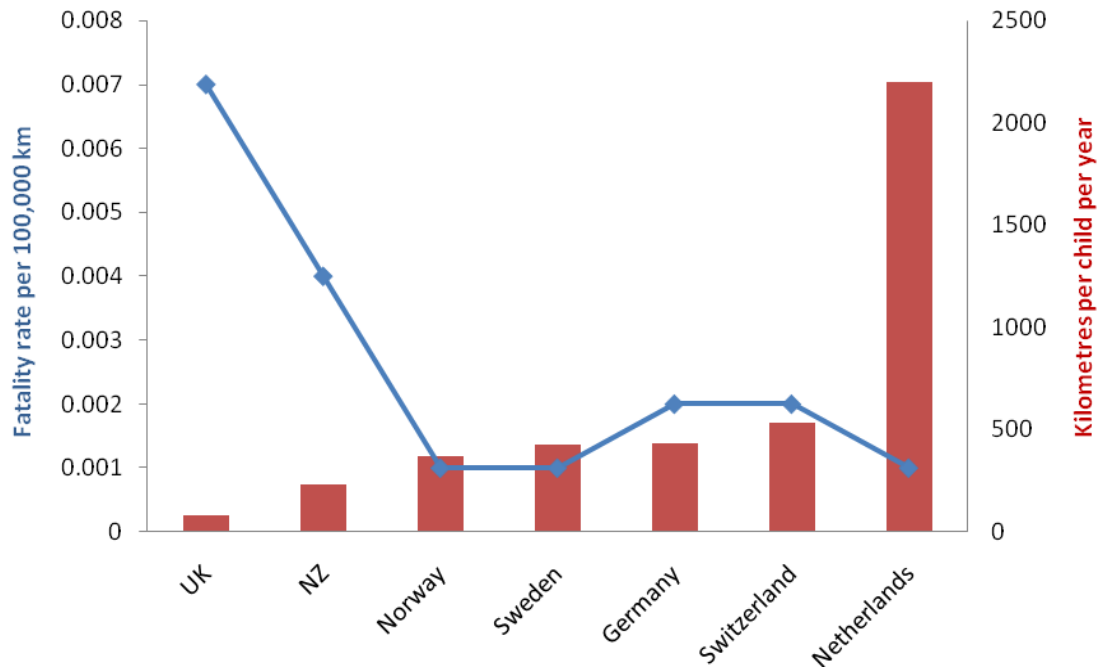


Figure 2: Fatality rate by distance cycled (10-14 years)
(Source: Christie et al 2004)

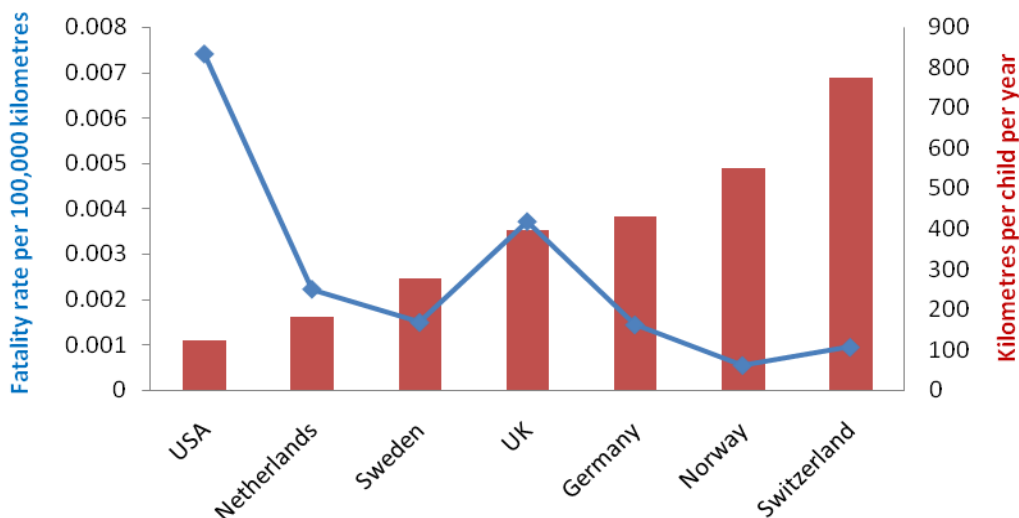


Figure 3: Fatality rate by distance walked (10-14 years)
(Source: Christie et al 2004)

As indicated in Figures 2 and 3, the study found little evidence of a steady gradation in pedestrian and cyclist fatality rates across countries (Christie et al 2004). Rather, there was a clustering effect, with five countries classified as the 'top performers' for pedestrian safety (Sweden, The Netherlands, Finland, Germany and Denmark). These countries have a strong commitment to fostering high levels of safe walking and cycling, and most have implemented a comprehensive package of integrated traffic safety measures including:

- a strong approach to infrastructure measures for pedestrian safety
- compulsory road safety education for children aged 6-9 years
- conducting *national* road safety campaigns once a year or more (most countries conduct regional publicity)
- speed reduction measures, including environmental modification and 30kph speed limits and signalised crossings in most areas, including very low speed limits outside schools
- legislation that assumes driver responsibility in an accident involving a child pedestrian
- commissioned research on child pedestrian safety
- support for a range of child pedestrian safety initiatives.

The clustering effect (of countries performing well and less well) was even more marked for child cyclist safety. Most of the top performing countries for child cyclist safety have implemented a comprehensive package of child cyclist safety measures including (in addition to those listed above for child pedestrians):

- high levels of cycling infrastructure provision
- promotion of child cyclist road safety education and training (often compulsory)
- *national* and regional child bicycle safety campaigns.

There is widespread recognition across OECD countries that while active travel carries a small risk of serious injury or death, the health and social benefits substantially outweigh the risks (Christie et al 2004). Consequently, rather than reducing children's exposure to traffic by discouraging walking and cycling, most OECD countries have policies aimed at promoting active travel and making it safer. There is variation, however, in commitment to active travel policies and implementation of the safety measures that simultaneously reduce risk and promote active travel.

Child overweight and obesity

The 2007-08 National Health Survey reported high and increasing levels of overweight and obesity among Australian children aged 5-17 years (ABS 2009). Based on measured height and weight, 17.1% of children are overweight, and 7.8% are obese. There has been a significant increase in the proportion of children who are obese; from 5.2% in 1995 to 7.8% in 2007/8 (ABS 2009).

Cross-country comparative data indicate an inverse relationship between child obesity and active travel (see Figure 4), but studies *within* countries such as Australia that have low active travel rates show no consistent relationship (Davison et al 2008; Booth et al 2006). Failure to detect a relationship in Australian studies may be due to the limited range of energy expenditure on active travel in Australia (ie children in the highest active travel categories in Australia have low levels of active travel compared with children in several European countries). Children in European countries with high active travel rates cover relatively large distances by foot or bicycle (see Table 1), thereby increasing the potential for active travel to contribute to energy expenditure and consequently the maintenance of healthy weight.

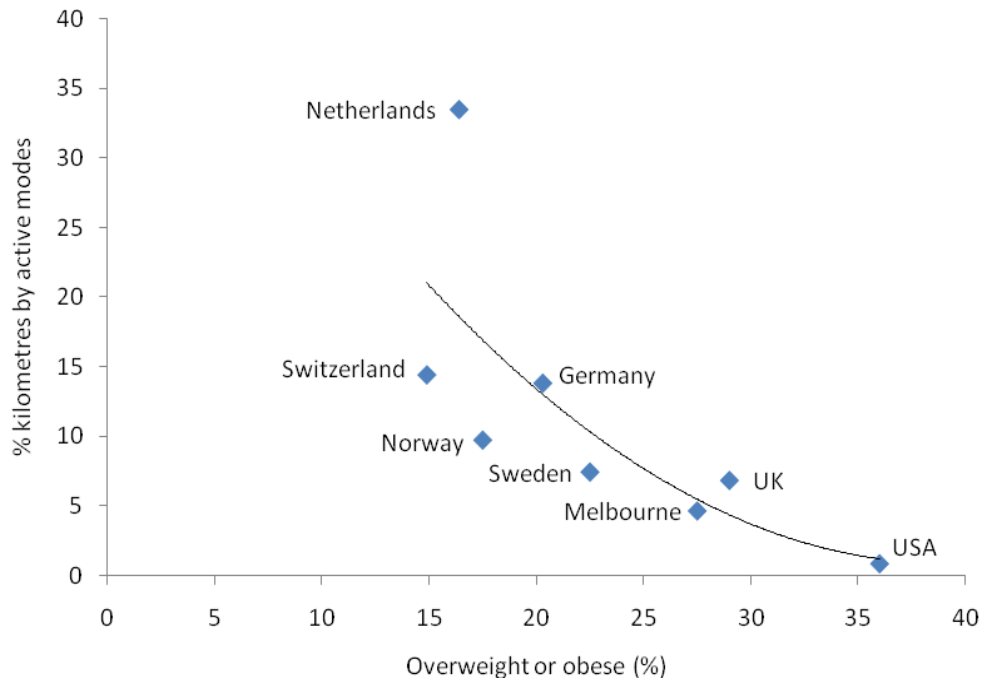


Figure 4: Active travel distance and overweight/obesity
(Melbourne Statistical Division travel data included in absence of Australian national data for children's active travel distance)
(Sources: Christie et al, 2004; International Obesity TaskForce, 2009)

Table 1: Distance walked and cycled per child (10-14 years) per year (km)

Country	Distance walked per child per year (km)	Distance cycled per child per year (km)	Proportion of total distance travelled using active modes (%)
USA	123	n/a	0.8 ⁵
UK	396	79	6.8
NZ	n/a	232	n/a
Norway	550	370	9.7
Sweden	275	424	7.4
Germany	431	518	13.8
Switzerland	773	535	14.4
Netherlands	180	2200	33.5
Melbourne ⁶	182	26	4.6

(Note: There is no current Australian national data available on children's walking and cycling trip distances.)

⁵ Walking only - cycling rates are not included in US data because they are very low.

⁶ Melbourne Statistical Division (Greater Melbourne Metropolitan Area), children aged 0-14 years, VATS 1994-99 average (Ironmonger and Norman 2007).

Additional benefits of active transport

The additional social benefits of increased active transport and reduced motor vehicle use include:

- transport benefits of reduced congestion, car space requirements and costs. Children being driven to school account for about 17% of all trips by all people in the Melbourne Statistical Division during the morning peak period between 8.30 and 9 am (Morris et al nd).
- environmental benefits of reduced air, noise, and visual pollution
- energy use reductions through fewer car numbers
- lower fossil fuel use and greenhouse gas emissions
- community strengthening through increased social interactions on streets and within neighbourhoods
- improved community safety, as ‘peopled’ places are safer places.

Mode shifts to active transport tick many ‘benefit boxes’ across multiple sectors, in contrast to the limited scope of some widely promoted, alternative ‘solutions’ to several key health, environmental, transport and urban planning problems (Litman 2009) (see Table 2).

Table 2: Multiple benefits of a mode shift to active transport

Planning objectives	Expand roadways	Efficient and alternate fuel vehicles	Mode shifts and smart growth
Reduce traffic congestion	✓		✓
Roadway costs savings			✓
Parking costs savings			✓
Consumer cost savings			✓
Improve mobility options			✓
Improve traffic safety			✓
Energy conservation		✓	✓
Pollution reduction		✓	✓
Efficient land use			✓
Public health and fitness			✓

(Source: Litman 2009)

5 Active travel in Australia and internationally

Current national data for all forms of travel undertaken by children in Australia are not available, but household travel surveys have been conducted in some capital cities. In Melbourne, data from the Victorian Activity and Travel Survey (VATS) for 1994-1999 show that the major mode of travel by children of all ages is as a car passenger.

Children aged 0-14 years in Melbourne (1994-1999 average) made an average of 23.1 trips per week, 16.3 of which were as a car passenger (71%), 5.0 as a pedestrian (22%) and 0.2 as a cyclist (1%) (Ironmonger and Norman 2007). Children spent on average 5 hours 12 minutes per week travelling, comprising nearly 4 hours as a car passenger, 48 minutes walking, and 2 minutes cycling. Children travelled a total of 87.3 km per week; 76 km (87%) as a car passenger, 3.5 km (4%) walking, and 0.5

km (0.6%) cycling. These travel patterns differ markedly from those observed in several of the countries included in Table 1. As outlined in the following section (correlates of children's and young people's active travel), the differences cannot be attributed solely (or even substantially) to greater travel distances in Australia.

Although the trip to school is a relatively short one for the majority of Australian children, most of these trips are by car. Data from the 2006 Victorian Child Health and Wellbeing Survey indicate that, for Victorian children aged five to under 13 years, car travel is the most common mode of travel to and from school (for a 5-day period) (64.1% of trips), followed by walking (22.7%), public transport (9.3%) and cycling (3.5%) (Department of Human Services 2007).

In Melbourne and Victorian regional centres, car travel is also the most common mode of travel to secondary education, but car travel is lower and public transport use higher than for primary school students (Department of Transport 2009).

Based on 1994-1999 VATS data for Melbourne, the majority of the car trips to and from primary school (61%) are linked trips; that is, activities other than going home are performed after dropping off or picking up children at school. Nevertheless, almost 40 percent of car trips made to school by parents with primary school children are simple home-school-home trips which may offer greater potential for substitution by active trips (Morris et al nd).

In contrast to public transport use among Australian adults, use of public transport on the trip to school may not involve a substantial active component. Based on NSW data, the median time spent walking for year 6 students who travelled to and from school by public transport was 0.0 minutes per trip. For year 8 students the median times was 2.0 minutes to school and 5.0 minutes from school (Booth et al 2006). These data indicate that while trips to school by public transport lead to multiple benefits associated with reduced car use, they may not make a substantial contribution to children's physical activity levels.

Australian children's rates of walking and cycling for transport are low in comparison to many other developed countries, and have declined substantially in recent decades. In Melbourne in 1970, 55.3% of young people walked to school or higher education, falling to 22.2% in 1994. In the same time period, cycling to education declined from 7.5% to 3.9% and car travel increased from 14.3% to 55.3%. In the rest of Victoria over this time period, walking to education fell from 35.4% to 15.9%, cycling from 20.3% to 7.9%, and car travel increased from 16.5% to 43.9%. (Australian Bureau of Statistics 1975; Australian Bureau of Statistics 1995)

Household travel surveys conducted in the Sydney metropolitan area show similar trends. The proportion of children aged 5-9 years who walked to school on the day of the survey more than halved between 1971 (57.7%) and 1999-2003 (25.5%). For children aged 10-14 years, walking to school dropped from 44% to 21.1%. Cycling data were not included in the analysis, but were reported to be low (1-2%) (van der Ploeg et al 2008).

The low rates of active travel to school in Australia are not universal among wealthy, industrialised countries. International data indicate that several European and Asian countries have high rates of active travel to school (Table 3).

Table 3: Frequency of walking and cycling to school

Location	Participants	Walk (%)	Bike (%)	Walk + Bike (%)
Victoria, Australia	3,000; 5-12 y	23	4	27
US	14,553; 5-18 y	12	1	13
Great Britain, 2006 National Travel Survey	5-16 y	46	2	48
The Netherlands	Primary school students	37	49	86
Odense, Denmark	323, 9 y	24	39	63
Izegem, Belgium	120, probability sample, 12-19 y	Urban: 13 Suburban: 2	Urban: 66 Suburban: 79	Urban: 79 Suburban: 81
Portugal	450, 12-18 y			23
Russia	4-11 y			59
Jiangsu Province, China	431 boys, 393 girls 12-14 y	Boys: 25 Girls: 21	Boys: 66 Girls: 63	Boys: 91 Girls: 84

(Note: data are indicative only, as measures of walking and cycling varied between studies)

(Sources: Sirard and Slater 2008; [UK] Department for Transport 2008; [Dutch] Ministry of Transport, Public Works and Water Management 2007; Department of Human Services 2007)

Most countries with high rates of active travel to school have higher rates of cycling than walking to school, which is opposite to the Australian pattern where walking is the main form of active travel to school and cycling rates are very low (Table 3). In many cases, children in countries with high rates of active travel to school also travel further to school than Australian children (van Dyck et al 2009).

This is likely a reflection of good neighbourhood-wide conditions for walking and (especially) cycling (Ministry of Transport Public Works and Water Management 2007). In contrast, in Australia, school crossings and reduced speed limits apply only in the immediate vicinity of the school; for example, 40km/hr school zone speed limits apply within a 250m radius of the school. In contrast, in Berlin, for example, 3,800 km of city streets (72%) are traffic calmed, with speed limits of 30km/hr or less, providing an extensive network of traffic-calmed streets (Jacobsen 2006). As noted in Section 4, speed reduction measures are a key component of child pedestrian and cyclist safety strategies in countries with high active transport levels.

6 Correlates of children's and young people's active travel

Several models of the influences on children's and young people's physical activity behaviour have been developed. A *social-ecological model* such as the one in Figure 5 can be applied to active travel. In this model, the environmental influences on active travel are both perceived and real. Intra-individual factors apply to both young people and parents, and include socio-demographic factors. As in all ecological models of behaviour, component factors are mutually interactive; for example, car-reliance (a social/cultural factor) contributes to urban sprawl (built environment), and urban sprawl in turn leads to car-reliance.

It is important to bear in mind that most of the research into the correlates of active travel reported in English-language journals are for studies conducted in Anglo-Saxon countries which have low rates of active travel. There is emerging evidence that the correlates of active travel in non-Anglo countries with high rates of active travel may differ markedly from those that have been identified in countries such as the US and Australia.

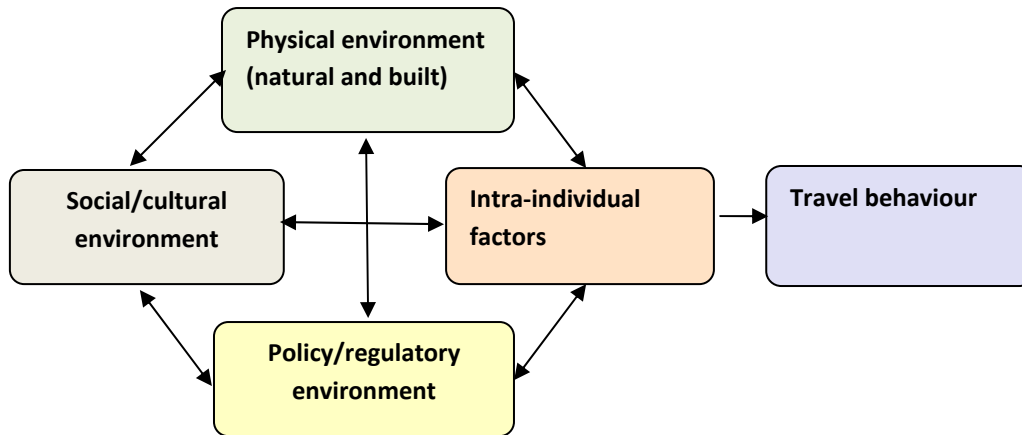


Figure 5: Environmental influences on children’s active travel behaviour
(Adapted from Gebel et al 2005)

Intra-individual factors (including socio-demographic factors)

In Australia, rates of active travel appear to be higher for older (secondary school age) students than younger age groups; and some, but not all studies report higher rates for boys than girls (Timperio et al 2006; Department of Health and Ageing 2008; Garrard et al 2009).

Research has also highlighted the important ‘gatekeeper’ role of parents. While this role is often framed in terms of traffic and safety concerns, the convenience of car travel, and parents’ own methods of travel to work and other destinations are also important (McMillan et al 2006; Davison et al 2008; Wen et al 2008; Garrard et al 2009).

‘Stranger danger’ can be a greater concern for parents and young women than road safety concerns (Garrard et al 2009), with some studies reporting that adolescent girls feel safer walking on busy roads (Kelty et al 2008).

The built environment

Travel distance is the strongest and most consistent predictor of active travel to school; with population density (within 800 metres of the school) and smaller schools also associated with higher active travel rates (Davison et al 2008). However, *perceptions* of feasible walking and cycling distances vary, and may be influenced by active travel behaviour (Ziviani et al 2006).

In countries with high rates of active travel to school, many students walk and cycle greater distances than considered feasible in countries such as Australia and the US (van Dyck et al 2009). These differences indicate that perceptions of feasible walking and cycling distances to school are shaped by cultural, environmental and policy factors (eg social norms of travel behaviour, walking and cycling infrastructure, urban speed limits).

Some studies report that walking and cycling infrastructure, traffic safety, urban/rural location, and weather conditions influence active travel to school (Davison et al 2008). However, while walking and cycling infrastructure is associated with active travel to school, neither perceived traffic safety nor weather conditions are consistent predictors of children’s active commuting.

A study of the impact of the road environment on children's and adolescents' active travel to local destinations in Melbourne, Australia, found no associations between road environment variables (such as traffic calming measures and traffic/pedestrian lights) and children's likelihood of walking or cycling to neighbourhood destinations, but some associations for adolescent boys and girls (Carver et al 2008a; Carver et al 2008b). The authors concluded that "The road environment influences physical activity among youth in different ways, according to age group, sex and type of physical activity."

Walkability indexes, which include numerous characteristics of the natural and built environments, do not necessarily apply to children and young people walking and cycling to school (Sirard and Slater 2008). In a Belgian study of 12-18 year-old adolescents, living in a less 'walkable' suburb (lower population density, street connectivity and mixed land use) in a suburban area of town was associated with *more* active travel to school (principally cycling) than living in a 'more walkable' inner city area (Van Dyck et al 2009).

A comparative study of commuting to school in urban and suburban municipalities in the Greater Toronto Area, Canada, found few consistent differences in the prevalence of active travel to school for urban and suburban locations (Buliung et al 2009). Between 1986 and 2006, active travel to school declined in all areas, though presumably the built environment did not change substantially over time. These and other studies (eg Christie et al 2004; Christie et al 2007) suggest that transportation and traffic safety policies may be more important determinants of children's active travel than urban form per se.

Social/cultural environment

At a national level, Christie et al (2004) reported associations between macro socio-economic indicators and child traffic safety performance (and by association, active travel rates - see Figures 2, 3 and 6) in OECD countries. While the relationships summarised in Table 4 are relatively weak, socio-economic factors such as GDP and economic inequality appear to be more important than demographic factors such as population density and car ownership. More equal societies "almost always do better" (Wilkinson and Pickett 2009) including maintaining healthy weight during childhood (Wilkinson and Pickett 2009), child traffic safety (Christie et al 2004) and, possibly, active travel.

At first glance the relationship between economic inequality and children's active travel (Figure 6) is surprising, and it is important to bear in mind that an observed association is not proof of causation. Nevertheless, there is a plausible mechanism for the relationship. Both crime and child traffic injuries are higher in less equal societies (Christie et al 2004; Wilkinson and Pickett 2009), and these are among the most commonly reported reasons for parents restricting their children's independent mobility (Davison et al 2008; Sirard and Slater 2008).

More equal societies are characterised by higher levels of trust, social cohesion, and involvement in community life; and lower levels of violence (Wilkinson and Pickett 2009). These features could well influence parents' willingness to allow their children the level of independent mobility that characterises children's use of public space in more equal societies, and in previous generations in Australia which were characterised by lower levels of economic inequality (Stilwell and Jordan 2007).

Countries with higher levels of economic equality also appear to support more equitable transportation systems that cater for the needs of all road users, including pedestrians and cyclists (see pages 5 and 6).

Table 4: Correlation coefficients for child traffic fatalities and socio-economic and demographic indicators, OECD countries

Indicator	Correlation with overall child traffic fatality rate
GDP per capita	0.51
Gini coefficient of economic inequality	0.47
Percentage of lone parent families	0.38
Child poverty index	0.36
Percentage urban population	0.21
Population density	0.18
Cars per capita	0.17

(Source: Christie et al 2004)

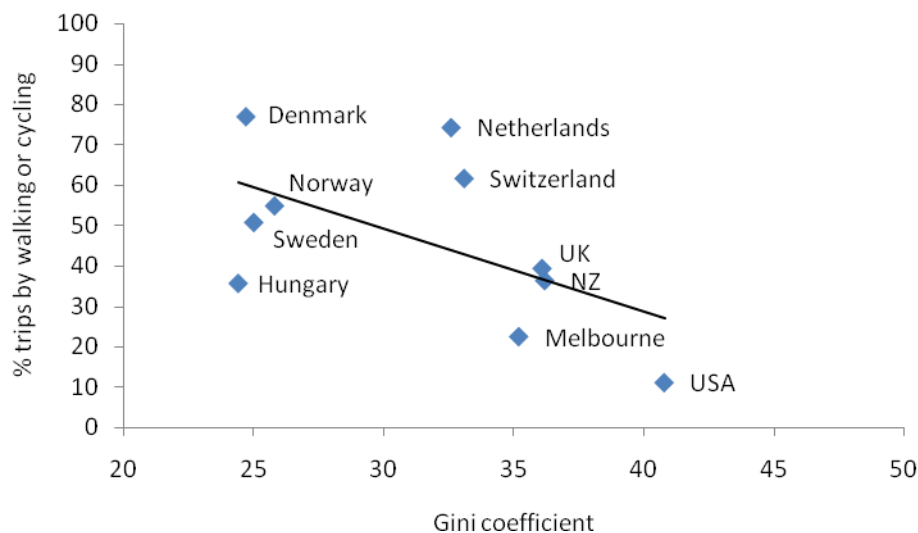


Figure 6: Economic inequality and active transport, children 10-14 years

(Source: based on data from Christie et al 2004)

Notes:

- Higher Gini Coefficient represents greater inequality
- Correlation Coefficient = -0.57
- Melbourne data point: trip data for Melbourne Statistical Division has been included in absence of Australian national data; Gini Coefficient is for Australia as a whole.

Social factors at the interpersonal level include behavioural norms, which are important determinants of individual behaviours (McKenzie-Mohr and Smith 1999). Although road safety has steadily improved in Australia since the 1960s, changed social norms of being a “good parent” have led parents to curtail children’s independence to explore their environments, walk to school, and spend the day unsupervised with their friends (Thomson 2009).

Other aspects of the social/cultural environment that inhibit active transport include a greater value placed on individual good compared with social or community good, which contributes to the vicious

cycle whereby parents drive their children to school to protect them from the adverse traffic conditions created by other parents driving their children to school (Dora and Phillips 2000).

Social norms often manifest as 'habits'. In a survey of Dutch adults, after controlling for variables in the theory of planned behaviour, habit strength was the strongest predictor of bicycle use as a means of transport (deBruijn et al 2009).

Among social environmental correlates of active travel to school, mixed results have been reported for crime, safety, and parental perceptions of neighbourhood safety at the local level (Davison et al 2008). On the other hand, more consistent findings have been reported for the impact of perceived social norms such as parental perceptions that other children in the area actively commute to school (Davison et al 2008).

The underlying cultural values and norms that shape travel mode choices are also reflected in transportation policies, which, in Australia, favour car use over non-motorised forms of transport. Several historians (Davison 2004), geographers (Tranter 2004), transport researchers (Mees et al 2008) and public health researchers (Hinde and Dixon 2005) have documented diverse aspects of Australia's 'culture of car dependence'.

The policy/regulatory environment

The policy and regulatory factors associated with child pedestrian and cyclist safety identified by Christie et al (2004) and summarised in Section 4 are also important policy and regulatory determinants of children's active travel. High rates of active travel are consistently associated with pedestrian and cyclist safety in developed countries, where promotion of active travel and safety have occurred concurrently.

In Australia, improvements in child pedestrian and cyclist injury rates have been achieved largely by removing children from the traffic environment, rather than ensuring a safe environment for pedestrians and cyclists. In contrast to Australia, the high active travel countries in Europe have adopted the latter policy position. In Denmark, for example, in response to increasing rates of child pedestrian and cyclist injuries in the 1980s, a range of safety measures was implemented that simultaneously promoted both active travel and child pedestrian and cyclist safety. As a result, Denmark now has one of the highest mode shares of active trips by children (77%, see Figure 6), while at the same time, child pedestrian and cyclist fatalities in 2001 have been reduced to one-eighth and one-sixth respectively of the 1981 fatality rates (Christie et al 2004).

It is interesting to note that, in Australia, the high rates of child car passenger fatalities described in Section 4, which are largely due to the relatively high vehicle kilometres travelled by Australian children, are being addressed through improved vehicle and road safety measures rather than by discouraging car use.

In summary, the correlates of children's active travel are complex, with a large number of inconsistent findings. Not surprisingly, in most studies about 70% of the variance in active travel rates remains unexplained (Krizek et al 2009).

In general, there are substantial differences between:

- young people and adults
- high active travel countries/localities and low active travel countries/localities
- boys and girls
- children and adolescents
- rural and urban areas
- active travel modes (walking and cycling).

7 Interventions aimed at increasing children's rates of active travel

Several frameworks have been used to develop interventions aimed at increasing children's active travel. These include

- Community-based social marketing (McKenzie-Mohr and Smith 1999)
- The 'four Es': Education, Encouragement, Engineering and Enforcement (Rose 1999)
- Integrated Health Promotion and the Ottawa Charter for Health Promotion
- Travel planning

A number of interventions to increase active travel (principally to school) are currently being conducted in several countries, but only a small number have been rigorously evaluated.

A recent systematic review and meta-analysis of 'soft' transport policy measures aimed at increasing active travel and reducing private car use (ie programs aimed at voluntary behaviour change, usually using social marketing strategies) reported inconsistent evidence for the effectiveness of school-based programs (Möser and Bamberg 2008).

Some recent evaluations have been reported in Australia and New Zealand. An evaluation involving five out of 15 primary schools in suburban Sydney that participated in the NSW TravelSmart program reported that active travel to school (defined as walking, cycling or public transport) increased over the program period in three out of the five schools⁷ (Fry 2008). The Central Sydney Walk to School Research Program, which comprised a randomised controlled trial involving 24 government primary schools in inner suburban Sydney, reported inconsistent evidence of an impact on students' walking trips to and from school. Parent-reported data showed an increase in students' walking trips, but student-reported data showed no significant changes (Wen et al 2008).

An evaluation of the Brisbane Active School Travel program reported a 24.8% increase in active travel mode share to school and an 18.1% increase in active travel mode share from school across the 13 primary schools that participated in the 2008 Active School Travel program. Walking trips to school increased by 19.1% (from 19.0% to 38.1%), and cycling trips by 3.1% (from 3.9% to 7.0%) (Brisbane City Council 2009). In New Zealand, the Auckland Regional Transport Authority's 2007 School Travel Plan evaluation, based on "roll call" data collected from 35,153 students across 68 primary and secondary schools, reported a reduction in travel by "family car" of 3.4% (Sullivan and Percy 2008).

Evaluation of the Ride2School program in Victoria found:

- An increase in active travel to school in an inner Melbourne suburb with a committed school, located in a supportive environment, and a relatively intensive intervention program.
- No consistent evidence of an increase in active travel to school across 13 primary schools in rural and metropolitan Melbourne following a less intensive intervention program.
- An increase in active travel to school on 'special event' days (eg annual Ride2School Day, monthly Hands Up! surveys).
- An increase in cycling to school following installation of bike storage facilities in 36 schools (Garrard et al 2009).

⁷ Aggregated findings across the five schools were not included in the report.

In summary, variable program impacts occur both between programs and for individual schools within multi-site programs. Much of this evaluation literature is relatively recent, and there has been little systematic assessment of the reasons for variable program impacts. However, based on limited process/implementation evaluation data to date, the determinants of success are likely to include factors associated with schools and their social, cultural and built environments; program type; and quality of program implementation. Evaluation designs and methods also impact on evaluation findings; for example, it appears that the more rigorous evaluations published in peer-reviewed journals tend to report smaller impacts than internal evaluations.

The evidence outlined in this report indicates that a combination of supportive national policies together with complementary local and regional policies and programs are required to achieve substantial and sustainable increases in children's levels of walking and cycling for transport.

8 Summary and future directions

Children enjoy walking and cycling in their neighbourhoods and the vast majority of children prefer to walk or cycle to school. Many parents also express preferences for active travel to school, but are constrained by social, policy and environmental factors that make active travel choices difficult choices (Garrard et al 2009).

The experience of several affluent European and Asian countries demonstrates that active travel choices can be easy choices, including within urban environments similar to the low population density suburbs surrounding Australian cities. With the right conditions, policies, education and encouragement, more children would undoubtedly travel to school by foot (up to about 1km) or by bicycle (up to about 5km). These distances place active travel within the reach of the approximately 77% of Australian families who live within 5km of school (ABS 1995).

It is important to bear in mind that travel choices involve choices among alternatives, each with their own set of perceived benefits and barriers. The conditions under which travel choices can be 'tipped' towards walking or cycling rather than driving for short distances are well-established in the transport and public health literature, as summarised in this report.

Small changes can be achieved, at least in the short-term, through programs such as Safe Routes to School, Walking School Buses, School Travel Planning, and Walk/Ride to School events. However, these initiatives need to be complemented by area-wide improvements that support children's independent mobility within their overall neighbourhood. These include reduced urban speed limits, good cycling and walking infrastructure, and secure bike storage at schools, shopping centres and community facilities.

Some 'hard infrastructure' investments (bike paths and pedestrian crossings) require substantial funding, while investing in 'soft infrastructure' (eg reduced urban speed limits, traffic calming, reduced car parking, and fostering safe, courteous driving and respect for all road users) requires community support and political leadership. Lessons from successful health promotion strategies in other health areas highlight the importance of community partnerships, intersectoral cooperation, and advocacy for policy and environmental change.

Good models for fostering individual travel behaviour change are also available (eg McKenzie-Mohr and Smith 1999). Community-based social marketing programs aimed at travel behaviour change need to be adequately resourced for a sustained period, well-implemented, and evaluated as part of a process of continuous improvement. Most Australian children, as well as many adults, already have positive attitudes to active travel to school and other destinations. Substantial and sustained change will be achieved by helping children and parents do the things they are already predisposed to do by addressing the perceived and real barriers to children's active travel.

Parental involvement in the change process is crucial, as parental opposition to active travel to school is one of the main barriers for children walking or cycling to school (Garrard et al 2009). It is also important to recognise that strategies for promoting walking and cycling differ somewhat; as will the strategies required in different school settings and for different families (eg family composition, work commitments and parents' own travel modes (Wen et al 2008)).

It is important to understand the motivations and processes whereby organisations such as schools commit to promoting active travel. While many schools see active travel as an important strategy for promoting health and environmental sustainability, some schools may be more interested in traffic management (Rose 1999) or improved school facilities such as bike storage (Garrard et al 2009).

Social and cultural norms of travel behaviour are a powerful influence, but a neglected area in active transport research and interventions. Parental and wider community behaviour, including among community leaders and respected role models (eg teachers, school principals) convey powerful messages about community norms of travel behaviour.

Parents and children are especially open to 'social cues' about appropriate travel modes when they move to new environments and engage with new organisations (Vanderbilt 2008). The many 'transitions' that children and parents experience through childhood and adolescence offer numerous opportunities to directly and indirectly convey 'active travel norms'; for example commencing travelling to child care, kindergarten, primary school, secondary school and university/TAFE. The transition from primary to secondary school is particularly important to counter the substantial decline in physical activity for adolescents, particularly girls. Strategies aimed at encouraging young people to delay purchasing their first car, particularly when they move from school to post-school education, may help young people make more economically rational transport decisions at a time when financial resources are often limited (Tranter 2004).

Most countries and municipalities, including within Australia, have a range of policies aimed at reducing car use and increasing young people's levels of walking and cycling for transport. The difference between stated intentions and actually achieving change lies in the strength of commitment to and investment in the integrated packages of measures that have been shown to be effective in increasing active travel and reducing car use.

Communities, organisations and all tiers of government need to work together to create the social and environmental conditions under which short trips by walking or cycling gradually replace car trips as the default travel choice for children, parents and the wider community.

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