Deakin University

What influences whether children walk or cycle to school?

Centre for Physical Activity and Nutrition Research

Summary report

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Executive summary

There is growing evidence that children who are more active experience better physical and psychosocial health outcomes. In addition, children who walk or cycle to school tend to be more physically active overall, compared to children who are driven by car.

Despite these benefits, participation in physical activity among children has declined in recent years, particularly in relation to walking and cycling to school. In order to effectively address this issue it is important to understand the factors that influence children's active commuting to school.

The Children Living in Active Neighbourhoods study (CLAN) explored influences on children's active commuting to and from school as they transitioned from early to late childhood and from childhood through to adolescence. The CLAN study was a longitudinal study involving surveys of parents and children in 2004 and 2006.

Half of the children and adolescents participating in the study were found to walk or cycle to school for at least one trip per week, and 25% actively commuted for five or more trips per week. The CLAN study also found that most children maintained this behaviour as they got older, emphasising the importance of establishing early habits for active commuting.

Influences on children's and adolescents' active commuting are many and varied. The CLAN study found the neighbourhood social environment to be important, particularly for younger children. Knowing many people within the neighbourhood was related to increases in children's active commuting. Active commuting among adolescents was strongly influenced by neighbourhood infrastructure such as adequate lighting and the availability of crossings. Adolescents with adequate pedestrian facilities in their neighbourhood were more likely to increase their active commuting.

The CLAN study findings support the need for effective programs to promote active commuting to and from school. The study identifies that future strategies should consider and address a range of factors influencing active commuting behaviours, including neighbourhood social networks and the physical environment in the local neighbourhood.

Those closest to young people, including families and schools, have a role to play in encouraging improved social networks within neighbourhoods to promote active commuting, whilst neighbourhood infrastructure factors can be directly addressed by urban planners and policy makers.

This report describes the key findings of the study. It will be of interest to parents and families of children and adolescents; teachers and schools; urban planners and policy makers; health professionals; and others interested in children's health and the promotion of active commuting.

Background and study aims

1.1 The importance of physical activity in childhood

Physical activity during childhood plays an important role in promoting physical, social and psychological health both in the short and long term.

Like adults, children who are physically inactive are more likely to be overweight or obese, to have poorer mental health profiles and to have reduced overall wellbeing [1]. Unfortunately, risk factors for conditions such as obesity and cardiovascular disease are maintained from childhood through to adolescence and on to adulthood [2]. In contrast, physical activity during childhood has been shown to protect against the development of several chronic diseases later in life. With current data showing that one in five Australian children are overweight or obese [3], it follows that, the promotion of physical activity during the transition from childhood through to adolescence should be an important public health priority.

1.2 How much and what sort of physical activity?

Children's physical activity is often referred to in terms of 'intensity' or how much energy is used when performing the activity. It is recommended that children spend at least 60 minutes per day in moderate-to-vigorous activity [4] such as organised sports (e.g. tennis or netball), active free-play (e.g. playing in the backyard, playing with the family dog) and active commuting (e.g. walking and cycling to/from school).

With one in five Australian children being overweight or obese, the promotion of physical activity is an important public health priority.

1.3 The role of active commuting

Active commuting can make a significant contribution to children's overall levels of physical activity, however, it is often overlooked as a source of physical activity amongst children [5].

Compared to children who are driven to school, children who walk or cycle tend to have higher levels of overall physical activity [6]. One study among Danish children showed that children who walked to school performed approximately 20 mins/day more moderate-to vigorous-intensity physical activity (MVPA) than children who were driven (193 mins/day compared to 156 mins/day); while those who cycled performed 10 mins/day more MVPA than those who were driven (166 mins/day compared to 156 mins/day). Similarly, a study among American children showed that those who walked or cycled to school performed approximately 3% more MVPA daily than other children.

Whilst there are no current Australia-wide data relating to frequency of children's walking and cycling to school, a state-wide study (2004 NSW Schools Physical Activity and Nutrition Survey) found that approximately 30% of year 6 children walked to school. However, among older youth, levels of active commuting were considerably less, with approximately 15% of year 8 and 18% of year 10 students walking to or from school.

1.4 What has happened to active commuting in recent years?

Overall rates of active commuting seem to have declined in recent years. One study from Victoria found that the number of children walking to and from school every day declined by approximately 10% between 1985 and 2001 (from an average of 4.4 trips/week to an average of 3.6 trips/week), while the number of children cycling to school halved during this time (from an average of 1.2 trips/week to an average of 0.4 trips/week) [8].

In Victoria, the number of children cycling to school halved between 1985 and 2001[8].

Figures from New South Wales support the Victorian findings, with declines in walking to school ranging from 10% to 20% between 1985 and 2004 [7]. Declines in cycling were also seen during this period. For year 8 boys, participation rates in regular cycling decreased from 7% in 1985, to only 0.3% in 2004. Declines were similar, if not greater among NSW girls [7].

Dramatic changes in active commuting patterns have also been seen among youth in the United States. In 1969, approximately 41% of students walked or cycled to school, and in 2001 this proportion had decreased to only 13%.

In light of these findings, understanding influences on young people's active commuting is vital if we are to prevent further declines in this important health behaviour.

1.5 Understanding factors affecting active commuting

Several factors are likely to influence children's walking and cycling behaviours, including:

- psychological and individual-level factors (e.g. not enough energy, too dark /cold in winter, too hot in summer);
- family and social factors (e.g. siblings or other children with whom to walk or cycle); and
- physical environmental factors (e.g. neighbourhood design).

Individual-level, family and other social influences have been examined in several studies with mixed results, however, relatively few studies have looked at environmental influences. One review suggests that children with access to places to walk or cycle to in their neighbourhood (e.g. shops, parks, friends' houses), recreational facilities (e.g. sporting arenas) and public transport tend to be more physically active [9]. That review also showed that children who live in neighbourhoods that have footpaths and intersections with lights or pedestrian crossings also tend to be more physically active. In contrast, children who live in neighbourhoods with a higher number of roads to cross, higher traffic density and speed, tend to be less physically active [9].

Children who live in neighbourhoods that have footpaths and intersections with lights or pedestrian crossings tend to be more physically active [9].

Importantly, few studies have examined the different levels of influence (individual, social and physical environmental) concurrently, particularly in relation to walking and cycling to school. In one study, Timperio and colleagues (2006) examined associations between individual, social and environmental factors and active commuting to school among 5-6 and 10-12 year-old Australian children [10]. Individual or family-level factors were not associated with active commuting among these children. Significant associations were however found between physical and social environmental factors (e.g. a busy road barrier on the route to school and few other children in the neighbourhood) and active commuting for the school journey.

A limiting factor of the study was that it considered children at only one point in time. A better understanding of the influences on changes in active transport during key transition periods (e.g. as children move into adolescence) is needed to inform programs and policies regarding the promotion of safe active transport practices.

1.6 Programs to improve active commuting

Few studies have measured the success of programs aimed at increasing walking and cycling to school. Staunton and colleagues (2003) implemented a 'Safe Routes to School' program in order to promote walking and cycling among youth in the United States[11]. Fifteen schools implemented the program, which identified and created safe routes for children to walk or cycle to school. A 64% increase in trips to school by walking and a 114% increase in trips to school by cycling were seen. However, as data from comparison schools not implementing the program were not collected, these findings should be interpreted with caution.

Another study among 21 schools in the United Kingdom examined the impact of changes to school policies and programs related to active transport[12]. Intervention schools were encouraged to change existing policies about active commuting and implement school travel plans. Nine of 11 intervention schools (compared to none of the 10 control schools) implemented a safe active travel to school plan, however, there were few differences in the proportions of children walking, cycling or using public transport for the school journey. The authors identified that parental fears about their child's safety did not change during the intervention, and this may have accounted for the lack of effect of the program.

1.7 Study aims

Programs promoting walking and cycling to school must be based on a sound understanding of the factors that influence these behaviours, and how these factors influence changes in behaviour over time. Studies examining multiple influences on children's walking and cycling to school, and influences on these behaviours over time are therefore needed. This study by the Centre for Physical Activity and Nutrition Research has sought to fill these gaps in research and thus inform the development of effective strategies to promote active commuting amongst schoolchildren.

The specific aims of this study were:

1. To examine rates of active commuting for the school journey;
2. To explore children's and parents' perceptions of individual, social and physical environmental factors;
3. To examine the association between individual, social and physical environmental factors and children's active commuting for the school journey;
4. To understand changes in children's active commuting for the school journey over time; and
5. To examine how individual, social and physical environmental factors predict increases in children's active commuting for the school journey.

Study design and methods

2.1 Study design

This study, known as the 'Children Living in Active Neighbourhoods' study or 'CLAN' study involved three main aspects:

- surveys of parents seeking information about their child's physical activity (including active commuting), their family and neighbourhood environment;
- surveys of adolescents seeking information on similar topics; and
- measurement of height and weight of participating children.

These methods were applied in 2004 and again in 2006 amongst children and parents in a range of socioeconomic status (SES) suburbs of metropolitan Melbourne.

Approval to conduct all phases of this study was received from the Deakin University Human Research Ethics Committee, from the Victorian Department of Education and from the Catholic Education Office. Consent for participation in the study was provided by the parents on behalf of themselves and their child.

2.2 Study participants

Participants were recruited from those who had participated previously in the Children's Leisure Activities Study (CLASS) conducted in 2001. Participants in CLASS were contacted in 2004 to be part of the follow-up study (CLAN), and again in 2006.

Children and their parents were recruited to the original CLASS study in 2001 from ten primary schools in the eastern suburbs (high SES) and nine primary schools in western suburbs (low SES) of metropolitan Melbourne. All children aged 5-6 years (prep), and 10-12 years (grades 5-6) and their parents were eligible to participate in the CLASS study. Participating children and their families were also asked if they wished to be contacted again for a follow-up study. Numbers of participants are outlined in Table 1.

In 2001, participants in the CLASS study included:

- Parents who had children in prep or in grades 5-6
- Primary schoolchildren in grades 5-6

In 2004, participants were:

- Parents who had children in grade 2 or years 7-10
- Secondary schoolchildren (adolescents) in years 7-10

In 2006, participants were:

- Parents who had children in grade 4 or in years 9-12
- Secondary schoolchildren (adolescents) in years 9-12

Table 1 Study participants in 2001, 2004 and 2006

	CLASS	CLAN	
	2001	**2004**	**2006**
Younger children	296 families	188 families	172 families
Adolescents	919 families	403 families	314 families
Total	**1210 families**	**591 families**	**486 families**

2.3 Parents' survey

Parents of all children completed surveys containing questions related to:

- *Family demographic characteristics* – Parents reported their marital status, highest level of education, and the number and age of children living in the house. They also reported their own height and weight from which their body mass index (BMI) was calculated (kg/m^2). Using standardised reference values, their weight status (e.g. underweight/normal weight: <24.9 kg/m^2, overweight: 25.0-29.9 kg/m^2; or obese: ≥30.0 kg/m^2) was calculated.
- *Barriers to physical activity* – Parents reported on the reasons why their child did not participate in more physical activity.
- *Neighbourhood* – Parents reported their perceptions of the social environment and various physical environmental factors in their local neighbourhood.
- *Active commuting* – Parents reported whether or not their child walked or cycled to and from school and the frequency with which their child did this.

2.4 Adolescents' survey

Adolescents completed a survey containing questions related to:

- *Barriers to physical activity* – Adolescents self-reported why they do not do more physical activity.
- *Active commuting* – Adolescents reported whether or not they walked or cycled to or from school and the frequency with which they did this.

2.5 Children's height and weight

Children's height (m) and weight (kg) were objectively measured using a stadiometer and digital scales. BMI was calculated (kg/m^2). From this, using a standardised equation, children's weight status was predicted [13] and they were classified as underweight/normal weight, overweight or obese.

Study findings

3.1 Characteristics of study participants

A total of 309 families participated in the CLAN study in 2004 and 2006.

Table 2 shows the characteristics of these children and families in 2004. Younger children were aged approximately 9 years, and older children/adolescents were aged approximately 14 years. The majority of parents in the study were married. Maternal education, which is commonly used as an indicator of children's socioeconomic status, varied. About half of the mothers of younger children had higher levels of education.

In 2006, younger children were aged approximately 11 years, and adolescents were aged approximately 16 years. The proportion of boys and girls was consistent between the study groups.

Table 2 Family characteristics of children and adolescents, 2004

	Children	Adolescents
CLAN 2004		
n	121	188
Age (years; mean, SD)	9.1 (±0.34)	14.5 (±0.65)
Maternal education level (%)		
Some high school or less	18.2	21.8
High school or technical certificate	31.4	34.0
University/tertiary	50.4	44.2
Weight status (%)		
Not overweight	76.0	75.0
Overweight/obese	24.0	25.0
Active commuting to/from school (mean trips/week)		
Walking	2.9	2.9
Cycling	0.4	0.2
Total	3.2	3.1
Active commuting to/from school (%)		
Never	38.0	52.1
≤ Once/day (1-5 trips/week)	39.7	22.3
Daily (6-10 trips/week)	22.3	25.5

Overweight and obesity among children

Overweight and obesity in childhood is an important public health concern. The most recent Australia-wide data suggest that 17% of Australian children are overweight and a further 6% are obese [3].

Figures 1 and 2 show the weight categories of children and adolescents in the CLAN study in 2004. Compared with national averages, slightly more children in the CLAN study were overweight or obese. Although most children are in the underweight or normal weight category, approximately 20% were overweight, with a further 6% in the obese category. There were no differences in children's weight status by maternal education level.

Figure 1 Weight category by sex among younger children in 2004 (n=121)

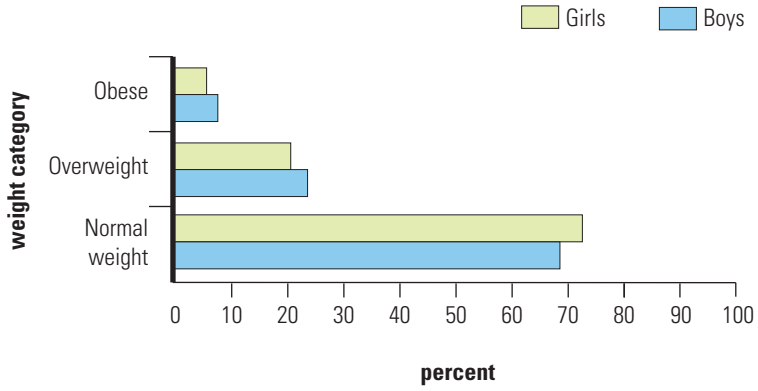
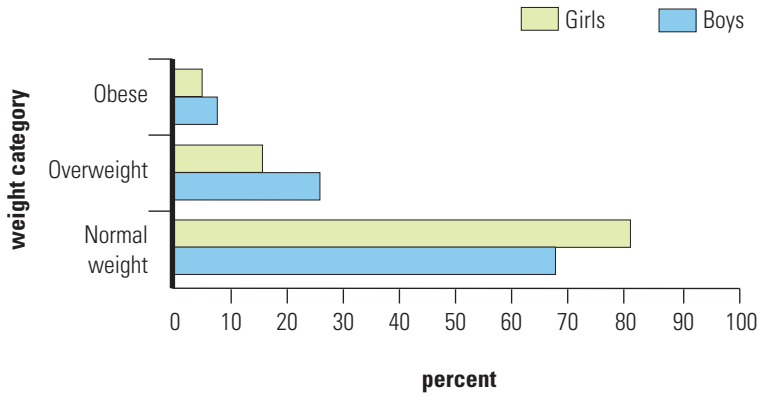


Figure 2 Weight category by sex among adolescents in 2004 (n=188)



Overweight and obesity among parents

According to the most recent Australian data, 67% of men and 42% of women are overweight or obese [14]. Table 3 shows the proportions of CLAN parents within these weight categories. The proportion of fathers in the overweight or obese categories appears consistent with national averages, although slightly fewer mothers in the CLAN study appear overweight or obese than national averages.

Table 3 Proportion of parents that were underweight/normal weight, overweight or obese in 2004

	Parents of younger children (n=120)	Parents of adolescents (n=182)
Mother weight status (%)		
Underweight/normal weight	64	61
Overweight	25	28
Obese	11	11
Father weight status (%)		
Underweight/normal weight	34	40
Overweight	49	47
Obese	17	14

3.2 Are children actively commuting to and from school?

Key findings:

- **In 2004, approximately 50% of CLAN children did not walk or cycle to or from school at all, and very few children, particularly girls, cycled to school.**
- **There were no differences between younger children and adolescents in the average number of active commuting trips to or from school.**
- **On average, boys walked or cycled to school more often than did girls, in both age groups.**

Parents of younger children in the 2004 CLAN study reported how often their child walked or cycled to or from school during a typical week. Adolescents reported this information themselves. Children's commuting behaviours were categorised as follows:

- do not actively commute (0 trips per week);
- actively commute at all (1-5 trips per week); and
- actively commute every day (6-10 trips per week).

Figure 3 shows the proportion of younger children actively commuting to and from school in a typical week. The majority of children did not walk or cycle to school at all, with 38% of boys and 52% of girls reporting no active commuting trips to or from school. Only about 12% of boys and girls walked or cycled for each school trip (10 trips/week). Overall, about 40% performed between 1-5 trips/week (actively commuted at all) and approximately 22% of children performed 6-10 trips/week (actively commuted every day).

Figure 4 shows the proportion of adolescents actively commuting to and from school in a typical week in the 2004 CLAN study.

The pattern observed for younger children is similar to that observed among adolescents, with most adolescents reporting no walking or cycling trips to or from school (47% among boys and 56% among girls). Approximately 17% of adolescents walked or cycled to or from school for each trip. Overall, approximately 22% of adolescents actively commuted at all, and approximately 26% of adolescents actively commuted every day. Figure 5 shows the average number of trips by CLAN children and adolescents, combining walking and cycling. On average, boys and girls walked to or from school approximately 3 times per week. Boys cycled approximately 0.7 times/week, but almost no girls reported cycling to or from school in a typical week, which was a significant difference.

Figure 3 Proportion of younger children actively commuting to/from school in 2004 (N=121)

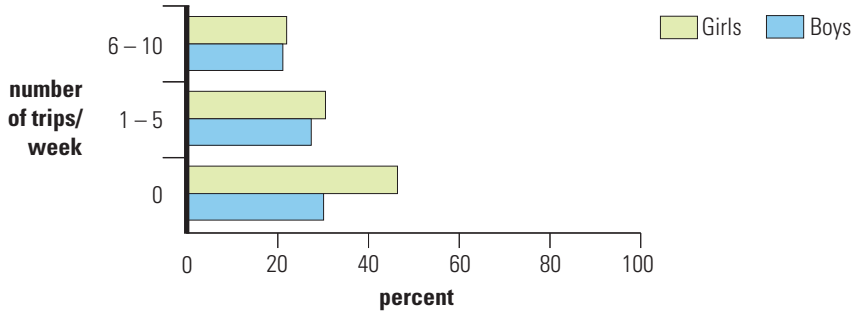


Figure 4 Proportion of adolescents actively commuting to/from school in 2004 (N=188)

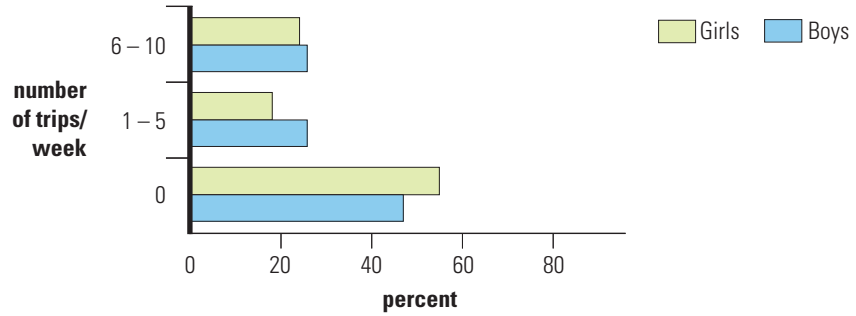
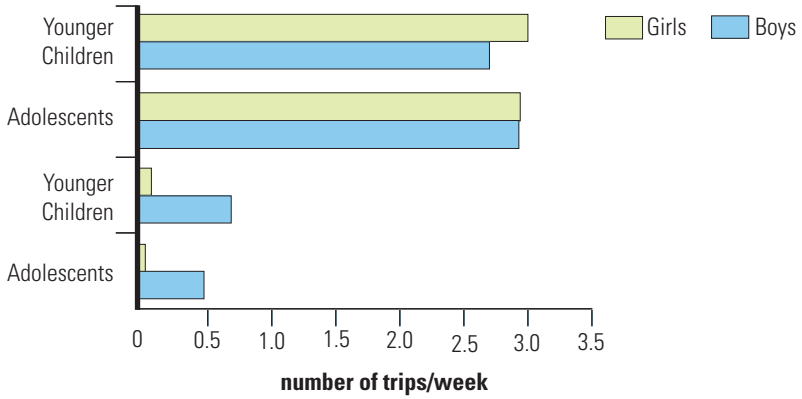


Figure 5 Combined number of walking and cycling trips to/from school per week by age group in 2004 (N=309)



3.3 What factors influence active commuting?

The factors that influence children's active commuting are likely to be many and varied. There are also likely to be several 'levels' of influence from personal barriers (e.g. haven't got the energy) to social factors (e.g. having many friends in the area with whom to walk or cycle) and physical environmental factors (e.g. the presence of heavy traffic in the neighbourhood).

3.3.1 Individual-level factors and active commuting

Key findings:

- **Few parents of younger children reported significant individual-level barriers to their child's active commuting to school.**
- **Few adolescents reported significant individual-level barriers to their own active commuting to or from school.**
- **Body weight was not found to be associated with active commuting in either younger children or adolescents.**

In the CLAN 2004 study, perceived barriers to children's physical activity were examined via the surveys of parents and adolescents.

Figure 6 shows the results in terms of the proportion of parents of younger children who agreed with statements about potential barriers to physical activity. Few parents of younger children (less than 10%) agreed that their child was too lazy or couldn't be bothered, didn't have the energy or wasn't the outdoors type, and less than 15% agreed that it was too hot in summer for their child to spend time outside. Approximately 30% of parents thought it was too dark and cold in winter for their child to spend time outside. There were no differences between the barriers reported for younger boys and girls.

Adolescents in the 2004 CLAN study self-reported their agreement with the statements about potential barriers (refer Figure 7). Compared to younger children, a higher proportion of adolescents reported they were too lazy or couldn't be bothered (4% compared with 12% respectively), and a lower proportion reported it was too cold or dark in winter to spend time outside (34% compared with 13% respectively). The proportion of adolescents agreeing that it was too hot in summer to spend time outside, they weren't the outdoors type or they didn't have the energy was low (approximately 5%). There were no differences between the barriers reported for adolescent boys and girls.

Figure 6 Parent-reported barriers in relation to younger children's activity in 2004 (N=121)

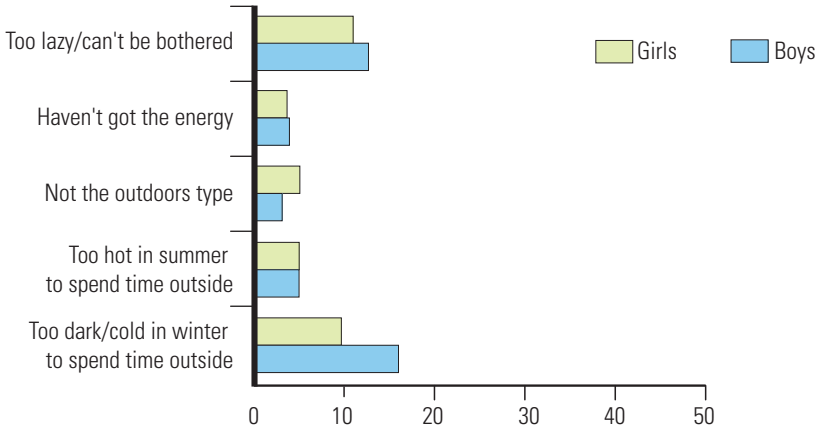
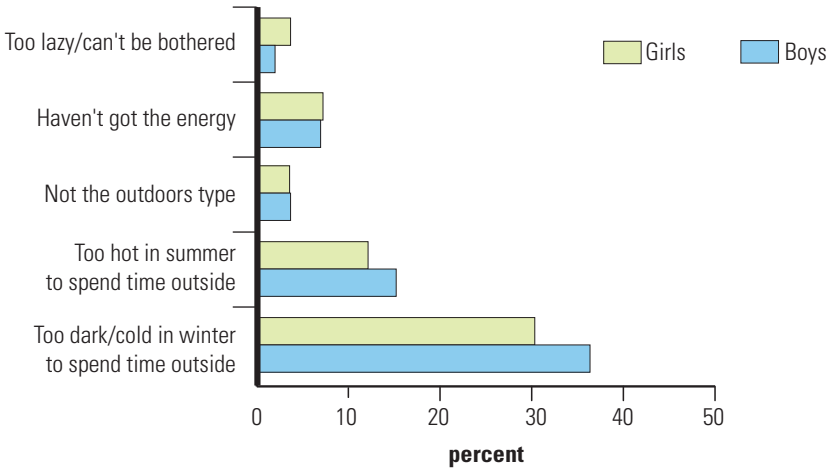


Figure 7 Self-reported barriers in relation to adolescents' activity in 2004 (N= 188)



The study also sought to determine any associations between the levels of active commuting reported by study participants and the barriers identified. It also examined a potential association between body weight and active commuting.

The weight status of children and adolescents' was not associated with their active commuting. Previous research among Australian children has also found no association between weight category and children's active commuting after statistically adjusting for maternal education and sex of the child. In contrast, research examining active commuting among

North American children showed that those who were 'at risk of becoming overweight' were significantly less likely to walk to school [15]. These contrasting findings highlight the importance of additional research into the complex relationship between activity and weight among children.

Individual factors associated with younger children's active commuting

For younger children, only one individual-level factor was significantly related to children's active commuting. Compared to children who did not walk or cycle to school, children whose parents reported it was too dark and cold in winter to spend time outside were 77% less likely to walk to or from school every day. Previous studies have shown that the weather can play an important role in children's physical activity, with children shown to be less physically active during winter than during the summer months [16], and this is supported by the findings from the CLAN study. Programs aiming to increase children's walking and cycling to and from school should consider targeting the fine weather months, in order to maximize participation.

Individual factors associated with adolescents' active commuting to and from school

There were no individual factors associated with adolescents' active commuting to school, suggesting that more important barriers to active commuting among this group may be social or physical environmental in nature.

3.3.2 Social factors and active commuting

Key findings:

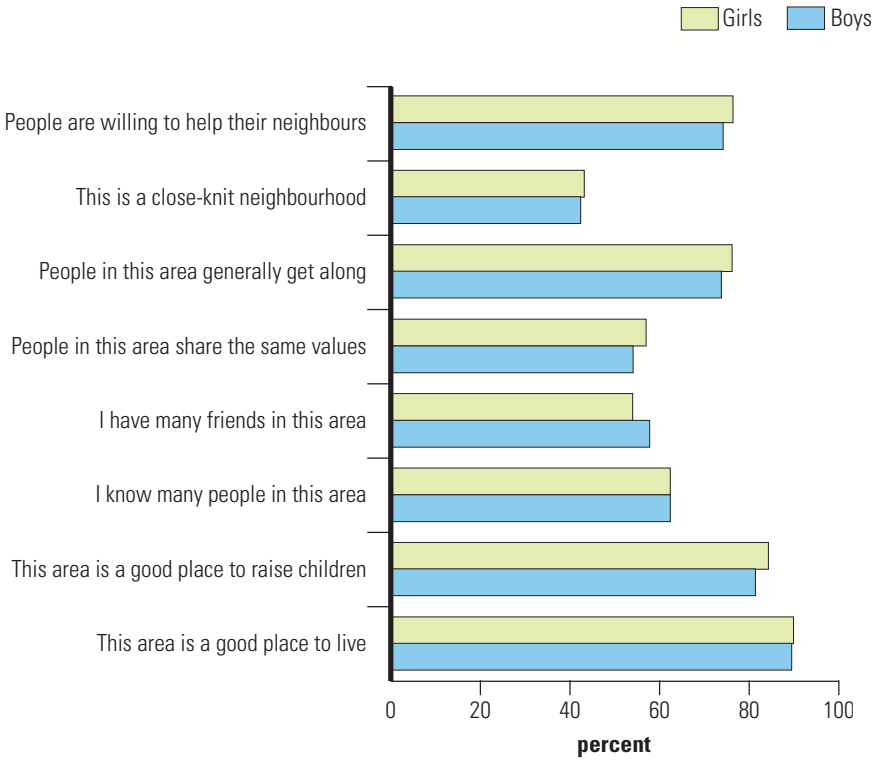
- **Most parents had positive perceptions of the social environment in their neighbourhood, with many parents reporting they liked the area they lived in and that most people were willing to help neighbours.**
- **Having strong social networks in the neighbourhood appears to be an important determinant of active commuting among children.**

Social influences on children's physical activity, such as modeling of parents' behaviours and peer influences, have been widely investigated, with several studies showing children who have active parents, tend to be more active themselves [16]. However, little is known about how the broader social environment in the local neighbourhood or community may influence children's activity, particularly active commuting. The limited evidence does suggest that social influences in the neighbourhood may be associated with children's physical activity [17] and active commuting to school [18].

The 2004 CLAN survey explored parents' perceptions about the social environment in their area. Figure 8 shows the results in terms of the proportion of parents agreeing with certain statements about their neigbourhood. Parents of younger children had similar perceptions when compared to those of adolescents, thus the results are combined in Figure 8.

Most parents had positive perceptions of their neighbourhood. Approximately 90% of parents thought their area was a good place to live and about 85% thought it was a good place to raise children. Two-thirds thought that most people generally got along in their area and over half of parents thought others in their area shared the same values. Interestingly, only about 40% of parents thought they lived in a close-knit neighbourhood but approximately 75% of people indicated that they would be willing to help their neighbours.

Figure 8 Parents' perceptions of the neighbourhood social environment in 2004 (N=309)



The neighbourhood social environment has only recently been examined for associations with children's physical activity, and studies conducted to date have shown significant associations with children's walking and overall physical activity [17].

Social factors associated with younger children's active commuting

In the 2004 CLAN study, younger children whose parents reported they knew many people in their area were twice as likely to walk or cycle to school at least once per week compared to other children. Knowing others in the neighbourhood is an indicator of social networks and these findings suggest that strengthening social ties within the local community may help to promote children's active commuting.

Social factors associated with adolescents' active commuting

The social environment was also important for adolescents' active commuting. Adolescents' whose parents agreed that people in their area generally got along were twice as likely to actively commute every day compared to children whose parents did not agree. Additionally, adolescents whose parents knew many people in their area were one and a half times more likely to walk every day compared to those whose parents did not agree.

Interestingly, adolescents whose parents agreed that their neighbourhood was a good place to live were only half as likely to actively commute to or from school every day compared to those whose parents did not agree. As seen among younger children, the social environment in the neighbourhood appears to be important [19] and highlights this as a possible target for programs aiming to increase adolescents' active commuting. Such programs could focus on parents' perceptions of their neighbourhood in order to increase the likelihood of children and adolescents' actively commuting for the school journey.

3.3.3 Physical environment and active commuting

Key findings:

- **Almost all families reported having footpaths in their neighbourhood. The majority of parents reported that there were many alternative routes to get to destinations, and that they were satisfied with the pedestrian facilities.**
- **The physical environment was particularly important for younger children, with several factors significantly related to their walking and cycling to or from school. Those living in a hilly neighbourhood or one with limited access to public transport tended to be less likely to actively commute.**
- **Having no lights or crossings was related to a lower likelihood of walking or cycling to or from school.**
- **Having many alternative routes to destinations increased the likelihood of active commuting among both younger children and adolescents.**

There is increasing evidence that the physical environment is an important influence on children's walking and cycling in the local neighbourhood [17], and on their active commuting to school [10].

In the 2004 CLAN study, parents responded to several statements about their perceptions of the neighbourhood physical environment. These statements addressed issues regarding neighbourhood design and infrastructure (e.g. public transport), traffic (e.g. availability of lights or crossings) and other aesthetic and safety factors (e.g. presence of litter or graffiti). Parents' perceptions are outlined in the following figures. As there were few differences in perceptions between parents of younger children and adolescents, these findings have been combined.

Figure 9 shows parents' perceptions regarding neighbourhood design factors. Few parents indicated that public transport was limited in their area. Approximately half were satisfied with the number of pedestrian crossings in their neighbourhood, but almost 30% reported that there were no lights or crossings in their area. Almost 100% of parents' reported that there were footpaths on most streets.

Most parents (approximately 75%) thought there were many alternative routes in their neighbourhood, indicating there were several ways to travel to destinations in their area. This corresponds with the smaller proportion of parents (approximately 25-30%) who reported living in an area with many cul-de-sacs, courts or no through roads. There were no differences in perceptions between parents of boys and girls.

Figure 9 Parents' perceptions of neighbourhood design and infrastructure in their area in 2004 (N= 309)

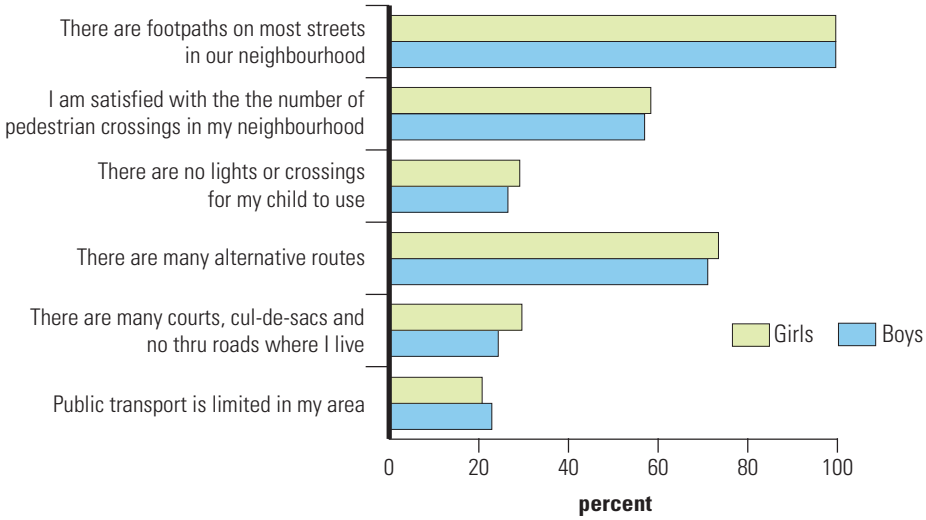
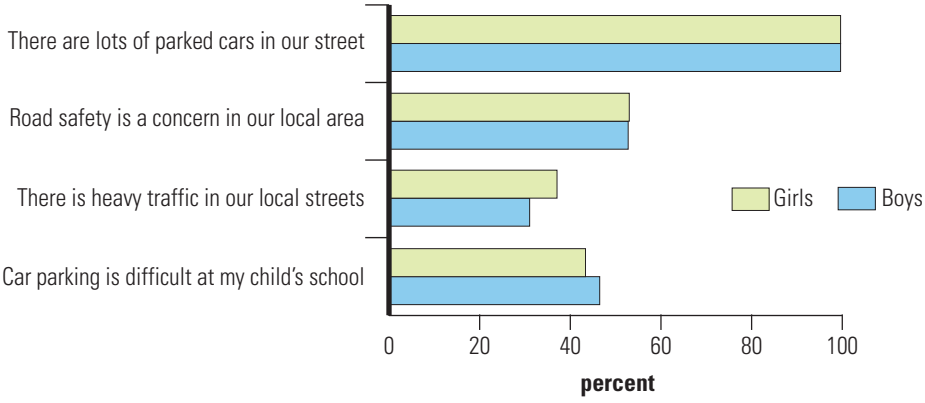


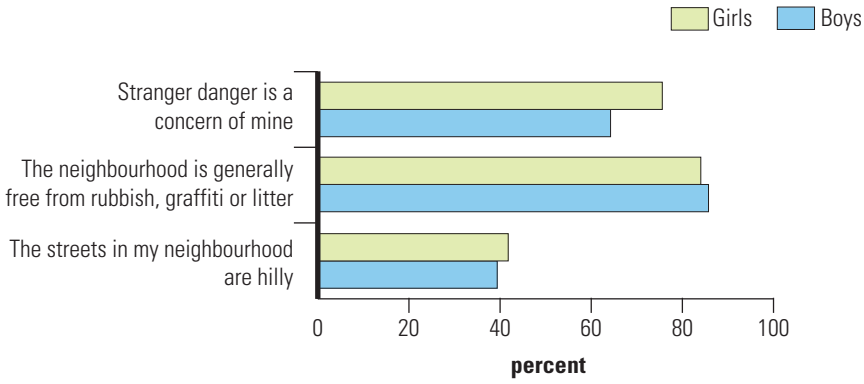
Figure 10 illustrates parents' perceptions of traffic issues in their neighbourhood. About one-third of parents thought there was heavy traffic in their local streets, and 42% of parents reported that car parking was difficult at their child's school. Almost all parents reported there were lots of parked cars on their street. Just under half of all parents reported that road safety was a concern in their area. There were no differences in perceptions of traffic issues between parents of boys and girls.

Figure 10 Parents' perceptions of traffic in their area in 2004 (N=309)



Parents' perceptions of aesthetic and safety factors in their neighbourhood are shown in Figure 11. Over 80% of parents thought their neighbourhood was free from litter, graffiti and rubbish. Approximately 40% of parents thought their neighbourhood was hilly. Stranger danger was a concern for 75% of parents of girls, and 64% of parents of boys (a significant difference).

Figure 11 Parents' perceptions of aesthetic and other safety issues in their area in 2004 (N=309)



The physical environment in the neighbourhood showed several associations with children's active commuting for the school journey. These are discussed below in terms of factors affecting younger children and adolescents.

Physical environmental factors associated with younger children's active commuting

Neighbourhood design factors were significantly associated with children's active commuting to or from school. Compared to other children, those whose parents thought public transport was limited in their area were 65% less likely to walk or cycle to or from school. Perceiving no lights or crossings in the neighbourhood was also associated with a 60% lower likelihood of active commuting.

Interestingly, children whose parents thought there were many alternative routes in their neighbourhood to get to destinations were three and a half times more likely to walk or cycle to or from school every day.

Having limited public transport in the neighbourhood has previously been shown to be a barrier to children's walking and cycling [20], and to overall physical activity [9], while neighbourhood design, including street networks that offer many alternative routes to destinations, are known to promote active transport [21]. These findings highlight the importance of neighbourhood infrastructure for the promotion of physical activity.

In this study factors related to traffic in the neighbourhood also showed associations with children's active commuting to and from school. Children

whose parents reported that there was heavy traffic in their local streets were over three times more likely to walk or cycle to or from school. Additionally, children whose parents reported they were concerned about road safety were almost twice as likely to walk or cycle to or from school, compared to other children. These findings may suggest that children who are actively commuting are out in the neighbourhood, and their parents have an increased awareness of the level of traffic. This may then translate into increased concern about road safety among these parents.

Physical environmental factors associated with adolescents' active commuting

Similar factors in the neighbourhood physical environment that appeared to be important for younger children's active commuting were also related to this behaviour among adolescents, particularly neighbourhood design factors. Those adolescents whose parents thought there were many alternative routes to reach destinations in their neighbourhood were more than twice as likely to actively commute. The presence of lights and crossings was also significantly related to adolescents' active commuting, with a lack of lights or crossings associated with a 77% lower likelihood of active commuting at all, and a 61% lower likelihood of active commuting every day.

In contrast to younger children, only one traffic-related factor was related to active commuting among adolescents. Children whose parents were satisfied with the number of pedestrian crossings in their neighbourhood were almost three times more likely to actively commute compared to those who did not report this.

3.4 What happens to children's active commuting as they get older?

Key findings:

- **From 2004 to 2006, younger children increased their active commuting to or from school by one trip per week and adolescents increased by more than one trip per fortnight.**
- **Approximately half of younger children and one-quarter of adolescents increased their active commuting over this time.**
- **Few children decreased their active commuting over the period (approximately 15%).**
- **Among younger children, social environmental factors such as knowing many people in the neighbourhood were related to increases in walking and cycling to or from school.**
- **Among adolescents, physical environmental factors seemed more important. Having adequate lights and/or pedestrian crossings had a positive effect on the likelihood of increases in active commuting.**

Several studies have demonstrated a substantial decline in children's overall physical activity as they get older. One Victorian study showed that children aged 10-12 years did approximately half the amount of moderate-to vigorous-intensity physical activity as children aged 5-6 years [22]. Few studies, however, have investigated what happens specifically to children's active commuting as they grow up.

Participants in the 2004 CLAN study were re-contacted two years later to determine how children's and adolescents' active commuting had changed between 2004 and 2006, and to examine which factors influenced changes in this behaviour.

Younger children were aged approximately 11 years, and adolescents were aged approximately 16 years at the 2006 follow-up. For the purpose of this analysis, those children who moved house (n=39), or moved school (n=56) during this time were excluded as this is likely to have influenced whether or not they actively commuted to or from school.

3.4.1 Changes in active commuting

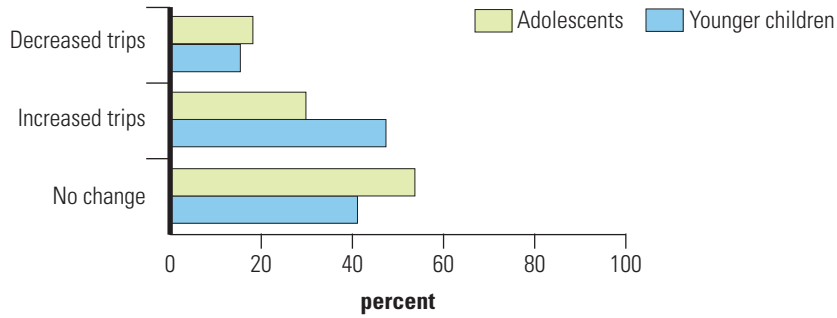
Table 4 shows the average number of active commuting trips for younger children and adolescents in 2004 and again in 2006. The number of weekly active commuting trips increased as children grew older. On average, younger children increased the number of trips by 1.1 trips/week, while adolescents increased by 0.7 trips/week. There were no significant differences in changes between boys and girls, or between younger children and adolescents.

Table 4 Mean number of weekly active commuting trips to or from school in 2004 and 2006 (N=309)

	Active commuting (trips/week)	
	Younger children (n=121)	**Adolescents (n=188)**
2004 mean	3.2	3.1
2006 mean	4.3	3.8
Difference, 2004 to 2006	Increase 1.1 trips/week	Increase 0.7 trips/week

Figure 2 shows the proportion of children who increased or decreased their active commuting, and those who did not change. Between 2004 and 2006, only 14% of younger children and 18% of adolescents decreased their trips. Among younger children, approximately half the sample increased the number of active commuting trips for the school journey, compared with approximately 29% of adolescents. For 40% of younger children and 53% of adolescents, there was no change in the number of such trips. A significantly higher proportion of younger children increased their trips compared to adolescents. There were no significant differences in change between boys and girls, therefore combined results for boys and girls are shown.

Figure 12 The proportion of children who increased, decreased or did not change their active commuting for the school journey in 2004 (N= 309)



3.4.2 What factors predict increases in active commuting as children grow up?

As far as the researchers are aware, there is no research that has looked at factors that influence increases in walking and cycling to school as children grow up. However, such information may provide important insights that could assist in the development of initiatives aimed at promoting active commuting.

For the younger children (50%) and adolescents (25%) who increased their active commuting between 2004 and 2006, the researchers investigated factors that might be associated with these increases.

Only one factor was significantly related to increases in younger children's active commuting. In relation to the social environment, children of parents who reported they had many friends in their area were almost three times more likely to increase their active commuting compared to other children. This finding further highlights the importance of having strong social ties in the neighbourhood for increasing children's active commuting.

No physical environmental factors were significantly related to increases in active commuting among younger children, although there was a non-significant trend that related to the weather. Children whose parents thought it was too cold or dark in winter to spend time outside were 50% less likely to increase their active commuting compared to other children. Weather has been known to play an important role in influencing children's physical activity, thus programs aiming to promote active commuting behaviours should consider targeting them during fine weather months. This may increase the likelihood of increases in children's active commuting for the school journey.

There were no individual-level or social environmental factors that predicted increased active commuting among adolescents. Two factors related to neighbourhood design and infrastructure, however, showed significant associations. Adolescents whose parents reported there were no lights or crossings available were 60% less likely to increase their active commuting. Similarly, adolescents whose parents were satisfied with the number of pedestrian crossings in their neighbourhood were more than twice as likely to increase their active commuting. These findings support the notion that neighbourhood infrastructure plays a key role in adolescents' walking and cycling and improvements to these facilities may increase the rates of active commuting for the school journey.

Study conclusions

In recent years, declines in the proportion of children actively commuting to or from school have been reported, with the most dramatic declines seen in cycling for the school journey [8]. Such findings demonstrate the need for effective programs that address these concerning trends.

Programs such as the 'Walking School Bus' and 'Walk Safely to School Day' aim to promote and increase the number of children walking or cycling to school. If these programs are to be successful in achieving and maintaining such increases, understanding the factors which influence children's active commuting is important.

The CLAN study is one of the first studies internationally to examine multiple levels of influence, including individual, social and physical environmental influences on children's physical activity and active commuting. CLAN is also unique in examining influences on children's level of activity and active commuting as they grow older.

Levels of active commuting

Overall this study found that about 50% of CLAN children actively commuted to or from school for at least one trip/week and that 25% were actively commuting to or from school at least once per day (i.e. 5 or more trips/week).

In terms of the mode of active commuting, walking accounted for the majority of trips performed by CLAN children. Very few children or adolescents, particularly girls, cycled to or from school. Among both younger children and adolescents in the CLAN study, more boys walked or cycled each day than girls, although this difference was not statistically significant. This finding is consistent with other studies of physical activity which show boys of all ages tend to be more physically active than girls [16].

There were no significant differences between younger children and adolescents in the average number of active commuting trips. Interestingly,

few children (approximately 15%) decreased their active commuting between 2004 and 2006. During this time, younger children increased their active commuting by 1.1 trips/week and adolescents increased by 0.7 trips/week. Approximately half of younger children and one-quarter of adolescents increased their active commuting. This increase suggests that the age-related declines in physical activity described in previous studies may be mainly due to declines in other types of physical activity, such as active free play among younger children and declines in organised sport among adolescents. This finding highlights the importance of developing and implementing programs that promote active commuting early in life.

Factors influencing active commuting

The CLAN study also explored the factors that were associated with children's and adolescents' active commuting. Influences at the individual-level (e.g. weight status and individual barriers), social factors (e.g. living in a close-knit neighbourhood) and physical environmental factors (e.g. there is heavy traffic in the neighbourhood) were all examined. In relation to weight status, the majority of CLAN children and adolescents were classified in the underweight/normal weight category, although slightly more CLAN children and adolescents were classified as overweight or obese compared to national estimates. However, weight status was not associated with active commuting to or from school among children or adolescents. This finding suggests that programs aiming to increase active commuting for the school journey are appropriate for all children, regardless of their weight status.

Individual factors

Few individual barriers to active commuting were reported among younger children and adolescents, although the weather (specifically 'it's too dark and cold outside in winter') was identified. There was a non-significant trend showing children whose parents thought it was too cold and dark outside in winter were less likely to walk or cycle to school compared to other children. The weather has previously been shown to be an important influence on children's activity [16]; therefore programs aiming to increase active commuting should consider implementing strategies outside the winter months.

The social environment

The neighbourhood social environment is increasingly recognised as having an important influence on health [23]. Although only about 40% of children whose parents thought they lived in their neighbourhood. Many parents reported that they liked the area they lived in and that most people were willing to help their neighbours. Several social factors were associated with active commuting. Having a strong social network in the neighbourhood appears to be an important determinant of active commuting, particularly among younger children. Additionally, factors such as knowing many people in the neighbourhood seem to be important. Improving parents' perceptions of the social environment in their neighbourhood could have important implications for the promotion of behaviours such as active commuting.

The physical environment

Several physical environmental factors were associated with active commuting, and these factors appeared to be particularly important among adolescents.

As previously demonstrated [10], children who lived in a hilly neighbourhood or one with limited access to public transport tended to be less likely to actively commute, while having many alternative routes to reach destinations increased the likelihood of active commuting among both younger children and adolescents. Further, those adolescents whose parents thought there were adequate lights and/or pedestrian crossings in their neighbourhood were more likely to increase their active commuting over time. These findings highlight the importance of pedestrian safety infrastructure, such as lights and crossings, for active commuting to and from school [9]. Thus, policies that address issues related to pedestrian safety may have significant impact on active commuting patterns among young people.

The CLAN study highlights the potential to improve children's levels of physical activity through increased active commuting to and from school, and supports the need for effective programs in this regard.

The study identifies that future strategies should address the range of factors influencing active commuting behaviours. This includes social networks and the physical environment of the local neighbourhood, particularly pedestrian infrastructure.

Those closest to young people, including families and schools, have a role to play in encouraging improved social networks within neighbourhoods to promote active commuting, whilst neighbourhood infrastructure factors can be directly addressed by urban planners and policy makers.

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What influences whether children walk or cycle to school?

Summary report