3. Transport and young people's health

3.1. Young people are especially vulnerable

The strongest reason to provide special attention to children's needs in relation to transport is the possibility that current arrangements are harming them more than they might be harming adults.

Evidence of special harm need not be surprising. Here's what the Canadian Institute of Child Health has said about the physical vulnerability of children.

> The developing body systems of the child, particularly tissues and organs, are more sensitive to environmental toxicants. Tissues that are under development are more susceptible to toxic effects because they rely on chemical messengers for growth. Organ development begins during early foetal life and continues into adolescence.
>
> Children receive greater exposures than adults because they eat more food, drink more water, breathe more air per unit of body weight than adults. Furthermore, depending on their age, children's ability to metabolize, detoxify and excrete many toxicants is different from that of adults.[14]

Many of these observations would likely apply also to growing adolescents. They suggest strongly that young people are more affected than adults by transport-related impacts.

Children and youth in poverty can be additionally vulnerable. They may have greater 'passive' exposure to traffic-related pollution because they are more likely to live near high traffic areas.[15] An additional vulnerability arises too when distances are large, facilities are centralized, and transport opportunities are limited. Access to health care can be especially compromised for poorer people including children and youth.[16]

3.2. Links among transport, physical activity, body weight, and health in young people

Poor nutrition and sedentary lifestyles that revolve around television and video games have been blamed for young people's reduced physical activity and rising average body weights.[17] Recent evidence from Canada,[18] the United States,[19] and the United Kingdom[20] suggests that dependence on automobiles to transport children to school and leisure activities may also be a factor. These are some relevant findings:

- "Over 50% of Canadian children and youth rely solely on inactive modes of transportation to travel to and from school, with a further 21% using inactive modes for at least part of the journey. Adolescents are more likely than children to commute to school using sedentary forms of transport."[21]

- "In Canada, the average amount of time in a school week devoted to physical education is less than one hour; this is among the lowest in the world and is less than 40% of the 150 minutes recommended to meet standards for Quality Daily Physical Education (QDPE). Fewer than 5% of schools in Canada meet standards of QDPE."[22] The low level of formal physical education contributes to the finding that 73% of Canadian children aged 2-15 years do not exercise enough to maintain a healthy body weight and only 9% meet Canada's exercise guidelines for children and youth[23]
- Over a quarter of Canadian young people aged 2-18 years were found in 2004 to be overweight. In four provinces, including Manitoba, the percentage was significantly above the national average (31% vs. 26%). The other provinces above the average were New Brunswick, Newfoundland and Labrador, and Nova Scotia.[24]
- A US study found that "adolescents living in sprawling counties were more likely to be overweight or at risk of overweight than those living in compact counties."[25]
- A UK study demonstrated that children who walk to school burn more calories than those who are driven. The number of calories burned weekly through walking to school is the equivalent of two hour-long classes of physical education. Also, children who walked to school were found to be generally more active than children who did not walk.[26]
- In a detailed assessment of numerous measures to prevent cancer, the World Cancer Research Fund and the American institute for Cancer Research gave the highest rating to confidence in the evidence for the efficacy of "creation and revival of active transportation systems."[27]

The World Health Organization (WHO) has published a comprehensive document on this subject that includes the following:[28]

> A systematic review of strategies that promote physical activity concluded that walking is the most important form of physical activity that should be encouraged to improve public health given that it is the activity most widely available. … Interventions that encourage walking and do not require attendance at a facility are most likely to lead to sustainable increases in overall physical activity.

Two US researchers have suggested that interventions with the most long-lasting effects involve changes to the built environment:[29]

> Changing the built environment to increase children's physical activity for recreation and transportation, to improve access to healthful foods, and to reduce access to less healthful foods can help provide long-term solutions to the childhood obesity epidemic. Unlike the often-transitory effects of motivational and education approaches to addressing obesity, changes in behavior prompted by changes in the built environment should be long lasting.

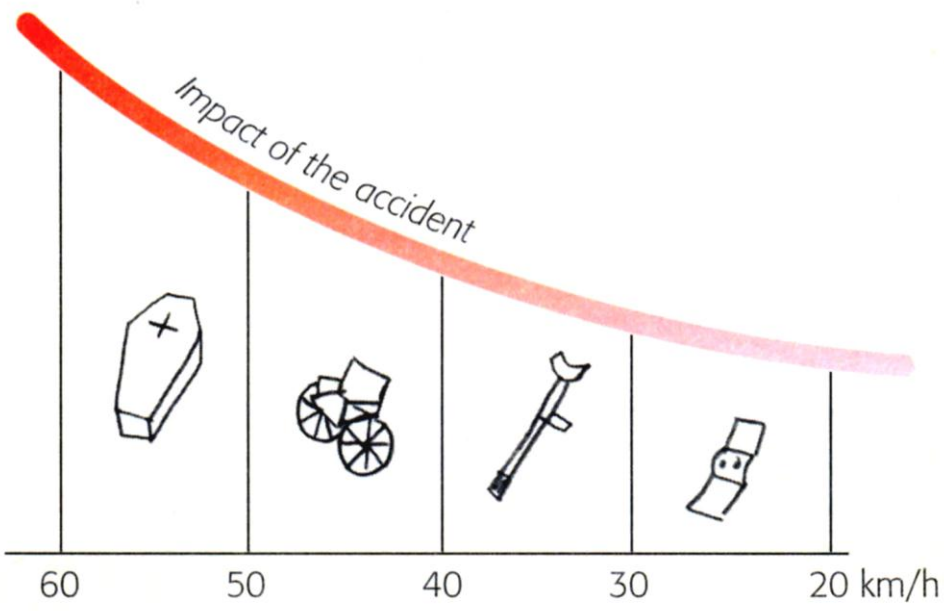
3.3. Traffic-related fatalities and injuries

The rates of traffic-related injury and fatality are generally lower for children than for adults. Nevertheless, the following should be considered:

- Road traffic crashes are the leading cause of injury death in Canada for children over the age of one year.[30]
- The risk of harm to a child from traffic is considerably higher than the risk of harm from a stranger.[31]
- A study in the UK found that a quarter or more of children who survive traffic crashes may suffer from post-traumatic stress disorder. Symptoms include depression, recurring nightmares, difficulty attending to school work, and fear of cars.[32]

Injuries and fatalities resulting from traffic crashes increase dramatically with the speed of the vehicle at the time of impact. For example, one U.S. study reported that compared with crashes involving a vehicle travelling 16-31 kilometres/hour, the risk of serious injury or death to a pedestrian aged under 20 years was 2.1, 7.2, and 30.7 times higher at vehicle crash speeds of 32-47, 48-63, and 64 km/h or more, respectively. For any given vehicle speed, children appear more able than adults to survive crashes without serious injury or death.[33] However, children are also more likely to travel by foot. The relationship between vehicle speed and crash outcome has been summarized by one source in the chart in Figure 1.[34]

Figure 1. Schematic relationship between vehicle speed and accident severity



Keeping Children Safe in Traffic,[35] a report by the Organization for Economic Cooperation and Development, outlines risks for children in traffic, progress made towards creat-

ing safer environments, and the best practices of countries that have made concerted efforts to reduce the risk to children from traffic. Some of the best practices include measures to reduce traffic speed, and public education for children, parents and drivers.

The *World Report on Child Injury Prevention*, produced by the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF), urges that speed limits be set at 30 kilometres per hour or lower in residential areas and around schools. Where high speeds are permitted, there should be provision to separate pedestrians and cyclists from other traffic.[36]

It's worth repeating here the observation in Section 1.3 above that "young people living in rural areas have much higher than average rates of traffic-related fatalities and injuries."

What can be added here is the particular danger, mostly in rural areas, arising from young people's use of all-terrain vehicles (ATVs). The Canadian Paediatric Society has taken the position that young people under 16 years of age should not be permitted to ride all terrain vehicles, noting that they account for almost one-third of ATV injury-related emergency department visits and hospitalizations.[37] Manitoba has had among the least strict rules concerning ATV use by children.[38]

In many places, ATVs are allowed on trails used by walkers, joggers, and cyclists. This would seem a dangerous practice, particularly where there are many such users and when shared-use trails enter towns and villages. In March 2009, the federal government announced a $25-million investment to build and renew multi-purpose trail infrastructure in Canada for walking, running, cross-country skiing, biking, ATVs, and snowmobiles.[39]

According to the two US researchers quoted above, "priority should … be placed on designing roads, sidewalks, and crosswalks that make it safe for children to walk and cycle." They noted that in countries where there are extensive active transport networks and strong well-enforced laws protecting pedestrians and cyclists there are lower rates of pedestrian and cycling injuries.[40]

3.4. Effects of traffic-related poor air quality, including poor in-vehicle air quality

Road traffic is the main cause of poor air quality in most of the urban areas of the world and many rural areas, including in Canada. There is considerable evidence that this poor air quality harms children, including the following:

- Work for the World Health Organization (WHO) has found that children may be more vulnerable to airborne pollution because their airways are narrower than those of adults.[41]

- The same work for WHO reported that there appears to be no threshold for ozone levels that are safe, and children are particularly susceptible.[42]
- Other work for WHO and for the United Nations Economic Commission for Europe (UNECE) reviewed numerous reports of significant associations between respiratory symptoms or hospital attendance and exposure to particulate matter or nitrogen dioxide, or both (two products of vehicle exhaust) in healthy children and in children with asthma or other chronic respiratory disease.[43] The same work reviewed studies of non-respiratory effects, including children's mortality and adverse pregnancy outcomes.[44]
- Work in Denver, Colorado, found that children who live near high-traffic areas (20,000 cars per day) may be six times more likely to develop childhood leukemia and other cancers.[45]
- Children living in areas of Europe and California with poor air quality have been found to have reduced lung function growth that places them at risk for future respiratory illness.[46]
- Children in low income areas may experience multiple adverse health impacts from transport. This has been raised as an issue of environmental injustice.[47]
- Visits to the emergency departments of 41 hospitals in Atlanta, Georgia, for asthma or wheeze were associated with ambient ozone levels and with levels of primary pollutants from traffic sources.[48]
- A Finnish study found that preschool children who were taken to day-care centres by car or bus had higher peak exposures to carbon monoxide than children who walked or who were taken by bicycle.[49]

The immediate cause of the higher exposures in the last finding was not clear. It could have been because car and bus journeys are longer, or because in-vehicle air quality was particularly poor. According to another report, "Elevated in-car pollution concentrations particularly endanger children, the elderly, and people with asthma and other respiratory conditions. While it receives little attention, in-car air pollution may pose one of the greatest modern threats to human health."[50]

Other work on in-vehicle air quality and its potential impacts includes the following:

- A study of children's exposure to diesel exhaust on school buses in the United States indicated that concentrations of fine particulates were often 5-10 times higher than average levels measured at fixed-site monitoring stations.[51]
- Another such study, conducted in California, found that "A child riding inside of a diesel school bus may be exposed to as much as four times the level of toxic diesel exhaust as someone riding in a car ahead of it. … these exposures pose as much as 23 to 46 times the cancer risk level considered significant under federal law. What's more, these troubling results suggest that diesel exhaust on school buses could contribute to respiratory problems among sensitive children, such as asthmatics."[52]

- One author reviewed relevant data and concluded, "Drivers and passengers in cars may inhale up to 18 times as much pollution as people outside their vehicle, the worst occurring in slow-moving driving conditions in urban areas. Levels of benzene were found to be two to 18 times higher than ambient air and levels of carbon monoxide two to 14 times higher. Nitrogen dioxide is also higher (1-2.5 times), especially during high-speed driving on motorways and during afternoon rush hours."[53]

Additional matters that may deserve more attention than they have been given are the higher-than-average concentration of vehicle-related pollution at sidewalks and the location of vehicle tailpipes in relation to pedestrian traffic. Several studies have shown that, for example, "roadside and in-vehicle and out-of-vehicle concentrations were typically several times higher (in congested roads) than those measured at a background monitoring station."[54]

An Australian study reported that pollution concentrations in pedestrian "breathing zones" resulting from passing vehicles (travelling less than 45 kilometres/hour) were on average *six* times higher when tailpipes were located on the curb side of the vehicle than when they were located on the other side.[55] Walking children and children in strollers are generally closer to tailpipes and for them the adverse effects of curbside tailpipe location may well be greater. In North America, vehicle tailpipes appear to be more often located close to rather than away from the curb.

3.5. Effects on emotional and behavioural development

A road traffic crash can have an extreme impact on a child's development, even if the child is not directly injured. There are more subtle effects from being in an automobile and from the effects of road traffic generally, including the effects of traffic noise and the effects of traffic on the quality of the social environment. Some relevant findings include the following:

- An Australian study found that heavy traffic reduces the independent mobility of children and youth.[56]
- An investigation in the UK found that opportunities and locations for spontaneous, non-structured play can be severely restricted by traffic.[57]
- An Austrian study found that the low-level but chronic noise of moderate traffic can stress children and raise their blood pressure, heart rate, and level of stress hormones.[58]
- Clear evidence on the effects of road traffic noise on the development and behaviour of young people may result from an ongoing major European Commission project (RANCH).[59] In the meantime, work showing an adverse effect of aircraft noise on children's cognitive performance can be noted.[60]

- There is some evidence from Austrian work that young people who walk to school are emotionally healthier than children who travel by motorized means.[61]
- A US report suggests that physically active teens have higher self-esteem and engage less in behaviour associated with health risks.[62]
- The Canadian Fitness and Lifestyle Research Institute asked youth to rate their quality of life and compared this to physical activity levels. Youth who were physically active in school and outside of school rated their quality of life higher than youth who were less active. [63]
- A Swiss study found that half of five-year-old children who lived on an "inadequate" street "where traffic is a nuisance and menace to children at play" never played outside, and only 10 per cent played outside for more than two hours a day, mostly in playgrounds. [64] All five-year-olds who lived on an "adequate" street played outside, most for more than two hours a day. (Whether the children were supervised was not recorded.) The report on the study concluded that the latter group had "a pool of experience that is clearly more diverse and rich". The report also noted that parents of children who go out least—mostly those who live on "inadequate" streets—had fewer social contacts with other parents and were therefore less able to meet child-care needs.
- U.S. work on adult social bonds in neighbourhoods found that these were weaker according to the extent of automobile dependence of a neighbourhood's residents (but not according to the extent of sprawl *per se*, i.e., according to how thinly the neighbourhood was populated).[65]
- A report on a California Department of Education study suggested that physically fit students performed better academically.[66]

On the negative side, common sense might also suggest that being in a car could have adverse effects on emotional development. According to the testimony of a psychologist before a U.S. Congressional committee,

> Driving and habitual road rage have become virtually inseparable. Road rage is a habit acquired in childhood. Children are reared in a car culture that condones irate expression as part of the normal wear and tear of driving. Once they enter a car, children notice that all of a sudden the rules have changed. It's okay to be mad, very upset, out of control, and use bad language that's ordinarily not allowed. By the time they get their driver's license, adolescents have assimilated years of road rage."[67]

However, there does not appear to be good evidence concerning the effect on children of exposure to in-vehicle aggression.

There appear to have been few formal studies concerning the impact of mode of travel to school on intellectual and emotional development. Common sense may suggest that

walking in particular, compared with travel by car, provides a richer environment more suited to enquiry and exploration and to establishing a sense of neighbourhood identity. Neighbourhood trust and social cohesion may be contributing factors.[68]

There is a growing body of research that supports the value for children and youth to increase their exposure to the natural environment.[69] A U.S. author has outlined the opportunity for communities to plan for such exposure.

> During the next decade or two, a crush of city and county master plans will be newly drawn or updated, determining the future of our open space. All over the country, creators of these plans and the public that advises them will have an opportunity to consider whether the veins of nature and wildness will be as important as the arteries of transportation to the future of our neighbourhoods.[70]

3.6. Links with land use

The intimate connection between how land is developed and used and transport, particularly active transport, is well recognized in the Government of Manitoba's draft Provincial Land Use Policies (PLUPs),[71] although not the specific concerns related to children and youth. Section 7B of the draft PLUPs is reproduced in Box 1 on the next page.

3.7. Concluding comment

All the foregoing taken together may provide more than ample justification for considering and implementing measures designed to change how children and youth move, and move themselves, and to reduce their exposure generally to transport's adverse impacts. Guidelines can provide both a stimulus and a guide to action.

Box 1. Promoting Transit and Active Transportation[72]

GOAL

To foster land use patterns and development design that caters to public transit users, cyclists, pedestrians and the mobility challenged, and reduces reliance on the automobile and its associated greenhouse gas emissions/air pollution/congestion.

POLICIES

7. All modes of transportation, particularly more active and environmentally sustainable forms such as walking, cycling and public transit, should be facilitated through development plans.

8. Development plan policies should support increased densities and mixed land uses in appropriate locations to reduce the number and length of vehicle trips, increase opportunity to use public transportation, and encourage pedestrian and bicycle trips.

9. To reduce reliance on the automobile, development plans should include policies to promote walkable and transit-supportive communities. Such policies could promote:

a) the mixing of compatible land uses instead of separation;
b) linkages between public transit, streets, sidewalks, river corridors, pathways and green spaces that form an interconnected network to connect communities;
c) the use of abandoned transportation corridors for public transit and trails;
d) street designs with direct connections that reduce walking times, over those with infrequent intersections;
e) the incorporation of bicycle paths and sidewalks into the existing built up area and into the design of new developments;
f) the inclusion of public transit routes where it is planned or available;
g) pedestrian, cyclist and public transit user access in developments catering to the public, such as schools, shopping, employment, health and recreation related facilities;
h) the concentration of high trip generating uses and public spaces in or adjacent to existing or planned transit stations and stops to enhance the viability of transit.

10. Where public transit exists or is anticipated, it should be integrated into the local transportation plan. Transit planning considerations should identify:

a) the public transit needs in the planning area, based on background studies, the development plan and growth centre strategy;
b) areas where public transit exists, locally or regionally, and the feasibility of providing transit service; and
c) 'nodes' and 'corridors' for transit-oriented development (TOD), where higher density, mixed use development can be directed;
d) transit supporting measures, such as:
    a. the location of transit stops within reasonable walking distances (e.g. 200 to 400 metres) from residential, commercial/business and institutional areas;
    b. the establishment of safe and secure park and ride facilities at appropriate locations; and
    c. the implementation of transit priority measures to assist in the unrestricted flow of transit vehicles and overall efficiency.

11. Public transit considerations should be incorporated into the design of affordable housing developments.