Active / Safe
Routes to School

Canadian Institute
of Child Health

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Active / Safe Routes to School

A Literature Review and Summary of Key Informant Interviews on Child/Youth Risk Factors Associated with Active Transportation To and From School and Recommendations to Promote Safe Routes

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1998

The development of this publication was made possible by the financial and technical support provided by Health Canada.

ISBN 0919747-55-8

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EXECUTIVE SUMMARY

Since 1977, the Canadian Institute of Child Health (CICH) has been working to ensure that the concerns and needs of all children and youth in Canada are heard. The Institute advocates for all children in order that they enjoy safe environments and optimum health. Over the past two decades, school commuting patterns have changed. Driving children to school has become more of a norm both in North America and abroad. In Canada, neighbourhood schools report more than 50% of the student body are frequently chauffeured to school by parents (Kowey et al, 1998).

Some are beginning to question both the short and long term consequences of these practices.

There are serious traffic safety concerns associated with this trend that have significant impacts on children and youth, their parents, families and communities at large. Traffic injuries are already the leading cause of serious injury and death among school-aged children and youth (CICH, 1994). Over the short term, driving children to school increases traffic congestion, which puts children at risk when cars collect along school streets, school parking lots and local neighbourhood streets. The result is chaos for children, who, as pedestrians and bicyclists, are forced into traffic jams as they seek to enter or leave their school yard. Over the long term, it teaches children auto dependency practices, at a time when seeking active, independent and environmentally sound choices is desirable.

The purpose of this report is *to review child/youth risk factors associated with active transportation to and from school and to develop recommendations to promote safe routes.* Two methods were used to achieve this goal and two reports have resulted.

The first report is a review of published literature with respect to child/youth risk factors and recommendations to promote safe routes to school.

The second report was generated from 20 key informant interviews considered to be either experts in the field or to represent community groups that have developed child safety initiatives in active transportation. From these key informants, risk factors of active transportation to and from school and recommendations for safe routes were compiled. Key informants were classified into four groups, with five individuals selected in each group. The four groups included child health researchers (university based), child health education groups, transportation professionals, and current programs of active/safe routes to school.

Both the literature review and key informants identified child, family, physical environment and driver risk as the major groups of risk factors to children seeking active/safe routes to and from school. The most distinguishing characteristic between the two sources of risk factor data collection was the strong statement of *"parent fear of stranger danger"* among the key informants, as opposed to the published literature where the focus of risk factors lay within the *physical environment*. The *differences in the focus of these risk factors may lie in the lack of parental awareness* of the magnitude of road traffic injuries to child/youth health as compared to *"stranger danger"*.

Recommendations for safer routes to school are documented in this report within the World Health Organization's Charter for Health Promotion framework. Both the literature and key informants strongly supported interventions to *build healthy public policy, create supportive environments and strengthen community action* in efforts to promote safe/active routes to school.

Often, community-based interventions are not published in scientific journals, as they may lack scientific rigor and evaluative components. This report, from its methodology, has been able to capture some unique, rich, and current grassroot interventions from key informants currently engaged, in some way, in efforts to promote active/safe routes to school for children and youth.

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SUMMARY OF RECOMMENDATIONS TO PROMOTE ACTIVE/SAFE ROUTES TO SCHOOL (FROM LITERATURE REVIEW)

1. BUILD HEALTHY PUBLIC POLICY

a) establish active/safe routes to school zones in communities;
b) recommend adult supervision of elementary school children on school routes;
c) stricter law enforcement of drivers on active routes to school;
d) establish municipal budgets for traffic calming measures on routes to school.

2. CREATE SUPPORTIVE ENVIRONMENTS

a) encourage car-free environments on routes to school;
b) attempt to calm traffic on routes to school.

3. STRENGTHEN COMMUNITY ACTION

a) collect and evaluate neighbourhood traffic information;
b) build community involvement into active routes to school.

4. DEVELOP PERSONAL SKILLS

a) evaluate child pedestrian education and re-think traditional approaches;
b) limitations of traditional child pedestrian education;
c) encourage children to wear the right equipment when travelling to school by active modes of transportation;

d) promote parent education of traffic safety;
e) promote driver education to avoid and/or travel slowly on routes to school.

5. RE-ORIENT HEALTH SERVICES

a) capitalize on teachable moments to families.

SUMMARY OF RECOMMENDATIONS TO PROMOTE ACTIVE/SAFE ROUTES TO SCHOOL (FROM KEY INFORMANTS)

1. BUILD HEALTHY PUBLIC POLICY

Municipal policies:

a) fiscal measures for building active/safe routes to school;
b) police cycle patrols for routes to school;
b) reduce speed limits in front of school;
c) priority snow clearance for all routes to school;
d) by-laws to reduce waiting time in school parking zones and to decrease traffic volume in parking lots and pull up spots;
e) reimbursement of low income families for child safety equipment such as helmets.

School-based policies:

a) designate ‘parent car drop off’ zones;
b) develop a safe routes to school handbook, and establish regular enforcement of school safety policies;
c) establish staggered dismissal times;
d) promote supervision of young children to and from school;
e) develop appropriate skill-based guidelines for parent information;
f) monitor families who drop off children too early;
g) encourage walkers, bikers and in-line skaters to wear reflective equipment;
h) involve parents and children throughout all planning for safe routes to school.

2. CREATE SUPPORTIVE ENVIRONMENTS

a) keep children physically well away from traffic;
b) widen sidewalks and entrances for pedestrians into school yards and create specific drop-off points for car-driven students away from pedestrians and bikes;
c) promote traffic-calming measures for vehicles along active routes to school.

3. STRENGTHEN COMMUNITY ACTION

a) establish community partnerships;
b) start with children and other community members will benefit;
c) be a good role model in traffic;
d) establish surveillance systems to collect and evaluate community traffic data;
e) recruit more block parents in urban neighbourhoods;
f) advocate for a paradigm shift to active transportation.

4. DEVELOP PERSONAL SKILLS

a) teach children active transportation skills;
b) teach parents child developmental limitations to "learning" safety rules;
c) teach drivers that "children can't fly".

CHAPTER I

LITERATURE REVIEW OF CHILD/YOUTH RISK FACTORS ASSOCIATED WITH ACTIVE TRANSPORTATION TO AND FROM SCHOOL AND RECOMMENDATIONS TO PROMOTE SAFE ROUTES

INTRODUCTION

1. Background and Purpose

Since 1977, the Canadian Institute of Child Health (CICH) has been working to ensure that the concerns and needs of Canada's children/youth are heard. CICH advocates for all children in order that they can enjoy safe environments and optimum health. The reduction of childhood injuries is a major goal of CICH. Population-based approaches have the potential to reach all children/youth and families, and to address risk factors.

School commuting patterns have changed among children/youth over the past two decades. Child transportation by private car to school has become more of a norm both in North America and abroad. In Canada, neighbourhood schools report more than 50% of the student body is frequently chauffeured to school by parents (Kowey et al, 1998). There are serious traffic safety concerns associated with this trend that have significant impacts on children/youth, parents families and communities.

Twenty-one percent of the Canadian population, approximately 6 million young citizens, children/youth aged 5 to 19 years, are spending many of their 12 million daily trips, 60 million weekly home to school commutes, in nonactive modes of transportation which contribute to local traffic congestion. Ironically, parents cite volume of traffic as a key factor in their choice of chauffeuring their children to school. Some are beginning to question both the short and long term consequences of these practices. In the short term, it puts children at risk when cars collect along school streets, school parking lots and neighbourhood driveways, creating chaos for children who have to dodge around cars in order to enter their school yard. Traffic injuries are already the leading cause of serious injury and death among school aged children and youth (CICH, 1994). Over the long term it teaches the children auto dependency practices, at a time when seeking active, independent and environmentally sound choices are desirable. In fact, promotion of active/safe routes to school may have shown cognitive benefits, as children who walk to school have shown stronger perceptual and observational skills, as seen in community map making-skills, in comparison to their classmates who are driven to school (Kennedy, 1998).

The purpose of this component of the report is to review literature on child/youth risk factors associated with active transportation to and from school and to develop recommendations to promote safe routes.

2. Literature Search Strategy

Five main strategies were used to search the literature for risk factors associated with children actively commuting to and from school. Only literature published in the past 10 years (1989 to 1998) with the exception of some classic publications on childhood injuries, were examined.

1. Electronic search of data bases, MEDLINE, ERIC, Cinahl (combining key words of "child pedestrian, traffic accidents, risk factors, child safety, socio-economic factors and child development) (40 publications resulted);
2. Reviewing biographical lists of articles obtained via the electronic search;
3. Internet search engines were explored using key words of "child safety and traffic" for relevant child safety programs and initiatives;
4. Suggested literature from key informants;
5. Hand search of most recent publications of the *Journal of Injury Prevention* (as several relevant articles were identified in this journal in the earlier electronic search).

3. Framework of Literature Review

Risk factors to children seeking active/safe routes to school are classified into the following types:

1. Child
2. Family
3. Physical environment
4. Driver

The risk factors are discussed first, followed by recommendations for active/safe routes to address these risk factors. The recommendations are presented within the framework of the World Health Organization - Charter of Health Promotion (WHO, 1986). Strategic health promotion actions include:

1. Building healthy public policy
2. Creating supportive environments
3. Strengthening community action
4. Developing personal skills
5. Re-orienting health services

I. CHILD FACTORS

Not every child in a community has an injury event, but every child carries some degree of injury risk (Towner, 1994). Child risk factors considered for active routes to school include:

a) cognitive development;
b) physical development; and
c) social development.

1. Cognitive Development

A child's cognitive functioning is important to consider in studying the safe modes of travel to school, as crossing the street involves 26 different tasks (Rivara, 1991). Using the Piaget framework, Schieber and Thompson (1996) described why each stage has risk for a child as a pedestrian and has application for all active modes of transportation for children.

a) Risk Factors of Pre-operational Intelligence

Sensorimotor intelligence is the first developmental stage covering birth to 18 months, when the child begins to build sequential concepts interacting in the environment. The stage of pre-operational intelligence spans from around 18 months to 7 years. Four main features of the pre-operational stage of development put these young children at risk when travelling in traffic, and make it difficult for a child in this developmental stage to "learn" traffic safety. These include:

i) egocentric thinking
ii) rigid thinking
iii) not understanding cause and effect
iv) distorting facts in order to create a personal reality.

i) Egocentric thinking

At the stage of egocentric thinking, children view the world as centering on them alone. They have difficulty imagining that a driver cannot see them standing between parked cars. There is no need to assess traffic before running across the street because in their mind the environment exists to serve them. This places children in danger as they cannot anticipate the driver's actions. This developmental response in a traffic situation accounts for the impulsive behaviour of children 5 and 7 years as their first impulse is to dart out in an attempt to cross suddenly between moving cars.

ii) Rigid thinking

In the stage of rigid thinking the child thinks that the shape of the container (one glass is tall and lean; the other is short and stubby) influences volume. With this classification system, a child in the pre-operational stage may perceive wide streets as dangerous and narrow streets as safe because size is the only basis for classification. Other dangers in this simple classification are that big cars travel faster than small cars.

Any young children actively travelling on roads at this stage of development, select the most direct route over the safest place to cross and may cross in mid block and diagonally, placing them at greater risk. Sandels (1975) concluded that a child at this stage prefers to cross on straight stretches of road because the intersections are too complicated for them to cope with. Parents may intervene with simple rigid rules for the child to follow. However, these rules do not always lead to greater safety, as the child does not have the cognitive ability to generalize from a specific circumstance addressed by the rule, to a similar situation not addressed by the rule, which may ultimately put them at greater risk.

Many children run across the street believing this is the safest way to cross, but of course it is much more startling to the driver. Children may also copy adults methods which are not always safe; the brief glances adults take may not always be thorough enough for a child (Sandels, 1975).

iii) Not understanding cause and effect

To children in the pre-operational stage of development, cause and effect are not understood and the children cannot comprehend that their actions have consequences. A young child may focus attention on one element of the environment to the exclusion of those which are often more important to his/her safety. A child may look at the colour of an oncoming car rather than think about how fast it is approaching. Since children of this age do not realize that their actions may have dangerous consequences, they undertake behaviour patterns with friends that can lead to risks that cannot be gauged and consequences they cannot expect.

iv) Distorting facts to create a personal reality

Children's assessment of speed is influenced by fantasy. Their ability to fantasize allows them to escape the immediate environment. They may think there are magical powers to stop approaching cars or feel that they as 'fast as a rocket' when crossing the street.

b) Risk Factors of Concrete Operational Intelligence

Concrete operational intelligence spans from about age 7 to adolescence. Three conceptual skills that a child acquires at this stage of development places him/her at risk in traffic environments. These concepts include:

i) Developing the skills of conservation
ii) Developing the classification skills
iii) Developing skills in combination-assessment of speed.

i) Developing the skills of conservation

Students at this stage of development are able to distinguish that the same amount of clay exists as a ball or pancake. A child that can classify in one dimension may have difficulty classifying in another dimension. So a student who can conserve the mass of clay objects may not be able to transfer this concept to their weight, placing a child pedestrian in danger as he/she attempts to develop skills in crossing the street (for example, the child has problems assessing car sizes and the time it will take the car to pass by).

ii) Developing the classification skills

The acquisition of classification skills begins to structure the principles of

logic. Developing these skills enhances the ability to identify dangerous situations. However, a child's performance is inconsistent while such skills are developing. For example, even the directions left and right may be confusing in traffic situations for a child at this developmental stage. Poor oral ability in younger boys and poor math ability among older boys (Pless et al, 1989) suggests that some children may be slower to master concrete operational intelligence and thus are more susceptible to traffic injury.

iii) Developing skills in combination - assessment of speed

The difficulty for a child at this stage of development is the ability to recognize dangerous situations as they unfold, due to a combination of several factors. For example, the child may have difficulty determining whether it is safe to cross when cars are parked dangerously on a crosswalk.

A further example of developing skills in combination is the need to assess the speed of a vehicle and then make a judgement to safely cross the street. Until about age eight, it is difficult for a child to assess if a vehicle is moving. Speed involves a combination of variables such as distance and time. The child's assessment of vehicle movement is unreliable, as this requires repeated assessments of vehicle size in relation to other objects. Researchers have videotaped children's ability to estimate whether there is sufficient time to safely cross a road and avoid a collision (referred to as gap acceptance). Results showed that children have more "tighter fits" than adults (Demetre, 1992). The judgments of safe crossing gaps made by children ages 7, 8 and 9 years of age, at three different vehicle approach speeds (20, 30 and 50 kph), indicated that all children made potentially dangerous decisions especially at higher vehicle speeds (Connelly et al, 1996). This skill needs development, even in adults.

Another study of 80 children and young adults ages 5-6, 7-8, 9-10 and 18 to 25 was conducted to judge their perception of vehicle distance, of approach time of vehicles and the estimated time they had for crossing the street. Results showed the real time of passing of each vehicle was underestimated by all groups. Further analysis indicated that children would reach adult performance (even though it was not always safe) at about 12 years of age (Hoffmann et al, 1980).

c) Risk Factors of Formal Operations

The final stage of cognitive development that Piaget described, begins in adolescence. Two developments put youth at risk in traffic environments; they include:

i) Beginning to think abstractly
ii) Making decisions based on two or more variables

i) Beginning to think abstractly

Youth are beginning to think abstractly about events not previously experienced.

Youth at this stage of cognitive development are only beginning to understand that their behaviour has consequences for others. For example, by running across the road they may be unaware of the risk they place on younger siblings with whom they are travelling.

ii) Making decisions based on two or more variables

Youth can now deal with combinations of two or more variables. They can for the first time judge both the speed and distance of an oncoming car. However, fast speed is most difficult to assess, even by adults (Hoffmann et al, 1980).

The risk behaviours of youth allow them to express a sense of autonomy and control over their life, express opposition to authority and allow them to gain acceptance to a peer group, all considered to be normal adolescent development. But adolescent risk-taking may be more related to underestimating risk associated with activities, rather than to their perceived invulnerability (Rile et al, 1989).

2. Physical Growth and Development

Canadian children aged 5 to 19 years range in height from 1.5 meters to full adult height (sometimes attained at age 12) with sudden growth spurts occurring in adolescence. Their weight ranges from 20 kg to full adult weight. Although growth in size and weight varies, the average seven year old girl and nine year old boy have reached 75 percent of their adult height. As a consequence of their smaller stature, when struck by a 1,000 kg vehicle, children tend to be pulled under the vehicle, potentially resulting in more severe injuries, in contrast to adults who tend to be thrown over the top of the vehicle (McMillan, 1998).

a) Visual Development

The short stature and lower eye level position of children, and the perspective they gain from an angle of vision that is more ‘sky'-oriented, limits a normal child's field of vision (Cross and Pitkethly, 1992). A child's field of view is easily obstructed by parked cars, utility poles, newspaper stands, post boxes, trees, planters, vegetation, garbage cans, buildings and commercial signage (Stevenson, Jamrozik, Burton, 1996).

In 20% of all child pedestrian injuries, the children were obscured by parked cars (Sandel, 1975). A child must often enter the street in order to be able to begin to assess the traffic. Their capacity to use information in peripheral visual field is not fully developed. They are easily distracted, less efficient at searching their visual field, and less able to sus-

tain attention in the search process (Akhar and Enns, 1989, Malek et al, 1990).

Research has shown that children with hearing or visual deficits may be more likely to sustain a pedestrian injury than those with normal sensory acuity (Roberts and Norton, 1995), although some work by Pless et al (1989) did not find this to be so. Manheimer and Mellinger, 1997 found physical disabilities such as poor eyesight and hearing associated with a higher injury liability for girls. This was not true for boys.

b) Auditory Development

Sounds can provide important clues in traffic. Six year olds are less able than adults to hear and detect correctly the direction of an oncoming vehicle (Sandel, 1975). Sensitivity to sound increases to age 12, then declines (Eagels, 1963). The direction of the approaching traffic danger may suggest different risks to children as research has found that right ear/left brain combina-tions perform better than left ear/right brain combinations (Kimura, 1963).

c) Motor Development

School age children have a central need for games and continuous movement because they are developing physically and must learn to adjust and revise previously learned movements. The mastery of physical skills has an important effect on a child's self-image. When they perform a skill a stronger self-image is developed.

Children aged 6-9 years with deficient locomotor skills (as assessed by experienced physical education teachers) had higher rates of school injury, particularly falls and collisions (Angle, 1975). Children 7-11 years described by their teacher as clumsy, fidgety or with poor gross motor control were at greater risk of injury (Pless et al, 1989). Boys with advanced physical development were also at increased risk of pedestrian injury (Christoff et al, 1996).

Children with impaired mobility may be physically smaller or may use wheelchairs. Successful street crossing skills are important to children with moderate-to-severe disabilities because such skills promote independence, thereby increasing their chances for successful integration into the community (Pattavina, et al, 1992).

d) Age

Most studies report older children walk to and from school more often and cross more streets than younger children, who are more likely to be driven (Hillman et al, 1990, Roberts, 1997, Rao, 1997, Towner et al, 1994).

Studies from the Policy Studies Institute of London, England reported that in 1971, 80 percent of 7 and 8 year olds had parental permission to go to school independently, while in 1990 this figure had dropped to 9 percent (Hillman et al ,1990). Additionally, in England the availability of bicycles for children has increased since 1971. Yet, in spite of the high level of bicycle ownership, the bicycle is not used as a mode of transportation to school. In England, only one in six of the 7 year olds and one in two of the 11 year olds surveyed were allowed to use their bicycles on main roads. Children are losing their freedom of movement "without society apparently noticing" (Rosenbaum, 1993).

In the absence of an exposure measure for active travel to and from school, pedestrian injury has been used as an index of safety. The age pattern of injuries represents an interplay of the child's developmental abilities, the parents' perception of these abilities and the risk of injury, and exposure to hazards (Rivara, 1995).

Among all the school age child groups, motor vehicle collisions were the leading cause of injury death (Health Canada, 1996). For every death of children aged 5 to 14 years, due to motor vehicle accidents, 87 were injured, resulting in 19,337 children injured by cars in 1990. Among 15 to 19 year olds the ratio of deaths to injuries from motor vehicles in 1990 was 1 in 80, resulting in 40,503 older teen injuries (Canadian Institute of Child Health, 1994).

Younger children face greater risk getting out of the car and walking into the school yard as a result of vehicle congestion by chauffeuring parents. Among 5 to 9 year old pedestrians, 48% of injuries occurred at mid-block and most of these resulted from stepping out from between parked cars. Older children have higher injury rates due to greater mobility compared to younger children. In the 10-14 age category, 56% of injuries occurred at intersections (Rivara and Barbar, 1985).

Differences in definitions of injuries and ages of children studied make international comparison difficult, however the following studies offer some insight with regard to age and injury. A Canadian study of 1,233 children (<15 years of age), reported the highest frequency of traffic injuries among child pedestrians was to 6-7 year olds and among child cyclists was to 13-14 year olds (Joly et al, 1991). School injuries reported from eastern Ontario were highest among 10 to 14 year olds, at 17 percent, compared with 5-9 year olds, at 8 percent (Gibson and Klassen, 1987). An American study of school children ages 5 to 9 years reported pedestrian motor vehicle crashes as the major source of fatalities (45 percent), while the proportion of non-fatal injuries associated with bikes and skates was 15 percent. In the 10 to 13 year old age group pedestrian motor vehicle crashes was the major cause of fatalities, 40 percent. Finally, among the 14 to 17 year olds motor vehicle crashes exceeded all other causes of death at 48 percent (Rivara, 1990). Studies among Scottish school children identified more head and face injuries to

11 year olds, and more neck, spine, upper and lower extremity injuries to 15 year olds (Currie, 1996). Swedish research estimates that the average risk for children being mortally injured in a traffic injury is ten times the risk experienced by adults (Appleyard, 1981).

e) Gender

Boys are more likely than girls to travel unaccompanied to school. They are also more likely to ride a bike compared to girls (Towner, 1994). Child pedestrian injuries have been reported to be more common in boys that girls (Pless, Peckham and Power, 1989; Rivara and Barber, 1985). In Canada, boys beyond age 2 years are two-to-four times more likely to sustain an injury than girls, and their injuries are likely to be more severe (Canadian Institute of Child Health, 1994).

Among 3,000 childhood injuries (0 to 17 years) seen in a tertiary care children's hospital serving eastern Ontario and western Quebec, 61 percent of injuries were to boys. The chances of being admitted to hospital following injury were six times higher among the boys than among girls. Injuries that occurred at eastern Ontario schools demonstrated a peak age of injury at 13 years for boys and 11 years for girls (Gibson and Klassen, 1996). Others have shown that adolescent males aged 16 to 19 report more "close calls" in traffic situations than adolescent girls (Cobb et al, 1995).

Why a gender difference?

Several reasons have been suggested to explain gender differences in injury rates. Gender differences in major injury rates may result from girls and boys having distinct cognitive styles regarding risk perception which increase with increasing age (as measured by ranking danger associated with certain behaviours) (Rile et al, 1996). Boys more than girls believed that their injuries resulted from bad luck, and consequently, boys repeated the injury risk-taking behaviour. Even though attributions to bad luck by boys between 6 and 10 years declined, there still emerged an optimistic belief by boys, who felt that they were less likely than their peers to get hurt. Boys may have smaller safe gap estimates (the last safe moment to cross) than girls, which results in more injuries and "close calls" (Connely et al, 1996). Lower rates of injury among girls may reflect the presence of an adult more often than for boys, as observed in children aged 8-10 years, where boys were more likely to be with another child and not near an adult when injured, as compared to girls (Morrongiello, 1997).

3. Social Development

a) Peer Presence

School-age children seek the approval of their peers rather than that of adults. Their allegiance to each other and to their peer leader is fickle but passionate while it lasts. Peer pressence affects behaviour in traffic and differences have been observed by age and gender. Younger school children age 5 to 11 years were more safety-conscious when they were alone than in a group, while the reverse was true of adolescence. Greater pedestrian volume among 5-9 year olds increased pedestrian injury (Agran et al, 1996). Children crossing streets alone were more careful when there was no traffic signal, while children in groups were more careful at intersections with signals (Winkler as cited by Willis et al, 1997).

Elementary school children are susceptible to the influence of older children's persuasive appeals for risk-taking. A positive relationship between the older and younger child contributed to the persuasion. Older brothers communicated appeals to fun whereas older sisters' persuasions were based on safety (Morrongiello, 1997).

b) Bully Behaviour

The National Block Parent Association reports that children being bullied by other children is the leading reason for the children they serve to seek shelter (Paterson, 1998). Childhood aggression has been associated with risk of pedestrian injury in children 4-14 years (Stevenson, Jamrozik, Burton, 1996) and in adolescence, as reported by injuries and close calls (Cobb et al, 1995). Using data from maternal interviews and school records, Pless et al (1989) reported higher accident liability in boys who were aggressive and hostile to parents, teachers or peers.

Measures of physical aggression in Canadian children are greater among boys than girls in both younger (4 to 7 year olds) and middle-school (8-11 years) age children. This type of indirect aggression (when the child is angry at someone and tries to get others to dislike him/her) was higher in girls than boys especially in the older age groups (Offord, Lipman, 1997).

Boys and girls from the lowest socio-economic scores had the highest physical aggression scores (Tremblay et al, 1996). Fifty-six percent of children in grades 6 to 12 reported that bullying had occurred in their schools (Nolin, Davies and Chandler, 1996). Twelve percent of American students in grades 6 to 9 reported being victims of bullying, (Nolin, Davies, Chandler, 1996) and 8 percent of Norwegian students (Olwens, 1991). Boys were more likely to be victims of bullying than girls in both populations. From grade 6 to 7, bullying behaviour remained stable for girls but increased among boys (Olwens, 1991).

c) Child-Blaming Social Norms

The allocation of blame for child pedestrian accidents by society has a profound effect on the injury rates and the freedom of children. A reduction in child pedestrian injuries should not necessarily be misinterpreted as an improvement in traffic safety. The

decline can be attributed to children retreating from the streets (Hillman, 1990).

Results from several traffic surveys in England demonstrated that among motorists in collisions with pedestrians, 75 percent blamed the pedestrian, and police blamed child pedestrians for 93 percent of car pedestrian crashes. Even among children themselves, 51 percent held themselves responsible (Hillman,1990).

Sixteen focus groups of English school children aged 7-11 years recounted their experiences of injury risk and prevention to researchers. The children perceived real injuries as caused by an enormous range of risk factors which could be managed and reduced. When describing their own experiences of accidents the children focused on their own behaviour rather than that of outside agents such as car drivers, authorities responsible for setting the traffic speeds, or parents. They accepted the blame as "my fault."

Comments included:

Janet
"We'd been on a bike and we were cycling around and it was my fault, because I scraped the curb...;"

Emma
"My mum and dad bought me a mountain bike and I went for my first ride and put my wrong brake on and I went over the bike;"

Darren
"My friend was crossing the road (at a marked pedestrian crossing) and he got hit by a car, it was his fault because he was looking in his bag for candy."

(Green, Hart, 1998)

II. FAMILY FACTORS

1. Family Resilience

Pless suggests that the pattern of injury risk is a family issue rather than a personal one for the child (Pless, Peckman, and Power, 1989). Hillman concurs, stating "because children's mobility is more restricted and controlled, it may be the parents' willingness to take risks rather than the child's that will determine child road death rates" (1990).

Measures of family disruption have been shown to be strong indicators of childhood pedestrian injury. Among older boys 12-16 years, living apart from their natural parents was associated with increased traffic injury risk. For girls 7-16 years of age, increased stress in the home and lack of parental supervision increased pedestrian traffic risk (Pless, 1989). Low levels of family support such as may be found in sole-parent families, disadvantaged socio-economic groups, children of large families and children of young mothers have all been associated with greater risk of child pedestrian injury (Robertson, 1994). Families with previous accidents requiring hospitalizations have shown increased risk of pedestrian injuries (Pless, Peckman and Power,1989).

Larger family size was associated with increased child pedestrian and bicycle injury (Pless, Peckman and Power, 1989; Scholer, Mitchell and Ray, 1997). Families living in homes with an excessive number of people per room (Mueller et al, 1990), and in crowded homes, also heightened risk of injury to child pedestrians (Christoffel, 1996). Reduced family cohesion and high stress may allow the child more independent and unsupervised activity and may also lead to reduced instruction in self protection behaviours (Christoffel et al, 1996).

2. Parent Knowledge, Attitudes and Practices

Parents state that the main reasons for driving their children to school are 1) safety related to the personal security of the child travelling alone (fear of molestation); 2) safety related to the street traffic, or maturity of the child (fear of being bullied); and 3) the convenience in driving the child to school (Hillman, 1990; Starnes, 1992).

In a telephone survey in two Canadian communities asking parents about perceptions of childhood health risks, most parents were more worried about their children getting cancer than about childhood injuries (Xiaohan et al, 1996).

In the United Kingdom, the risk of road traffic death of children 5-15 years is 50 times greater than that of a child being killed by a stranger (Sustrans, 1998). Parents are more worried about kidnapping and drug abuse than about childhood injury; fears which represent a distortion from reality (Eichelberger, 1990).

Parents with school-age children stated that they often do not provide anticipatory guidance to their children, for fear that doing so will make the child become aware of an injury risk behaviour in which they might not otherwise engage (Morrongiello and Daylor, 1996).

When parental expectations of their child's abilities against their child's actual skills were measured, parents overestimated their 5-6 year olds' skills on all tests. This mismatch decreased with age as the 9-10 year olds 'grew' into their parents' expectations (Dunns, Asher, Rivara, 1992). Some parents believe that injuries are a 'natural' consequence of childhood (Morrongiello, 1997).

In a study of 2,400 American children from kindergarten and grades one-to-four in a suburban school district, 94 percent of parents did not believe that 5-6 year old children could reliably cross streets alone. Yet in spite of this finding, one third of the parents allowed children this age to cross

quiet residential streets and allowed children in grade one to walk to school alone. The presence of speeding traffic or lack of safe places to walk did not influence parents' decisions to limit their children's crossings (Rivara, Bergman, Drake, 1989).

Boys are less likely to tell their parents about injuries than girls, which suggests differential parenting styles for sons and daughters. Boys' risk-taking was attributed largely to innate characteristics, and they were encouraged by parents to engage in this behaviour. In contrast, girls' risk-taking was attributed mostly to failing to think about injury risk. Parents assumed that risk-taking by boys was more normative than for girls. They believed that boys' risk-taking was less modifiable than girls (Morrongiello, 1997).

3. Parent Supervision

Peterson and Stern (1997) argue that supervision is the most basic parenting practice to protect children from injury. It has been estimated that in Britain, 1,356 million hours are spent escorting children, principally because of traffic danger (Hillman, 1990). Supervision by mother versus father needs further examination as children ages 8-11 years have reported that their father would tolerate more risk-taking than their mother (Morrongiello and Bradley, 1997). Parental supervision shifts according to the developmental stage of the child, from adult participation in a younger child's activities, to observing and only occasionally intervening in an older child's activities. Adults travelling with younger children may "flag" small pedestrians for drivers as well as help children judge when to enter streets safely (Wills et al, 1997). Older adolescent children can be monitored by discussing the child's plans and experiences.

Only 10 percent of children involved as pedestrians were accompanied by an adult at the time of the injury, while 45 percent were accompanied by another child and 45 percent were alone (Howarth, 1974). Injury rates were higher when the child's peers were present, even with adult supervision (Wills et al, 1997). Pless, Peckman and Power (1989) also reported that low level parent supervision was associated with increased risk of pedestrian injury.

Poorer children whose parents did not own a car or a telephone, were less likely to be accompanied by an adult when walking to or from school (Towner, 1994). There are a number of processes that manifest themselves within troubled families that seem to increase the danger of inadequate child supervision. These include parents' inexperience in parenting, lack of knowledge of child development, social isolation, and diminished capacity such as feeling overburdened, mental illness, depression, or substance abuse.

4. Culture/Ethnicity

Hillman compared German and English school children's independent mobility. German parents were more confident about allowing their children to travel on their own and allowed them more independence than the English families. Hillman speculated that English child supervision appears to be a more private family matter, compared to Germany, where child supervision is seen as a more collective responsibility, whereby the entire community is watchful and mindful of all children (Hillman,1990).

Urban, ethnic minority boys aged 5-9 years, have demonstrated higher rates of child pedestrian injury (Agran et al, 1996). Aboriginal children have an overall injury rate four to seven times greater than the national average rate for children (Canadian Institute of Child Health, 1994).

5. Maternal Employment

Mothers mainly escort children to school in England (Gershuny, 1993). In England, 58 percent of the mothers with 7 year old children worked outside the home compared with 79 percent of the mothers of 11 year olds, suggesting that the age of the child and the need to escort younger children to school may influence maternal employment patterns (Hillman, 1990).

The clash between full time employment and the requirements of the escorting timetable is most acute at the end of the school day. Parents who work out of the home can often find after-school care but problems arise getting the child from the school to the caregiver (Hillman,1990). Observations show that in comparison to the morning-driven escort to school, more children walk home in the afternoon, unaccompanied by an adult, and in the company of children their own age (Towner et al, 1994).

6. Family Income

Many studies from different countries report that poorer children measured by lack of family ownership of car or telephone, or residence in low income census tracts, are at greater risk of pedestrian injury (Carlin, 1997; Rao, 1997; Mueller et al, 1990; Agran et al, 1996; Rivara, 1992). Data from police and hospital reports on child injuries showed children of poorer families had a 2-to-6 times higher injury and death rate than those from more affluent families (Dougherty, Pless and Wilkins, 1990). Census data have also shown that children living in census tracts with lower median income levels were at increased risk for injury compared to those in higher income census tracts (Mueller et al, 1990).

Among children 5-9 years old, those in the lowest income bracket crossed a higher number of roads annually than mid and upper income children combined. For children age 10-14 years, there was less variation with household income (Roberts, Keal, and Frith, 1994). Greater pedestrian

exposure (Eichelberger, 1990; Roberts et al, 1994), lack of access to cars, the difficulty of supervising children in single-parent families (Roberts, 1994), and limited understanding of childhood safety (Starnes, 1992) may account for the differential risk by income.

7. Parent Education

Lower maternal education has been associated with lack of parental accompaniment among school children crossing of the streets (Carlin, 1997). In a Canadian study, a high level of parent education was associated with a lower risk of child injury when walking or biking (Pless, Verreault, Tenina, 1989). Observations from two Ontario communities reported that children whose primary caregiver had no college degree had a significantly higher risk of injuries. A greater percentage of parents with college degrees, compared to those without, had concerns about childhood injury (50 percent versus 23 percent) (Xiaohan, et al, 1996).

III. PHYSICAL ENVIRONMENT FACTORS

1. Neighbourhoods

Child accident rates (0 to 15 years) in Montreal mapped by census tract over almost 2 years (Joly et al, 1991) found that children were over-represented in poorer downtown neighbourhoods. Specific census tract characteristics that were associated with greater risk for child pedestrian and child cyclist traffic injuries included; demographic characteristics of many young children, low socio-economic status, high unemployment rates, low levels of adult education, high residential mobility, the presence of recent immigrants, and single parent families. Ninety-six percent of the child- pedestrian and cyclists injuries took place in the census tract of the child's residence.

An Australian case-control study explored the relationship between 40 traffic risk factors and child pedestrian injury. Significant risk factors among the 100 injury sites included traffic volume in combination with excessive traffic speed, and the presence of footpaths on one or both sides of the street. Although not significant in the regression model, the presence of commercial facilities such as shops, was observed at 44 percent of the injury sites and only 13 percent of control sites. Child pedestrian and bicyclist injuries were four times more likely to have occurred near a convenience store, gas station or fast food store (Kraus et al, 1996). The absence of footpaths on the child's street of residence has been associated with the reduced pedestrian injury (Stevenson, Jamrozik, Burton, 1996), and the presence of footpaths has been associated with the sites of child pedestrian traffic injury (Mueller et al 1990). The authors speculate that where there are no footpaths children have to walk on the road and may be more cautious, or the presence of footpaths may represent confounding issues of greater speed and volume of traffic. Alternatively, the child with a footpath may perceive it as a safe play area and play too close to traffic.

In a Montreal-based, case-control study Pless et al (1989) reported a strong association between child injury rates and parents' reports of fewer parks, fewer bike paths, poorly-designed intersections and dense traffic in their neighbourhoods.

Sixty-five percent of the variance in childhood pedestrian injuries was attributable to living in neighbourhoods with higher population density as measured by the number of crowded housing units per acre (Christoffel, 1996). Children living in multifamily dwellings, apartments or condominiums had a risk for injury 5.5 times greater than children living in single family homes (Mueller, 1990). Greater child population density (children/acre) was also a risk factor for traffic injury (Braddock, 1991).

2. Traffic

a) Congestion

According to the National Travel Survey in Great Britain, 12 percent of morning rush hour traffic is comprised of parents in private cars escorting their children to school (Hillman, 1990). The more complex the traffic situation, the higher the risk to children using active routes of transportation to school. Sixty-six percent of the child pedestrian injuries in Montreal occurred at sites where the traffic was moving in both directions (Joly, Foggin and Pless, 1991). Pedestrian injuries are 13 times more likely to occur on busy streets (Roberts et al, 1995). Rezoning of school boundaries and use of more strict criteria for those eligible for bus services has had an impact on the increase of vehicular traffic in neighbourhoods and school zones.

b) Speed, Volume and Parked Cars

A case control study matched the 44 injured child pedestrians with two sets of controls: hospital and population, of similar age and gender for neighbourhood traffic risk factors. Results found that neighbourhoods with posted traffic speed greater than 64 mph had a three fold increase in pedestrian injury risk, mean daily traffic volume of 15,000, an almost 4-fold increase in pedestrian risk, and more than two lanes of traffic a 5-fold increase in risk (Mueller et al, 1990). Joly et al reported an elevated risk of child pedestrian injuries when there was a higher volume of traffic in a child's neighbourhood (1991).

Parked cars represent a risk factor to children due to visual blockage (Agran et al, 1996), particularity if 10 percent or more of the curb is occupied by cars (Roberts et al, 1995). Posted speed limits, number of stoplights, frequency of pedestrian travel, amount and speed of traffic, proximity to downtown business, and connections to large highways are important

factors in the pedestrian injury risk (Rao, 1997).

c) Mid-Block Crossing

The greatest proportion of pedestrians killed and injured in motor vehicle accidents in Canada occurred where no traffic control was located, likely between intersections (Transport Canada, 1997). Research with a sample of Montreal children found that one-third of the injuries occurred getting in or out of a vehicle, one-third were injured crossing the street disobeying a traffic signal, and 10 percent were injured when crossing properly. American researchers report that 90 percent of child pedestrian injuries occurred when the child was crossing the street. One-half of these injuries occurred when the child did not cross at the intersection. One-fifth happened when a child came out from behind a parked car. Children less than 9 years of age stepping out from between parked cars accounted for 31 percent of child pedestrian injuries (Rivara and Barber).

Mid-block crossing is the most likely reason for injury amongst child pedestrians age 5 to 17 years (Kraus, 1996; NACCHO, 1997; Rivara, 1990). Forty-eight percent of child pedestrian injuries occurred on residential streets, and 70% within 200 meters of an intersection when the road was straight 89 percent (Stevenson, 1997).

3. Season and Weather

Pedestrian fatalities and injuries in Canada have occurred most frequently in the fall months of October, November and December (Transport Canada, 1994). Two-thirds of children's injuries reported by Joly et al (1991) occurred in clear sunny conditions. Rivara and Barber (1985) reported most child pedestrian injuries occurred on dry roads.

4. Day and Time

A Canadian study reported 6 percent of child injuries happened to children on their way to school compared to 30 percent that occurred on the way home. The researchers suggested lack of attention and fatigue by children at the end of the day may account for differences in these rates (Joly et al, 1991). Fifty-six percent of the injuries occurred in the after-school hours, 2:30 p.m. to 7:00 p.m.. 80 percent of the injuries occurred in the daylight. Friday was the peak day for injuries compared to all other days (Rivara and Barber, 1985). Seventy-six percent of the child pedestrian motor-vehicle injuries occurred during the week (Mueller, et al, 1990).

IV. DRIVER FACTORS

1. Driver Speed

The speed at which a car is driven has a strong relationship with the severity of pedestrian injuries. When pedestrians are struck by a moving car at 20 mph only 5 percent are killed, at 30 mph, 45 percent are killed, rising to 85 percent at 40 mph (Kimber,1990). If the driver is exceeding 50 km/hr, or fails to use any avoidance manoeuvres, such as braking or swerving, the child is more likely to be severely injured (Pitt et al, 1990).

Vehicle speeds and car distance from the curb were measured outside of elementary schools in a city in northern England. The presence of children by the roadside had no effect on the drivers' speed or position of the vehicle on the road. Even large groups of pedestrians only reduced mean speeds by one mph. Drivers were inadequately prepared for the unpredictable behaviour of child pedestrians (Thompson, 1985). Estimates of driver action as responsible for child-pedestrian motor vehicle collision range from 21 percent (Rivara and Barber) to 46 percent (Baker et al, 1974). Speeding was implicated in many reported child pedestrian injuries (Rivara and Barber, 1985, Kraus et al, 1996).

A descriptive case report of a 10-year girl killed by a motor vehicle as she attempted to cross the street, examined the civil engineer's assessment notes after the fatality to discover that what had been labelled as impulsive, heedless crossing was instead the perceived need by the child to run across the intersection in an attempt to cross. Engineering reports revealed cars were travelling 58 kph, in a posted 40 kph zone, at a mean traffic rate of 15 vehicles per minute (Roberts, 1994).

2. Driver Action

Drivers have trouble detecting a child and correctly estimating his/her distance from the car because of the child's short stature (Rivara, 1990). Among children *struck* at intersections, one quarter of the vehicles were turning and three quarters of the vehicles were going straight.

Most pedestrians *deaths* occurred while the vehicle was travelling straight ahead. The second highest number of child pedestrian deaths were caused when the driver was reversing the car and the third greatest proportion of child deaths resulted from drivers turning either right or left. Similarly the majority of pedestrian injuries occurred while the vehicle was moving straight ahead, then by turns in either direction and lastly while the driver was in reverse (Transport Canada, 1994).

3. Driver Vehicle

Drivers of cars, vans and light trucks, compared to all other vehicles such as heavy trucks, trains and buses, have been involved in the majority of pedestrian collisions in Canada (Transport Canada, December, 1997). The greatest number of pedestrians were killed in collisions with automobiles (58 percent), followed by light trucks and vans (22 percent), single unit trucks (7 percent) and tractor trailers (5 percent). Among pedestrians injured, 75 percent were involved in collisions with automobiles, 15 percent with light trucks and vans and 2.4 percent with single unit trucks. Pedestrians killed and injured by automobiles and commercial vehicles showed downward trends between 1986-1995, while the number of pedestrians injured by light trucks and

vans increased. Injuries with light trucks and vans occurred more often in parking lots and driveways compared to other locations, suggesting that problems in visibility accounted for the frequency of injuries in these locations (Transport Canada, 1994).

Among street location injuries, three-quarters of the vehicles were passenger cars, as opposed to trucks, buses, vans, etc. (Agran et al, 1994). Fatal pedestrian injury rates were 26 percent higher when caused by sharp-cornered cars as opposed to smooth-cornered cars (Robertson, 1990). Changes to the motor vehicle design exterior can reduce the risk of serious injury to pedestrians who are struck (Rivara, 1990).

V. SUMMARY OF RECOMMENDATIONS FROM LITERATURE REVIEW

1. Build Healthy Public Policy

a) Establish Active/Safe Routes to School Zones in Communities

Children appear to be unintentionally injured when the demands of a particular task exceed the ability of the child/youth to safely complete that task (Grossman, Rivara, 1992). The develop-mental attributes affecting the behaviour of children makes them more likely to be struck by a vehicle (Schieber and Thompson, 1996; Guyer, 1998). The source of danger is the traffic. Policies need to be developed and enforced that put the onus of safe child pedestrian travel on the driver. In Sweden, a pro-pupil stance is supported by the national Road Traffic Act, which mandates the protection of children against dangers posed by motorized traffic on their way to and from school.

More than ten years ago, arguments were raised that if a driver injures a child on a residential road they will be presumed negligent unless they can prove otherwise (Howarth and Lightbourne, 1981). More recently, a Home Zone policy was proposed in England (Preston, 1990). Such a public policy would rest on the assumption that children should be able to live in residential streets and behave like children. Preston proposed the policy of Home Zones in residential areas, where child pedestrians should have the priority and any driver who injures a child should be presumed negligent (1990).

Communities need to establish policies along the Active/Safe Route to School to address:

i) *Acceptable speeds of traffic* (15-20 mph has been suggested (Adams,1993; Engwicht,1998);
ii) *Acceptable volume of traffic* (re-route traffic away from high density child populations especially during peak hours of child travel to and from school);
iii) *Acceptable parking levels* (restricted parking during times of child travel);
iv) *Preventing unsafe turns;*
v) *One way streets;*
vi) *Neighbourhood/school signs* (stating how many children travel on the road to this school);
vii) *Bubble zones* in the immediate vicinity of schools that discourage parents and caregivers from driving into this zone (within a block or two of the school) for 20 minutes before and after school, to make it safer for children walking and biking (Kowey,1998).

Although injuries treated in hospital outpatient departments carry a lower risk of permanent disability, because outpatient treated accidents are considerably more common, they account for the majority of injury related permanent disability. This suggests that preventative interventions aimed at the larger number of less severe accidents may have the greatest overall effect on the population burden of disability (Currie et al, 1996).

There is evidence to suggest that low income children have higher pedestrian exposure and thus increased pedestrian risk, so policy efforts to create active/safe routes to school should begin in the neighbourhoods where they live.

b) Recommend Adult Supervision of Elementary School Children on School Routes

Parent and child safety advocates should promote more supervision of child pedestrian and bicycling behaviour, including travelling on established set paths or commonly travelled routes (Pless et al, 1989 Scheiber, Thompson, 1997). Family-friendly work policies allow parents time to actively accompany their children to school, especially those parents with younger children in elementary school. The school age child (5-9 years) appears to be particularly vulnerable because the skills needed to safely handle traffic exceed the abilities of the child at this developmental age (Rivara et al, 1991). When teachers were asked about injury prevention, they supported more supervision for children rather than more safety education (Carter, Jones and Bannon, 1994). In a Home-To-School Transportation study in the state of Florida, child focus groups identified challenges to walking and bicycling to school and provided meaningful solutions. The younger ones wanted their parents to walk them to their school because it made them feel safer (Starnes et al, 1992).

Parents may consider these guidelines:

1. Age-based Guidelines

Age guidelines have been suggested for safe pedestrian travel. *Alberta Safe Kids* suggests children age 9 or less should always be accompanied by alert adults or older children when crossing the street (Alberta Safe Kids, 1998). Children up to the age of 12 years do not have the physical stature, behavioural or cognitive skills to negotiate through traffic (Guyer, 1998).

Scheiber and Thomas, 1997 suggested:

i) **Children 5-7 years:**
Should be supervised for all street crossings,
ii) **Children 7-8 years:**
Could cross streets that the child is familiar with which have low traffic residential volume during the daytime;
iii) **Children 12 years:**
Must have a signalled crosswalk to cross independently if there are high volumes of traffic or there are several lanes of traffic;
iv) **Adolescents:**
Can cross major arteries independently.

2. Develop Skill-based Guidelines for Children

Others have suggested that age-specific guidelines take the responsibility away from parents and may give parents a false sense of their own child's capabilities. Skill-based guidelines for parents to reinforce safe travel would be more suitable (Morrongiello, 1998).

c) Stricter Law Enforcement for Drivers Who Travel on Active Routes to School

At a municipal level parents, schools and community members advocate for stricter fines and stricter enforcement for speeders in school zones. In Ontario, Solicitor General Jim Flaherty introduced legislation May 27, 1998 to double the fines for motorists who commit offences in designated "school zones." Fines for going through a stop sign or failing to yield to a pedestrian would double. This bill could be passed as early as September 1998. Parents and child advocates should voice their support for this policy (Government of Ontario, May 1998).

d) Establish Municipal Budgets for Traffic-Calming Measures on Active Routes to School

In traffic-calming, the overall aim is to reduce the speed and volume of cars (Pitt et al ,1980). It requires city planners and civil engineers, as well as parents, to motivate the public to ensure that there are funds available for these safety interventions. Also, a concerted effort must be made between municipalities and school board planning offices to devise capital improvement plans to fund the purchase of land for the construction of needed pedestrian and cyclist facilities (Starnes et al, 1992).

Allocate municipal budgets to support necessary traffic-calming measures along designated routes to school. Internationally, the greatest reduction in pedestrian mortality occurred in Denmark and Sweden, where emphasis was placed on environmental changes of traffic-calming (Roberts, 1993). In New Zealand, it has been estimated that approximately 18 hospitalizations of child pedestrians

could be prevented annually if funds for pedestrian education (which to date have not shown reduced injury rates) were allocated to spend on the physical environment for the purposes of traffic calming (Roberts et al, 1994). The success of traffic-calming measures has also been proved in a natural experiment, when, during the energy crisis in New Zealand, the reduction in cars on the road, led to a 46 percent reduction in child pedestrian mortality (Roberts, Norton, Jackson, Dunne, Hassell, 1995).

2. Create Supportive Environments

a) Encourage Car-free Environments on Routes to School

Normal growth and development of children in the sensorimotor and preoperational stages of cognitive development present difficulty in making correct judgments about traffic threats including: judging vehicle distance, vehicle movement, vehicle speed, gap acceptance and anticipation of driver behaviour. There is general agreement in the literature that the impulsive behaviour of most children under the age of 12, and their lack of ability to accurately assess distances, speed, and localize sound, places them at risk in unsafe environments (Muller, 1996).

Klassen concluded from a large review of child prevention injury intervention literature, that the best way to keep children age 5 to 7 years safe is to create environments to keep them separated from traffic (1995). When asked, older children (11 or more years) said they wanted to be more independent on their routes to school; and they wanted sidewalks and bike paths separate from the roadway (Starnes,1992).

Parents' poor knowledge of child pedestrian risk supports the importance of passive environmental modifications that do not rely on a high level of parental safety-consciousness to be effective (Eichelberger et al, 1990).

Agran et al (1996) suggested areas with 30 or more pedestrians in small areas in a 15 minute time span should receive high priority for pedestrian intervention. These authors claim that when volume of vehicle traffic is light and children are actively travelling on quieter streets they are still at risk. They suggest that the streets in residential communities should be blocked off from traffic, at least through traffic, during peak child pedestrian activity (Agran, et al 1994).

b) Attempt to Calm the Traffic on Routes to School

Research from the Netherlands has demonstrated that following traffic-calming there is a reduction of up to 30 percent of pedestrian injury as vehicles take alternative routes (Vis and Dijkstra, 1992). By using designs to make the road less hazardous by de-paving, seeding, creating curves,

bumps and plantings, and widening the sidewalk, traffic-calming measures can slow the pace of moving vehicles.

Where the child lives in relation to the location of the school is not amenable to change, but provision of safe crossing facilities, encouraging pupils to use the crossing facilities, and decreasing car speed on roads where students travel to school, are all possible measures (Towner,1994). Municipal transportation policies determine provision of school- crossing patrols. Only one, rather dated (1988), study was identified that evaluated the effectiveness of school-crossing patrols. Conducted in the United Kingdom, the results suggested that patrols could reduce pedestrian injuries (Boxall, 1988).

3. Strengthen Community Action

a) Collect and Evaluate Neighbourhood Traffic Information

Communities need information to exercise control over their route to school environments.
Currie et al (1996) conceptualizes a schematic of childhood injury, the base-treated or not treated at home; those seen in a medically-attended, community clinic by nurse or physician; and emergency-attended, those seen in emergency and released; and finally hospitalizations. Setting a criterion of severe injury admission, reduces the available data by three-quarters (Towner et al, 1994).
Xiaohan et al (1996), found that injuries based on emergency room data underestimated child injury incidence rates by 30 percent. Police accident data report injuries, and changes over time in casualty numbers might simply reflect changes in the extent of under-reporting (Roberts, 1993).

Population estimates of the full range of child road injuries are needed to understand and address the entire problem. Population surveys can produce better risk profiles for small populations (Towner, 1994). Children can be very useful sources of information about their injury and close call experiences, including where the event occurred, who was present, what the observers said, and what happened leading up to the injury (Morrongiello, 1997).

Objective measures of neighbourhood traffic can develop insight into existing traffic and pedestrian patterns around the school, and develop measures for future evaluation of effectiveness of the community and school initiatives. Students from senior classes could help collect data. The best times to conduct surveys are 15 to 30 minutes preceding and following the school day, as well as at over the lunch period. Variations by day-of-the-week, and season can determine variations in patterns of pedestrian and vehicle traffic (Kowey,1998).
Tools to measure child-traffic exposures on route to school should include:

1. Parent survey that can identify reasons parents drive and barriers they see to having their child choose active transportation;
2. Child surveys of how each child in the class travelled to school on a given day (this can be turned into a graphing exercise for the entire class);
3. Pedestrian Count Form - helps identify habits of neighbourhood children;
4. Pedestrian Tracking Form - helps track spots in the physical environment where children jay walk or could benefit from crosswalks or traffic calming;
5. Vehicular Count Form - identifies conflicts among users on the street, including such issues as violations of traffic regulations - e.g., no-stopping zones, backing up, double parking and stops on the wrong side of the road;
6. Vehicle Travel Diary - a record for parents and other community members to document reasons for and patterns of personal car use.

Some assessment tools have been developed (e.g., Kowey, Hunter and Associates, 1998).

The suitability for walking of routes to schools in the neighbourhood may also be determined by communities. Such quality of life measures for children could include the proportion of children of various ages who regularly, actively and safely travel to and from school.

b) Build Community Involvement into Active Routes to School

In creating safe routes to school, parents must get involved and create neighbourhood organ-izations that support children's safety in numbers. Neighbourhood associations need to dedicate trails or paths for home-to-school travel, raise the awareness of the benefits of walking, and help make the school journey safer by pooling (Starnes et al, 1992).

Parent and neighbourhood programs that create and encourage active transportation include bicycle ‘pools', walk-in school buses, block parents, neighbourhood speed watch, bike patrol police, and Safe Kids Coalition. Community awareness programs should target different groups within the community with the message ‘share the road', and increase awareness of child-active transportation to school.

Streets where older pedestrians crossed were at lower risk for injury to child pedestrians which suggests that modelling of safe pedestrian behaviour by adults can be protective (Agran et al, 1996). Pedestrian programs in low income neighbourhoods seem to require a larger police presence. Such officers can assist in making the home to school journey safer from crime. These may be potential sites for "cops on wheels" programs (Starnes et al, 1992).

A "Safe Routes to School" initiative in Savannah, Georgia reported no pedestrian injuries in the neighbourhoods of four schools that, 3 years before the implementation of the program, were high risk areas of pedestrian injury (NACCHO, 1997). Germany has a "No Car Week" at schools which creates a parent network for shared walking, and bike pooling, and has resulted in a 30 percent reduction in motor vehicle use for school trips.

Chicago Public Schools encourage schools to create volunteer neighbourhood patrols to oversee students en route to school. Participants feel this program lowers the opportunity for a predator to stalk a child, and makes it easier for parents and police to patrol (Chicago Parent, 1997).

4. Develop Personal Skills

a) Evaluate Child Pedestrian Education and Re-think Traditional Approaches

Child education programs have been the most common approach to child pedestrian injury prevention (Malek et al, Roberts, 1994). Seventy-one percent (56 articles in total) of publications identified by Klassen (1995) in his systematic review of child pedestrian interventions were educational. Some research on practical training programs for elementary school children has shown improved knowledge and behaviour in children for road crossing skills. For example, a school-based training program targeted at teaching pedestrian safety skills to school children in Kindergarten to grade 4 was modestly successful in changing their behaviour. Prior to training, only 50 percent of children stopped before crossing, 25 percent looked both ways before crossing, and only 20 percent kept on looking while crossing. Training which involved parents as well as the child was able to double "looking" behaviour among the children before they crossed the street (Rivara et al, 1991).

School-based interventions appear to be more effective than those in ambulatory care settings (i.e., doctor's office) among school-aged children (Klassen, 1995). A non-traditional approach to traffic education implemented by teachers attempted to teach young children age 6 and 7 the concept of speed, in order to advance their understanding of time and distance as critical components of speed (Cross and Pitkethly, 1991). The 6-week core program utilized dance, craft, measurement, role playing, and cooperation, in order to challenge the children, and expand their intellectual understanding of speed. The lessons involved a progression from the simplest concept of movement to the ability to analyze by comparison, distance and time variables in terms of speed. The authors claim that a significant proportion of children did increase their understanding of the concept of speed. Whether or not this knowledge translates into safe pedestrian practice remains to be determined. Interventions to youth safety education lack evidence for effectiveness. Perhaps innovative strategies aimed at groups of adolescents, rather than at individuals, may invoke positive change by capitalizing on peer pressure (Klassen,1995).

Safe Routes to School programs occurring in the state of Georgia are noteworthy. Grades 1-3 received teaching equipment that included a Jell-O brain mold, a model skull, safety videos and student workbooks. Child-friendly maps were drawn by a local artist and distributed to the children for lessons on map skills. The teacher conducted walks in the school neighbourhoods and using the maps, the children identified traffic signs, crossing guard locations and other landmarks. Imaginary safety cruises were also held for this age group. In a room with a nautical theme, children received stamped passports after they completed safety activities in several aspects including pedestrian, bike and car occupant safety. Activities targeted to teens included a showcase by hospital emergency nurses on emergency care for alcohol- related injuries, and Ghost Out (a theatrical method for demonstrating the number of teens that die in automobile crashes) (NACCHO, 1997). Other campaigns in which injured adolescents make presentations to their peer group report a positive behaviour change in relevant activities among participants.

A non-traditional approach to pedestrian education which targeted elementary school children raised awareness of the impact of traffic on children and on the environment. The project recorded modes of transportation to school on a "traffic tree." A brown leaf represented a journey made as one passenger in a car, a green leaf represented all other modes of transportation. Month-by-month students and parents were asked to "green the traffic trees" in seeking active and safe routes to school (Sustrans, 1998).

Based on the finding that different types of approaches, safety for girls and fun for boys may sway safety decision- making for elementary school children, interventions need to be aimed at enabling or training children to resist peer pressure risk-taking in traffic safety. Also, understanding that the number of repetitive appeals influence decision- making indicates that what is said, as well as how many arguments are made, influence elementary school children's ability to alter a decision about risk-taking (Morrongiello and Bradley, 1997).

Morrongiello and Bradley (1997) offer advice for messages on safety education to younger school-aged children. Their research suggests younger children are more susceptible to the influence of a decision change, such as selecting a safe bike route, when the relationship shared with the persuader was predominately positive (acceptance, kindness, pro- social, nurturing affectionate, companionship, intimacy, admiration and similarity) as opposed to negative (dominance, quarreling, competition, aggression, hostility and avoidance).

b) Limitations of Traditional Child Pedestrian Education

Towner, Dowswell and Jarvis (1993), in a review of literature on health promotion research to reduce child pedestrian injuries, suggest that education programs need to demonstrate effectiveness in real road situations, need adequate teacher training and need some coordination between safety education agencies, police, education, and health. Many child pedestrian education programs have no theoretical base for the implementation of the program and materials may be inappropriate for the child audience. Methodological problems, such as lack of randomization of groups to assess effectiveness of pedestrian safety interventions and lack of any evaluation on effectiveness of interventions, such as in the Kidestrians program, limits the evidence to support the educational interventions to children. Long term maintenance is a critical element in child pedestrian education and programs need to include techniques to enhance generalization and maintenance of traffic safety skills (Pattavina et al, 1992). Similarly, no evidence from bicycle education programs has led to the reduction of bicycle-related injuries in subsequent years (Carlin, Taylor and Nolan,1996).

Some researchers conclude that evidence on effectiveness of educational child pedestrian interventions has been internationally inconsistent and shown small gains (Roberts, 1993) and should not be relied on as the major preventive strategy (Grossman and Rivara, 1992). In fact, Roberts (1994) suggests that parents who are expecting road safety education in the school might have unrealistic expectations of children's performance in traffic, an attitude which could result in increased traffic exposure and increased injury rates.

Scheiber and Thompson (1996) conclude that from a developmental perspective, traditional pedestrian traffic education has limited value for young elementary school-aged children and that most efforts targeted to reduce traffic injuries in this age group should be directed towards improving the roadway, vehicles, drivers and adult supervision. These findings concur with research more than two decades ago on child pedestrian behaviour in Sweden by Sandels who concluded that "it is not possible for young children to adapt to the traffic environment; they are biologically incapable of managing its demands." (1975)

Children recalled prevention advice as largely about prohibitions, and reported that a risk-free environment would be "no fun." (Green, Hart, 1998) Parents, children and legislators seem to hold the erroneous belief that caution and vigilance are effective means of protecting a child from a traffic injury. (Eichelberger, et al, 1990)

c) Encourage Children to Wear the Right Equipment When Travelling to School by Active Modes of Transportation

Child factors can be modifiable to reduce risk: for example the wearing by children of bright/fluorescent clothing, hats shoes, boots and backpacks for increased visibility. (Capital Health Authority, 1997)

One out of three injured child cyclists were reported, on police records, to be distracted when the bike injury occurred. Prevention of serious bicycle injuries cannot be accomplished through helmet use alone. It may require separation of cyclists from motor vehicles, and delaying cycling until children are developmentally ready (Rivara, 1997). CHIRPP data indicated that bicycle helmet use in Canada is increasing and that helmet use is associated with fewer serious head injuries (Herbert, 1996).

d) Promote Parent Education of Traffic Safety

Parents' attitudes and practices indicate that many parents have inappropriate expectations for their children as pedestrians, and often teach children skills that are not commensurate with their developmental level. (Rivara, Bergman, Drake, 1989) Parents assume falsely that children themselves can act to avoid injuries and that the parent's own role in preventing childhood injuries is minimal. (Morrongiello and Dayler 1996)

Interventions in a child injury prevention program should give parents more accurate knowledge about the developmental skills and limitations of their children. Parents need to be reminded on a day-to-day basis to routinely think in terms of injury possibilities to their children. Where should parents receive messages about child injury prevention? Xiaohan reported parental attitudes on childhood injuries and found that most families had taken their children to the family physician for a check-up, but during visits only 20 percent had ever been advised about how to prevent childhood injuries. Some evidence supports that parent knowledge of child injury risk is related to safety practices (Xiaohan et al, 1989), although there is no specific evidence to date concluding that counselling about paediatric injuries will be beneficial (Bass,1993). The literature suggests that parent knowledge of child injury risk is related to family safety practices (Xiaohan, Rivara, et al, 1989; Peterson, 1990; Scheidt, 1988). More research at the family level may increase knowledge and generate solutions toward family-level interventions for health (Young, 1998). Since mothers are more likely to have the responsibility of escorting children to school, consideration could be given to targeting some messages specifically to mothers.

An Injury Behaviour Checklist (Potts et al, 1997) could be used to educate parents/teachers to identify behaviours for injury liability among children 5 to 10 years of age.

e) Promote Driver Education to Avoid and/or Travel Slowly on Routes to School

Drivers need to be increasingly alert for children walking, running or riding in active/safe routes to school areas. Campaigns to "kill your speed not a child" are aimed at bringing home the message to motorists the fact that even if an accident cannot be avoided, its consequences are much less severe if the car is being driven slowly (Carlisle, 1993). Education for drivers on routes to school needs to stress among drivers to be extra careful in the mid-to-late-afternoon, when the injury rate is highest. Some experts feel that education of drivers regarding child pedestrians, safe driving strategies and avoidance manoeuvres such as breaking and swerving may be effective strategies to decrease injury to children actively travelling along the roadside. (Pitt et al, 1996)

5. Re-orient Health Services

a) Capitalize on Teachable Moments to Families

Cobb suggests that children with aggressive behaviours may be an important target group for interventions (1995). Pediatricians, nurses and teachers should counsel parents of 5 to 8 year old children with advanced physical development that they need extra monitoring, not extra freedom (Christoffel, 1996). Medical personnel should counsel families with high stress, low cohesion and who reside in crowded homes, who are also at an increased risk for child pedestrian injuries (Christoffel, 1996) (although there is no specific evidence to date that counselling about child injuries will be beneficial).

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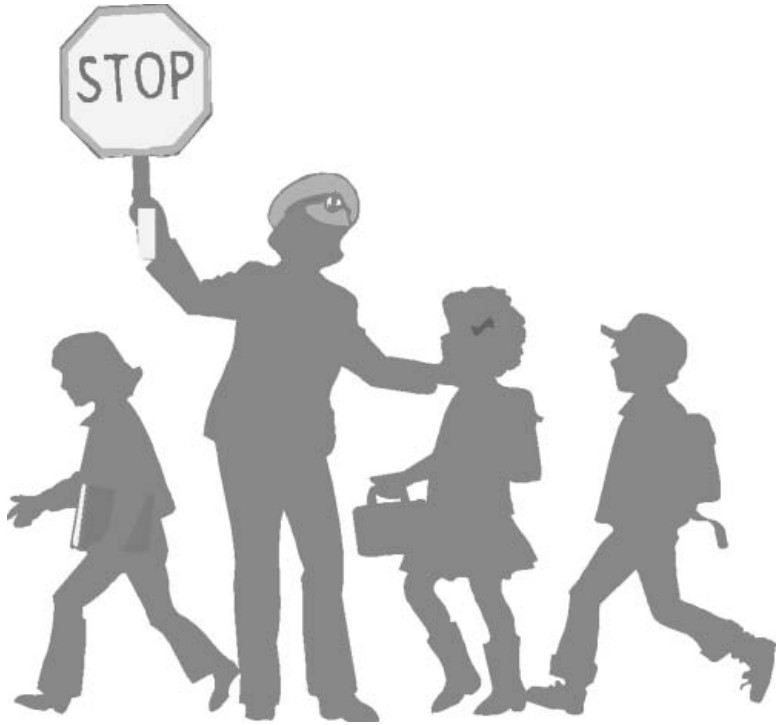

CHAPTER II

SUMMARY OF KEY INFORMANT INTERVIEWS REGARDING CHILD/YOUTH RISK FACTORS ASSOCIATED WITH ACTIVE TRANSPORTATION TO AND FROM SCHOOL AND RECOMMENDATIONS TO PROMOTE SAFER ROUTES

PURPOSE

The purpose of conducting key informant interviews was twofold. First, to gather consensus with regard to the identification of the safety problems with active transportation to school and important risk factors to children seeking active routes, and second to identify important health promotion strategies known to key informants that address the risk variables to promote safe/active routes to school.

METHODS

a) Key Informant Selection

The matrix of key informants was organized to select a sample that reflects the geographic diversity of Canada with representation from both urban and rural areas, and the diversity of the stakeholders who represent different interests and expertise in childhood safety as it pertains to active/safe travel of children (5 to 19 years) to and from school.

Child Health Researchers; University-based	Child Health/ Education Community Groups	Transportation Professionals	Current Programs Active/Safe Routes to School
Dr. B. Pless & Associates McGill University Contact: Dr. Helen Bélanger-Bonneau	Canadian Home & School Federation; Ms. J. Eynon, Ottawa	Edmonton Police Department; Constable Brad McMillen	Children/Parents & Teacher; Greenest Cities Ms. J. Kennedy, Toronto
Dr. B. Morrongiello Guelph University	Canadian Principals Association; Mr. J. Dean, New Brunswick	Rural-based planner; Ms. M. Bishop, Newfoundland	Way to Go; Ms. B. Kowey Vancouver
Dr. T. Klassen & Associates, Ottawa University Contact: Ms. Morag McKay	Teacher/CICH Board Member; Mr. D. Landry Ottawa	Victoria Policy Transport Institute; Mr. T. Litman, Victoria	Trauma Prevention Council; Kidestrians; Ms. L. Dayler, Hamilton
Dr. B. Guyer Johns Hopkins University Baltimore, MD	Smart Risk Foundation Dr. R. Conn Toronto	Canadian Automobile Association; Ms. R. Weisbrod, Ottawa	Sudbury Health District Healthy Kids Walk to School; Ms. F. Brunet- Sechner
Dr. L. Chambers McMaster University Hamilton	NB Block Parents Association; Ms. L. Patterson, New Brunswick	Ms. D. Hope, City Planner Ottawa	Ms. J. Hobart, Recreation Coordinator; North West Territories

b) Data Collection

All key informants were first identified by telephone by the principal investigator. Once verbal consent was obtained for study participation a brief outline of the project and a list of the key informant questions to be discussed, were mailed or faxed to respondents (See Appendix), and a date set for the interview. The average length of the interview was one hour. Introductory remarks involved an information exchange about the role of CICH and the role of CICH in the project Active/Safe Routes to School. Most interviews were conducted on the telephone (14/20 or 70%) while the remainder occurred in person (6/20 30%). All interviews were conducted by the primary investigator between May and July 1998, written notes were collected and subsequently transcribed into a computer-generated 'documents per key informant'. Results presented here are a summary of these data.

RESULTS

A. The Problem

1. Magnitude of the problem

All respondents agreed that the safety of children travelling to and from school is an important issue. One respondent described safe routes to school as a "timeless issue with changing conditions." Another claimed children's active school travel is a "grey area because parents assume the school is talking about it and the school assumes parents are discussing it."

2. Definition of the Problem

Two main concerns were voiced by key informants about children's safety in regard to active transportation to school:

i) 85% (17/20) stated traffic congestion
ii) 75% (15/20) stated parent fear of stranger danger

Traffic congestion included pedestrian congestion in areas where the sidewalks are narrow or nonexistent where children are walking/biking on both sides of the roads; congestion from vehicles on the roadways; and congestion at the school due to parents chauffeuring children. Comments on congestion are important to note such as: "congestion occurs 15 minutes before school and for 15 minutes as school is dismissed", and "congestion results at the average elementary school - kindergarten to grade 6 when about 150 cars arrive/depart in a 15 minute period." Another informant commented "far too many parents are driving children to school when it is not necessary." Traffic congestion was viewed as a more recent problem in comparison to stranger danger. Most key informants felt parents cope with stranger danger by choosing to drive the child to the "front door" of the school.

Several barriers to walking children to school were identified by parents currently involved in active routes to school programs. The most common barrier they perceived was the stranger danger; others include:

i) Seeing children carrying too many books and musical instruments;
ii) Finding it easier to drop off children on route to work;
iii) Early in morning younger siblings of school-age children are still in their pajamas; It is easier to put everyone in the car and drive the oldest to school;
iv) "A fence exists at my end of the school so we can't travel through school yard";
v) Difficulty in getting a child in a wheelchair to go through the snow.

Meanwhile, on a positive note, one parent who walks with her children to school commented on the positive impact that can result from active transportation: "I enjoy my walks with my children, we have lively discussions, I look forward to this special time together."

With help from their teacher, children in grades 1 and 2, in an urban southern Ontario community identified problems they face travelling to school. Two issues arose:

i) The children had only one crossing guard on their route and they felt there are many busy streets they have to cross so more crossing guards or helpers were needed to cross the streets;
ii) The children wanted to get to a park on their way home from school to play, but they felt the park was out of their reach because the street to cross was so wide and it had heavy traffic volume with streetcars and delivery trucks.

3. Problem recognition

When asked how the problem of children's school travel is recognized in the community, 60 percent (12/20) identified a trigger experience that had recently sparked community attention through the media. Some stories of trigger experiences included:

i) A child having an anaphylactic reaction but the responding ambulance unable to immediately enter the school parking area due to traffic congestion from parents' cars;
ii) The threat to eliminate crossing guards as a municipal cost-saving measure;
iii) Concern raised by a community hospital over the cost of pedestrian injuries.
iv) School neighbours witnessing many "near misses" of students with car traffic;
v) Two pedestrian fatalities of senior citizens crossing in a pedestrian zone;
vi) The drowning of a 7 year old child who was on his way home from school (no foul play suspected).

B. Risk Factors to Children Actively Commuting To and From School

1. Child Factors

All respondents identified some child risk factors. The most common risks noted concerned younger children, especially boys, and children's inability to judge the speed of oncoming traffic. All respondents working in child health (5) identified normal child development as a risk factor for traffic safety. Among the remaining respondents only 40 percent (6/15) stated children are at risk because they are children. Comments indicating this position included "children need to be children," "children are carefree not careless," and "children want to ride side by side and talk to their friends."

Other child risk factors to active modes of transportation that were identified were related to the child's age. The age risk factors identified were:

i) *5 to 9 years* - concerns over distance they must travel;

ii) *10 to 15 years* - some respondents claimed parents fear stranger danger as these children are most often unsupervised, latch-key children (4/20) who arrive at school before teacher supervision is available, complaints by children to their parents about having to walk (2/20), and bullying (5/20). Lack of safe practices or poor risk management among some 10 to 15 year olds was suggested by the following comment: "students may wear their helmets so parents see them but when the teachers see them the helmets are around the handlebars — students claim it messes up their hair, or their friends will think they are a wimp";
iii) *15-19 years* - active transportation risks include bullying, gang violence and carrying heavy objects such as band instruments.

2. *Family Factors*

Sixteen of the twenty key informants identified family risk factors. Those most common were parental attitude, knowledge and behaviour. Comments included "young children, unsupervised, reflect parents knowledge who have an overestimation of children's abilities in traffic;" "Parents feel they have given safety knowledge to their children, and the children can recite it, but the behaviours have not been internalised;" "Parents are not always good role models in traffic;" "Parents may choose to drive their children to school thinking that they are doing their child a service." "Parents are operating under a 'hurried child' focus (3/20) whereby the child is dropped off at school on route to work and scooped up after school to be shuttled to the next activity of the day."

Other comments included decreased family resilience. Families who frequently move, the child consequently living in changing neighbourhoods and having fewer social supports. Working parents may place children at greater risk if they leave the child unsupervised. Separation and divorce may cause the caretaking spouse to fear that the other spouse may pick up the child: therefore, the parent who has custody will not let the child walk.

Higher or lower socioeconomic status of the family are risk factors for different reasons. For example, the children of new Canadians walk to school, but as the family becomes established and their income increases, they purchase a car and drive their children to school, adding to traffic congestion around the school. Adolescents of higher income families may have access to a car which increases risk to themselves and others actively travelling to school. A key informant involved with active transportation programs commented that among wealthier neighbourhoods parents have been able to organize *Walking School Bus* initiatives with greater success than less affluent neighbourhoods. The informant also noted that less affluent families and those with dual working parents often send older siblings to escort younger

children which is less safe than adult supervision.

One respondent told a story of a school traffic education day, during which a number of community agencies presented information to the children. All presenters, who included police and public health nurses were astonished when, at the end of the school day, the students were dismissed to a sea of parents' cars doubled parked, parked on pedestrian crosswalks and parents yelling from their cars for their children to run to the cars to go home.

3. *Physical Environment Factors*

All twenty respondents identified greater volume of traffic over the past 10 to 15 years and speeding as the leading risk factors for children attempting to seek active routes to school. Seven respondents identified distance to travel to school and school location as a risk factor. Several concerns were expressed:

i) Lower educational resources has resulted in fewer neighbourhood schools. As a result, children must travel further away from their homes (the greatest risk is travelling outside of the school zone);
ii) Some students do not qualify for bus transport and have to walk 30 to 45 minutes. In the winter months this may be in the dark; some parents choose to drive their children at these times;
iii) Some new communities have built schools halfway between two communities so instead of half being able to walk, the total population has to be bussed.

Additional physical environment factors which are a risk to children included weather - cold and windy conditions usually cause parents to chauffeur; *school parking lots* where near-misses occur as a result of congestion as walkers, bikers and pedestrians cross paths with parent chauffeurs and teachers driving into the parking lot. *Parked cars* whichblock views; *poor road conditions*, such as rough road surfaces which are hazardous to bikers, in-line skaters and those on skateboards; road design such that "streets were made for cars not pedestrians"; and the *lack of sidewalks* were also noted. Concerns with municipal priorities that result in less timely snow removal from pedestrian walkways, but priority snow clearance for car traffic and resultant *high snowbanks* for children to climb while entering or dismounting from buses especially where there are no sidewalks, were also identified as risk characteristics.

4. *Driver Factors*

Eleven of the twenty key informants identified driver risk factors. All of these responses focused on driver stress and road rage. Five respondents, three from the transportation professional group and two from the current active/safe routes program group expressed concern over the type of vehicle, particularly vans and

sports utility vehicles that have a very large blind spot; "in these wedge shaped cars drivers can't see four feet behind them" and "a small child can easily be hidden behind a utility vehicle when in a school zone or parking lot." One story shared was of a child whose backpack became hooked on the side mirror as she dismounted from the family van. Her mother did not realize this and began to drive away, dragging the child. Fortunately a student patroller caught the mother's attention and the child was rescued.

C. Health Promotion Strategies to Promote Active/Safe Routes to School

The WHO Charter for Health Promotion was utilized to frame the numerous health promotion comments identified by key informants, since these are important elements to current and future initiatives in building safe routes for children to actively travel to and from school.

The largest group of respondent strategies concerned the need to build healthy public policy (17/20), followed closely by creation of supportive environments (16/20). Strengthening community action was suggested by 13, and nine noted the need to develop person skills, mostly aimed at parents, drivers, and parent-drivers. The following discussion is a summary of the health promotion strategies described by key informants.

1. Build Healthy Public Policy

Municipal-based policies

a) Fiscal measures to improve active/safe routes to school;

Health researchers advocated that communities should demand that each municipality set priorities and budgets to address the physical environment. Such measures would include traffic calming and traffic reducing technology, reduction of speed limits and use of red light cameras to reduce speeding in environments where children actively travel;

b) Police cycle patrols for routes to school;

c) Reduce speed limits in front of school zones (not uniform across country);

d) Priority snow clearance for all routes to school;

e) By-laws to reduce waiting times in school parking zones and to decrease traffic volume in parking lots and pull up spots;

f) Reimbursement of low income families for child safety equipment such as helmets.

School-based policies

a) Schools need designated drop off points.

Cars and pedestrians should be completely separated from the school so that pedestrian and car traffic do not mix. All parking lots need specifically identifiable, pedestrian pathways; for example use of pylons, vegetation, canopies, or paint on coloured pavement; use of a code of behaviour to slow vehicles for pedestrians.

b) Schools should develop a safe routes to school handbook and establish regular enforcement of school safety policies.

For example, students should walk their bikes on school property and reminders can be given on school announcements.

c) Establish staggered dismissal.

Younger children should arrive and leave a few minutes earlier (or later) than older children, thus minimizing traffic chaos at beginning and end of day. Crossing guard/patrols and parents could then pay attention to the needs of smaller children and older children separately.

d) Promote supervision of young children to and from school.

Parents who cannot supervise their children before or after school should be encouraged to find an older student or neighbour to make sure their child safely gets on and off the bus to and from school.

e) Develop appropriate skill-based guidelines for traffic.

Advocating skill-based guidelines for children allows parents to judge their own children's independent mobility. For example, a child is ready to cross a street when a) not impulsive (will not run out) and b) visual skills are adequate to scan traffic and estimate speeds.

f) Schools should monitor families who drop children off early.

Assess the need for before and after school care which should be followed up by the school.

g) Set school policies to encourage walkers, bikers and in-line skaters to wear reflective equipment.

All children should be given reflectors to wear to school.

h) Involve parents and children throughout all planning for safe routes to school.

This was advocated by those involved in current programs. For example, a teacher mapped the best route by a

tennis court and the younger children said they wouldn't go that way because the bullies hang out at the tennis court.

2. Create Supportive Environments

a) Keep children away from traffic.

All five child health researchers insisted that the message be kept simple: wherever possible children should be kept physically well away from traffic. Environmental modification to ensure active/safe routes was given high priority by all respondents in the child health researchers group. Traffic-calming measures, such as creation of islands with trees and use of other vegetation can have the added advantage that they improve the neighbourhood appearances and increase real estate values for community members.

b) Widen sidewalks and create specific drop off points for car-driven students, away from pedestrians and bikers.

Environmental modifications were also supported by child education informants, such as widening sidewalks and refitting school entrances to create safer places for active commuting students to enter the school ground. These modifications required support from parents, teachers, principal and school board. In one example, the informant told of a school that had placed physical barriers at the front of the school to prevent parents from driving onto the sidewalk. Establishing specific drop off zones for parent chauffeurs is easily achieved by use of fluorescent cones (taller structures may be needed in winter). Parents of the school may participate in Parent Parking Patrols (PPP) to reinforce the security of the dropping off zone.

Assistance with law enforcement will be needed. For example, when it was realized that at the times when traffic congestion occurred at the 238 schools there were only 28 traffic police officers on duty, *Parking Parent Patrols* were developed by the Edmonton Police Department and a parent. Principles for success outlined by the key informant on this program included:

i) Sending out memos of the pending implementation of the PPP to parents in all dialects in the school community;
ii) Positive reinforcement to the child dropped off at the correct spot, such as giving away prizes;
iii) Effectiveness of PPP is attained when about 80 percent of parent population behave properly in the parking lot.

c) Promote traffic-calming measures for child pedestrians

Suitable traffic-calming measures for child pedestrians suggested by some of the transportation professionals include:

i) Sidewalks or at least paved shoulders with a clear side line marking the sides or edge of the roadway;
ii) Elevated crossings so that children have a shorter distance to cross at intersections and are more visible in the areas where they cross;
iii) Narrowing of roads at crossings so that children have a shorter distance to cross;
iv) Create traffic calming corner bulges which let children see traffic better by elevation, and allows them to see from behind parked cars;
v) Colourful, fluorescent street signs should identify school zones. But there is also a need to refresh signs intermittently (change colours) to continue to remind drivers of school zones and the need to reduce speeds. (A comment by one informant noted that after a time, the sign disappears and is ignored by drivers so that steps need to be taken to make signs have a ‘new face');
vi) Painting colourful footprints along the school routes on the pavement was another suggestion to heighten driver awareness of presence of school children and the need to slow down.

3. Strengthen Community Action

a) Establish community partnerships

All five child health researchers clearly identified traffic as a community-based issue needing mediation by all disciplines including traffic engineers, parents, schools, drivers, police and public health. No informant offered suggestions as to who should take the leadership role. Although traffic education has been established for sometime, initiatives to reduce parent chauffeuring to and from school and to promote active safe routes to school are very new, most less than three years old.

b) Start with children and other community members will benefit

Other informants suggested that communities link the developmental deficits of younger children with the needs of older populations so as to advocate for changes in the physical environment to make walking safer for the broader community. ‘Intergenerational walking buddies' is under investigation in one community to encourage safe/active transportation to school for young children and to improve cardiovascular fitness among the seniors. Other walking buddy programs with elementary students teaming with high school students was also suggested.
One program informant suggested that a Walking School Bus (WSB) initiative could have been more successful if the school and parent association had sent home a newsletter and identified specific streets where the students could meet.

Some concerns expressed by parents about the Walking School Bus included:

i) Parents want to know who is walking their children;

ii) Children who go to a baby-sitter after school need a different arrangement for the route home from school;
iii) Concerns about liability and safety (one school suggested they treat WSB drivers as any school volunteer);
iv) Concerns about WSB in bad weather of if the driver is ill.

c) Be a good role model in traffic

Parents and other community members should be better role models when crossing streets. One key informant told a story about group of business men walking in a mid-upper class area in a Canadian city. When asked why they had stopped at the intersection when no cars were coming, they responded that they were trying to set a good example for the children who were walking alongside on their way to school.

d) Establish surveillance systems to collect and evaluate community traffic data

All of the child health researchers endorsed surveillance systems of local child pedestrian travel patterns, and recording of injuries and near misses by mapping, to determine geographical areas of risk. Two of the five had these procedures in place in their research community.

e) Recruit more block parents in urban neighbourhoods

Only about 1,000 communities in Canada have Block Parents. There is a need to expand safe routes to include small business environments (banks, corner grocery stores) to be participants in Block Parents, available to children on routes to school.

f) Advocate a paradigm shift to active transportation

The size of the project teams was small in the 28 schools that have applied the Way to Go school trip reduction program in the Greater Vancouver area. In many cases, the entire program implementation was undertaken by one or two devoted parents. The commitment of these parents was the most important factor in the success of the program.

Two informants suggested the need for social change to shift the current paradigm from car focused to active transportation focused communities. Actions to facilitate the paradigm shift include :

i) Walking routes must BUILD A CRITICAL MASS OF WALKERS so that the community sees active transportation;
ii) Parents and children will acknowledge an ‘eyes on the street' approach to frequent and familiar safe adults, and reduce the anxiety of stranger danger;

iii) Seasonal changes are good entry points for marketing education themes and campaigns to celebrate active transportation;
iv) Must rebuild active/safe routes to school team every September as people change, new students, new parents, new drivers, new community members become involved;
v) Heighten the sense of community responsibility by better reporting of child pedestrian injuries by the media, giving as many facts as possible, including age, gender, actions, driver responsibilities.

4. Develop Personal Skills

a) Teach children skills

Child health researchers advocate evaluation research on all measures to improve safety and decrease injuries and fatalities. One key informant in this group commented that community action groups are turning their attention to a new curriculum for school children despite the fact that developmentally the children cannot cope with the physical traffic environment. Others agreed that before adolescence it is difficult for children to take general safety knowledge as presented in a classroom situation and apply it to specific situations such as necessary with individual street crossing with variations in volumes, speed and direction of traffic. Two of the five child health researchers are working on virtual reality computer programs to teach safe pedestrian skills to children and communities.

Transportation professionals interviewed advocate a population based approach to traffic safety, blending community and environmental awareness and health and safety promotion, delivered in a developmentally appropriate manner through the school curriculum study on Community. This structure is currently undertaken in some communities. Starting at grade 1-2, students examine local maps of their own community. As they grow older, the children continue to be asked what makes them feel safe as they seek active ways to travel in their communities. They can talk about where they live, locate it on local maps, and point with their fingers at the streets they travel to get to school. Community skills develop so that by grade 4 students are able to compare maps of cities and in grade 5 learn about levels of government and discuss the history of settlement patterns. As adolescence approaches, the youth have the tools to understand how communities work and the steps necessary to implement policies within communities.

One transportation informant represented an organization advocating school safety patrols. Students must be in grade 5 or above to perform the functions of a patroller. They must be selected by the school principal and are trained by the police department. For over 40 years this child pedestrian traffic intervention has been in existence in Canada but with no evaluation of its effectiveness. The theory behind the intervention is that the children may assimilate more traffic

safety teaching from peer role models. Evaluations of the effectiveness of adult safety patrollers are also rare. One key informant in the child health research group is currently collecting international literature in an attempt to develop a study to evaluate the effectiveness of adult crossing guards. Without evaluations of these services for children, municipalities are not persuaded of their importance in creating safe environments for the active travel of children to school.

Those in the child education groups advocated the need for different messages for different age groups of boys and girls, 5-9 year olds, 10 to 14, and 15 to 19 year olds. Better social marketing messages that educate should be tailored for the target groups. Younger school age children are most interested in messages about HOW THE BODY WORKS. Adolescents are very interested in the HOW THE BODY LOOKS, so messages need to appeal this way. There is a need to avoid negative messages to adolescents but to empower them to manage risk. There is a need to generate interest in injury prevention in youth by the thrill of risk management. This appeals to youth by giving them power to make the 'smart' choice. It is important to point to the benefits of exercise in regard to body image for adolescents to encourage them to choose active transportation methods to school.

b) Teach parent skills

Concern about parent knowledge of 'what is responsible parenting' was raised by a child health researcher. Parent knowledge of child development and skill acquisition was identified by a few other informants. One key informant who participated in a parent school night promoting home safety was astonished when some parents felt that children as young as 4, 5 or 6 were 'safe enough' to cross a street in a school zone.

Others informants suggested the need for concurrent education of parents about the scope of the problem of child pedestrian injuries and child abduction so that steps to promote active/safe routes could address both these fears. Several informants suggested that regular communication from school to parents with newsletters about active transportation issues and policies may promote support.

c) Teach driver skills

A community newsletter developed by a key informant entitled "Children Can't Fly" summarizes the need for driver education. Another indicated that drivers need to think "If you were walking, what would you like to happen?"

SAMPLE QUESTIONS TO KEY INFORMANTS

Magnitude of the Problem

- Are children actively (walk, bike, roller blade, in-line skate) travelling to school in your community?
- How many and what ages actively travel to and from school?
- Among those who don't actively travel to school, why do they not?
- Is the safety of children/youth travelling to and from school a concern?
- To whom is it a concern? (children/parents/educators/other community members?)
- How was the problem recognized (i.e., were children hurt/injured)?

Risk Characteristics

- Specifically, what are the concerns/risks (in your community) to children's safety travelling to and from school in an active way? (descriptors of those children at risk, i.e., child factors age/gender/developmental stage, family factors; SES, parent attitudes, physical environment/ traffic patterns/ speed/volume/visibility, driver concerns).

Current Steps

- Are any steps underway to improve/promote safer routes to school to children and reduce their risk? (Actions - individual / programs - collective)

Future Steps/Guidelines/Policies/Legislation

- What further steps do you see as important to promote safer routes to and from school?
- Who needs to address/ understand these steps?
- What guidelines/policies/legislation do you feel is required to reduce the risk and improve the health of Canadian children to allow them to access safe and active ways of travelling to and from school?

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Healthy Child Development: A Lifelong Commitment of the Canadian Institute of Child Health

Research has shown that a child's early attachments have a vital influence on brain development. When nurtured in caring environments, children are more likely to become healthy, happy and competent adults. The Canadian Institute of Child Health has embarked on a major initiative to focus attention on early child development. Beginning with the parenting booklet *The First Years Last Forever*, we are producing multi-media resources that inform employers, professionals and all segments of communities about the importance of supporting young children and their families.

As well, the Institute recognizes injury prevention as a major health issue and we have worked successfully to bring this issue to the forefront. We have been a leader in promoting the safe use of car seats and bicycle helmets and were the driving force behind standards on flammability of children's pyjamas. We will continue to develop injury prevention and safe environment programs and resources, and act as an advocate for the safety of all children and youth in Canada.

In addition to Early Child Development and Safe Environments, our other areas of focus include:

- Advocacy - acting as a voice for children
- Monitoring of children's health
- Healthy pregnancy and childbirth

For more information on the activities of the Institute, contact us at (613) 230-8838, or e-mail cich@cich.ca Don't forget to check us out on the web at **www.cich.ca** for detailed information, news releases and a complete resource listing.

Go for Green
The Active Living and Environment Program

Go for Green is a national non-profit organization encouraging Canadians to pursue healthy, outdoor physical activities while being good environmental citizens. Since 1992, Go for Green has worked in close partnership with health, environment, transportation, and community organizations across the country; progressive Canadian corporations; and governments at all levels. During this time, Go for Green has supported more than 1,000 initiatives to enhance personal and environmental health.

One of Go for Green's national programs is the Active & Safe Routes to School program, which encourages the use of active modes of transportation to and from school. The benefits include:

- increased physical activity for children and youth
- a healthier lifestyle for the whole family
- less traffic congestion around schools
- safer, calmer streets and neighbourhoods
- improved air quality and a cleaner environment

To obtain more information on Go for Green or the Active & Safe Routes to School program, call 1-888-UB- ACTIV or visit our website at **www.goforgreen.ca**

Go *for* Green
The Active Living & Environment Program

WE WANT TO KNOW !

Your comments are important to us. In order to ensure that we continue to develop the best possible resources, please take a moment to send us your feedback - on this document as well as your thoughts on where you see a need or gaps in research and resources required to ensure the safety of our children. Please fax back to the Canadian Institute of Child Health, (613)224-4145 or Go for Green at (613)562-5314.

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