

**Review of International Best-Practices for Improving
Child Passenger Safety
and
Evaluation of Saskatchewan's Program**

Submission to the Acquired Brain Injury Partnership Project
Ministry of Health and Saskatchewan Government Insurance

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The British Columbia Injury Research and Prevention Unit (BCIRPU) was established by the Ministry of Health and the Minister's Injury Prevention Advisory Committee in August 1997. BCIRPU is housed within Developmental Neurosciences and Child Health Cluster (N2N) of the Child and Family Research Institute. BCIRPU's vision is "to be a leader in the production and transfer of injury prevention knowledge and the integration of evidence-based injury prevention practices into the daily lives of those at risk, those who care for them, and those with a mandate for public health and safety in British Columbia".

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HIGHLIGHTS

1. How does the Saskatchewan model compare to international best-practices?

- The Saskatchewan model for child passenger safety is primarily education focused.
- The Saskatchewan model is uniquely focused on certifying Child Passenger Safety Technicians to deliver education to the parents and caregivers of young children.
- Some distribution of free or discounted child safety seats is available through community grants and First Nations and Inuit Health (FNIH).
- International evidence focuses on short-term interventions rather than long-term programming. Consequently, comparisons to, and conclusions with regard to the Saskatchewan model, are difficult.
- Education coupled with another component (e.g. enforcement, distribution) is more effective than education alone.

2. Does the Saskatchewan model increase usage of child passenger restraints?

- National proportions of unrestrained children seen to decline from 12.9% in 1997 to 5.4% in 2006 to 4.2% in 2010.
- The proportion of Saskatchewan child passengers unrestrained according to the 2010 survey was 8.7%.
- The proportion of children 0-4 years and 5-8 years with motor vehicle crash-related injury who were improperly restrained decreased between 1988 and 2011 (TAIS data).
- The Saskatchewan model is associated with a decrease in number of children not restrained, who are the target audience of this project.

3. Does the Saskatchewan model increase PROPER usage of child passenger restraints?

- According to Transport Canada, the rate of correct use of child passenger safety seats in Saskatchewan has continuously declined since the 1997; however, the definition for correct use has also changed over the years.
- Observers in Saskatchewan in the 2010 Transport Canada roadside survey may have been more critical with regard to what constitutes correct use.
- Low proportions of proper use among 5-9 year olds may be related to the lack of a booster seat law in Saskatchewan.
- TAIS data indicate a decrease in improper use over time among children injured or killed in a motor vehicle crash.
- The majority of respondents of a Parking Lot Inspection in rural Saskatchewan had not attended a child passenger safety clinic; issues found with child seat use included Universal Anchorage System (UAS) routing, tightness of UAS/seat belts; insufficiently snug harnesses, location of chest clips; anchoring tether straps for forward-facing seats.
- Saskatchewan Prevention Institute Child Passenger Safety Clinic post-clinic telephone survey conducted in 2004 found that clients perceived an increase of knowledge from an average score of 6.03 out of 10 at pre-clinic to 8.58 at post-clinic; with 62% reporting a change in how they installed their child safety seat post-clinic and 43% in how they secured their child.
- Two student-lead client pre-post evaluations in 2006 and 2007 found that Saskatchewan participants reported a high self-perceived knowledge of child passenger safety following their clinic experience, yet actual knowledge remained low for some

specific elements such as knowing if the seat was installed sufficiently tight.

- Current client post-evaluation found that participants attending for rear-facing seats had higher knowledge of how to install the safety seat and how to secure the child properly than those clients with forward-facing seats; only 60% of clients with rear-facing seats knew when to move a child from rear-facing to forward-facing.
4. Do the demographics of caregivers involved in Saskatchewan interventions match the demographics of the Saskatchewan population? Are there segments of the population being missed?
- The Saskatchewan Child Passenger Safety program targets the parents and caregivers of children ages 0-4 years.
 - The majority of respondents of the Child Passenger Safety Clinic Client Survey were well-educated with high income; primarily Caucasian with 4% Aboriginal, and 3.5% of the sample were recent immigrants.
 - The segments of the population that may be missed by the Child Passenger Safety Program include lower socioeconomic families and Aboriginal families.
 - New Immigrant families appear to be availing themselves of this resource, although this needs to be confirmed.
5. Is there a match between the caregivers targeted by the Saskatchewan model, and the parents/guardians of the children injured in motor vehicle collisions? If not, what other method could be used to target these parents/ guardians?
- Drivers involved in motor vehicle crashes where a child passenger is injured are women ages 16-44 years; men 16-44 years.
 - No information on other demographics or socioeconomic information is available concerning the parents or guardians of children injured in motor vehicle crashes.
 - The systematic review of the literature did not reveal specific methods for targeting segments of the populations at higher risk.

- Potential methods for targeting the Child Passenger Safety Program are: Closer association with hospitals and Public Health units for all new parents; Partner with Aboriginal-serving and Immigrant-serving organizations (e.g. Friendship Centres); Partner with an existing aligned NGO (e.g. SK Abilities Council) for the distribution of child safety seats to lower socioeconomic populations.

6. What is the cost-effectiveness of the Saskatchewan model?

- Total Child Passenger Safety program costs are calculated to be \$231,210 annually.
- The program period saw 17 to 41 fewer deaths, 375 fewer hospitalizations, 164 fewer emergency room visits, and 784 fewer ambulance attended child passenger injuries than the pre-program period.
- Total direct costs decreased by a range of \$4.3M to \$8.2M within the pre-program period; and by a range of \$4.6M to \$8.6M during the program period.
- A range of cost reductions from \$25.2M to \$45.1M were calculated for the direct costs for child passenger injury and mortality medical care, comparing the program period to the pre-program period.
- The inclusion of indirect costs of child passenger injury and mortality would see significantly increased savings and return on investment.
- A return on investment ranging from \$12 to \$16 of costs avoided for every \$1 invested in child passenger safety was found, with the caveat that the Child Passenger Safety program is not the only factor involved in increased child passenger safety in Saskatchewan.
- Although it is not possible to determine if the Child Passenger Safety program is a cost-saving measure, there is strong evidence supporting its contribution to child passenger safety in Saskatchewan.

Recommendations

Education

- Use social media to the fullest. Credible information can be disseminated via social media: YouTube channel, Facebook, Twitter and LinkedIn. The Saskatchewan Prevention Institute has accounts with all four of these social media platforms. Current videos posted on YouTube focus on fetal alcohol syndrome and smoking/second hand smoke prevention.
<http://www.youtube.com/user/PreventionInstitute1>
<http://www.facebook.com/SaskatchewanPreventionInstitute>
<http://twitter.com/#!/SkPrevention>
<http://ca.linkedin.com/pub/communication-department/33/276/594>
- Enlist the support of ‘Mommy Bloggers’. Young female drivers were seen to be involved in single vehicle crashes where a child was injured. The influence of Mommy Bloggers should not be underestimated in their ability to influence behaviour among their peers. This is a credible audience for spreading child passenger safety messages and being part of the solution.
- Develop web-based/DVD instructional videos, e.g. Step 1, 2, 3 on how to install a car seat; how to adjust the straps securing your child, etc.
- Increase police education. The Child Safety Link located in the Maritimes has Child Passenger Safety Information and Resources for Enforcement Personnel, such as laminated resource cards detailing the child passenger laws and safety recommendations
<http://professional.childsafetylink.ca/child-passenger-safety/enforcement>
- Review the upcoming Child Passenger Safety Tool Box for its potential to support or enhance Child Passenger Safety Technician training. Currently in development by Dr. Beth Bruce as part of AUTO 21, this online toolbox will be targeted to professionals working in child passenger safety.

Equipment Incentive/Distribution

- Formalize distribution programs. Limited distribution currently takes place through the use of community grants and work with FNIH. A provincially co-ordinated program targeted at low socioeconomic families, Aboriginal and recent Immigrant families for the distribution of discounted or free child safety seats, should be considered.
- Utilize child seats that will serve the passenger safety needs of the child over several years, e.g. convertible (rear to forward-facing), or combination (forward-facing to booster seats), or 3-in-1 seats.
- Partner with the Saskatchewan Abilities Council, who has an established Special Needs Equipment Loan Program, including retail items. Depots are currently located in Prince Albert, Regina, Saskatoon (central warehouse), Swift Current and Yorkton.
<http://www.abilitiescouncil.sk.ca/index.cfm>
- Partner with Aboriginal organizations such as Friendship Centres. A full list of Aboriginal organizations in Saskatchewan is available at <http://www.fnmr.gov.sk.ca/community/directory/>.
- Partner with Immigrant organizations providing services to new immigrants to Saskatchewan, e.g.

In Regina –

Regina Open Door Society Inc.
<http://rods.sk.ca/index.php?p=Home>
Regina Immigrant Women Centre
<http://www.iwsregina.org/>

In Saskatoon –

Global Gathering Place
<http://www.globalgatheringplace.com/>
International Women of Saskatoon
<http://www.internationalwomenofsaskatoon.org/>
Saskatchewan Intercultural Association Inc.
<http://saskintercultural.org/>
Saskatoon Open Door Society
<http://www.sods.sk.ca/>

Other Locations –

Moose Jaw Multicultural Council

<http://www.mjmcinc.ca/>

YWCA Prince Albert Settlement Services

<http://ywcaprincealbert.ca/ProgramsandServices/RefugeesImmigrantsandNewcomers.aspx>

Enforcement / Enactment

- Increase enforcement and child passenger safety blitzes. Re-establish partnerships with the RCMP and municipal police forces to increase the profile of child passenger safety and the enforcement of child passenger safety seat use.
- Support the enactment of legislation of booster seat use for children ages 5 to 9 years of age. Political lobbying is required to support a provincial politician. Other provinces have typically passed this law with little adversity when backed by a legislative champion.

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INTRODUCTION

Overview

Motor vehicle crashes are the leading cause of death and injury among Canadian children younger than 14 years of age (Snowdon et al., 2008). According to Transport Canada, 3,500 children are injured and 61 children are killed each year in motor vehicle crashes (Safe Kids Canada, 2011). The Canadian Paediatric Society and the American Academy of Paediatrics recommend appropriate child safety seat use to reduce injury risk (Canadian Paediatric Society, 2008; Durbin, 2011). Despite significant increases in child safety seat use over the past 25 years, many children are still not properly restrained. Appropriate use of child safety seats has been shown to reduce the risk of death and serious injury by roughly 70 percent (Kahane, 1986), however, it has been estimated that as many as one-third of Canadian children are not properly restrained (Transport Canada, 2006; Yi Wen et al., 2010).

According to the Saskatchewan Comprehensive Injury Surveillance Report, 1995-2005 (2008), injury is the leading cause of death among children ages 0 to 9 years in Saskatchewan, excluding perinatal illness and congenital issues. Motor vehicle crashes are the leading cause of injury resulting in these childhood deaths. It is also the second leading cause of hospitalization among children in Saskatchewan, accounting for 18.2 percent. Among ages 0 to 4 years specifically, motor vehicle crashes tie with fire and flame-related injury as the second leading cause of death after falls (Saskatchewan Comprehensive Injury Surveillance Report, 1995-2005 2008).

Furthermore, in 2004 Saskatchewan had the third highest per capita injury-associated health care costs in Canada (SMARTRISK, 2009). These unintentional injuries, including those resulting from motor vehicle crashes, totalled \$629 million. Injuries claimed the lives of 399 people living in Saskatchewan, left 192 people with permanent disability, and a further 2,348

people with permanent partial disability. Of these, transport related incidents were the leading cause of death per capita (12.9 per 100,000) and were responsible for 13 percent of injury hospitalizations, nine percent of all emergency department visits, and 13 percent of permanent disability, costing the health care system approximately \$147 million.

To address the continuing high social and economic costs associated with transportation injuries, Road Safety Vision 2010 was approved to carry on the work of Canada's inaugural national road safety vision – "to have the safest roads in the world" (Transport Canada, 2001).

The targets of the Road Safety Vision include:

1. Reducing the number of road users killed and seriously injured during the 2008-2010 period by 30 percent as compared to the 1996-2001 figures (Transport Canada, 2009)
2. Achieving a 95 percent seat belt wearing rate and proper child occupant restraint use among occupants of light duty vehicles (Transport Canada, 2011)
3. Passengers younger than sixteen years of age restrained according to their size or development, either in a vehicle seat belt or child passenger restraint system (Canadian Council of Motor Transport Administrators, 2010).

Taking a new approach, the Road Safety Vision 2015 includes the four strategic objectives: raising public awareness and commitment to road safety; improving communication, cooperation and collaboration among all stakeholders; enhancing enforcement; and improving road safety information in support of research and evaluation (CCMTA, 2011).

The Saskatchewan Model

The model for addressing child passenger safety within Saskatchewan consists primarily of education – the education of parents and caregivers through the training of certified Child Passenger Safety Technicians, child passenger

safety clinics, and the distribution of resources – supplemented with some distribution of car seats to particular high risk populations through community grants, and the enforcement of child restraint laws.

Critical partners in child passenger safety within Saskatchewan include Saskatchewan Government Insurance (SGI), the Ministry of Health Acquired Brain Injury (ABI) Partnership Project, the Saskatchewan Prevention Institute, St. John Ambulance, and community-based partners such as emergency services. Each organization plays a key role in child passenger safety, such as funding, expertise, personnel, and resources (Table 1). Both the Saskatchewan Safety Council and the Transportation Centre at the University of Saskatchewan have also played key roles in the past.

The Community Liaison position was located at the Saskatchewan Safety Council from July 2000 to March 2009, at which time it transitioned to the Saskatchewan Prevention Institute as the Child Traffic Safety Coordinator. While housed at the Safety Council, the Community Liaison position addressed child passenger safety by:

- Chairing the *Provincial Interagency Committee on Child Passenger Safety*.
- Offering local contacts guidance to plan clinics.
- Maintaining a database of the clinics held, Instructor/Technician involved, number of seats checked and volunteers that assisted.
- Maintaining a technical knowledge of child restraints and serving as a provincial resource on child passenger safety:
 - Assisting with the training of Child Passenger Safety Technicians.
 - Making service available to perform car seat checks at the Saskatchewan Safety Council, as weather permits.
 - Responding to phone inquiries regarding Child Passenger Safety in Saskatchewan.
- Maintaining a relationship with the Saskatchewan Prevention Institute on their initiatives to:
 - Develop a network of trained child restraint community resource people.

- Distribute information on new initiatives to the child passenger network in Saskatchewan.
- Maintaining a relationship with St. John Ambulance on the ongoing progress of the National Child Restraint Program to:
 - Accommodate the requests for technician and instructor training courses.
- Providing communication to Child Passenger Safety Technicians through the Saskatchewan Prevention Institute's Child Passenger Safety Connection.

The CARE (Children Are Restrained Every Ride) program was also offered by the Saskatchewan Safety Council for three years, ending in February of 2009 (Saskatchewan Safety Council, 2009). This program allowed caregivers to rent a seat for two weeks for a \$20 fee. Over the three year period, approximately 100 loans were made (Lemon, 2009).

Today, the Child Passenger Safety Program within Saskatchewan consists of the Child Traffic Safety Coordinator funded through SGI, and the Child Injury Prevention Program Coordinator funded by the ABI Partnership Project. SGI provides child passenger safety materials for public clinics; promotes public clinics via radio announcements and newspaper advertisements; develops and distributes resources; and funds the program.

The Saskatchewan Prevention Institute began its focus on Child Passenger Safety Training in 1990, later receiving funding from the ABI Partnership Project to continue its work in child injury prevention in 1997 (Saskatchewan Prevention Institute, 2005). Use of the new National Child Passenger Safety Technician Training program was established in 2003. The Saskatchewan Prevention Institute encompasses child passenger safety, bicycle safety, and general injury prevention.

The Saskatchewan Prevention Institute organizes the Technician training sessions; produces continuing education materials such as e-mail updates (formerly newsletters) and annual Technician training updates; develops and distributes resources; and organizes public clinics. Child passenger safety information handouts and

loaner videos currently available through the Saskatchewan Prevention Institute include: *Universal Anchorage System* Fact Sheet; *Does Your Child Need to use a Booster Seat?* Information Card; *Air Bags* Fact Sheet; *Pregnant*

Women and Seat Belts Information Card; *What Car Seat Should a Child Use?* Fact Sheet; Transport Canada *Car Time 1, 2, 3, 4* VHS; and Safe Kid Canada's *Kids That Click* DVD.

Table 1 – Saskatchewan Child Passenger Safety Program

Critical Partners	Key Roles
Saskatchewan Government Insurance	<ul style="list-style-type: none"> • Funding for program: staffing and grants • Expertise • Personnel support for training events • Support at community events • Development and distribution of resources • Providing materials and promotion of the clinics through radio, newspaper advertisement (proper promotion requires at least 2 week notification)
Ministry of Health – Acquired Brain Injury Partnership Project	<ul style="list-style-type: none"> • Funding for community grants • Funding for four education and prevention coordinators (1 provincial, 3 regional) • Funding for child injury prevention coordinator • Involvement in evaluation processes
Saskatchewan Prevention Institute	<ul style="list-style-type: none"> • Organization of Technician trainings, including personnel • Continuing education (e.g. Newsletter, Annual Updates) • Development and distribution of resources • Organization of clinics • Record keeping (database, clinics, requirements for re-certification) • Community support • Administers Interagency Network
St. John Ambulance	<ul style="list-style-type: none"> • Provides Technician certification
Community-based Partners – police services, ambulance services, health regions, tribal councils, and others	<ul style="list-style-type: none"> • Personnel support • Hosting clinics throughout the province • Providing indoor space for clinics during winter
Saskatchewan Safety Council (onset – 2009)	<ul style="list-style-type: none"> • Technician database • Community-based work, e.g. clinics • Community Liaison position (2000 – 2009) • CARE (Children Are Restrained Every Ride) (2006 – 2009)
Transportation Centre – University of Saskatchewan (onset – 2011)	<ul style="list-style-type: none"> • Expertise • Personnel support for training events

Staff at the Saskatoon Prevention Institute is also trained in car seating for special needs children, and has hosted two training sessions by Dr. Marilyn Bull from the Riley Hospital for Children, Indianapolis, Indiana. The Saskatchewan Prevention Institute is currently working with the Department of paediatric Orthopaedics for loaner seats while children are

in casts following surgery. These loaner seats are currently available via the Saskatchewan Cerebral Palsy Association in Saskatoon and the Wascana Rehabilitation Centre in Regina.

First Nations and Inuit Health (FNIH) Branch of Health Canada is currently partnering with the Saskatchewan Prevention Institute to offer child passenger safety Technician mentoring and

updating for several First Nations communities. Child passenger car seats are also provided to each of these Technicians to take back to their communities.

The Child Passenger Safety Technician training is currently offered as a three-day in-person training course by the Saskatchewan Prevention Institute and SGI, with both classroom learning and practical training. A written exam is administered at the end of the training period, and Technicians are required to inspect at least ten child seats each year in order to retain their certifications.

There are currently 170 certified Technicians, including instructors, who support communities in reducing child safety seat misuse by educating parents and caregivers about the best evidence for appropriate child safety seat use. This service may be in the form of a booked appointment, a drop-in clinic, or contact by telephone.

Community-based and other critical partners combine efforts to host drive-through infant and child car seat clinics. Over the past five years, 11,289 child safety seats have been checked (Table 2).

Table 2 – Child Passenger Safety Clinic Information, 2007-2011

Year	# Seats Checked	# Clinics	# Communities Hosting Clinics
2007	3,053	125	73
2008	2,214	101	62
2009	2,440	115	59
2010	2,423	86	61
2011	1,159	105	59

There has been one recent telephone survey by the Saskatoon Prevention Institute, and two student-lead evaluations of Child Passenger Safety Clinics looking at the change in knowledge of the clinic clients. The Saskatchewan Prevention Institute conducted a post-clinic telephone survey in 2004 to measure the perceived usefulness and change in knowledge and behaviour one year after attending a car seat clinic (Saskatchewan Prevention Institute, 2004). A total of 150 participants reported an average self-satisfaction score of 4.7 out of 5; a perceived increase of knowledge from an average score of 6.03 out of 10 at pre-clinic to 8.58 post-clinic; and with 62 percent changing how they installed their child safety seat post-clinic and 43 percent changing how they secured their child post-clinic.

Wallace (2006) evaluated clinics held by the Saskatoon Public Health Services, while Trinder (2007) evaluated child passenger safety clinics encompassing all of Saskatchewan. Both studies employed a pre-post survey design, although

Tinder allowed respondents to answer “I do not know” on the true/false knowledge questions, which had not been available on Wallace’s survey. Both studies found that participants self-reported a high perceived knowledge of child passenger safety following their clinic experience, yet actual knowledge remained low for some specific elements such as knowing if the seat is installed sufficiently tight.

Beyond child passenger safety education, the ABI Partnership Project and SGI provide community grants for traffic safety and general injury prevention programming. The community grants program was established by the SGI and Saskatchewan Health in 1997 (Saskatchewan Prevention Institute, 2005). These grants have enabled community groups to address safety issues primarily concerning: impaired driving, ATV/motorcycle safety, bicycle/skateboard/inline skating safety, child passenger restraint, and the prevention of falls among seniors. Funding through community grants has spanned both urban and rural communities,

including First Nations and Aboriginal organizations. Currently, a minimum of \$75,000 is available each year for community grants.

An example of a community-based child passenger safety program is *Kids in Safety Seats* (KISS). KISS is a distribution program for economically challenged families as well as a short-term loaner program that runs in the Swift Current, Moose Jaw and North Battleford areas.

Finally, enforcement of child restraint laws, which do not currently include a booster seat law in Saskatchewan, is an integral part of any child passenger safety program.

In 2010, the ABI Partnership Project, Ministry of Health and SGI issued a Request for Proposals for a review of international best-practices for improving Child Passenger Safety, and an evaluation of the Saskatchewan Program. The purpose of this evaluation is to:

1. Examine how the Saskatchewan model compares to best-practices being used across the world.
2. Examine the effectiveness of the various elements of the Saskatchewan model.
3. Examine the match between the injury problem and the Saskatchewan model.

The results of this evaluation will be used to provide guidance for improving the Saskatchewan model, and through these improvements, reducing the number and severity of child passenger injuries in Saskatchewan.

Purpose of this Report

This report is the evaluation of the Saskatchewan Child Passenger Safety Program, addressing the following six evaluation questions:

1. How does the Saskatchewan model compare to international best-practices?
2. Does the Saskatchewan model increase usage of child passenger restraints?
3. Does the Saskatchewan model increase PROPER usage of child passenger restraints (to be assessed with both increased

knowledge of proper usage AND improved behaviour)?

4. Do the demographics of caregivers involved in Saskatchewan interventions match the demographics of the Saskatchewan population? Are there segments of the population being missed?
5. Is there a match between the caregivers targeted by the Saskatchewan model, and the parents/guardians of the children injured in motor vehicle collisions? If not, what other method (from the international best-practice review) could be used to target these parents/guardians?
6. What is the cost-effectiveness of the Saskatchewan model?
 - a. Are the interventions cost-saving measures?
 - b. Is there a return on investment of the interventions being used to improve child passenger safety?

To answer these questions, seven discrete projects were undertaken:

1. Systematic Review of International Best-Practices for Improving Child Passenger Safety
2. Saskatchewan Child Passenger Roadside Survey
3. Saskatchewan Child Passenger Parking Lot Inspection
4. Saskatchewan Child Passenger Safety Clinic Client Survey
5. Saskatchewan Child Passenger Safety Technician Survey
6. Secondary Data Analysis of the Saskatchewan Traffic Accident information System (TAIS) data
7. Saskatchewan Child Passenger Safety Economic Analysis

These projects are described in Chapters I through VII. Answers to the evaluation questions are provided in the Discussion section, along with recommendations presenting options for the future of the Child Passenger Safety program in Saskatchewan.

References

- Canadian Council of Motor Transport Administrators- National Occupant Restraint Program (NORP) (2010). <http://www.ccmta.ca/english/committees/srp/norp/norp-legislation.cfm> (Accessed August 12, 2010)
- Canadian Paediatric Society (2008). Transportation of infants and children in motor vehicles. Position Statement (IP 2008-01). Paediatr Child Health 13(4): 313-318). <http://www.cps.ca/english/statements/IP/IP08-01.pdf> (Accessed March 21, 2012)
- Canadian Council of Motor Transportation Administrators (CCMTA) (2011). Canada's Road Safety Strategy 2015. Ottawa. http://www.ccmta.ca/crss-2015/files/road_safety_strategy_2015.pdf (Accessed April 10, 2012).
- Durbin RD. Technical Report – Child Passenger Safety (2011). Pediatrics 127 (4):1050-1066. <http://pediatrics.aappublications.org/content/127/4/e1050.full.pdf+html?sid=8babac05-a65a-4f20-a827-39e830e60066> (Accessed March 21, 2012)
- Kahane C (1986) An evaluation of child passenger safety: the effectiveness and benefits of safety seats. Washington, D.C.: National Highway Traffic Safety Administration, 1986. (Report no. DOT HS 806 890.)
- Lemon S (2009). Jan 14, 2009 Letter to the Patrons of the Safety Council Car Seat Rental Program from Shauntel Lemon, Community Traffic Safety Program, Saskatchewan Safety Council.
- Safe Kids Canada (2011)-Child Safety Good Practice Guide: Good investments in unintentional child injury prevention and safety promotion - Canadian Edition. <http://www.safekidsCanada.ca/Professionals/Documents/34968-GoodPracticeGuide.pdf> (Accessed Dec 20th, 2011).
- Saskatchewan Comprehensive Injury Surveillance Report, 1995-2005 (2008). Ministry of Health, Government of Saskatchewan, Canada. <http://www.health.gov.sk.ca/injury-report-1995-2005> (Accessed March 12, 2012)
- Saskatchewan Safety Council (2009). Community Traffic Safety Program, 2008 Annual Report. January 1, 2008 – December 31, 2008.
- Saskatchewan Government Insurance (SGI) (1999). The Traffic Accident Information System (TAIS) data 1999.
- Saskatchewan Prevention Institute (2004). Saskatchewan Car Seat Clinic Evaluation Phone Survey. Saskatoon, SK.
- Saskatchewan Prevention Institute (2005). Celebrating 25 Years (1980 - 2005) History Book. Saskatoon, SK. <http://www.preventioninstitute.sk.ca/home/resources-and-links> (Accessed March 12, 2012)
- SMARTRISK (2009). The Economic Burden of Injury in Canada. SMARTRISK: Toronto, ON. <http://www.smartrisk.ca/downloads/burden/Canada2009/EBI-Eng-Final.pdf> (Accessed March 21, 2012)
- Snowdon AW, Hussein AA, Ahmed SE (2008) Children at risk: predictors of car safety seat misuse in Ontario. Accid Anal Prev. 40(4):1418-23. Epub 2008 Apr 4.
- Transport Canada (2010). Canada's Road Safety Targets to 2010. Minister of Public Works and Government Services. http://www.tc.gc.ca/media/documents/roadsafety/crs_target.pdf (Accessed March 21, 2012)
- Transport Canada (2006). Canadian Motor Vehicle Traffic Collision Statistics: 2006 Transport Canada. Road Safety and Motor Vehicle Regulation 2006.
- Transport Canada (2009). Canadian Motor Vehicle Traffic Collision Statistics: 2009 Transport Canada. Road Safety and Motor Vehicle Regulation 2009.

Trinder K (2007). Evaluation of the Influence of Saskatchewan Car Seat Clinics on Caregiver Knowledge and Behaviour.

Wallace J (2006). Program Evaluation of the Saskatoon Car Seat Clinics. Saskatoon Public Health Services and First Nations University of Canada.

Yi Wen T, Snowden AW, Hussein A, Ahmed SE (2011). Managing non-response rates for the National Child Safety Seat Survey in Canada. *Inj Prev* 17(2):97-101

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CHAPTER I

SYSTEMATIC REVIEW OF INTERNATIONAL BEST-PRACTICES FOR IMPROVING CHILD PASSENGER SAFETY

Abstract

A systematic review of the literature was conducted concerning the evaluation of child passenger safety initiatives and strategies for children up to 12 years of age. Randomized controlled trials and controlled before and after studies were included, with the primary outcomes of: increased child passenger restraint use, appropriate child passenger restraint use, or decreased motor vehicle crash injury among children. Database searches included MEDLINE, EMBASE, Psychlit, Sociological Abstracts, and the Transportation Research Information Services (TRIS). A total of 19 studies were selected for review, categorized based on the following intervention strategies: education; education and legislation/enactment; education and enforcement; education and distribution (e.g. free child passenger safety seats); and education and incentive (e.g. discounted child passenger safety seats). No studies were found examining child safety seat technician curricula, or child passenger safety programs addressing environment or engineering. Other recent systematic reviews of child passenger safety were also described and summarized. Best practices were identified as those combining education with another strategy such as enforcement or economic incentive (discount or seat distribution).

Purpose

The purpose of this study was to assess child passenger safety interventions and strategies regarding child occupants up to 12 years of age in order to identify best practices.

Methods

A logic model was developed, conceptualizing the systematic review (Figure 1).

Criteria for considering studies for this review

Randomized controlled trials (RCT) and controlled before and after studies were considered for review. Studies were required to include one or more of the primary outcomes of interest.

Participants: Children up to 12 years of age; parents and caregivers who transport children aged 0 to 12 years old in motor vehicles

Interventions/Strategies:

- Education - parent/caregiver OR child safety seat technician curricula
- Enforcement of legislation and policies
- Engineering
- Environment
- Economic (incentive or distribution)
- Community based interventions

Comparisons: No interventions/no active intervention

Outcomes: increased child passenger restraint use; increased appropriate child passenger restraint use; and decreased motor vehicle crash injury among children

Inclusion criteria:

- Articles from 1990 - to date
- English and French languages

- Research methodology: RCT and controlled before and after studies
- Children up to 12 years of age
- Studies conducted in OECD (Organization for Economic and Co-operative Development) countries

Exclusion criteria:

- Children with special needs
- Premature infants
- Studies conducted outside highly motorized countries
- Child passenger safety seat use outside of motor vehicle use

Search strategy

The goal of the search was to identify the best available evidence while attempting to keep the number of irrelevant articles to a minimum. This was accomplished by two parallel and independent searches, one by a research librarian and the other by a study team member. The initial screening criteria included: the evaluation of a child passenger safety program/initiative with a stated objective, addressing and quantifying at least one of the primary outcomes, and with at least one comparison group. Studies were restricted to those published in English and French. The final methodology was also informed by the search strategy of the Cochrane systematic review on child safety seat use (Ehiri et al., 2006).

Databases: MEDLINE, EMBASE, Psychlit, Sociological Abstracts, Transportation Research Information Services (TRIS). MEDLINE and EMBASE were selected as primary databases because of their relatively high level of indexing, their inclusion of a large body of peer-reviewed publications, and their focus on health aspects of motor vehicle injuries and/or prevention. Initial searches were conducted using subject headings to capture studies implicitly as well as explicitly on child safety seat related research topics. In order to broaden the document retrieval beyond RCT and controlled before and after studies, the searches were not qualified by publication type or methodology. This decision was influenced by the demonstrated inconsistency of indexing in these areas. Follow-up searches were conducted in both MEDLINE

and EMBASE, excluding subject headings and including key words, to identify documents missed in the initial search.

Due to the nature of the research question, the search was conducted across disciplines and included many different databases and collections of literature. Research on motor vehicle injuries is interdisciplinary, resulting in studies published across a variety of journals and reports. Broad keyword searches were conducted, as well as topic-specific follow-up searches. The specified databases cover different fields, with the exception of MEDLINE and EMBASE. EMBASE is known to cover much more of the international literature than MEDLINE, specifically for developed countries.

TRIS contains government publications that are largely unpublished or not included by other databases. The reference section from each eligible study was reviewed for further citations. National and international experts were identified and contacted for additional leads to published and unpublished literature and reports. Google Scholar search engine was also used to find gray area literature. Finally, the search strategy from the 2006 Cochrane systematic review on child safety seat was replicated.

The following Medical Subject Headings (MeSH) were used: accidents, traffic; motor vehicles; wounds and injuries; infant equipment; protective devices; community health services; decision making; evidence-based medicine; economics; preventive health services; public health practice; education; child occupants safety; children transport; parents and caregivers; technician curriculum.

Two reviewers independently reviewed the search results using the *Systematic Review Inclusion Form* (ED & KT), first based upon title and abstract, and secondly based on the full article (see Appendix 1.1 for the Systematic Review Inclusion Form).

Assessment of study quality

While there are several tools for validating studies and more are being developed, there is currently no gold standard instrument for

assessing the quality of studies. The *Effective Public Health Project Quality Assessment Tool for Quantitative Studies* (Effective Public Health Practice Project) was selected, which indicates overall component ratings as *strong*, *moderate*, or *weak* for each study (Appendix 1.2). This tool contains component ratings for selection bias, allocation bias, confounders, blinding, data collection methods, withdrawals and drop-outs, analysis and intervention integrity, as well as checklists for reporting statistical tests, sample size calculation, measurement of confounding, adjustment of confounding and follow-up.

Two reviewers independently conducted quality assessment on each selected study (ED & TI or KT), based upon the abstract, methodology and study results.

Data Analysis

Data were entered into the Cochrane Collaboration Review Manager (RevMan) version 5.2 (2011) software and were summarized by meta-analyses when appropriate. For dichotomous data, odds ratios (OR) and confidence intervals (CI) were calculated. Two-by-two tables were combined using the Mantel-Haenszel pooling method. Effects of each combined intervention type were assessed using the fixed-effect model. To determine the effects of the different types of child safety seat promotional interventions, data were categorized and analyzed by type of promotional intervention and compared to no intervention or no active intervention.

To determine heterogeneity among studies, a chi square test, τ^2 and I^2 tests were performed. Funnel plots were used to examine publication bias.

Review of Systematic Reviews

Other recent systematic reviews of child passenger safety were described and summarized.

Results

The article selection process is summarized in Figure 1.2. A total of 2,225 articles relating to child passenger safety were identified through the electronic database searches. The review was based first on Title & Abstract, and second on Study Type against the inclusion and exclusion criteria, resulting in 22 articles. Two articles were further excluded based upon the outcome measures included in the studies (see Appendix 1.1 for the Systematic Review Inclusion Form). The *Effective Public Health Project Quality Assessment Tool for Quantitative Studies* (Appendix 1.2) was applied to the remaining 20 articles, ranking them as *strong*, *medium* or *weak* studies (see also Appendix 1.3 - *Systematic Review Quality Assessment Dictionary*). One further study was excluded at this point due to methodological weakness.

Studies were categorized based on intervention strategies that included:

1. Education
2. Education & Legislation/Enactment
3. Education & Enforcement
4. Education & Distribution (e.g. free CPS seats)
5. Education & Incentive (e.g. discounted CPS seats)

Some community-based initiatives are included in this review, and are found within the appropriate category as described above. No studies were found examining Education regarding child safety seat technician curricula or child passenger safety programs addressing Environment or Engineering.

Description of studies: Complete descriptions of the 19 included studies and the one excluded study are presented in Appendix 1.4. Descriptions include the study design, intervention, and summary of results. Studies are categorized based on intervention type and study design.

Figure 1.1 - Systematic Review Logic Model

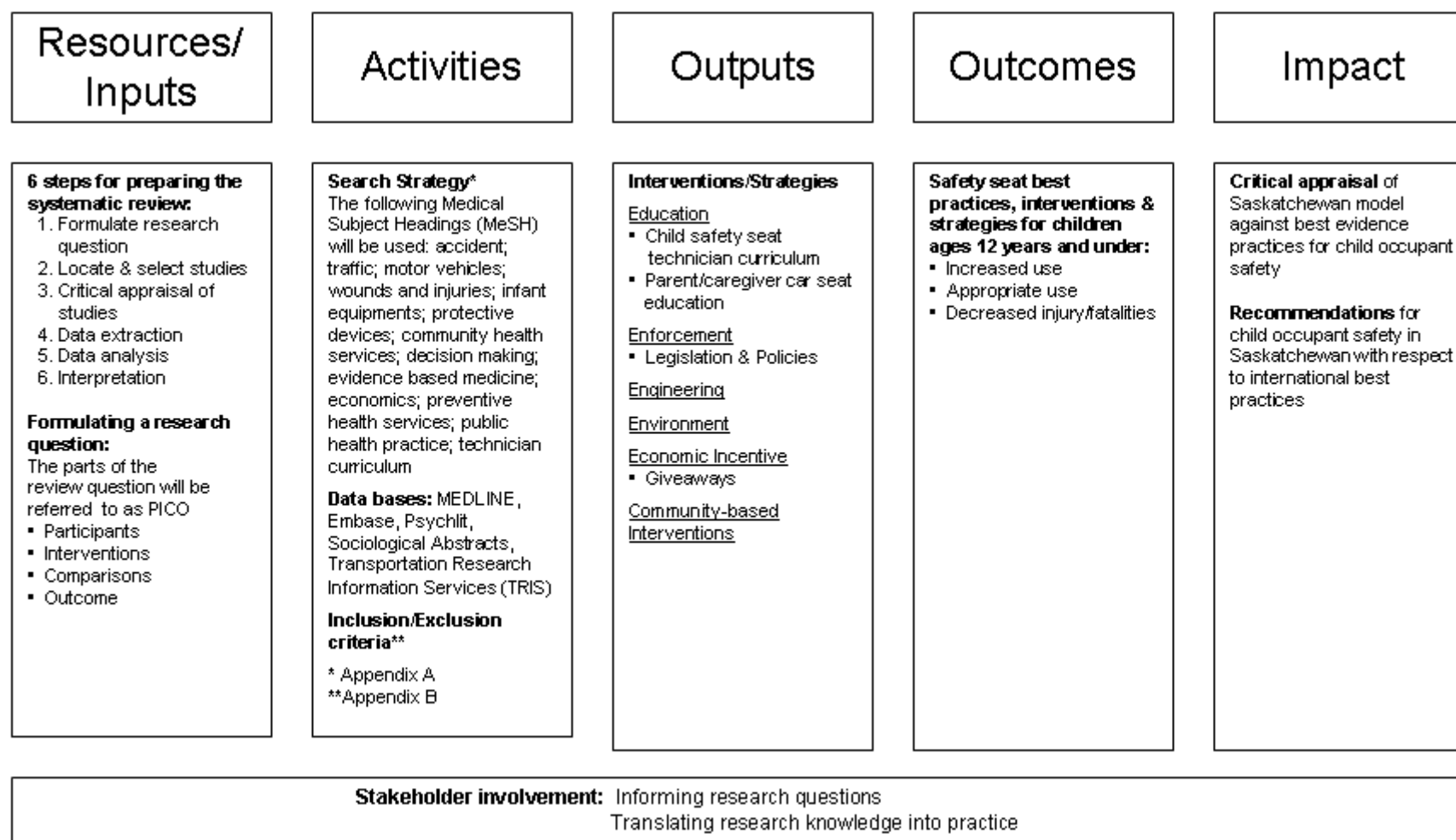
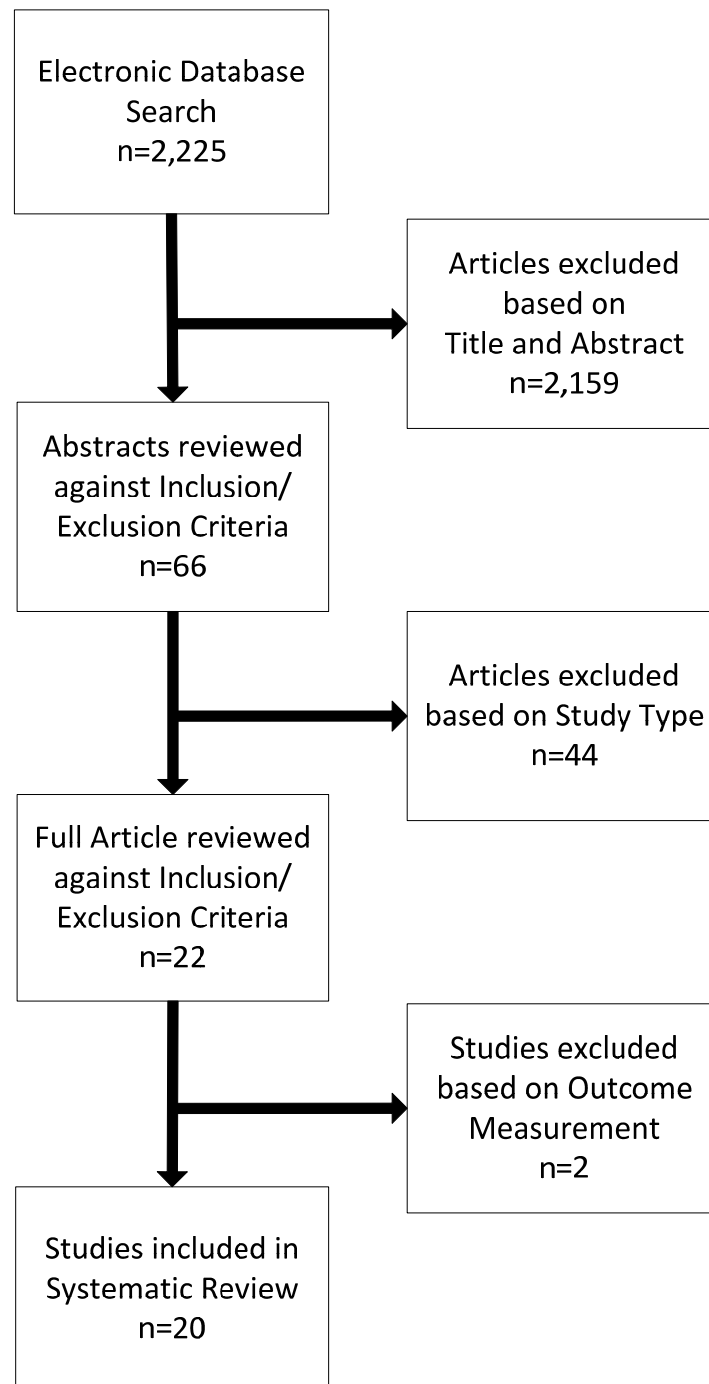


Figure 1.2 - Systematic Review Article Selection



*Note: One further study was excluded due to methodological weakness after applying the methodological quality assessment criteria, for a final number of 19 articles included in the systematic review.

1. Education

Serwint et al. (1996) examined whether education can increase infant child passenger safety seat use when delivered at a prenatal paediatric visit. They found that education is not an effective intervention, with an odds ratio (OR) of 0.56 with a 95 percent confidence interval (95% CI) of 0.02-1.55.

McDonald et al. (2005) examined whether kiosk-based education at the physician's office can increase infant child passenger safety seat use. They found that kiosk-based education is not an effective intervention, with an OR of 1.07 (95% CI: 0.41-2.80).

Gielen et al. (2007) examined whether kiosk-based tailored education at the emergency department can increase the knowledge about state law regarding child passenger safety seat laws. They found that kiosk-based education is not an effective intervention for changing parental and caregiver knowledge, with an OR of 0.81 (95% CI: 0.59-1.11).

Shenoi et al. (2010) examined whether emergency department based education consisting of a video presentation coupled with handouts can increase parental knowledge regarding child passenger safety. They found that emergency department education is effective in improving parental child passenger safety knowledge. There was a significant improvement in test scores in the intervention group as compared to the comparison group, with the difference in mean pre-test and post-test scores between the two groups being 0.65 (95% CI: 0.14-1.16) on a simple t-test ($p = 0.012$).

Five studies examined the effects of promotional campaigns on child passenger booster seat use, as delivered through such settings as schools, daycares, and retail outlets (Table 1.1). The combined results from these studies indicate that promotional campaigns are effective in increasing booster seat use, with a statistically significant 50 percent increase as compared to the control group (OR: 1.50; 95% CI: 1.25-1.80).

Table 1.1 – Promotional campaigns Meta-Analysis: booster seat use

Study or Subgroup	Experimental		Control		Weight	Odds Ratio M-H, Fixed, 95% CI	Odds Ratio M-H, Fixed, 95% CI
Events	Total	Events	Total				
Ebel 2003	184	705	213	1065	66.1%	1.41 [1.13, 1.77]	
Johnston 2000	42	195	7	132	3.5%	4.90 [2.13, 11.29]	
O'Neil 2005	62	393	54	339	25.8%	0.99 [0.66, 1.47]	
St. Louis 2008	40	71	12	23	4.2%	1.18 [0.46, 3.04]	
Stevens 2000	36	96	1	32	0.5%	18.60 [2.43, 142.15]	
Total (95% CI)		1460		1591	100.0%	1.50 [1.25, 1.80]	
Total events	364		287				
Heterogeneity: $\text{Chi}^2 = 18.36$, $\text{df} = 4$ ($P = 0.001$); $I^2 = 78\%$							
Test for overall effect: $Z = 4.37$ ($P < 0.0001$)							

2. Education & Legislation/Enactment

Alvarez & Jason (1993) examined whether infant child passenger safety seat use can be increased by education at the physician's office coupled with legislation enactment. They found that education coupled with legislation enactment is effective in increasing infant child passenger safety seat use, statistically significantly increasing use within the intervention group as compared to control group, with an OR of 2.71 (95% CI: 2.22-1.55).

3. Education & Enforcement

Decina, Temple & Dorer (1994) examined whether infant and forward facing child passenger safety seat use increases after education through community school visits coupled with enforcement, for ages 0 to 4 years. They found that education coupled with enforcement is effective in increasing compliance of the law, increasing compliance statistically significantly within the intervention group compared to control group, with an OR of 1.61 (95% CI: 1.12-2.33).

Decina, Temple & Dorer (1994) also examined whether infant and forward facing child passenger safety seat use increases after education coupled with enforcement via citations, for ages 0 to 5 years. They found that education coupled with enforcement is effective in increasing infant and forward facing child passenger safety seat use, increasing use statistically significantly by 56 percent compared to control group, with an OR of 1.56 (95% CI: 1.29-1.88).

4. Education & Distribution

Four studies examined education and distribution via prenatal clinics, maternity hospital or paediatric physician visits on infant child passenger safety seat use (Table 1.2). The combined results from these studies indicate that education coupled with distribution is effective in increasing infant child passenger safety seat use, increasing use statistically significantly by 17 times compared to the control group, with an overall odds ratio of 17.67 (95% CI: 12.34-25.29).

Two studies examined education and distribution on forward facing child passenger safety seat use via community-wide promotion and daycare centres serving low income communities (Table 1.3). The combined results from these studies indicate that education coupled with distribution is effective in increasing forward facing seat use, increasing use statistically significantly by 33 times compared to the control group, with an OR of 1.33 (95% CI: 1.18-1.49).

Table 1.2 – Education & Distribution Meta-Analysis: infant seat use

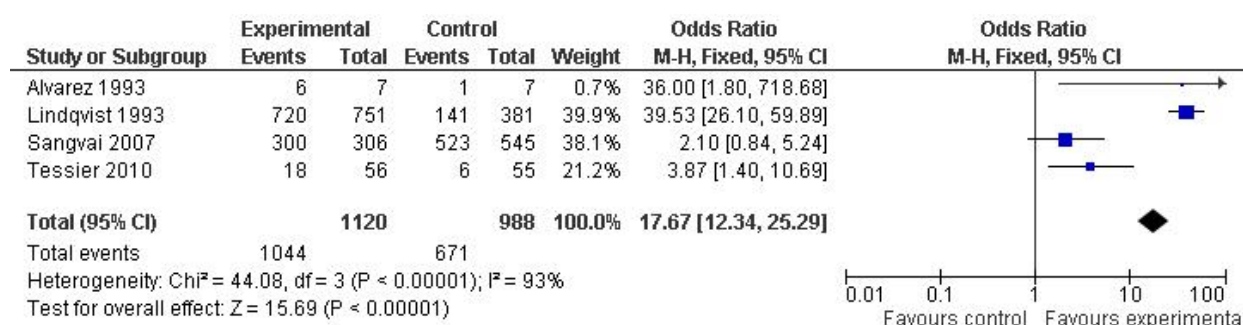
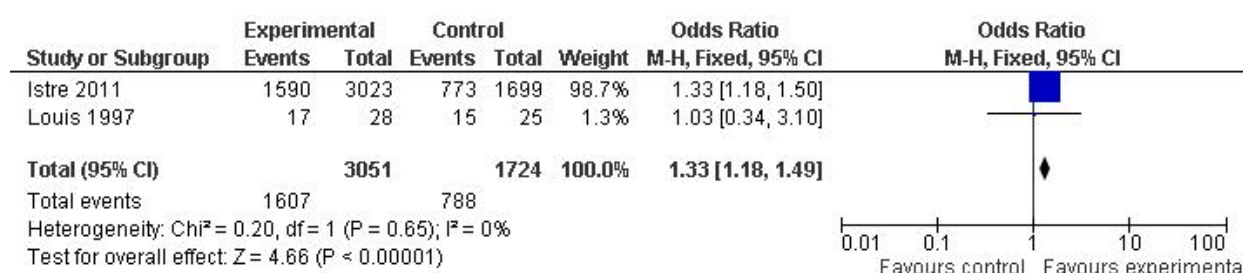


Table 1.3 – Education & Distribution Meta-Analysis: forward facing seat



Five studies examined education and distribution on child passenger safety booster seat use delivered in the emergency department, via pre-school home visits, daycare, or community-based interventions (Table 1.4). The combined results from these studies indicate that education coupled with distribution is effective in increasing booster seat use, increasing use statistically significantly by more than two times compared to the control group, with an OR of 2.31 (95% CI: 1.72-3.11).

Thoreson et al. (2008) also examined booster seat education and distribution program in the childcare centre setting, however crude data were not available for inclusion in the meta-analysis. They found that education coupled with distribution is effective in increasing booster seat use, with programming increasing both parental and

childcare center staff knowledge about booster seats with an OR of 4.06 (95% CI: 2.48-6.67). Parents in the intervention group initiated conversation regarding booster seat use with childcare center staff significantly more often than the control group (OR, 3.95; 95% CI, 2.26-6.88), and in the intervention group parental knowledge increased significantly regarding when to move children from booster seats to seat belt only (OR, 3.39; 95% CI, 1.91-5.99). However, the intervention group did not differ in proportions using booster seats as compared to the control group (OR, 1.03; 95% CI, 0.62-1.73). Results were similar for children aged 4 to 5 and 6 to 8 years. All outcomes were significantly less likely among child passengers riding in pick-up trucks.

Table 1.4 – Education & Distribution Meta-Analysis: booster seat use

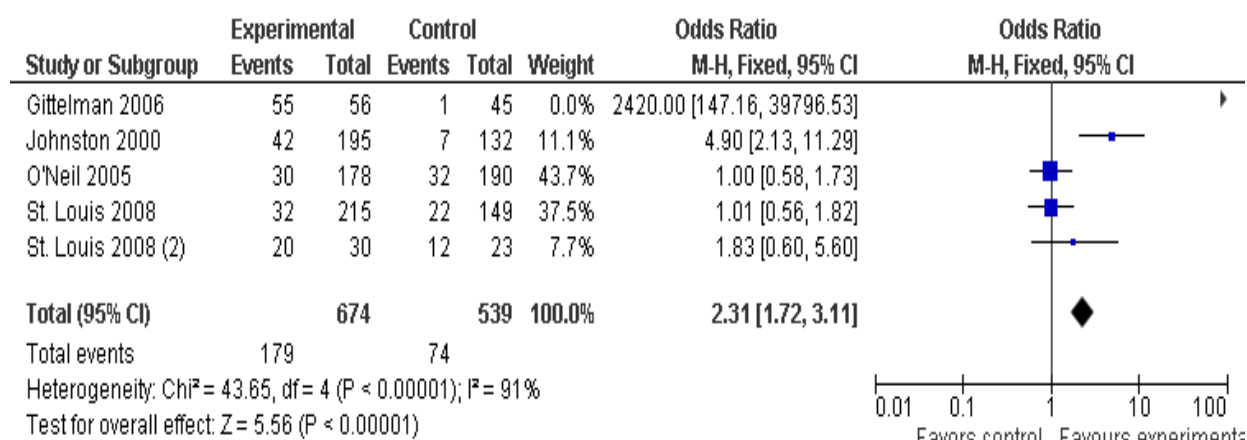
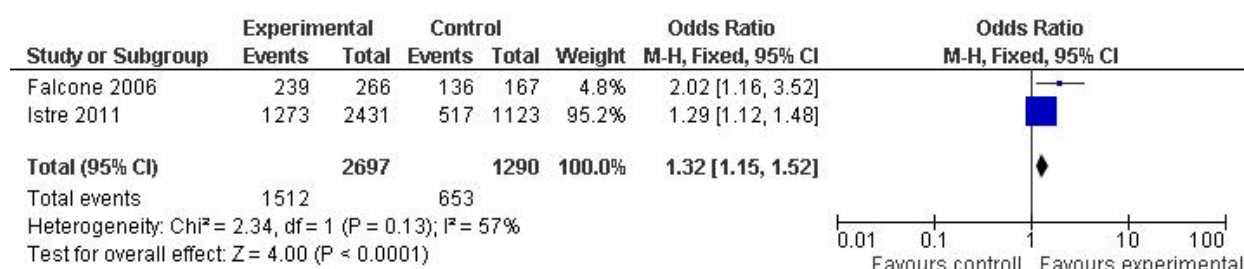


Table 1.5 – Education & Incentive Meta-Analysis: safety seat use ages 0 to 8 years

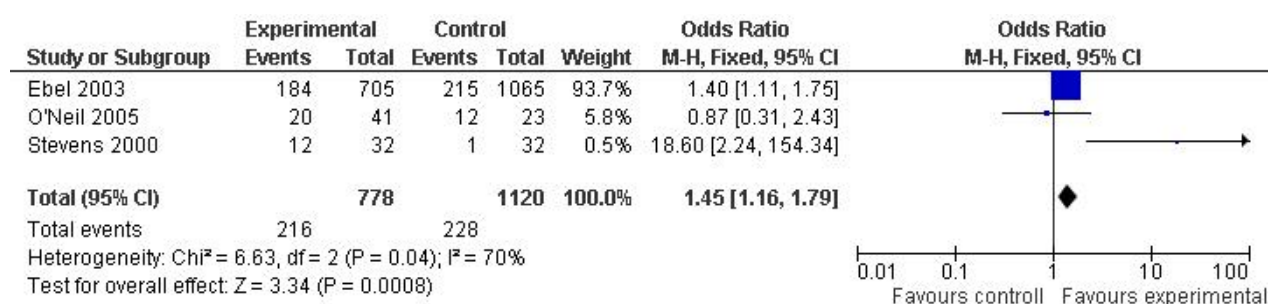


Two studies examined education coupled with distribution of child passenger safety seat use among children ages 0 to 8 years through a church-based initiative and a diverse community initiative (Table 1.5). The combined results from these two studies indicated that education coupled with distribution is effective in increasing child passenger safety seat use, increasing use statistically significantly by 32 percent compared to the control group, with an OR of 1.32 (95% CI: 1.15-1.52).

5. Education & Incentive

Three of the studies examined the effects of education coupled with economic incentives on child passenger safety booster seat use through a multifaceted community campaign, daycare centre/preschool initiative, and a retail outlet initiative (Table 1.6). The combined results from these studies indicated that education coupled with an economic incentive is effective in increasing booster seat use, increasing use statistically significantly by 45 percent compared to the control group, with an OR of 1.45 (95% CI: 1.16-1.79).

Table 1.6 – Education & Incentive Meta-Analysis: booster seat use



Summary of evidence from other recent child passenger safety systematic reviews:

In total, 10 systematic reviews were assessed. A complete description of these studies is presented in Appendix 1.5. Four studies examined the effectiveness of interventions to increase restraint use among child passengers in different age groups. The remaining six studies reported on a variety of injury prevention interventions, including but not restricted to child passenger safety.

Child Passenger Safety Studies

1. Grossman et al. (1999) examined the effectiveness of 18 community- and clinical-based programs to increase child passenger restraint use, including education programs, community-based campaigns, and infant seat loan programs. They showed evidence of overall moderate short-term effectiveness of these programs; however, effects diminished significantly one or more months following the intervention. There is a need for longer follow-up intervals to gather stronger evidence on the long-term effects of these programs. In addition, the authors noted that many of the studies had serious design and methods limitations that could lead to overestimation of the reported effect.

2. Zaza et al. (2001) reviewed the evidence from 35 population-based interventions to improve child passenger safety seat use. This systematic review found strong evidence for safety seat legislation and distribution

coupled with education programs, sufficient evidence for community-wide information coupled with enhanced education campaigns, and economic incentives coupled with education programs. Insufficient evidence was found for education-only programs.

3. Turner et al. (2005) found some evidence of the effectiveness of community-based programs, with three out of the eight studies reviewed achieving considerable improvements in increased child passenger restraint use and decreased motor vehicle injury outcomes. However, a limited number of studies were reviewed, with varying interventions and evaluation methodologies.

4. Ehiri et al. (2006) evaluated the effectiveness of interventions to increase child passenger booster seat use, including community-wide information campaigns coupled with enhanced enforcement, education coupled with booster seat distribution, education coupled with booster seat discounts, and education-only programs. Four of the five studies demonstrated significant increases in observed or reported booster seat use. Education coupled with economic incentives (either discount or distribution) produced more consistent results than education-only interventions. The authors noted that two of the studies relied on self-reporting and therefore were subject to bias and variable study duration.

Injury Prevention Studies

5. MacKay et al. (1999) examined the relationship between socioeconomic status (SES) and unintentional childhood injury, finding evidence that lower SES is associated with lower child passenger restraint use and/or correct use. Although 57 studies were included in the review, only five non-RCTs focused on child passenger restraint use.

6. Towner et al. (2001) evaluated 42 studies on childhood injury prevention interventions. Only two of the studies examined the effects of child passenger restraint legislation, with both reporting a positive effect on restraint use.

7. Morrison et al. (2003) assessed 28 systematic reviews of transport interventions to improve population health. The six highest quality reviews indicated that health promotion campaigns are the most effective interventions to promote child passenger restraint use, demonstrating a beneficial effect for preventing childhood injury through primary care counselling.

8. Bruce et al. (2005) examined group-based injury prevention interventions for young children, finding a positive effect in six of the nine studies reviewed. The evidence indicates that interventions with multiple interactive learning tools may positively influence the development of safety behaviours among young children. However, a limited number of studies used randomization and some studies had poor design.

9. Williams et al. (2007) assessed 17 studies addressing the effectiveness of primary care counselling to increase correct restraint use and to reduce alcohol-related driving behaviours. They found fair evidence that counselling leads to increased short-term correct passenger restraint use among infants and children up to the age of four years. Larger effects were reported for interventions that included distribution of free safety seats and/or a demonstration of proper use. However, there were a limited

number of trials describing the effects of counselling to increase restraint use among other age groups.

10. Inman et al. (2011) reviewed 40 programs on various topics such as prevention of pregnancy, violence, and tobacco and substance abuse. All three programs that focused on motor vehicle injury prevention led to an increase in child passenger safety seat use. However, the search strategy for this review was not described, and quality assessment of the studies was missing.

In total, these 10 reviews evaluated the evidence from 267 studies on injury prevention. Fewer than half of these studies were focused on transportation injury prevention (i.e. road safety, child passenger safety seat use, etc). In addition, there was a limited number of RCT, which are often not feasible in the assessment of injury prevention interventions due to ethical issues.

Many of these previous systematic reviews were conducted prior to the release of the most recent American Academy of Paediatrics (AAP) best practice guidelines, in 2011. The results from studies measuring proper observed or reported child passenger restraint use may be inaccurate considering the recent changes in the recommendations for *proper* use. The AAP guidelines advocate for child passenger restraint legislation that is consistent with the best-practice recommendations in order to increase the use of child passenger restraints.

The current AAP Guidelines on Child Passenger Safety present five evidence-based recommendations to optimize safety for children in passenger vehicles (Durbin 2011). These guidelines argue the importance of appropriate restraint use and provide a summary of the evidence on inadequate and/or improper restraint use among children. The best-practice recommendations are as follows:

1. *All infants and toddlers ride in a rear-facing car safety seat (CSS) until they are 2 years of age or until they reach the highest weight or*

height allowed by the manufacturer of their CSS

2. *All children 2 years or older, or those younger than 2 years who have outgrown the rear-facing weight or height limit for their CSS, should use a forward-facing CSS with a harness for as long as possible, up to the highest weight or height allowed by the manufacturer of their CSS*
3. *All children whose weight or height is above the forward-facing limit for their CSS should use a belt-positioning booster seat until the vehicle lap-and-shoulder seat belt fits properly, typically when they have reached 4 feet 9 inches in height and are between 8 and 12 years of age*
4. *When children are old enough and large enough to use the vehicle seat belt alone, they should always use lap-and-shoulder seat belts for optimal protection*
5. *All children younger than 13 years should be restrained in the rear seats of vehicles for optimal protection*

The guidelines note that although legislation has played a critical role, primary and secondary enforcement are necessary to increase proper restraint use and decrease injuries.

Key Point Summary

- Education alone does not appear to be an effective strategy for increasing child passenger safety seat use.
- Kiosk-based education does not appear to be an effective strategy for increasing infant child passenger safety seat use.
- Kiosk-based education does not appear to be an effective strategy for increasing parental/caregiver knowledge about child passenger safety.
- Emergency department education consisting of a video coupled with handouts appears to be an effective strategy for improving parental child passenger safety knowledge.
- Community-based/Group-based promotional campaigns appear to be effective in increasing booster seat use.
- Education coupled with legislation enactment appears to be effective in increasing infant child passenger safety seat use.
- Education coupled with enforcement appears to be effective in increasing compliance in child passenger safety laws and in increasing infant and forward-facing child passenger safety seat use.
- Education coupled with free safety seat distribution appears to be effective in increasing child passenger infant, forward-facing and booster seat use.
- Education coupled with economic incentive (discounted safety seats) appears to be effective in increasing child passenger booster seat use.
- Low SES appears to be associated with lower child passenger restraint use.
- Best Practices for improving child passenger safety appear to combine education with a second strategy – distribution of free child passenger safety seats or economic incentives for discounted safety seats being good examples.

References

- Durbin DR; Committee on Injury, Violence, and Poison Prevention. Child passenger safety. Pediatrics. 2011;127(4):e1050-66.
- Effective Public Health Practice Project (EPHPP). Quality Assessment Tool for Quantitative Studies
http://www.ephpp.ca/PDF/Quality%20Assessment%20Tool_2010_2.pdf (last accessed Dec 9, 2011).
- Ehiri JE, Ejere HO, Magnussen L, Emusu D, King W, Osberg JS. [Interventions for promoting booster seat use in four to eight year olds traveling in motor vehicles](#). Cochrane Database Syst Rev. 2006 Jan 25;(1):CD004334. Review.

Appendices

Appendix 1.1 - Systematic Review Inclusion Form

INCLUSION FORM

Date: dd _____ mm _____ yr _____ Reviewer: _____

Article name (number) _____

1. STUDY TOPIC:

Research evaluating:

Child safety seat intervention Yes [] No []

2. STUDY DESIGN

RCT Yes [] No []

Control before and after study Yes [] No []

3. STUDY PARTICIPANTS

Study population involve vehicle occupants (age 0-12 years) Yes [] No []

4. STUDY OUTCOMES

Study reports at least one objective quantified outcome specific to children age 0-12 years old (safety seat best practices, interventions and strategies for children) (CIRCLE):

1. increased use
2. appropriate use
3. decrease injuries/fatalities

Yes [] No []

5. FINAL DECISION

[] INCLUDE

[] EXCLUDE-reason _____

[] UNSURE

If disagreement between reviewers, final outcome

[] INCLUDED

[] EXCLUDED

Appendix 1.2 - Systematic Review Quality Assessment Form

Effective Public Health Practice Project (EPHPP). Quality Assessment Tool for Quantitative Studies
http://www.ehphp.ca/PDF/Quality%20Assessment%20Tool_2010_2.pdf (last accessed Dec 9, 2011).

QUALITY ASSESSMENT TOOL FOR QUANTITATIVE STUDIES



COMPONENT RATINGS

A) SELECTION BIAS

(Q1) Are the individuals selected to participate in the study likely to be representative of the target population?

- 1 Very likely
- 2 Somewhat likely
- 3 Not likely
- 4 Can't tell

(Q2) What percentage of selected individuals agreed to participate?

- 1 80 - 100% agreement
- 2 60 – 79% agreement
- 3 less than 60% agreement
- 4 Not applicable
- 5 Can't tell

RATE THIS SECTION	STRONG	MODERATE	WEAK
See dictionary	1	2	3

B) STUDY DESIGN

Indicate the study design

- 1 Randomized controlled trial
- 2 Controlled clinical trial
- 3 Cohort analytic (two group pre + post)
- 4 Case-control
- 5 Cohort (one group pre + post (before and after))
- 6 Interrupted time series
- 7 Other specify _____
- 8 Can't tell

Was the study described as randomized? If NO, go to Component C.

No Yes

If Yes, was the method of randomization described? (See dictionary)

No Yes

If Yes, was the method appropriate? (See dictionary)

No Yes

RATE THIS SECTION	STRONG	MODERATE	WEAK
See dictionary	1	2	3

C) CONFOUNDERS

(Q1) Were there important differences between groups prior to the intervention?

- 1 Yes
- 2 No
- 3 Can't tell

The following are examples of confounders:

- 1 Race
- 2 Sex
- 3 Marital status/family
- 4 Age
- 5 SES (income or class)
- 6 Education
- 7 Health status
- 8 Pre-intervention score on outcome measure

(Q2) If yes, indicate the percentage of relevant confounders that were controlled (either in the design (e.g. stratification, matching) or analysis)?

- 1 80 – 100% (most)
- 2 60 – 79% (some)
- 3 Less than 60% (few or none)
- 4 Can't Tell

RATE THIS SECTION	STRONG	MODERATE	WEAK
See dictionary	1	2	3

D) BLINDING

(Q1) Was (were) the outcome assessor(s) aware of the intervention or exposure status of participants?

- 1 Yes
- 2 No
- 3 Can't tell

(Q2) Were the study participants aware of the research question?

- 1 Yes
- 2 No
- 3 Can't tell

RATE THIS SECTION	STRONG	MODERATE	WEAK
See dictionary	1	2	3

E) DATA COLLECTION METHODS

(Q1) Were data collection tools shown to be valid?

- 1 Yes
- 2 No
- 3 Can't tell

(Q2) Were data collection tools shown to be reliable?

- 1 Yes
- 2 No
- 3 Can't tell

RATE THIS SECTION	STRONG	MODERATE	WEAK
See dictionary	1	2	3

F) WITHDRAWALS AND DROP-OUTS

(Q1) Were withdrawals and drop-outs reported in terms of numbers and/or reasons per group?

- 1 Yes
- 2 No
- 3 Can't tell
- 4 Not Applicable (i.e. one time surveys or interviews)

(Q2) Indicate the percentage of participants completing the study. (If the percentage differs by groups, record the lowest).

- 1 80 -100%
- 2 60 - 79%
- 3 less than 60%
- 4 Can't tell
- 5 Not Applicable (i.e. Retrospective case-control)

RATE THIS SECTION	STRONG	MODERATE	WEAK	
See dictionary	1	2	3	Not Applicable

G) INTERVENTION INTEGRITY

(Q1) What percentage of participants received the allocated intervention or exposure of interest?

- 1 80 -100%
- 2 60 - 79%
- 3 less than 60%
- 4 Can't tell

(Q2) Was the consistency of the intervention measured?

- 1 Yes
- 2 No
- 3 Can't tell

(Q3) Is it likely that subjects received an unintended intervention (contamination or co-intervention) that may influence the results?

- 4 Yes
- 5 No
- 6 Can't tell

H) ANALYSES

(Q1) Indicate the unit of allocation (circle one)

community organization/institution practice/office individual

(Q2) Indicate the unit of analysis (circle one)

community organization/institution practice/office individual

(Q3) Are the statistical methods appropriate for the study design?

- 1 Yes
- 2 No
- 3 Can't tell

(Q4) Is the analysis performed by intervention allocation status (i.e. intention to treat) rather than the actual intervention received?

- 1 Yes
- 2 No
- 3 Can't tell

GLOBAL RATING

COMPONENT RATINGS

Please transcribe the information from the gray boxes on pages 1-4 onto this page. See dictionary on how to rate this section.

A	SELECTION BIAS	STRONG	MODERATE	WEAK
		1	2	3
B	STUDY DESIGN	STRONG	MODERATE	WEAK
		1	2	3
C	CONFOUNDERS	STRONG	MODERATE	WEAK
		1	2	3
D	BLINDING	STRONG	MODERATE	WEAK
		1	2	3
E	DATA COLLECTION METHOD	STRONG	MODERATE	WEAK
		1	2	3
F	WITHDRAWALS AND DROPOUTS	STRONG	MODERATE	WEAK
		1	2	3
				Not Applicable

GLOBAL RATING FOR THIS PAPER (circle one):

- | | | |
|---|----------|----------------------------|
| 1 | STRONG | (no WEAK ratings) |
| 2 | MODERATE | (one WEAK rating) |
| 3 | WEAK | (two or more WEAK ratings) |

With both reviewers discussing the ratings:

Is there a discrepancy between the two reviewers with respect to the component (A-F) ratings?

No Yes

If yes, indicate the reason for the discrepancy

- | | |
|---|---|
| 1 | Oversight |
| 2 | Differences in interpretation of criteria |
| 3 | Differences in interpretation of study |

Final decision of both reviewers (circle one):

- | | |
|---|----------|
| 1 | STRONG |
| 2 | MODERATE |
| 3 | WEAK |

Appendix 1.3 - Systematic Review Quality Assessment Dictionary

Effective Public Health Practice Project (EPHPP). Quality Assessment Tool for Quantitative Studies Dictionary http://www.ephpp.ca/PDF/QADictionary_dec2009.pdf (last accessed Dec 9, 2011).

Quality Assessment Tool for Quantitative Studies Dictionary



The purpose of this dictionary is to describe items in the tool thereby assisting raters to score study quality. Due to under-reporting or lack of clarity in the primary study, raters will need to make judgements about the extent that bias may be present. When making judgements about each component, raters should form their opinion based upon information contained in the study rather than making inferences about what the authors intended.

A) SELECTION BIAS

(Q1) Participants are more likely to be representative of the target population if they are randomly selected from a comprehensive list of individuals in the target population (score very likely). They may not be representative if they are referred from a source (e.g. clinic) in a systematic manner (score somewhat likely) or self-referred (score not likely).

(Q2) Refers to the % of subjects in the control and intervention groups that agreed to participate in the study before they were assigned to intervention or control groups.

B) STUDY DESIGN

In this section, raters assess the likelihood of bias due to the allocation process in an experimental study. For observational studies, raters assess the extent that assessments of exposure and outcome are likely to be independent. Generally, the type of design is a good indicator of the extent of bias. In stronger designs, an equivalent control group is present and the allocation process is such that the investigators are unable to predict the sequence.

Randomized Controlled Trial (RCT)

An experimental design where investigators randomly allocate eligible people to an intervention or control group. A rater should describe a study as an RCT if the randomization sequence allows each study participant to have the same chance of receiving each intervention and the investigators could not predict which intervention was next. If the investigators do not describe the allocation process and only use the words 'random' or 'randomly', the study is described as a controlled clinical trial.

See below for more details.

Was the study described as randomized?

Score YES, if the authors used words such as random allocation, randomly assigned, and random assignment.

Score NO, if no mention of randomization is made.

Was the method of randomization described?

Score YES, if the authors describe any method used to generate a random allocation sequence.

Score NO, if the authors do not describe the allocation method or describe methods of allocation such as alternation, case record numbers, dates of birth, day of the week, and any allocation procedure that is entirely transparent before assignment, such as an open list of random numbers of assignments.

If NO is scored, then the study is a controlled clinical trial.

Was the method appropriate?

Score YES, if the randomization sequence allowed each study participant to have the same chance of receiving each intervention and the investigators could not predict which intervention was next. Examples of appropriate approaches include assignment of subjects by a central office unaware of subject characteristics, or sequentially numbered, sealed, opaque envelopes.

Score NO, if the randomization sequence is open to the individuals responsible for recruiting and allocating participants or providing the intervention, since those individuals can influence the allocation process, either knowingly or unknowingly.

If NO is scored, then the study is a controlled clinical trial.

Controlled Clinical Trial (CCT)

An experimental study design where the method of allocating study subjects to intervention or control groups is open to individuals responsible for recruiting subjects or providing the intervention. The method of allocation is transparent before assignment, e.g. an open list of random numbers or allocation by date of birth, etc.

Cohort analytic (two group pre and post)

An observational study design where groups are assembled according to whether or not exposure to the intervention has occurred. Exposure to the intervention is not under the control of the investigators. Study groups might be non-equivalent or not comparable on some feature that affects outcome.

Case control study

A retrospective study design where the investigators gather 'cases' of people who already have the outcome of interest and 'controls' who do not. Both groups are then questioned or their records examined about whether they received the intervention exposure of interest.

Cohort (one group pre + post (before and after))

The same group is pretested, given an intervention, and tested immediately after the intervention. The intervention group, by means of the pretest, act as their own control group.

Interrupted time series

A time series consists of multiple observations over time. Observations can be on the same units (e.g. individuals over time) or on different but similar units (e.g. student achievement scores for particular grade and school). Interrupted time series analysis requires knowing the specific point in the series when an intervention occurred.

C) CONFOUNDERS

By definition, a confounder is a variable that is associated with the intervention or exposure and causally related to the outcome of interest. Even in a robust study design, groups may not be balanced with respect to important variables prior to the intervention. The authors should indicate if confounders were controlled in the design (by stratification or matching) or in the analysis. If the allocation to intervention and control groups is randomized, the authors must report that the groups were balanced at baseline with respect to confounders (either in the text or a table).

D) BLINDING

(Q1) Assessors should be described as blinded to which participants were in the control and intervention groups. The purpose of blinding the outcome assessors (who might also be the care providers) is to protect against detection bias.

(Q2) Study participants should not be aware of (i.e. blinded to) the research question. The purpose of blinding the participants is to protect against reporting bias.

E) DATA COLLECTION METHODS

Tools for primary outcome measures must be described as reliable and valid. If 'face' validity or 'content' validity has been demonstrated, this is acceptable. Some sources from which data may be collected are described below:

Self reported data includes data that is collected from participants in the study (e.g. completing a questionnaire, survey, answering questions during an interview, etc.).

Assessment/Screening includes objective data that is retrieved by the researchers. (e.g. observations by investigators).

Medical Records/Vital Statistics refers to the types of formal records used for the extraction of the data.

Reliability and validity can be reported in the study or in a separate study. For example, some standard assessment tools have known reliability and validity.

F) WITHDRAWALS AND DROP-OUTS

Score **YES** if the authors describe BOTH the numbers and reasons for withdrawals and drop-outs.

Score **NO** if either the numbers or reasons for withdrawals and drop-outs are not reported.

The percentage of participants completing the study refers to the % of subjects remaining in the study at the final data collection period in all groups (i.e. control and intervention groups).

G) INTERVENTION INTEGRITY

The number of participants receiving the intended intervention should be noted (consider both frequency and intensity). For example, the authors may have reported that at least 80 percent of the participants received the complete intervention. The authors should describe a method of measuring if the intervention was provided to all participants the same way. As well, the authors should indicate if subjects received an unintended intervention that may have influenced the outcomes. For example, co-intervention occurs when the study group receives an additional intervention (other than that intended). In this case, it is possible that the effect of the intervention may be over-estimated. Contamination refers to situations where the control group accidentally receives the study intervention. This could result in an under-estimation of the impact of the intervention.

H) ANALYSIS APPROPRIATE TO QUESTION

Was the quantitative analysis appropriate to the research question being asked?

An intention-to-treat analysis is one in which all the participants in a trial are analyzed according to the intervention to which they were allocated, whether they received it or not. Intention-to-treat analyses are favoured in assessments of effectiveness as they mirror the noncompliance and treatment changes that are likely to occur when the intervention is used in practice, and because of the risk of attrition bias when participants are excluded from the analysis.

Component Ratings of Study:

For each of the six components A – F, use the following descriptions as a roadmap.

A) SELECTION BIAS

Strong: The selected individuals are very likely to be representative of the target population (Q1 is 1) **and** there is greater than 80% participation (Q2 is 1).

Moderate: The selected individuals are at least somewhat likely to be representative of the target population (Q1 is 1 or 2); **and** there is 60 - 79% participation (Q2 is 2). 'Moderate' may also be assigned if Q1 is 1 or 2 and Q2 is 5 (can't tell).

Weak: The selected individuals are not likely to be representative of the target population (Q1 is 3); **or** there is less than 60% participation (Q2 is 3) **or** selection is not described (Q1 is 4); and the level of participation is not described (Q2 is 5).

B) DESIGN

Strong: will be assigned to those articles that described RCTs and CCTs.

Moderate: will be assigned to those that described a cohort analytic study, a case control study, a cohort design, or an interrupted time series.

Weak: will be assigned to those that used any other method or did not state the method used.

C) CONFOUNDERS

Strong: will be assigned to those articles that controlled for at least 80% of relevant confounders (Q1 is 2); **or** (Q2 is 1).

Moderate: will be given to those studies that controlled for 60 – 79% of relevant confounders (Q1 is 1) **and** (Q2 is 2).

Weak: will be assigned when less than 60% of relevant confounders were controlled (Q1 is 1) **and** (Q2 is 3) **or** control of confounders was not described (Q1 is 3) **and** (Q2 is 4).

D) BLINDING

Strong: The outcome assessor is not aware of the intervention status of participants (Q1 is 2); **and** the study participants are not aware of the research question (Q2 is 2).

Moderate: The outcome assessor is not aware of the intervention status of participants (Q1 is 2); **or** the study participants are not aware of the research question (Q2 is 2); **or** blinding is not described (Q1 is 3 and Q2 is 3).

Weak: The outcome assessor is aware of the intervention status of participants (Q1 is 1); **and** the study participants are aware of the research question (Q2 is 1).

E) DATA COLLECTION METHODS

Strong: The data collection tools have been shown to be valid (Q1 is 1); **and** the data collection tools have been shown to be reliable (Q2 is 1).

Moderate: The data collection tools have been shown to be valid (Q1 is 1); **and** the data collection tools have not been shown to be reliable (Q2 is 2) **or** reliability is not described (Q2 is 3).

Weak: The data collection tools have not been shown to be valid (Q1 is 2) **or** both reliability and validity are not described (Q1 is 3 and Q2 is 3).

F) WITHDRAWALS AND DROP-OUTS - a rating of:

Strong: will be assigned when the follow-up rate is 80% or greater (Q2 is 1).

Moderate: will be assigned when the follow-up rate is 60 – 79% (Q2 is 2) **OR** Q2 is 5 (N/A).

Weak: will be assigned when a follow-up rate is less than 60% (Q2 is 3) or if the withdrawals and drop-outs were not described (Q2 is 4).

Appendix 1.4 - Summary tables of included (19) and excluded (1) studies

Table A1.4-1 – Summary of included studies

Author (year)	Objectives	Study design	Study population	Intervention and follow-up	Outcomes measured	Key study results	Study quality
Serwint et al. (1996)	To measure the impact of prenatal paediatric visits on breastfeeding decisions, infant car safety seat use, circumcision, health maintenance, emergency room visits, and paediatrician's perception of knowledge of the mother	RCT	<p><u>Location</u> Baltimore, USA</p> <p><u>Population</u> Urban, low-income nulliparous pregnant women over the age of 18</p> <p><u>Participants</u> 156 parents</p>	<p>Intervention: attended a prenatal paediatric visit between 32-36 weeks gestation with the infant's future paediatrician. A standardized prenatal visit form was used to cover historical questions. Counselling topics included feeding options; advantages of breastfeeding; infant car safety set use; circumcision; and access and appropriate utilization of paediatric health care.</p> <p>Control: no prenatal paediatric visit. Control mothers were sent a letter welcoming them to the paediatric clinic, as well as a clinic brochure.</p>	<p>Several safety practices</p> <p>Of relevance: Self-reported ownership of a car safety seat and use during the last car ride</p>	<p>There were no significant differences between groups in initiation or duration of breastfeeding at 30 and 60 days, infant car safety seat use, circumcision, or health maintenance visits.</p> <p>Reported use of the car seat during the last ride was high for both intervention and control groups.</p> <p>Other outcomes: 45% of mothers in the intervention group changed their mind in favour of breastfeeding after enrolment compared with 14% in the control group. Mothers in the intervention group were more likely to make fewer emergency room visits (0.58 compared to 1.0). Paediatricians' knowledge of mother was higher among the intervention group (54%) vs. control group (29%).</p>	Moderate

McDonald et al. (2005)	<p>To describe the development and feasibility of implementing a computer tailored injury prevention intervention (Safety Land) in a busy urban primary care practice</p> <p>To evaluate the program's impact on parents' home and child passenger safety knowledge, beliefs and behaviours</p>	RCT	<p><u>Location</u> Baltimore, USA</p> <p><u>Population</u> Parents of children between the ages of 6 weeks and 24 months who were under the care of one of the participating physicians</p> <p><u>Participants</u> 121 parents</p>	<p>Intervention: completed assessment of knowledge, beliefs and behaviours related to smoke alarms, child passenger safety, poisons and falls, and then received tailored information about two selected injury topics that they would "like to learn more about". In addition, a physician feedback report was printed and results were discussed with the parent</p> <p>Control: completed shorter assessment about contact and demographic information. Did not receive tailored information or physician feedback</p>	Changes in safety knowledge, safety behaviours, and prevention beliefs	<p>Feasibility: "SafetyLand" kiosk program was demonstrated to be feasible for parents and physicians</p> <p>Knowledge: parents in the intervention group were significantly more knowledgeable than control group parents at follow up on a number of items (including the fact that the front seat is not safe for children less than 5 years old)</p> <p>Prevention beliefs: parents in the intervention group differed significantly on three of the prevention belief items</p> <p>Safety behaviours: there were no significant differences between intervention and control group in terms of car safety seat behaviours (i.e. Owning and using car seats)</p>	Good
Gielen et al. (2007)	To evaluate a theory-based, computer-tailored	RCT	<p><u>Location</u> Baltimore, USA</p> <p><u>Population</u> Parents of children</p>	Intervention: completed assessment (based on precaution adoption process model) then received tailored educational intervention about	Child safety seat use, smoke alarm, and poison storage	Knowledge: No significant differences between correctly answered questions about proper child safety seat use	Good

	intervention called Safety in Seconds, which was designed to promote parents' car seat, smoke alarm, and poison storage safety knowledge		aged 4-66 months who were in the Emergency Department (ED) of a level 1 paediatric trauma center for either an injury or a medical complaint <u>Participants</u> 901 parents	child safety seat use, smoke alarm use, and poison storage Control: completed assessment and received education about other child-health related topics Follow-up period: 2-4 weeks	knowledge and behaviour	between intervention and control groups Behaviour: Intervention group was significantly more likely to report having the correct child safety seat, using it consistently, and having it inspected/installed by a car seat expert (~50%) compared to control group (<25%) *Parents with per capita incomes of at least \$5000 were more likely to report correct child safety seat use	
Shenoi et al. (2010)	To evaluate the impact of an educational video on improving child passenger safety knowledge	Prospective randomized study	<u>Location</u> Houston, Texas, USA <u>Population</u> Parents of non-critically ill children younger than 9 years of age who were at the emergency department of an urban children's hospital <u>Participants</u> 244 parents	Intervention: emergency department based education including a video presentation plus handouts on age-appropriate child passenger safety Control: emergency department based education of handouts on age-appropriate child passenger safety Follow-up period: one month	Reported child passenger safety knowledge(difference in mean pre-test-post-test scores)	The intervention group showed a significant improvement in child passenger safety knowledge compared with the control group.	Moderate
Ebel et al. (2003)	To evaluate the	Prospective, nonrandomize	<u>Location</u> Washington State	Multifaceted community booster seat campaign	Observed booster seat	Before the intervention, 13.3% of eligible children	Good

	effectiveness of a multifaceted community booster seat campaign in increasing observed booster seat use among child passengers in motor vehicles.	d, controlled community intervention trial.	<p>and Oregon, USA</p> <p><u>Population</u> Intervention group: 4 communities in the greater Seattle, Wash, area Control group: Eight communities in Portland, Ore, and Spokane, Wash, served as control sites.</p> <p><u>Participants</u> 3609 booster seat eligible children</p>		use 15 months after the start of the campaign	in the targeted intervention communities and 17.3% in the control communities were using booster seats, adjusting for child age, driver seat belt use, and sex of driver. Fifteen months after the start of the campaign, adjusted booster seat use had increased to 26.1% in the intervention communities and 20.2% in the control communities	
Johnston et al. (2000)	To evaluate the feasibility, acceptability, and effectiveness of an injury prevention program delivered by school based home visitors to the families of low income children attending preschool enrichment	Controlled trial with a concurrent comparison group (?)	<p><u>Location</u> Washington State, USA</p> <p><u>Population</u> Families of children in a defined geographic boundary who were 4 or 5 years old and enrolled in Head Start or Washington State's Early Childhood Education and Assistance Program (ECEAP) between Jan and June 1998</p>	<p>Families in both the intervention and control groups received a scheduled home visit from Head Start/ECEAP case workers who administered a baseline home safety assessment (evaluation of smoke detectors, poison prevention knowledge, presence of ipecac, hazardous chemicals and medications, and the presence and self-reported use of age appropriate child safety restraints in cars), and a follow-up home visit</p> <p>Intervention: case workers delivered safety related educational information and provided supplies as needed</p>	<p>Observed and reported presence of a working smoke detector, poisonous substances and ipecac at home, and age appropriate car safety seats in family vehicles</p> <p>Reported knowledge of poison prevention</p>	<p>Intervention: child safety restraints The % of families with age appropriate child safety seats was similar between the intervention and control groups at baseline, but at follow up, 22% of the intervention group reported the presence of a new, age appropriate restraint, compared to only 5% of the control group.</p> <p>33% of those in the intervention group, who reported no previous instruction on the use of</p>	Moderate

	programs in Washington State		<u>Participants</u> 418 families	(i.e. a free booster seat if the family vehicle was equipped with rear set lap-shoulder restraints) Control: received written information only Follow-up period: 3 months	and use of age appropriate car safety seats	child passenger safety seats, reported having received such instruction at follow up, compared to 9% of the comparison group. Families in the intervention group were almost twice as likely to report “always” having their child restrained in the car. Other interventions: positive changes were also seen with respect to smoke detectors and poisoning prevention in the intervention group.	
O’Neil (2005)	To determine methods to increase the proper use of belt positioning booster seat in 4-6 year old children attending day cares pre schools	RCT	<u>Location</u> Indiana, USA <u>Population</u> Parents of children 4-6 years old and children attending 9 day care centers <u>Participants</u> Participant numbers not reported	Children received age-appropriate educational classes in the centers and schools. Interventions for parents were either distribution of booster seats and education/skills training; incentive to purchase a seat and education/skills training; or no information (control group).	This study attempted to determine if the intervention education and distribution increase booster seat use	After six months, observed booster seat use increased: from 42.6% to 66.7% in distribution and education group; from 34.7% to 48.8% in the incentive and education group; from 39.4% to 52.2% after 6 months in the control group.	Moderate
St. Louis et al. (2008)	To evaluate the effects of two community-	Cluster randomized controlled trial	<u>Location</u> Michigan, USA <u>Population</u>	Intervention (low-income group): -Free/low-cost safety seat vouchers	Observed booster seat and seat belt use	Low-income group: no statistically significant differences in booster seat use before and after	Good

	based booster seat promotion programs in Michigan		<ol style="list-style-type: none"> 1. Parents with children aged 4-8 years living in a low-income inner city population of Michigan 2. Hispanic parents of children aged 4-8 years <p><u>Participants</u> 349 booster seat eligible children</p>	<p>-Appointment based or walk-in fitting station (seat distribution with voucher, seat checks, and installation) -Booster seat education (video, presentations, visual demos, handouts) -Booster seat information table -Media (radio interviews and ad campaigns, TV news broadcasts, newspapers, posters)</p> <p>Interventions (Hispanic group – conducted in Spanish) -Free/low-cost safety seat vouchers -Appointment based fitting station (booster seat services, seat distribution with or without voucher) -Special event (booster seat blessing at local Catholic church) -Booster seat education (video, workshops, county fair booth, info distributed at elementary schools) -Media (newspapers, booster seat flyers, and radio ad campaigns)</p> <p>Control group: no intervention</p> <p>Follow-up period: baseline observations were conducted between June 20-July 1 2005, and final observations were conducted from October 13-22, 2006.</p>		<p>the program, and no statistically significant differences in belted and unrestrained rates of 4-8 year old children within each group.</p> <p>Hispanic group: there was a significant increase in booster seat use in the intervention community after the program compared to before, and no change during the same time period in the comparison community. There were no statistically significant differences in safety seat use in belted and unrestrained rates of 4-8 year old children within each group.</p>	
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Stevens (2000)	To evaluate whether Booster educational and information pamphlets and discount coupon to buy booster seat improve booster seat use	RCT	<p><u>Location</u> Virginia, USA</p> <p><u>Population</u> Parents of children 3.5 to 8 years old and weighing 35-80 pounds entering a retail toy store in</p> <p><u>Participants</u> 128 parents</p>	Booster educational and information pamphlets (pamphlet contained a warning label, a true story of a child who was killed because he was restrained in an adult seat belt instead of a booster seat, statistics, and consequences of nonuser seat) and discount coupon (coupons' value was \$30.00) to buy booster seat	<p>This study attempted to determine if the intervention of pamphlets and coupons could influence booster seat purchase and increase booster seat use.</p> <p>This study demonstrated that simple interventions such as pamphlet and a coupon could increase booster seat purchase.</p>	Purchase of booster seat increased 34% for the C+P group, 38% for P, 41% for C, and 3% for the control group. All respondents self-reported using the booster seat every time child travelled	Moderate
Alvarez & Jason (1993)	To evaluate the effectiveness of education, loaner program with education without loaner programs on use of child safety seat	Controlled clinical trial.	<p><u>Location</u> Chicago, USA</p> <p><u>Population</u> Pregnant women attending a prenatal clinic affiliated with Chicago hospital</p> <p><u>Participants</u> 30 women</p>	<p>Intervention</p> <p>Education-only group: attended a check-up appointment where the physician discussed Illinois child passenger legislation, explained the benefits of automobile restraint devices, listed available infant and toddler restraint devices, and demonstrated the proper use of one type of automobile restraint device</p>	Observed child restraint use	The education-loaner group had a significantly higher rate of infant restraint on the first ride home compared to the education-only group. However, at 6 weeks, there was no significant difference in restraint use between the education-only and education-loaner groups.	Moderate

				<p>Education-loaner group: received same intervention as described above, as well as an infant automobile restraint device on loan for 5 months for a \$10 deposit</p> <p>Follow-up period: 6 weeks</p>		<p>According to parents' reports (via telephone) prior to the sixth-week follow-up observation, 77% of rides for infants in the education-loaner group were safe, compared to only 45% of rides for infants in the education-only group.</p>	
Decina, Temple & Dorer (1994)	To evaluate the effect of a combined occupant-restraint enforcement program plus a public information and education program at increasing proper child-restraint use in 3 suburban communities of Pennsylvania	Non-randomized community trial	<p><u>Location</u> Pennsylvania, USA</p> <p><u>Population</u> Intervention group: Residents of Tredyffrin and Haverford, Pennsylvania. Control group: Residents of Abington, Pennsylvania.</p> <p><u>Participants</u> 3 communities; participant numbers not reported</p>	One year educational and enforcement intervention. Distribution of print materials and promotional items through community, school visits and citations	Observed and self-reported child safety seat and seat-belt use	<p>Child restraint use in toddlers aged 3 to 5: Tredyffrin; pre 40.6%, post 49.4%. Haverford; pre 30.5%, post 39.4%. Abington; pre 38.7%, post 38.6%.</p> <p>"Fully protected" toddlers aged 3 to 5: Tredyffrin; pre 36.5%, post 45.1%. Haverford; pre 27%, post 37.5%. Abington; pre 33.2%, 33.6%.</p> <p>These findings were not statistically significant</p>	Moderate
Lindqvist (1993)	To evaluate whether loaning infant car seats leads to increased use during and after the first	Nonrandomized community trial	<p><u>Location</u> Central Sweden</p> <p><u>Population</u> Intervention group made up of children born in</p>	Intervention: 795 car seats were loaned to parents of new born infants in Motala hospital. Demonstrated how to use/functions of child safety seats by maternity ward staff and shown a video-"Safety from beginning"	Use of the car seat at age 0-9 months and later, purchase of new seat and parents feeling about the use of	Use increased greatly during the first nine months (loan period) when the seat was freely available to the intervention group; but no important difference emerged between the	Moderate

	nine months of the infant's life		<p>Motala hospital, which loaned out child car seats free of charge.</p> <p>Control group selected from Finspang and Soderkoping situated in eastern Ostergotland</p> <p><u>Participants</u> 1,132 parents</p>	<p>These seats were suitable for use children 0-9 months old. It was supposed to return the seats when child reach 9 months. Two weeks to nine months families were sent a questionnaire to determine how often the seat was use, what parents thought about the seat, how the child react to the seat, whether parents have become more safety conscious and whether parents decided to buy new seat. Corresponding questionnaire was sent to parents in control group.</p> <p>When child reach 15 months, the second questionnaire has sent to determine whether they bought new seat and how often they used new seat.</p>	safety seats use	intervention and control groups after nine months of age concerning long or short journeys. In the intervention group use of the seat was lower for short trips than long trips during the first nine months. In the control group, there were no differences in use based on trip duration.	
Sangvai et al. (2007)	To determine the feasibility and effectiveness of a chronic care model approach to injury prevention compared with standard anticipatory guidance	Prospective randomized Controlled clinical trial	<p><u>Location</u> Pittsburgh, USA</p> <p><u>Population</u> Caregivers of children 5 years or younger who were with their child at a health maintenance visit at one of three paediatric sites in Pittsburgh</p>	<p>Intervention: focused counselling from a physician and health assistant, educational handouts, phone follow-up, and access to free safety devices and automobile restraint evaluations</p> <p>Control: no intervention. Received standard counselling from their physician during their visit.</p> <p>Follow-up period: home visits were conducted by a research</p>	Observed household safety practices, observed proper automobile restraint practices, report of injuries in the past 6 months, and unintentional	There were no significant difference in child seat use between groups, and no significant differences in the number of medically attended injuries between groups	Moderate

			<u>Participants</u> 319 parents	assistant 6 months after enrolment	injuries documented by medical chart review		
Tessier (2009)	To evaluate whether a hands-on education intervention makes a significant difference in the proper use of child passenger restraints by parents	Randomized clinical trial	<u>Location</u> Hawaii, USA <u>Population</u> Expectant parents of at least 7 months gestation who lived in Oahu, Hawaii, had some connection with the Honolulu women's and children's medical center, and planned to transport their infants in passenger motor vehicles <u>Participants</u> 122 parent/infants pairs	Intervention: received a free car seat, a standardized education session on the safety and use of child passenger restraints, and a hands-on demonstration and return demonstration of correct installation and use in their own vehicle Control: received a free car seat and the standardized education session (see above) Follow-up period: at least 2 months after birth	Observed correct use of child passenger restraint	The intervention group was significantly (over 4 times) more likely to correctly use their car seat (32%) than the control group (11%). The rate of errors was 33% less in the intervention group than in the control group.	Good
Istre et al. (2010)	To measure the effect of the WHO Safe Communities model approach to increasing child restraint use	Controlled community trial	<u>Location</u> Dallas, Texas, USA <u>Population</u> An ethnically diverse population in the southeast part of Dallas, Texas	Intervention: a multi-dimensional awareness program (education about the importance of children riding in child passenger safety seats and booster seats, the state laws, ongoing classes about CSS usage, free CSS/booster seat if needed, and free "car seat checks")	Observed child restraint and driver seat belt use, and proportion of children riding in the back seat	Intervention: child restraint Baseline Follow-up 32.4% 56.3% Child restraint use compliant with state law increased by 23.9% Intervention: child	Moderate

	in motor vehicles		<u>Participants</u> 2 communities; participant numbers not reported	Control: no intervention Follow-up period: 2 years		location Baseline Follow-up 65.0% 69.2% 4.2% more children were observed riding in the back seat compared to baseline Intervention: driver restraint Baseline Follow-up 76.8% 92.3% There was a 16.3% increase in driver restraint use at follow-up The multivariate analysis showed significantly greater increases for child restraint use, driver seat belt use, and children riding in the back seat of the vehicle in the intervention group compared to the control group	
Louis & Lewis (1997)	To evaluate whether providing free car safety seats for low-income minority families, with	Controlled trial	<u>Location</u> New Jersey, USA <u>Population</u> Low income, urban minority families from nine day care centers in Newark, JK	Intervention: received car seats and a 1-hour educational session on the importance of using car restraints "Control": also received car seats, but were only given instructions on their use	Observed child restraint use	Intervention: car seat distribution only group Baseline Follow-up 4% 84% After receipt of car seats, 83% of children were observed in car seats after 1 month, 74% after 4-5	Moderate

	or without education about car restraint use, increases the use of car seats for toddlers		<u>Participants</u> 53 families	Follow-up occurred at 1 month, 4-5 months, and 1 year		<p>months, and 60% after 1 year (a significant increase from baseline). The rate of car restraint use after 1 year declined significantly from the rate after 1 month.</p> <p>Intervention: car seat distribution plus education group Baseline Follow-up 7% 82%</p> <p>Car seat use increased significantly for both intervention groups. In addition, both groups continued to show a significant increase over pre-distribution rates 4-5 months and 1 year after they received car seats.</p>	
Gittelman, Pomerantz & Laurence (2006)	To determine if a 5-minute educational intervention within an ED setting would increase booster seat use in a lower SES population presenting to ED for any chief complaint	Prospective, randomized trial	<u>Location</u> Ohio, USA <u>Population</u> Families with children between 4-7 years of age, weighing 40-80lbs, and living in one of twenty targeted ZIP codes who presented to the Cincinnati Children's Hospital Medical Center ED	Intervention: 1. Educational group: 5-minute instruction from a certified car seat technician (AAP handouts, video, instructions on how to obtain booster seat) 2. Educational and booster seat giveaway group: same education as above plus free booster seat properly installed by a certified child passenger seat technician	Self-reported booster seat use	Education + free booster seat intervention group was significantly more likely to report using a booster seat for their child during follow-up (98.2%) compared with education only intervention group and control group (5.5% combined)	Moderate

	To determine if the proper installation of a booster seat at the ED visit would increase the likelihood of using the seat		<p>with any chief complaint</p> <p><u>Participants</u> 225 ED patients</p>	<p>Control: received standard discharge instructions from ED</p> <p>Follow-up period: 1 month</p>			
Thoreson et al. (2009)	To compare child care center-based booster seat education and distribution with no intervention when implemented immediately after booster seat legislation	Cluster randomized controlled trial	<p><u>Location</u> Colorado Springs, Colorado, USA</p> <p><u>Population</u> Parents and children aged 4-8 years leaving selected urban child care centers in Colorado Springs, Colorado</p> <p><u>Participants</u> 40 child care centres; participant numbers not reported</p>	<p>Intervention: trained staff members delivered lesson plans, messages promoting booster seats, children's activities, and free booster seats to parents and children in the intervention group</p> <p>Control: no intervention</p> <p>Follow-up period: around 20 months</p>	Observed booster seat use, "good practice" restraint use (rear seating, not sharing a seat/restraint, and correctly using the height/weight appropriate restraint), and legal restraint use (consistent w/ Colorado law)	<p>The intervention and control groups did not differ in proportions using booster seats (44% vs. 43%), good practice (42% vs. 41%) or legal restraints (both 65%). The intervention increased parents' receipt of information about booster seats but not use of booster seats.</p> <p>In a subgroup of the intervention group, drivers who reported receiving any information on child restraints from the center were significantly more likely to use good practice, compared with drivers who did not.</p> <p>Children aged 6-8 years were less likely than</p>	Good

						children aged 4-5 years to be restrained using good practice in booster seats, but more likely to be legally restrained. In addition, children were significantly less likely to use booster seats, good practice restraints, or legal restraints if the driver was of black or Hispanic ethnicity or driving a pickup or other vehicle.	
Falcone et al. (2006)	To evaluate if a culturally relevant/sensitive community-based program focused on transportation safety would lead to significantly improved child occupant restraint use among African Americans	Controlled community trial	<p><u>Location</u> Cincinnati, Ohio, USA</p> <p><u>Population</u> Members of one of 14 predominantly African American churches (children, parents and grandparents – ages not specified)</p> <p><u>Participants</u> Participant numbers not reported</p>	<p>Intervention:</p> <ul style="list-style-type: none"> -Sunday school curriculum for children aged 5-14 years -Teen empowerment program -Parent and grandparent educational series -Ministerial messages -Theatrical performance -Family safety fair -Car seat checks and education about car seat installation by a certified technician -Congregational empowerment (special sermons) -Safety service distribution (car safety seats were provided at no charge to families that could not afford them) <p>Control: nutrition education program</p>	Observed restraint use and proper seating position	<p>The intervention churches showed a significant increase in correct rear seating position among children ²8 years old and a significant reduction in unrestrained children ²8 years old post-intervention compared to pre-intervention</p> <p>The intervention churches showed a significant increase in safety belt use by drivers and passengers in cars with restrained drivers post-intervention compared to pre-intervention</p>	Moderate

Table A1.4-2 – Summary of excluded studies

Author (year)	Objectives	Study design	Study population	Intervention and follow-up	Outcomes measured	Key study results	Reason for exclusion
Williams, Wells & Ferguson (1997)		To evaluate impact of the state-wide "click it or ticket" program- To determine the feasibility and effectiveness of a intervention to increase CRS use and rear seating	<u>Location</u> North Carolina, USA <u>Population</u> Children in 3 elementary schools and 3 day care centers <u>Participants</u> Participant numbers not reported	Enforcement/ education	Increase use of restraint use, decrease in front seating in targeted areas and unexpectedly one controlled area day care centre had statistically significant increase in restraint use.		Methodologically weak study

Appendix 1.5 - Summary table of other recent child passenger safety systematic reviews

Table A1.5 -1 – Summary of other recent child passenger safety systematic reviews listed in chronological order

CPS Studies					
Author (Year)	Objectives	# Studies Reviewed	Interventions	Results	Notes / Limitations
Grossman et al. (1999)	To review the effectiveness of non-legislative community and clinical programs to increase the rate of child motor vehicle occupant restraint use among children less than the age of 5 years	18 studies 3 RCT, 4 controlled trials w/o random assignment, 3 controlled pre-post trials 8 uncontrolled pre-post trials	Clinical or community-based interventions to increase child restraint use in children less than 5 years of age 5 daycare center car seat education programs, 2 community-based campaigns, and 11 infant car seat loan programs during the peri-partum period	Preschool programs were associated with 12-52% increases in seat belt rates (short term gains), but only 8-14% one or more months after intervention Community-based media campaigns were associated with a 5-14% increase in long-term child restraint use Peri-partum counselling programs were associated with a 6-27% increase in long-term child restraint use Results show that programs have overall moderate short-term effectiveness, but that the effects diminish significantly one or more months after intervention	Limited evidence of long-term effects (intervention effects often measured 1+ months after completion) No large randomized controlled interventions Many reviewed studies had serious design and methods limitations that could lead to overestimation of the reported effect (i.e. lack of control group, lack of blinding, etc)
Zaza et al. (2001)	To review the evidence of effectiveness of population-based interventions to improve the use of safety seats among children aged 4 years and under	35 studies 6 education-only interventions (3 for parents, 1 for children, and 1 for professionals) 4 incentive and education programs	Child safety seat laws, community-wide info and enhanced enforcement campaigns, distribution and education programs, incentive and education programs, and education-only	Strong evidence of effectiveness for child safety seat laws, and for distribution plus education programs Sufficient evidence of effectiveness for community-wide information plus enhanced enforcement campaigns, and for education plus incentive programs Insufficient evidence for education-only programs aimed at parents, young children, healthcare professionals, and	No studies discriminated between correct and incorrect use of child safety seats No investigation of positioning of children within the car

		<p>10 distribution and education programs</p> <p>4 community-wide info and enhanced enforcement campaigns</p> <p>11 on safety seat laws</p>	programs	law enforcement personnel	
Turner et al. (2005)	To examine the effectiveness of community-based models for reducing injury due to inadequate car seat restraint use in children aged 0-16 years	<p>8 studies total</p> <p>4 studies had control communities matched on demographic characteristics</p> <p>2 studies compared results from the intervention community to the rest of the geographical region</p> <p>2 studies used the intervention community as a historical control</p>	Community-based interventions with different controls	<p>Significant reductions in vehicle occupant injury (33-55%) were reported in the studies measuring injury outcomes.</p> <p>Community-based programs reporting observed restraint use increased restraint use in children aged 1-5 years by up to 11%, booster seat use in children aged 4-8 years by up to 13%, and rear restraint use in children aged 15 and below by 8%. In addition, there was a 50% increase in restraint use in pre-school children in a high-risk community, and a 44% increase in children aged 5-11 years.</p> <p>Overall, some evidence supporting community-based programs for increasing child safety restraint use and/or reducing motor vehicle occupant injury are effective.</p> <p>3 of the 8 programs achieved considerable improvements in injury outcomes or increased use of restraints.</p>	Limited number of studies and wide range of interventions and evaluation methodologies
Ehiri et al. (2006)	To assess the effectiveness of interventions to increase acquisition and use of booster seats among children aged 4 to 8 years	5 studies total (RCT and controlled before-and-after studies)	Educational and promotional measures to increase booster	Interventions were generally effective in increasing booster seat use among children aged 4-8 years (4 out of the 5 studies showed significant increases in	3 studies were based on observations, and 2 were based on self-reports (weaker

		3 peer-reviewed articles 1 unpublished conference proceeding 1 thesis	seat use among children 4-8 years old (community-wide info and enhanced enforcement campaigns, distribution plus education, incentive plus education, and education-only programs)	observed or reported booster seat use among at least one intervention group compared to the control group). Education plus incentive or distribution programs produced more consistent results than education-only interventions.	evidence b/c subject to recall and social desirability bias) One study suffered from considerable attrition Variable study duration and follow-up intervals
Injury Prevention Studies					
Author (Year)	Objectives	# Studies Reviewed	Interventions	Results	Notes / Limitations
MacKay et al. (1999)	Synthesize evidence regarding the relationship between SES and unintentional childhood injuries, and determine implications for Canadian injury prevention research, programming and policy 1. Describe the types of SES measures used in the study of childhood injury 2. Assess the quality of evidence re: relationship between SES and incidence of childhood injury 3. Assess evidence re: relationship between SES and uptake of injury-preventing behaviours	57 studies 18 were intervention studies (4 RCT, 12 non-RCT, 2 pre-post) 13 cohorts 26 case-control studies	Motor vehicle collisions, bicycle helmet use, pedestrian safety, scald prevention, and general home safety	Six non-RCTs evaluated measures to decrease motor vehicle-related injuries. Five of these focused on child passenger restraint use, and found that lower SES was associated with lower restraint use and/or correct use No studies specifically examined if SES affected uptake of prevention measures as a primary research question	Low quality of reporting (weak and subject to substantial bias) Only 6 studies conducted in Canada Different measures of SES were used
Towner et al. (2001)	To evaluate the evidence on the effectiveness of intervention studies related to childhood injury prevention	42 studies in total (8 RCT, 5 rated as good/reasonable evidence)	Road environment interventions (traffic calming, skills training, promotion of	8 studies evaluated the effects of educational campaigns, and 2 examined the effects of legislation on helmet use in children. The studies, although not focused on child restraint use, suggested	Covered a broad variety of interventions (only included two studies that focused on child seat belt use)

		<p>18 related to interventions in the road environment, 11 the home environment, and 5 the leisure environment</p> <p>5 broad community based studies</p> <p>3 mass media or general training trials</p>	<p>bicycle helmets, bicycle helmet legislation, and seat belt legislation)</p> <p>Interventions in the home and leisure environment, community based studies, and general/mass media interventions are summarized in "Part 2"</p>	<p>that educational campaigns and legislation can achieve some positive effect in behaviour. The evidence relating to the effect on injury rates is limited.</p> <p>The 2 studies on seat belt legislation for children showed a positive effect (both classified by authors as "Good/reasonable evidence")</p>	
Morrison et al. (2003)	To evaluate systematic review literature that describes the effectiveness of transport interventions (policies and programs) in improving population health	28 systematic reviews and meta-analyses	Health promotion, engineering, environmental, and legislative interventions	<p>Highest quality systematic reviews indicated that the most effective interventions are health promotion campaigns (to prevent childhood injuries, to increase bike and motorcycle helmet use, and to promote children's car restraint use), traffic calming, and specific laws against drunk driving</p> <p>High quality reviews identified beneficial effects of primary care based counselling to prevent childhood injury</p> <p>Programs to increase restraint use by children are effective but their effects seem to be comparatively short-lived</p>	Only 6 reviews had minimal flaws (all were health promotion interventions)
Bruce et al. (2005)	Examine group based injury prevention interventions for young children (< 6 years) to determine the evidence of effectiveness of such strategies in enhancing children's safety behaviours	9 studies, all had a control group but 2 lacked baseline testing for comparison	Road crossing, car restraint, spinal cord safety, poison safety, 911/stranger danger	<p>Positive effect of group interventions was seen in 6 studies, mixed results in 3 studies, and no effect in 1 study.</p> <p>Successful programs involved group sessions with multiple interactive learning</p>	<p>Potential bias due to reliance on convenience sampling in many studies</p> <p>Cluster randomization</p>

		Only 2 studies randomly assigned participants		<p>tools – suggests potential to positively influence the development of safety behaviours among young children using group interactions. However, unsure if behaviours are transferable and can be incorporated into a child’s decision making skills about injury risks.</p> <p>Not clear if engaging parents as reinforcement has any significant effect.</p>	<p>used in only 2 studies</p> <p>Vague re: intervention consistency</p> <p>Lack of control over intensity and duration of intervention</p> <p>No measure of injury rates in studies</p>
Williams et al. (2007)	To systematically assess the evidence on the effectiveness of primary care counselling among people of all ages about occupant restraints or alcohol-related driving to prevent injuries	<p>17 studies</p> <p>9 RCTs, 8 controlled clinical trials (CCT)</p>	Primary care behavioural counselling interventions to increase correct use of restraints and reduce alcohol-related driving behaviours	<p>7 CCTs and 6 RCTs showed that counselling to increase the use of child passenger safety seats leads to increased short-term restraint use</p> <p>Interventions that include distribution of safety seats or a demonstration of proper use reported larger effects</p> <p>There were a limited number of trials describing the effects of counselling children aged 4-8 years (1 RCT), older children, adolescents, or adults (2 RCTs and 1 CCT)</p> <p>There were no trials describing the effects of counselling primary care patients to reduce alcohol-related driving behaviours</p> <p>Overall, the literature provides fair evidence of the effectiveness of behavioural counselling interventions for infants and children up to 4 years of age in increasing short-term correct restraint use. However, the incremental effect of primary care counselling on</p>	<p>Most studies were published before the widespread implementation of child safety seat laws</p> <p>Many included studies had multiple methodological flaws (no study was considered “good quality” according to the criteria of the US Preventive Services Task Force)</p>
Inman et	To identify evidence-based programs	Reviewed 40	Pregnancy and STI	All 3 of the motor vehicle prevention	Search methods not

al. (2011)	and resources to address the goals of Health People 2020 and to increase comprehensive school health education	programs in total, 3 of which were motor vehicle injury prevention programs that focused on increasing restraint use	prevention, violence prevention, injury prevention, tobacco and substance abuse prevention, and exercise and healthy eating	programs led to an increase in safety seat use; however, one program for children between 5-18 years only increased restraint use in low-income schools with good program implementation. One community-based study targeting children between 3 and 11 years of age also resulted in increased knowledge.	described well, and quality of studies was not assessed
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Appendix 1.5 – Systematic Review References (20)

- Alvarez J. and Jason L.A. The effectiveness of legislation, education, and loaners for child safety in automobiles. *J Community Psychol*. 1993;21:280–284
- Decina LE, Temple MG, Dorer HS. [Increasing child safety-seat use and proper use among toddlers. Evaluation of an enforcement and education program.](#) *Accid Anal Prev*. 1994 Oct;26(5):667-73.
- Ebel BE, Koepsell TD, Bennett EE, Rivara FP. [Use of child booster seats in motor vehicles following a community campaign: a controlled trial.](#) *JAMA*. 2003 Feb 19;289(7):879-84.
- Falcone RA Jr, Brentley AL, Ricketts CD, Allen SE, Garcia VF. [Development, implementation and evaluation of a unique African-American faith-based approach to increase automobile restraint use.](#) *J Natl Med Assoc*. 2006 Aug;98(8):1335-41.
- Gielen AC, McKenzie LB, McDonald EM, Shields WC, Wang MC, Cheng YJ, Weaver NL, Walker AR. [Using a computer kiosk to promote child safety: results of a randomized, controlled trial in an urban pediatric emergency department.](#) *Pediatrics*. 2007 Aug;120(2):330-9.
- Gittelman MA, Pomerantz WJ, Laurence S. [An emergency department intervention to increase booster seat use for lower socioeconomic families.](#) *Acad Emerg Med*. 2006 Apr;13(4):396-400. Epub 2006 Mar 10.
- Istre GR, Stowe M, McCoy MA, Moore BJ, Culica D, Womack KN, Anderson RJ. [A controlled evaluation of the WHO Safe Communities model approach to injury prevention: increasing child restraint use in motor vehicles.](#) *Inj Prev*. 2011 Feb;17(1):3-8. Epub 2010 Oct 27.
- Johnston BD, Britt J, D'Ambrosio L, Mueller BA, Rivara FP. [A preschool program for safety and injury prevention delivered by home visitors.](#) *Inj Prev*. 2000 Dec;6(4):305-9.
- Lindqvist KS. [Does the use of child safety seats increase as a result of loan schemes?](#) *Accid Anal Prev*. 1993 Aug;25(4):421-9.
- Louis B, Lewis M. [Increasing car seat use for toddlers from inner-city families.](#) *Am J Public Health*. 1997 Jun;87(6):1044-5.
- McDonald EM, Solomon B, Shields W, Serwint JR, Jacobsen H, Weaver NL, Kreuter M, Gielen AC. [Evaluation of kiosk-based tailoring to promote household safety behaviors in an urban pediatric primary care practice.](#) *Patient Educ Couns*. 2005 Aug;58(2):168-81.
- O'Neil J. Methods to increase booster seat use in 4-6 year old children. The 49th AAAM Annual Conference (<http://www.firealliance.org/presenter.html>) September 11-14 2005
- Sangvai S, Cipriani L, Colborn DK, Wald ER. [Studying injury prevention: practices, problems, and pitfalls in implementation.](#) *Clin Pediatr (Phila)*. 2007 Apr;46(3):228-35.
- Serwint JR, Wilson ME, Vogelhut JW, Repke JT, Seidel HM. A randomized controlled trial of prenatal pediatric visits for urban, low-income families. *Pediatrics*. 1996;98(6 Pt 1):1069-75.
- Shenoi R, Saz EU, Jones JL, Ma L, Yusuf S. [An emergency department intervention to improve knowledge of child passenger safety.](#) *Pediatr Emerg Care*. 2010 Dec;26(12):881-7.
- St Louis RM, Parow JE, Eby DW, Bingham CR, Hockanson HM, Greenspan AI. [Evaluation of community-based programs to increase booster seat use.](#) *Accid Anal Prev*. 2008 Jan;40(1):295-302. Epub 2007 Jul 16.
- Stevens LS. Effects of intervention on booster seat purchase-A field study-Masters Thesis-Virginia Polytechnic Institute and the State University, 2000.

Tessier K. [Effectiveness of hands-on education for correct child restraint use by parents.](#) *Accid Anal Prev.* 2010 Jul;42(4):1041-7. Epub 2010 Jan 13.

Thoreson S, Myers L, Goss C, DiGuseppi C. [Effects of a booster seat education and distribution program in child care centers on child restraint use among children aged 4 to 8 years.](#) *Arch Pediatr Adolesc Med.* 2009 Mar;163(3):261-7.

Williams AF, Wells JK, Ferguson SA. Development and evaluation of programs to increase proper child restraint use *Journal of Safety Research*, 1997, 28:197-202

Review Articles (10)

Child Passenger Safety Studies

1. Grossman DC, Garcia CC. Effectiveness of health promotion programs to increase motor vehicle occupant restraint use among young children. *Am J Prev Med.* 1999;16(1 Suppl):12-22.
2. Zaza S, Sleet DA, Thompson RS, Sosin DM, Bolen JC; Task Force on Community Preventive Services. [Reviews of evidence regarding interventions to increase use of child safety seats.](#) *Am J Prev Med.* 2001 Nov;21(4 Suppl):31-47. Review.
3. Turner C, McClure R, Nixon J, Spinks A. [Community-based programs to promote car seat restraints in children 0-16 years -- a systematic review.](#) *Accid Anal Prev.* 2005 Jan;37(1):77-83. Review.
4. Ehiri JE, Ejere HO, Magnussen L, Emusu D, King W, Osberg JS. [Interventions for promoting booster seat use in four to eight year olds traveling in motor vehicles.](#) *Cochrane Database Syst Rev.* 2006 Jan 25;(1):CD004334.
5. MacKay M, Reid DC, Moher D, Klassen T. Systematic review of the relationship between childhood injury and socio-economic status. Published by authority of the Minister of Health © Her Majesty the Queen in Right of Canada, represented by the Minister of Public Works and Government Services Canada, 1999. http://www.phac-aspc.gc.ca/hp-ps/dca-dea/stages-etapes/childhood-enfance/injury-blessure/pdf/injury_e.pdf (last accessed Dec 13, 2011)
6. Towner E, Dowswell T, Jarvis S. Updating the evidence. A systemic review of what works in preventing childhood unintentional injuries: Part 2. *Inj Prev.* 2001; 7(3):249-53.
7. Morrison DS, Petticrew M, Thomson H. What are the most effective ways of improving population health through transport interventions? Evidence from systematic reviews. *J Epidemiol Community Health*, 2003, 57(5):327-33.
8. Bruce B, McGrath P. Group interventions for the prevention of injuries in young children: a systematic review. *Inj Prev*, 2005, 11: 143-147.
9. Williams SB, Whitlock EP, Edgerton EA, Smith PR, Beil TL; U.S. Preventive Services Task Force. [Counseling about proper use of motor vehicle occupant restraints and avoidance of alcohol use while driving: a systematic evidence review for the U.S. Preventive Services Task Force.](#) *Ann Intern Med*, 2007 Aug 7, 147(3):194-206. Review.
10. Inman DD, van Bakergem KM, Larosa AC, Garr DR. Evidence-based health promotion programs for schools and communities. *Am J Prev Med*, 2011, 40(2):207-19.

CHAPTER II

SASKATCHEWAN CHILD PASSENGER ROADSIDE SURVEY

Abstract

Proper use of vehicle child passenger safety restraint systems is crucial to reduce the risk of injury in a crash. Roadside observational studies are periodically conducted in partnership with Transport Canada to examine the use of child restraints across Canada. This study examined Saskatchewan data from the 2010 Canadian National Survey on Child Restraint.

Methodologies were replicated closely from the 2006 national survey to allow for comparison between results. A total of 18 intersections were randomly selected within Saskatchewan for inclusion in the roadside survey, with 16 being successfully observed. A total of 609 children were observed passengers in 470 vehicles in Saskatchewan. Data collectors were trained to accurately estimate child's age and type of safety seat used. Proper use of child passenger safety systems was based upon the child's age. Saskatchewan demonstrated the lowest weighted estimate of correct child safety seat use at 53.47 percent, as compared to the national estimate of 67.07 percent.

Saskatchewan tied with Manitoba at 8.7 for the highest rate of unrestrained child passengers. A high proportion of children in all age groups in Saskatchewan were found not using the appropriate child passenger restraint. Specifically, there is a high rate of incorrect restraint use among children between the ages of 4 and 8 years. This includes inappropriate seatbelt use when a booster seat is indicated, although Saskatchewan does not legally require the use of booster seats.

Purpose

The 2010 Canadian National Survey on Child Restraint is a follow-up to the 2006 roadside observational survey submitted to Transport Canada. These surveys are conducted periodically to examine the use of child passenger restraints across Canada. The study included a representative sample for data collection, including all provinces and territories except Nunavut. Efficacy of data collection was improved in 2010 by excluding previously used parking lot surveys and interviews, which had been associated with high rates of non-participation in 2006. The observational study was carried out on a sample of 196 randomly selected intersections across Canada, including 16 successfully observed intersections in Saskatchewan.

The purpose of this study was to examine the use and misuse of child passenger restraint in Saskatchewan as compared to current recommendations by the American Academy of Paediatrics (AAP) Car Safety Seat Guidelines (Committee on Injury and Poison Prevention, 2002). The research questions addressed are:

- *What is the rate of correct use of child safety seats in vehicles in Canada?*
- *How do rates of correct use vary in each of the provinces and territories?*
- *What are the patterns of correct use of child safety seats relative to driver ethnicity?*
- *How do the rates of correct use in this study compare to rates in the 2006 study?*

This work in Saskatchewan was undertaken by the study team in collaboration with the 2010 Canadian National Survey on Child Restraint (Snowdon et al., 2010).

Methods

Please note: The following methods section is based upon Snowdon et al. (2010), Technical Report: Canadian National Survey on Child Restraint use 2010 Completed for Transport Canada, in partnership with AUTO21.

Design

Roadside observational surveys were conducted at randomly selected intersections across Saskatchewan. Data collectors observed child passenger and driver safety restraint use in stopped vehicles at selected intersections. Data collectors were trained to estimate the age range of child passengers and to identify types of child restraints.

Sampling Design

The sampling design was based on that of the 2006 observational study to allow for valid and accurate comparison of the results. The statistical team at Transport Canada provided the sample of intersections to be observed. Additional intersections were included as potential replacements to any of the original intersections that were not feasible for data collection. The sampling frame included drivers with child occupants travelling in private, light duty vehicles including automobiles, minivans, pick-up trucks and sport utility vehicles (SUV) with Canadian license plates travelling on Canadian roads during the months of May through October of 2010. The Saskatchewan observations took place in August and September, 2010.

Geographic Location

Transport Canada defined six urban population strata to be included in the survey. Due to low traffic volume on rural roads and difficulty in accessing the more remote settings, only urban census subdivisions (CSD) were included. Based on Statistic Canada's demographic definition of urban and rural, the urban strata were defined as follows:

U1: Census subdivisions (CSD) within a Census Metropolitan Area (CMA; i.e. large cities) and having a population over 500,000

U2: Census subdivisions (CSD) within a (CMA) and having a population between 100,000 and 499,000

U3: Census subdivisions (CSD) within a (CMA) and having a population between 50,000 and 99,999

U4: Census subdivisions (CSD) within a (CMA) and having a population between 10,000 and 49,999

U5: Census subdivisions (CSD) within a Census Agglomeration (CA; i.e. small cities) and having a population over 50,000

U6: Census subdivisions (CSD) within a (CA) and having a population between 10,000 and 49,999

The first level of stratification was by province/territory, and the second level of stratification was by U1-U6 definitions. Intersections were randomly selected from the second level strata to ensure equal probability of selection. For every additional 75,000 children in a stratum, an extra intersection was drawn using systematic sampling from the list of intersections in the stratum. This information was accessed from Transport Canada's Canadian Highway Information System, a geographic information system (GIS) database that includes all road segments in Canada. This sampling method ensured that the distribution of selected intersections was proportional to the child population density across Canada, while reducing the possibility of selecting intersections clustered in the same area of the stratum. Day and time period for data collection were randomly selected for each intersection.

Google Earth was used to complete a preliminary screening of the accessibility and suitability of selected intersections for data collection. The criteria for accessibility included safety for data collectors, and the presence of a controlled stop to facilitate observation. Intersections were excluded if they were unsafe (no sidewalk or safe location for data collectors to stand), or if they did not have a controlled stop (traffic light or stop sign).

After the preliminary screening, data collectors visited the intersections to further evaluate their suitability. Data collectors ensured that each intersection was: (1) controlled by traffic lights or a stop sign; (2) had a minimum traffic volume of 10 vehicles per hour; and (3) had a safe place for the data collectors to stand and observe (such as a sidewalk or median). Intersections that did not meet these criteria were replaced with another intersection within the same province and U1-U6 category. Intersections that did not meet the minimum criteria for traffic volume were deemed “failed

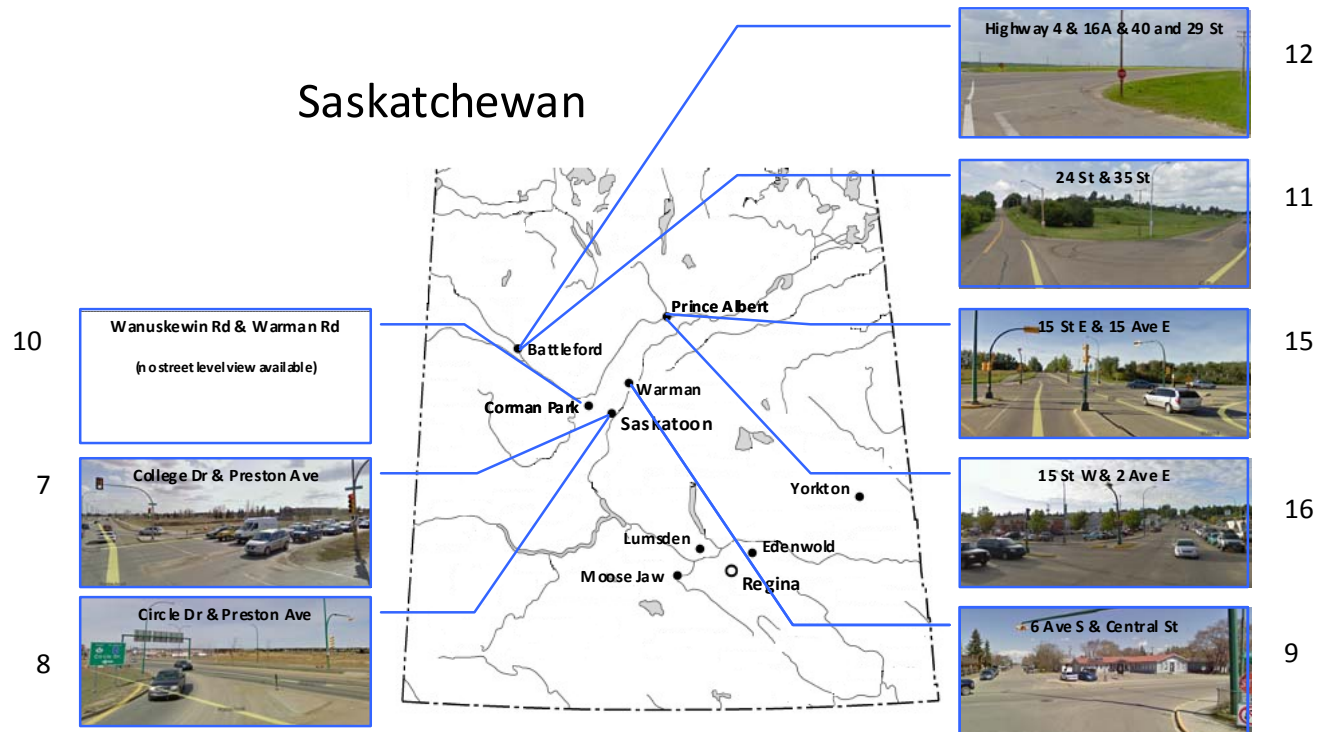
sites”. In the case of a failed site, data collectors travelled in a random direction to the nearest intersection to collect data. In 22 of the selected intersections, there were no nearby intersections with adequate traffic volume.

In Saskatchewan, 18 intersections were selected from the U1-U6 strata. There were 2 “failed sites” due to low traffic volume, neither of which was successfully replaced. Observations at 16 sites were completed for this study (Table 2.1; Figure 2.1).

Table 2.1 - Information on selected observational sites

Number	Location	Street Name	Street Name 2
1	Regina	BROAD ST	COLLEGE AVE
2	Regina	PARK ST	ARCOLA AVE E
3	Lumsden	JAMES ST	QU'APPELLE DR
4	Edenwold No. 158	HIGHWAY 364	HIGHWAY 640
5	Moose Jaw	1 AVE SE	MANITOBA ST E
6	Moose Jaw	MAIN ST S	MANITOBA ST E
7	Saskatoon	COLLEGE DR	PRESTON AVE
8	Saskatoon	CIRCLE DR	PRESTON AVE
9	Warman	6 AVE S	CENTRAL ST
10	Corman Park No. 344	WANUSKEWIN RD	WARMAN RD
11	Battleford	24 ST	35 ST
12	Battleford	HIGHWAY 4 & 16A & 40	29 ST
13	Yorkton	YORK RD W	GLADSTONE AVE N
14	Yorkton	HIGHWAY 9 & 16	KING ST E
15	Prince Albert	15 ST E	15 AVE E
16	Prince Albert	15 ST W	2 AVE W

Figure 2.1 - Selected observational sites



Data Collectors

Data collectors were recruited from academic institutions and injury prevention organizations in Saskatchewan. Unlike other provinces, preference was given to those who were experienced in child seat safety inspection or had previously conducted child seat surveys. Data collectors had to be 18 years or older, and had to complete training and testing for accuracy of estimating child age ranges and type of child safety seat in vehicles. All data collectors were required to complete a 30-minute online training program to become familiarized with the procedures of data collection, including identification of children's age ranges, type and requirements of seat used, and appropriate seat for each age group. Participants were then tested on their ability to correctly identify child age and type of child safety seat used. Participants were required to achieve a score of 75 percent or higher. A total of 9 data collectors were recruited to conduct surveys in Saskatchewan with help of Saskatchewan Prevention Institute and Saskatchewan Government Insurance (SGI). SGI summer student safety squad services were also available to support this survey.

Data Collection Procedure

Two data collectors were stationed in each intersection. One data collector was responsible for counting the total number of vehicles with

child occupants passing through the intersection. These data were used to determine total traffic volume of vehicles with child occupants for each intersection. The second data collector was responsible for observing the child occupants in vehicles while the vehicle was stopped at the intersection (either at a red light or a stop sign). Data collectors recorded information such as date, location code, driver information, age of child, location of child in the vehicle, type of restraint used, driver use of seat belts, and driver ethnicity.

The data collectors observed as many vehicles as possible during each red light cycle. Every vehicle that arrived at a stop sign was observed before it proceeded through the intersection. Data was collected over a 3-hour period at each intersection.

Definition of Proper Child Restraint System

Correct use of child passenger safety seats for the survey was based on the child's estimated age. Most of the existing guidelines for child passenger safety seat use contain ambiguous classes for age, weight, and height groups for the various seat types. Table 2.2 defines the correct safety system based on the child's age alone.

Table 2.2 - Definition of Correct Safety System Based on the Child's Age Group.¹

Types of Seat	Age Group
Rear-facing infant seat	<1 year
Forward-facing seat	1-4 years
Booster seat	4-9 years
Seatbelt only	9-14 years

¹ Please Note: This Road Side Survey was conducted during the summer of 2010, prior to the revised guidelines for child passenger safety published in 2011.

In the 2006 survey, correct use of child safety seat was defined based on child's age alone, weight alone, and combined age, weight and height (Snowdon et al., 2006). The definition based on age alone was adopted for the 2010 observational study to allow researchers to make valid comparisons of correct use rates of safety seats and restraints in vehicles. The definitions of correct safety systems based on child's weight alone, and combined age, weight and height were not used in the 2010 survey. Collection of weight and height data was not possible because the data collection methods of parking lot surveys and interviews were not used in the 2010 survey.

The roadside observational study conducted in 1997 also defined proper restraint use by child's age alone. However, the age groups were defined differently, and included: less than 1 year, 1-2 years, 1-4 years, 3-4 years, 5-9 years, and 10-15 years (Transport Canada, 1997).

Instruments

The instruments used for this National Child Seat Survey were updated versions of the surveys used in the 2006 study (see Appendix 1). The only change in the 2010 survey was the inclusion of driver ethnicity to allow for the identification of possible patterns of child restraint use in various population groups.

Analysis

The main objective was to estimate the rates of use of child safety seats and restraints among child occupants in vehicles. Children were grouped into four age groups: infant (<1 year), toddler (1-3 years), school age (4-8 years) and older (> 9 years). The samples were stratified by province or territory, and weighted based on the population of children in each sampling frame to account for the probability of each intersection being drawn from the sample. This ensures the sample is distributed evenly across the population. The following excerpt from the 2010 Technical Report outlines the procedure

for including the weights:

Let $y_{psidtkj}$ be the observation from the j^{th} child in the k^{th} vehicle collected at the t^{th} time of the d^{th} day at the i^{th} intersection of the s^{th} strata in the p^{th} province. Corresponding to this measurement, we have a sampling weight denoted by $w_{psidtkj} = w_p w_s w_{v(i,s,t,d,k)} w_{i(s)} w_t w_d$. Here, w_p , w_s are, respectively, child population densities of the p^{th} province/territory and of the s^{th} strata with respect to child population of Canada and that of the province/territory, respectively. The quantities w_t , w_d are, respectively the inverses of probabilities of time and day selection from Tables A-1 and A-2 of [4], $w_{i(s)}$ is the inverse probability of selection for the i^{th} intersection in the s^{th} strata and $w_{v(i,s,t,d,k)}$ is inverse of the probability of observing the k^{th} child carrying vehicle at the i^{th} intersection in the s^{th} strata at time t and day d . The latter quantity was estimated as the ratio of the total number of vehicles with child occupants observed at the intersection during the survey period to the total number of vehicles that passed through the intersection during the survey period. This would in fact introduce some sort of post stratification adjustments to the strata weights.

There were deviations from the scheduled times and days for data collection due to travel and weather complications. The actual day of survey completion was used in the analysis. Missing data were ignored under the assumption that they were randomly missing. Weighted analyses were conducted with the PROC SURVEYFREQ and PROC SURVEYMEANS of the SAS software and all descriptive statistics were generated using the SPSS software.

Results

Please note: The following results are consistent with Snowdon et al. (2010), Technical Report: Canadian National Survey on Child Restraint use 2010 Completed for Transport Canada, in partnership with AUTO21.

Sample

Of the 18 intersections originally selected for Saskatchewan, 16 intersections were successfully completed as selected. Two of the original 18 sites were deemed unsuitable for the survey due to inadequate volume of vehicles. A total of 609 child passengers were observed as passengers in 470 vehicles in Saskatchewan, averaging approximately 1.3 child passengers per vehicle (Table 2.3). Nationally, 9,772 child passengers were observed in 7,307 vehicles. Using the national

data, the average number of children per vehicle was calculated to be between 1.3 and 1.4.

Over half (54.6%) of observed Saskatchewan drivers were female. The majority of drivers were Caucasian at 84.9 percent, followed by Aboriginal at 10.4 percent (Table 2.4). The term “Southeast Asian” referred to individuals from countries such as India, Bangladesh, and Pakistan, and was used to distinguish Eastern Asians (i.e. Chinese, Japanese & Korean). Data on ethnicity was missing from 4.4 percent of the forms in the entire study. The observation of ethnicity was meant to be an estimate and not a detailed examination due to limitations associated with observational studies.

Table 2.3 – Number of Observed Vehicles and Child Passengers by site

ID	Location	# Vehicles	# Child Passengers	ID	Location	# Vehicles	# Child Passengers
1	Regina	33	47	9	Warman	41	51
2	Regina	30	42	10	Corman Park	17	20
3	Lumsden	59	71	11	Battleford	2	2
4	Edenwold	5	6	12	Battleford	34	48
5	Moose Jaw	91	120	13	Yorkton	25	31
6	Moose Jaw	3	5	14	Yorkton	28	36
7	Saskatoon	18	22	15	Prince Albert	14	20
8	Saskatoon	33	46	16	Prince Albert	35	43

* Snowdon report has total of 470 vehicles and 610 child passengers

Table 2.4 - Driver Ethnicity information

Driver Ethnicity	Percentage
South East Asian	0.9
African Canadian	0.9
Asian	1.4
Middle Eastern	1.4
Aboriginal	10.4
Caucasian	84.9

Descriptive Statistics for Child Occupants

A total of 609 child occupants were observed for age and restraint status in Saskatchewan (Table 2.5). This province was tied with Manitoba for the highest rate of unrestrained child passengers at 8.7 percent. This rate is more than double the national rate of unrestrained child passengers in the study at 4.2 percent.

Due to an inability to clearly observe restraint status in all vehicles, there were missing data on a proportion of child occupants in each age group, with an 'all ages' missing proportion of 7.1 percent.

The highest rate of unrestrained passengers was observed in children between 4 to 8 years of age at 10.7 percent.

The majority of child passengers in Saskatchewan were sitting in the backseat at 72.0 percent (Table 2.6). The trend of backseat child passengers was seen to increase from infants and 1 to 3 years (10.2% and 10.5%, respectively), to 4 to 8 year olds (26.2%) and 9 to 14 year olds (51.6%).

Table 2.5 – Child Passenger Restraint Status by Age Group

Infants <1 year (n=53)	Frequency	Percentage
Not restrained	2	3.8
Can't see	1	1.9
Rear-facing infant seat	41	77.4
Rear-facing convertible	4	7.5
Forward-facing convertible	5	9.4
Booster seat	0	0.0
Seat belts	0	0.0
Children 1-3 years (n=140)		
Not restrained	12	8.6
Can't see	5	3.6
Rear-facing infant seat	1	0.7
Rear-facing convertible	3	2.1
Forward-facing convertible	100	71.4
Booster seat	4	2.9
Seat belts	15	10.7
Children 4-8 years (n=242)		
Not restrained	26	10.7
Can't see	22	9.1
Rear-facing infant seat	0	0.0
Rear-facing convertible	0	0.0
Forward-facing convertible	31	12.8
Booster seat	32	13.2
Seat belts	131	54.1
Children 9-14 years (n=153)		
Not restrained	11	7.2
Can't see	14	9.2
Booster seat	1	0.7
Seat belts	127	83.0

Table 2.6 – Location of child occupant in the vehicle

Location of child occupant in the vehicle	Frequency	Percentage
Infants <1 year		
Front seat	5	10.2
Back seat	44	89.8
Child 1-3 years		
Front seat	14	10.5
Back seat	119	89.5
Child 4-8 years		
Front seat	60	26.2
Back seat	169	73.8
Child >8 years		
Front seat	79	51.6
Back seat	74	48.4

When two children were in the vehicle, 23 children were observed in the front seat:

- 1 case less than 1 year of age
- 4 cases 1 to 3 years
- 12 cases 4 to 8 years
- 13 cases 9 to 14 years

When three children were in the vehicle, 11 children were seated in the front seat:

- 1 child 1 to 3 years
- 4 children 4 to 8 years
- 5 children 9 to 14 years
- 1 child with age missing

Six pairs of children were found to be sitting in the front seat. We suggest that these vehicles were likely pick-up trucks without a rear compartment. In this situation parents and caregivers do not have an alternative other than to seat children in the front of the vehicle.

The proportion of correct child passenger restraint use among all children in Saskatchewan was found to be 55.7 percent, with a weighted estimate of 53.5 percent and a standard error of 2.86 percent (95% CI 47.85% – 59.09%).

Key Point Summary

- 45.4% of drivers with child passengers were observed to be male.
- 84.9% of drivers with child passengers were observed to be Caucasian, with 1.4% Aboriginal and the remaining Middle Eastern, Asian, African Canadian or South East Asian.
- 8.7% of child passengers were observed to be unrestrained, double the national rate of 4.2%.
- Child passengers aged 4 to 8 years had the highest rate for being unrestrained.
- 72.0% of child passengers were seated in the vehicle's backseat.
- Proportion of child passengers in the front seat increased with age.
- 53.5% of child passengers were observed to be correctly restrained.

References

- Committee on Injury and Poison Prevention (2002). Selecting and Using the Most Appropriate Car Safety Seats for Growing Children: Guidelines for Counseling Parents. *Pediatrics* 109; 550(Available at: <http://pediatrics.aappublications.org/content/109/3/550.full.html>) (Accessed 10th April 2012)
- Snowdon A, Hussein A, Ahmed E, Kolga C & Howard A. (2006) Technical Report: Canadian National Survey on Child Restraint use 2006 Completed for Transport Canada, in partnership with AUTO21.
- Snowdon A, Hussein A & Ahmed E. (2010). Technical Report: Canadian National Survey on Child Restraint use 2010 Completed for Transport Canada, in partnership with AUTO21.
- Transport Canada- Child Restraint Use in Canada: 1997 Survey Data. TP 2436, Road Safety Leaflet # CL 9804 E 1998-
http://www.tc.gc.ca/eng/roadsafety/tp-tp2436-cl9804-menu_e-151.htm (Accessed 17th August 2011).

Appendices

Appendix 2.1 – Step by Step Protocol for Data Collectors

Every observer must complete the required training and online quizzes and achieve a score that is approved before collecting any data.

1. Arrive at observation point and locate a safe place to stand
2. Safely park vehicle
3. Retrieve clip board, data collection sheets, and any other items needed to avoid unnecessary trips to the vehicle
4. ***Record location code on EVERY data collection sheet used at that particular site* (could complete this before data collection begins)**
5. ***Enter date***
6. Identify safe place to stand for observation (most sites have been pre-evaluated for safety)
 - Includes sidewalk, grass and median close to the selected intersection
 - Stand closest to the vehicle lane you will be observing
7. Record the start time on site collection summary form
8. When the traffic light turns red, vehicles come to a stop, begin observing each vehicle, recording observations, then proceed to the next vehicle, and complete as many vehicles as possible before they begin to proceed through the intersection.
9. Continue observations until the light turns green
10. Resume data collection at the next red light cycle
11. Record data for the first hour to determine the number of vehicles with children
 - At this time, one individual should be filling out the data collection sheet, while the other individual is counting the

number of vehicles with children

- Data will be collected and recorded at a controlled stop (stop sign or red light) in the lane closest to the observation area

12. **At least 10 vehicles with child occupants must be observed within the first hour or the site is not considered viable, and observation should be discontinued.** If there are more than 10 vehicles observed during this hour, continue with observation for a total of three hours at each site.
13. Should weather change to the point where observations are no longer possible, the survey should immediately be concluded and rescheduled for another day
14. Once you've completed 3 hours total of data collection, ***enter the finish time***
15. When there is sufficient time, enter the data into the provided digital program

Appendix 2.2 - Transport Canada Roadside Observation Data Collection Forms

ROADSIDE SITE OBSERVATION - VEHICLES WITH CHILD PASSENGERS

Date
Day Month Location Code

Driver's Sex: Male.....☐ Female....☐ **Driver Restrained** Y N Unsure...☐

Ethnicity: Asian☐ SE Asian☐ Aboriginal☐ Middle Eastern☐ African Cdn. ☐ Caucasian ☐

Child #1:

AGE:

<1 years) ☐ (4-8years) ☐
(1-3years) ☐ (9-14years) ☐

LOCATION :

FRONT SEAT ☐
BACK SEAT ☐

RESTRAINT TYPE:

Not restrained ☐ Can't See ☐ Circle one of the following:
Rear facing infant seat ☐ Chest Clip at Armpit Y N Can't See Straps Tight Y N Can't See
Rear facing convertible ☐
Forward facing child seat ☐ Tether Fastened Y N Can't See
Booster seat ☐
Seat Belt ☐ Shoulder Belt Y N Can't See Lap Belt Over Hips Y N Can't See

Child #2:

AGE:

<1 years) ☐ (4-8years) ☐
(1-3years) ☐ (9-14years) ☐

LOCATION :

FRONT SEAT ☐
BACK SEAT ☐

RESTRAINT TYPE:

Not restrained ☐ Can't See ☐ Circle one of the following:
Rear facing infant seat ☐ Chest Clip at Armpit Y N Can't See Straps Tight Y N Can't See
Rear facing convertible ☐
Forward facing child seat ☐ Tether Fastened Y N Can't See
Booster seat ☐
Seat Belt ☐ Shoulder Belt Y N Can't See Lap Belt Over Hips Y N Can't See

Child #3:

AGE:

<1 years) ☐ (4-8years) ☐
(1-3years) ☐ (9-14years) ☐

LOCATION :

FRONT SEAT ☐
BACK SEAT ☐

RESTRAINT TYPE:

Not restrained ☐ Can't See ☐ Circle one of the following:
Rear facing infant seat ☐ Chest Clip at Armpit Y N Can't See Straps Tight Y N Can't See
Rear facing convertible ☐
Forward facing child seat ☐ Tether Fastened Y N Can't See
Booster seat ☐
Seat Belt ☐ Shoulder Belt Y N Can't See Lap Belt Over Hips Y N Can't See

**ROADSIDE SITE OBSERVATION -
VEHICLES WITH CHILD PASSENGERS
*NUMBER OF VEHICLES WITH CHILD OCCUPANTS***

Date

--	--

Day

--	--

Month

--	--	--	--	--	--	--	--	--	--

Location Code

Start Time:

--

Finish Time:

--

Number of Vehicles With Child Occupants Observed (First Hour):

--

Number of Vehicles With Child Occupants Observed (Second Hour):

--

Number of Vehicles With Child Occupants Observed (Third Hour):

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CHAPTER III

SASKATCHEWAN CHILD PASSENGER PARKING LOT INSPECTION

Abstract

Child passenger safety restraint systems need to be used and used properly in order to reduce the risk of injury in the event of a motor vehicle crash. The purpose of the parking lot inspection was to measure the use and misuse of child passenger restraint systems in rural Saskatchewan, to compare practices between drivers who had and had not attended a child passenger safety clinic, and to compare other factors (e.g. driver age, sex) to levels of proper child passenger restraint use. Partnering with local enforcement, parking lot inspections were conducted in four locations identified through a sampling strategy guided by Transport Canada. Vehicles with at least one child passenger were directed to the inspection site. A brief set of naturalistic data was collected for all vehicles. All vehicles were inspected for use and misuse of child passenger restraints. Inspection data were recorded only for consenting participants, along with the administration of a driver survey. A total of 32 vehicles were directed to the inspection areas, of which 17 drivers (53%) consented to participate in the study, including 22 children. The limited sample size prevented the completion of the comprehensive data analysis plan, therefore only descriptive and anecdotal analyses are presented. All drivers were observed to be wearing seat belts as they approached the inspection area. Eight children were riding in infant seats, one in a rear-facing convertible seat, 11 in forward-facing seats and two using booster seats. Two additional children using seat belts were excluded from the study.

Purpose

The purpose of this research project was to:

1. Obtain a measure of the current nature and level of proper use and misuse of child passenger restraint systems in rural Saskatchewan.
2. Compare drivers who report attending a Child Safety Clinic in rural Saskatchewan to those who do not with regards to current levels of proper child restraint system use.
3. Compare other factors (e.g. driver age, sex) to levels of proper child passenger restraint use.

Methods

Methodology for this study was based on the Transport Canada Canadian National Survey on Child Restraint Use 2006 (Snowdon et al., 2006). This study was conducted in conjunction with official police-led child passenger safety inspections during the spring of 2011. To achieve these objectives, the following key activities were performed:

1. Partner with enforcement within four rural Saskatchewan areas.
2. Select sites in rural areas in Saskatchewan with sufficient parking areas.
3. Recruit site coordinators (trained child safety seat technicians) in each selected site.
4. Conduct training sessions with data collectors (greeters and observers).
5. Conduct data collection in selected sites.
6. Analyze and summarize data and prepare the report.

The sampling strategy took First Nations communities into consideration, guided by Transport Canada selection criteria (Appendix 3.1). In total, four rural sites throughout Saskatchewan were selected. At least two of the four sites were in the proximity of First Nations communities. Prior to conducting the inspections, each site was assessed for feasibility and suitability for the data collection process.

Appropriate vehicles for the inspection, including at least one child passenger estimated to be zero to 12 years of age was diverted to a designated site within the parking lot by RCMP for three of the sites, and by the Weyburn Police for the Weyburn site. The police officer explained that an official CPS inspection was taking place. Inside the parking area, one of two certified CPS Technicians working with the police officer provided further details about the inspection.

During this time, another study member collected naturalistic observation data regarding the driver, any occupants and status of restraint use information (Appendix 3.2). No identifying information was collected (i.e. license plate number).

One of two study members then introduced him/herself to the driver, introduced the study, and asked the driver to read the informed consent form.

When the driver finished reading the consent form, the study member explained the objectives and procedures, and enquired if the driver would like to participate in this study. If the driver agreed to participate, the consent form was completed prior to the CPS Technician conducting the vehicle inspection regarding child passenger restraint. During the inspection, the study member completed the data collection forms based upon the findings of the CPS Tech inspection (Appendices 3.3 & 3.4) and invited the driver to complete the driver survey (Appendices 3.5-3.7). Information collected included child demographics, direct observation of child restraint use and/or misuse, child weight, child safety seat type, and position of children in the vehicle. The driver survey

collected information regarding driver knowledge of correct restraint use. Upon completion of the data collection, the driver was thanked by the study member, who then moved back into position to wait for next prospective vehicle.

If the driver declined to participate in the study, the CPS Technician conducted the child restraint inspection, but did not collect any data and did not administer the driver survey.

If no CPS issues were identified by the CPS Technician during the inspection, the driver was thanked, received a complimentary information pack (a.k.a. 'goodie bag') and was then free to leave.

In the case where a child four years of age and under (approximately 40 lbs and under) was found to be travelling without adequate restraint use, the driver was offered information and training by a certified CPS Technician. The driver received a complimentary bag of information about proper child safety seat installation/proper use. If a new seat was urgently required, a convertible seat was provided. Seats were made available free-of-charge (provided by the study funding). Booster seats were not provided, as Saskatchewan law does not require their use.

For any drivers who refused to participate in the study, the naturalistic observation form had been completed prior to asking consent, in order to collect basic information regarding the driver, passengers and restraint status of occupants (Appendix 3.2). Regardless of study participation, the driver was provided with information and/or training to correct any CPS issues identified by the official CPS inspection. Please see flow chart in Appendix 3.8.

The data collected during the child restraint parking lot inspection were anticipated to estimate four different rates:

- Child restraint seat use
- Proper child restraint seat use (re: age & weight)
- Correct installation of the child restraint seat in the vehicle
- Correct installation of the child in the child restraint seat

Safe Kids Canada guidelines for age and weight proper restraint use (Table 3.1) were used to identify individual child seat use/misuse parameters (Table 1- Safe Kids Canada, 2001).

Critical child restraint seat misuse areas include: selection (age/weight/fit); installation to vehicle (proximity to air bag, direction of seat, and secure installation); and placement of the child (i.e. harness strap tightness and connection).

Sample Size Calculations

The main objective for inference is to estimate the proportion of drivers/vehicles in compliance with good child safety practises in non-urban areas in Saskatchewan to supplement comparable data already available for urban districts. A sample size of 137 will provide 80 percent power to detect a 10 percent difference rural/urban difference in compliance based on historical estimates of at least 80 percent

compliance in urban areas. In addition, this sample size ensures that confidence intervals for compliance in non-urban areas will be no wider than ± 8.5 percent.

Analysis Plan

Descriptive data are presented as frequencies and percentages. Data analyses were anticipated to compare the current situation of child passenger restraint in rural Saskatchewan with expected rates of CPS use as reported in previous studies based on Canadian urban communities using Chi Square analysis. Logistic regression was anticipated to be used to investigate factors relating to proper CPS use versus non-use. The dichotomous outcome (proper use: yes/no) was anticipated to be related to these factors. These analyses were not possible due to small sample size.

Table 3.1 – Safe Kids Canada Guidelines for Proper Child Safety Seat Use

Type of child safety seat	Safe Kids Canada Guidelines
Stage 1: Rear-facing infant seat	Use until child outgrows weight and height requirements of particular seat (0 to at least 1 year of age)
Stage 2: Forward-facing child seats	Child too heavy or too tall for rear-facing infant seat. At least 1 year of age until ages 4–5 years
Stage 3: Booster seat	Child should weigh at least 18kg (40lb). Ages 4–5 until approximately 9 years.
Stage 4: Seat belt	Child is over 36kg (80lb) and has grown enough to use the seat belt. Approximately 9 years+ of age

Source: Table 1-Safe Kids Canada, 2001

Results

In total, parking lot inspections were conducted at four rural sites within Saskatchewan from June 10th to 14th, 2011: Fort Qu'Appelle, Weyburn, Biggar and Meadow Lake. The sample size of 137 participants was not attained at the Parking Lot Inspections; a total of 32 vehicles were directed to the inspection area, of which 17 drivers (53%) consented to participate in the study (Table 3.2). The 2006 Transport Canada survey reported as high as a 67 percent refusal rate (Snowden et al., 2010). This sample size limitation prevented the completion of the comprehensive data analysis plan, therefore only descriptive and anecdotal analyses are presented.

Naturalistic observations were recorded for the 32 vehicles directed to the inspection area. All drivers were observed to be wearing seat belts as they approached the inspection area, while two children were observed to be travelling unrestrained (Table 3.2).

Of the 17 drivers that participated in the research project, 10 were 20 to 29 years old, 5 were in their thirties and 1 was in the 50 to 59 age group (Table 3.3). Twelve of the 17 drivers were female, and 13 of the 17 drivers were married. Five of the 17 drivers self identified as First Nations, while the others were Caucasian or other ethnicities. Only one driver had not achieved high school graduation, while 8 had attended or graduated from college or university. Income was fairly evenly split between less than \$40,000, \$40-\$80,000, and over \$80,000 per year.

Child Passenger Safety Knowledge

Based upon the driver survey, none of the drivers correctly identified all of the criteria for moving a child from a rear-facing infant seat to a forward-facing seat (Table 3.4). Reasons important to parents who had moved their child from rear-facing to forward-facing were feet hitting the vehicle seat and reaching 20 lbs in weight. Only 45.5 percent of drivers always use the tether strap on their forward-facing child seat, while 90.9 percent planned to use a booster seat when appropriate.

For children currently riding in a forward-facing seat, over half of parents (54.5%) planned to move the child to a booster seat when the child reached 40 lbs or over. A total of 64.7 percent of drivers reported never transporting children younger than 12 years old in the front seat of their vehicle, while a small portion of parents (5.9%) stated that they always transport children in the front seat. Over two-thirds of drivers (77.6%) reported that their driving practices have improved as a result of transporting children. The majority (65%) of respondents had not attended a child passenger safety clinic.

Table 3.2-Basic comparison of participants (n=17) compared to non-participants (n=15)

Characteristics	Participants (n=17)	Non-participants (n=15)	Total
Male drivers	5	8	13
Female drivers	12	7	19
Restrained Drivers	17	15	32
Vehicles with other adults occupant	8	8	16
Number of children	22	22	44
Number of children not restrained	1	1	2

Table 3.3 – Driver demographic information (n=17)

Category	Frequency	Percent
Age		
20-29 Years	10	58
30-39 Years	5	29
50-59 Years	1	6
Sex		
Male	5	29
Female	12	71
Marital Status		
Married/Common-law	13	81
Single	3	19
Race/Ethnicity		
Caucasian & Other	11	65
First Nations	5	29
Missing	1	6
Education Level		
Some high school	1	6
High school graduate	6	35
Some college/university	4	23
College graduate	3	18
University	1	6
Missing	2	12
Income		
Less than \$40,000	4	24
\$40,000 - \$80,000	3	18
More than \$80,000	5	29
Missing	5	29

Table 3.4 – Parental Child Passenger Safety Practices by Seat Type

	Frequency	Percent
Rear-facing Infant Seat (n=9)		
When will your child be ready to be moved from a rear-facing infant seat to a forward-facing child seat? (n=8)		
When my child weighs over 20 lbs	2	22.2
When my child is at least one year old	3	33.3
When my child can stand unassisted	1	11.1
All of the above [CORRECT RESPONSE]	0	0
I don't know	1	11.1
No response	2	22.1
Child Seat (n=11)		
What reasons were important when deciding to move your child to a forward-facing child seat?		
Feet hitting the vehicle seat	4	36.4
Turned one year	2	18.2
Weigh more than 20 pounds [CORRECT RESPONSE]	4	36.4
No response	1	9.1

Table 3.4 – Continued...

When travelling with children using a forward-facing seat, how often do you use a tether strap?		
Always	5	45.5
Often	2	18.2
Rarely	1	9.1
Never	2	18.2
Don't know what a tether strap is	1	9.1
When your child outgrows forward-facing seat, what will your child use next?		
A booster seat [CORRECT RESPONSE]	10	90.9
A seat belt	1	9.1
No response		
At what weight do you plan to move your child out of forward-facing child seat?		
30 lbs and over	1	9.1
35 lbs and over	0	0
40 lbs and over [CORRECT RESPONSE]	6	54.5
I don't know	4	36.4
No response		
All Child Safety Seat Types (n=17)		
Are there times when you transport a child(ren) under 12 years old in the front seat of your vehicle?		
Never	11	64.7
Rarely	3	17.6
Sometimes	1	5.9
Always	1	5.9
No response	1	5.9
Are there times when a child under 8 uses only a seat belt when you are driving?		
Yes	1	5.9
No	15	88.2
No response	1	5.9
Since you have started transporting children, would you say that your driving has changed?		
Definitely more cautious	12	70.6
Somewhat more cautious	1	5.9
No, I have always been cautious	3	17.6
No response	1	5.9
Have you ever attended a child passenger safety clinic?		
Yes	5	29.4
No	11	64.7
No response	1	5.9

Child Passenger Safety Seat Inspection

A total of 24 children were riding in the 17 vehicles with drivers who consented to participate in the study. The child passenger safety seat inspection included eight children riding in infant safety seats, one in a rear-facing convertible seat (an 18-month-old child who was not restrained), 11 using forward-facing safety seats and two using booster seats (Table 3.5). Two child occupants ages 5 and 7 years were found to be restrained using seatbelts, and were not included in this study.

Table 3.5 – Child Passengers' Sex, Relationship to Driver and Type of Restraint in Use

Category	Frequency
Sex	22 children
Male	8
Female	8
Unknown	6
Relationship to Driver	17 drivers
Parent/Foster Parent	11
Grandparent	1
Other family	4
Other	1
Type of Restraint	22 children
Rear-facing Infant Seat	8
Rear-facing Child Seat	1*
Forward-facing Child Seat	11
Booster Seat	2
Seatbelt Only	2**

*Unrestrained

**Excluded from analysis due lack of information

Table 3.6 - Child Restraint Use Status based on Actual Child Weight

Restraint Use Status	Count	Percentage
Correct	17	77
Incorrect	5	23
Total	22	100

Rear-facing Seats

Eight infants were riding in infant safety seats, while only one child presented at the inspection with a rear-facing convertible child seat. (However, this child was unrestrained at the time of the inspection). Four of the rear-facing seats were installed using the Universal Anchorage System (UAS), yet only half had the straps correctly routed and only one was

installed tightly (Table 3.5). Of the five seats installed using the seat-belt, all had the straps correctly routed, but only two had the seat-belt sufficiently snug. One of the nine infants did not have its harness fastened, and only three of the eight with fastened harnesses were sufficiently snug. Five of the eight infants with fastened harnesses did not have the chest clip in the correct location.

Table 3.5 - Rear-facing Seat Inspection Results (n=9)

	Frequency
Universal Anchorage System (UAS) used (n=9)	
Yes	4
No	5
UAS correctly routed (n=4)	
Yes	2
No	2
UAS tight (n=4)	
Yes	1
No	3
Seat-belt fastened (n=9)	
Yes	5
No	4
Seat-belt correctly routed (n=5)	
Yes	5
No	0
Seat-belt snug (n=5)	
Yes	2
No	3
Base used (n=8)	
Yes	6
No	2
Seat reclined (n=8)	
Yes	7
No	1
Harness fastened	
Yes	8
No	1
Shoulder strap fit snugly (n=8)	
Yes	3
No	5
Harness passing over the shoulders (n=8)	
Yes	7
No	1
Chest clip fastened (n=8)	
Yes	8
No	0
Chest clip in correct location (n=8)	
Yes	3
No	5

Forward-facing Child Seats

Eleven children were riding in forward-facing seats. Of these, five were installed using the UAS and six using seat-belts (Table 3.6).

Tightness of the UAS straps or seat-belts was an issue. All harnesses were fastened, with only one improperly positioned over the shoulders.

Most of the harnesses were not sufficiently snug, and more than half of the chest clips were not in the correct position. Fewer than half of the tether straps were correctly fastened.

Table 3.6-Forward-facing child restraint inspection results (n=11)

	Frequency
Universal Anchorage System (UAS) used (n=11)	
Yes	5
No	6
UAS correctly routed (n=5)	
Yes	3
No	1
Unknown	1
UAS tight (n=5)	
Yes	1
No	4
Seat belt fastened (n=11)	
Yes	6
No	5
Seat belt correctly routed (n=6)	
Yes	6
No	0
Seat belt snug (n=6)	
Yes	0
No	6
Harness fastened (n=11)	
Yes	11
No	0
Harness passing over shoulders (n=11)	
Yes	10
No	1
Shoulder strap fit snugly (n=11)	
Yes	2
No	9
Chest clip fastened (n=11)	
Yes	11
No	0
Chest clip location correct (n=11)	
Yes	4
No	7
Tether strap correctly anchored(n=11)	
Yes	5
No	4
N/A (Tether missing) or Unknown	2
Tether strap tight	
Yes	4
No	5
N/A (Tether missing) or Unknown	2

Booster seats

Two children were observed to be riding in booster seats. One of these children weighed less than 40 lbs, and the parent was advised that the child should be in a forward-facing child seat.

Estimation of child weight

Only 13 children had their actual weights recorded, while parent's estimation of their child's weight was recorded for 14 children. The distribution of mean and standard deviation for actual and estimated child weights are presented in Table 3.7. Chi square test showed that there was no statistically significant difference in caregiver estimation and actual weight of the child. The highest proportion of

children fall in the 20 to 40 lbs weight group ($8/14 = 57\%$), with the remainder falling in the 10 to 20 lbs weight group ($6/14 = 43\%$).

Expired Seats

A total of seven expired seats were found during the inspections (Appendix 3.9). Two of the expired seats belonged to a family with two vehicles. This child received one replacement seat. One child was too tall for a new seat, and so that expired seat could not be replaced. Therefore, a total of five seats were given out to families with expired seats. A sixth seat was given to a child riding in a booster seat who should have been in a forward-facing seat.

Table 3.7-Child estimated and actual weight

Child Weight	n	Minimum	Maximum	Mean	Standard Deviation
Actual	13	9 lbs	51 lbs	23.05	11.996
Estimated	14	9 lbs	40 lbs	21.50	9.019

Anecdotal Observations

General Impressions

Although only a limited number of child safety seats were inspected, a number of serious installation and other issues were observed. The most common serious issue was the use of expired seats, which appeared to be among families with more than one child.

Very few seats were correctly installed. The majority of seats required 5 to 10 minutes to adjust. Some people didn't understand the word "tether", but they had it properly installed.

Many fathers did not know the answers to the survey questions, but relied on the mothers to have the best answer.

12 child passenger safety seats were distributed to parents and care givers and the local CPS Technicians in participating communities.

Small issues with the Transport Canada's questionnaire included the year of birth needed updating to include more recent years; and the box for the VIN number was not big enough as they had more than 10 digits.

The CPS technicians at two of the sites were less eager to do the inspections.

The Meadow Lake inspection received media attention (Appendix 3.9). The article was published in the Meadow Lake Progress, available at:
<http://www.meadowlakeprogress.com/ArticleDisplay.aspx?e=3187115>

Site A

The refusal rate was observed to be higher among members of the First Nations community.

One parent commented that the community CPS Technician had given her repeated reminders to attend the local child safety seat clinic, but it took police intervention to bring her in.

One mother specifically came looking for the inspection site because she wanted to have her child safety seat checked.

One expired seat was replaced.

The CPS Technician noted that there are local families who cannot afford to purchase a child passenger seat.

Site B

The police officers were delayed in coming to the inspection site as they were searching for a missing person. Being a small community, the officers were observed to talk with the drivers rather than directing them to the inspection area. Several vehicles (> 6) with child passengers were observed to drive away after speaking with the officer.

One parent had an expired seat in her car. She informed us that her husband's vehicle was the primary vehicle used for transporting the children. The husband was invited to come to the inspection, and the car seat for the younger child in the husband's vehicle was also expired. Furthermore, the family had one child weighing less than 40 pounds who was using a booster seat. This family was provided with two new seats, one for each child.

Site C

The parking lot being used for the inspection was away from the main road, therefore one of the study members had to stand outside the parking lot to ensure drivers directed by the police officer came to the inspection site.

Both police officers did a great job directing vehicles with child occupants to the inspection area. An additional patrol car frequently patrolled the inspection site and adjoining roads for vehicles with child passengers.

One vehicle was observed with a child occupant under 8 years of age riding in the front passenger seat without a booster seat.

Three expired seats were replaced. A fourth child was travelling in an expired forward-facing seat, but the child had also outgrown the seat. A replacement seat could not be provided due the height mismatch.

The local CPS Technician commented that parents and caregivers have poor knowledge about recalled and expired car seat use and safety. Most parents and caregivers seek child safety seat information from unreliable online sources. One mother suggested that there should be an educational program to guide parents and caregivers about best evidence practices of child safety seat use.

Site D

The police officer did a great job despite coming a bit late and leaving a bit early. The local CPS Technician suggested having two officers divert vehicles to the inspection site, as the parking lot had multiple entrances/exits and drivers were observed avoiding the inspection.

In contrast to a previous site, First Nations parents and caregivers were very enthusiastic to participate in our inspection and to learn about child passenger safety.

Many old cars packed with many occupants were observed.

The local CPS Technician commented that in most of the communities where she conducts clinics, the parents and caregivers frequently complain about the access to transportation "We do not have cars. Why do you insist that we buy car seats?"

One father was very annoyed at having to undergo the inspection; however he changed his disposition and was very attentive once the technicians started explaining why the child seat was improperly installed. Afterwards, the technicians commented that it was probably the worst installed seat they had seen during the inspection, with the infant seat facing the wrong direction.

Key Point Summary

- The sample size of 137 participants was not attained at the Parking Lot Inspections.
- Naturalistic observations were recorded for the 32 vehicles directed to the inspection.
- 17 drivers (53%) consented to participate in the study; only descriptive and anecdotal analyses are presented.
- All drivers were observed to be wearing seat belts; two children were observed to be travelling unrestrained.
- 12 of the 17 drivers were female; 13 of the drivers were married; 5 drivers self-identified as First Nations.
- None of the drivers identified all of the criteria for moving a child from a rear-facing infant seat to a forward-facing seat.
- 54.5% of drivers planned to move their child out of the forward-facing seat when the child reached 40 lbs or over.
- 45.5% of drivers always use the tether strap on their forward-facing child seat.
- 90.9% of drivers planned to use a booster seat when appropriate.
- 8 children were riding in infant seats, 1 in a rear-facing convertible seat, 11 in forward-facing seats and 2 using booster seats.
- 2 children ages 5 and 7 years were restrained with seatbelts.
- An 18-month-old child was not restrained in its rear-facing convertible seat.
- For rear-facing seats: UAS routing was an issue, tightness of UAS/seat belts was an issue; 3 of the 8 infants had harnesses sufficiently snug, 5 did not have the chest clip in the correct location.
- For forward-facing seats: 5 of the 11 seats were installed using the UAS and 6 using seat-belts, almost all were correctly routed, not all were sufficiently tight; all harnesses were fastened, 1 not properly positioned over the shoulders, most were not sufficiently snug, more than half of the chest clips were not in the correct position; fewer than half of the tether straps were correctly fastened.

References

- Safe Kids Canada (2011). Child Safety Good Practice Guide: Good investments in unintentional child injury prevention and safety promotion - Canadian Edition. <http://www.safekidscanada.ca/Professionals/Documents/34968-GoodPracticeGuide.pdf> (Last accessed Dec 20th, 2011).
- Snowdon A, Hussein A, Ahmed E, Kolga C & Howard A (2006). Technical Report: Canadian National Survey on Child Restraint use 2006 Completed for Transport Canada, in partnership with AUTO21.
- Snowdon A, Hussein A & Ahmed E (2010). Technical Report: Canadian National Survey on Child Restraint use 2010 Completed for Transport Canada, in partnership with AUTO21.

Appendices

Appendix 3.1 - Transport Canada parking lot survey protocol guidelines

- (a) Parking lot should consist of an entrance that can be observed without difficulty and an area protected from traffic where a team member can safely seek approaching vehicles' consent to participate in the survey
- (b) Traffic flow into the parking lot should not be affected negatively by the survey
- (c) There should be enough space in the parking lot for three observation stations that are at least two parking spaces wide by two parking spaces deep
- (d) Parking lot should be situated within walking distance of a child seat vendor for ethical reasons,
- (e) There should be at least 50 vehicles with child passengers entering the parking lot in a two-hour period

Appendix 3.2 - Transport Canada parking lot survey-Non-Participant Survey (Naturalistic Observation)

NON-PARTICIPANT SURVEY VEHICLES WITH CHILD PASSENGERS

Date
Day Month

Location Code

VEHICLE NUMBER	DRIVER'S SEX		DRIVER RESTRAINED		NUMBER OF CHILDREN IN VEHICLE	NUMBER OF CHILDREN UNRESTRAINED	OTHER ADULT PASSENGERS	
1	M	F	Y	N	1 2 3 4 5	1 2 3 4 5	Y	N
2	M	F	Y	N	1 2 3 4 5	1 2 3 4 5	Y	N
3	M	F	Y	N	1 2 3 4 5	1 2 3 4 5	Y	N
4	M	F	Y	N	1 2 3 4 5	1 2 3 4 5	Y	N
5	M	F	Y	N	1 2 3 4 5	1 2 3 4 5	Y	N
6	M	F	Y	N	1 2 3 4 5	1 2 3 4 5	Y	N
7	M	F	Y	N	1 2 3 4 5	1 2 3 4 5	Y	N
8	M	F	Y	N	1 2 3 4 5	1 2 3 4 5	Y	N
9	M	F	Y	N	1 2 3 4 5	1 2 3 4 5	Y	N
10	M	F	Y	N	1 2 3 4 5	1 2 3 4 5	Y	N
11	M	F	Y	N	1 2 3 4 5	1 2 3 4 5	Y	N
12	M	F	Y	N	1 2 3 4 5	1 2 3 4 5	Y	N
13	M	F	Y	N	1 2 3 4 5	1 2 3 4 5	Y	N
14	M	F	Y	N	1 2 3 4 5	1 2 3 4 5	Y	N
15	M	F	Y	N	1 2 3 4 5	1 2 3 4 5	Y	N
16	M	F	Y	N	1 2 3 4 5	1 2 3 4 5	Y	N
17	M	F	Y	N	1 2 3 4 5	1 2 3 4 5	Y	N
18	M	F	Y	N	1 2 3 4 5	1 2 3 4 5	Y	N
19	M	F	Y	N	1 2 3 4 5	1 2 3 4 5	Y	N
20	M	F	Y	N	1 2 3 4 5	1 2 3 4 5	Y	N
21	M	F	Y	N	1 2 3 4 5	1 2 3 4 5	Y	N
22	M	F	Y	N	1 2 3 4 5	1 2 3 4 5	Y	N
23	M	F	Y	N	1 2 3 4 5	1 2 3 4 5	Y	N
24	M	F	Y	N	1 2 3 4 5	1 2 3 4 5	Y	N

Appendix 3.3 - Transport Canada parking lot survey-OBSERVATION FORM, Part 1 (Inspection Check Sheet)

PARKING LOT SURVEY – OBSERVATION FORM

Location Code

CASE NO. - - Date

VIN NO.

Day Month

DRIVER'S AGE	DRIVER'S SEX	VEHICLE TYPE
1. Under 25 <input type="checkbox"/>	1. Male <input type="checkbox"/>	1. Passenger Car <input type="checkbox"/>
2. 25-50 <input type="checkbox"/>	2. Female <input type="checkbox"/>	2. Minivan/SUV <input type="checkbox"/>
3. Over 50 <input type="checkbox"/>		3. Pickup Truck <input type="checkbox"/>
		4. Unsure <input type="checkbox"/>

BELTED STATUS BY SEATING POSITION *(please enter all occupants)*

LEGEND:

- A Belted Adult
- B Unbelted Adult
- C Child Occupant
- D Unsure

1 DRIVER A <input type="checkbox"/> B <input type="checkbox"/> C <input checked="" type="checkbox"/> D <input type="checkbox"/>	2 A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/>	3 A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/>
4 A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/>	5 A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/>	6 A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/>
7 A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/>	8 A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/>	9 A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/>

TOTAL NUMBER OF CHILDREN IN VEHICLE: _____

TOTAL NUMBER OF CHILDREN OBSERVED: _____

Appendix 3.4 - Transport Canada parking lot survey-OBSERVATION FORM, Part 2 (Inspection Check Sheet)

CHILD RESTRAINT SURVEY – OBSERVATION FORM

CHILD 1

SEATING POSITION: 2 3
4 5 6
7 8 9

IS CHILD RESTRAINED? Yes ☐ No ☐ SEX OF CHILD: M ☐ F ☐

BIRTH YEAR: 2005 2004 2003 2002 2001 2000 1999 1998 1997 1996 1995 1994 1993 1992 1991
BIRTH MONTH: JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

WEIGHT OF CHILD: Actual _____ (lbs) _____ (kg) Caregiver estimate _____ (lbs) _____ (kg)

MAKE OF CR: Cosco/Dorel/Eddie Bauer ☐ Century/Graco ☐ Evenflo ☐ Peg Perego ☐ Other ☐ NK ☐

Fill the block corresponding to the restraint used.

INFANT SEAT:

Rear-facing ☐ Forward-facing ☐

- Are UAS latches used?Yes ☐ No ☐
Correctly routed?Yes ☐ No ☐
Tight?Yes ☐ No ☐
- Seat belt
Fastened?Yes ☐ No ☐
Correctly routed?Yes ☐ No ☐
Snug (max. 1 inch of side movement)?Yes ☐ No ☐
- Is a base used?Yes ☐ No ☐
- Is seat reclined at approx. 45°?Yes ☐ No ☐
- Harness
Type of harness?
• 3 point☐
• 5 point☐
Fastened?Yes ☐ No ☐
Passing over the shoulders?Yes ☐ No ☐
Snug (1 finger)?Yes ☐ No ☐
Doubled back?Yes ☐ No ☐ N/A ☐
Chest clip fastened?Yes ☐ No ☐ N/A ☐
Correct chest clip location?Yes ☐ No ☐

BOOSTER:

Type? High back ☐ No back ☐ Shield ☐ Built-in ☐

- Seat belt fastened around child?Yes ☐ No ☐
- Is lap belt placed low and snug across the hips?Yes ☐ No ☐
- Is shoulder belt placed properly in front of child?Yes ☐ No ☐ N/A ☐
- Is UAS used?Yes ☐ No ☐ N/A ☐
- Is tether used?Yes ☐ No ☐ N/A ☐

CHILD SEAT:

Rear-facing ☐ Forward-facing ☐

- Are UAS latches used?Yes ☐ No ☐
Correctly routed?Yes ☐ No ☐
Tight?Yes ☐ No ☐
- Seat belt
Fastened?Yes ☐ No ☐
Correctly routed?Yes ☐ No ☐
Snug (max. 1 inch of side movement)?Yes ☐ No ☐
- Harness
Type of harness?
• 5 point webbing☐
• T-shield☐
• Overhead shield☐
Fastened?Yes ☐ No ☐
Passing over the shoulders?Yes ☐ No ☐
Snug (1 finger)?Yes ☐ No ☐
Chest clip fastened?Yes ☐ No ☐ N/A ☐
Correct chest clip location?Yes ☐ No ☐
- Tether strap (skip if seat is rear-facing)
Type of tether?
• Missing☐ Double-back Yes ☐ No ☐
• Strap slide☐
• Latch plate☐
Correctly anchored?Yes ☐ No ☐
Tight?Yes ☐ No ☐

SEAT BELT:

- Seat belt fastened?Yes ☐ No ☐
- Is lap belt placed low and snug across the hips?Yes ☐ No ☐
- Is shoulder belt placed properly in front of child?Yes ☐ No ☐ N/A ☐

BUILT-IN CHILD SEAT:

- Is harness fastened?Yes ☐ No ☐
- Passing over the shoulders?Yes ☐ No ☐
- Snug (1 finger)?Yes ☐ No ☐
- Chest clip fastened?Yes ☐ No ☐ N/A ☐
- Correct chest clip location?Yes ☐ No ☐ N/A ☐

Appendix 3.5 - Transport Canada parking lot survey-Parent/care giver survey form, Part 1

SURVEY OF PARENTS' USE OF CAR SEATS FOR CHILDREN

PLEASE REFER TO SEAT PICTURES DISPLAYED HERE TO ANSWER THE QUESTIONS BELOW.



Infant Seat



Child Seat



Integrated Car Seat



Booster Seat



Seat Belt*

*Image provided by the Virginia Department of Education, USA

CASE NO. - -
(Location Code)

- Caregiver relationship:
☐ Parent/Foster ☐ Grand parent ☐ Other family ☐ Other
- Duration of trip today:
☐ Less than 20 mins ☐ More than 20 mins

DRIVERS WHO TRAVEL WITH AN UNRESTRAINED CHILD, PLEASE COMPLETE SECTIONS 1, 6, 7
 DRIVERS WHO TRAVEL WITH A CHILD USING AN INFANT SEAT, PLEASE COMPLETE SECTIONS 2, 6 AND 7
 DRIVERS WHO TRAVEL WITH A CHILD USING A CHILD SEAT, PLEASE COMPLETE SECTIONS 3, 6 AND 7
 DRIVERS WHO TRAVEL WITH A CHILD USING A BOOSTER SEAT, PLEASE COMPLETE SECTIONS 4, 6 AND 7
 DRIVERS WHO TRAVEL WITH A CHILD USING A SEAT BELT, PLEASE COMPLETE SECTIONS 5, 6 AND 7

SECTION 1: UNRESTRAINED CHILDREN

- What are the reasons why your child is not using a child seat or seat belt?
☐ I don't feel it's necessary
☐ Child seats are too expensive
☐ My child refuses to be restrained
☐ Too much trouble
☐ Never got around getting the seat installed
☐ Other
- Are you aware that there is a fine for unrestrained occupants?
☐ Yes
☐ No

SECTION 2: CHILDREN USING INFANT SEATS

- When will your child be ready to be moved from a rear-facing infant seat to a forward-facing child seat?
☐ When my child weighs over 20 lbs
☐ When my child is at least one year old
☐ When my child can stand unassisted
☐ All of the above
☐ I don't know



Transport Canada

Canada

Appendix 3.6 - Transport Canada parking lot survey-Parent/care giver survey form, Part 2

SURVEY OF PARENTS' USE OF CAR SEATS FOR CHILDREN

SECTION 3: CHILDREN USING CHILD SEATS

1. What reasons were important when deciding to move your child to a forward-facing child seat? (check all that apply)
 - ☐ When my infant's feet were hitting the back of the vehicle seat
 - ☐ When the straps of the infant seat were too tight to fit over my child
 - ☐ When the seat was needed by another child in the family
 - ☐ When my child turned 1 year old
 - ☐ When my child weighed more than 20 lbs
 - ☐ When my child was standing unassisted
 - ☐ I don't know/I don't remember
2. Where is the tether strap located? (Please show)
 - ☐ Tether
 - ☐ Harness
 - ☐ Other
3. When traveling with children using a forward-facing seat, you use a tether strap: (check one)
 - ☐ Always ☐ Often ☐ Sometimes ☐ Rarely
 - ☐ Never ☐ Don't know what a tether strap is
 - ☐ Using an integrated car seat

If the tether strap is not always being used please indicate the reasons. (Check all that apply)

 - ☐ Don't know how to use the tether strap
 - ☐ The vehicle does not have an anchor for the tether strap
 - ☐ Don't feel the tether strap is necessary
 - ☐ The car seat is often moved from one vehicle to another
 - ☐ Tether strap is too difficult to use
4. When your child outgrows this seat, what will your child use next?
 - ☐ A booster seat
 - ☐ A seat belt
 - ☐ I don't know yet
5. At what weight do you plan to move your child out of this forward-facing child seat?
 - ☐ 30 lbs and over
 - ☐ 35 lbs and over
 - ☐ 40 lbs and over
 - ☐ I don't know

SECTION 4: CHILDREN USING BOOSTER SEATS

1. What reasons were important when you decided to move your child to a booster seat? (check all that apply)
 - ☐ When the seat was needed by another child in the family
 - ☐ When my child turned 5 year old
 - ☐ When my child weighed more than 40 lbs
 - ☐ My child was not comfortable in a child seat
 - ☐ My child refused to sit in a child seat
 - ☐ My child no longer fits in a child seat
2. What is the appropriate weight to move your child out of a booster seat?
 - ☐ 60 lbs
 - ☐ 80 lbs
 - ☐ I don't know

SECTION 5: CHILDREN USING SEAT BELTS

1. Did your child use a booster seat? ☐ Yes ☐ No
 If No, please indicate the reasons (you may check more than one)
 - ☐ The child has used it but is now ready to use a seat belt only
 - ☐ The child refuses to sit in a booster seat
 - ☐ The seat belt does not fasten properly when the booster seat is used
 - ☐ We do not own a booster seat
 - ☐ Not required by law

Appendix 3.7 - Transport Canada parking lot survey-Parent/care giver survey form, Part 3

SURVEY OF PARENTS' USE OF CAR SEATS FOR CHILDREN

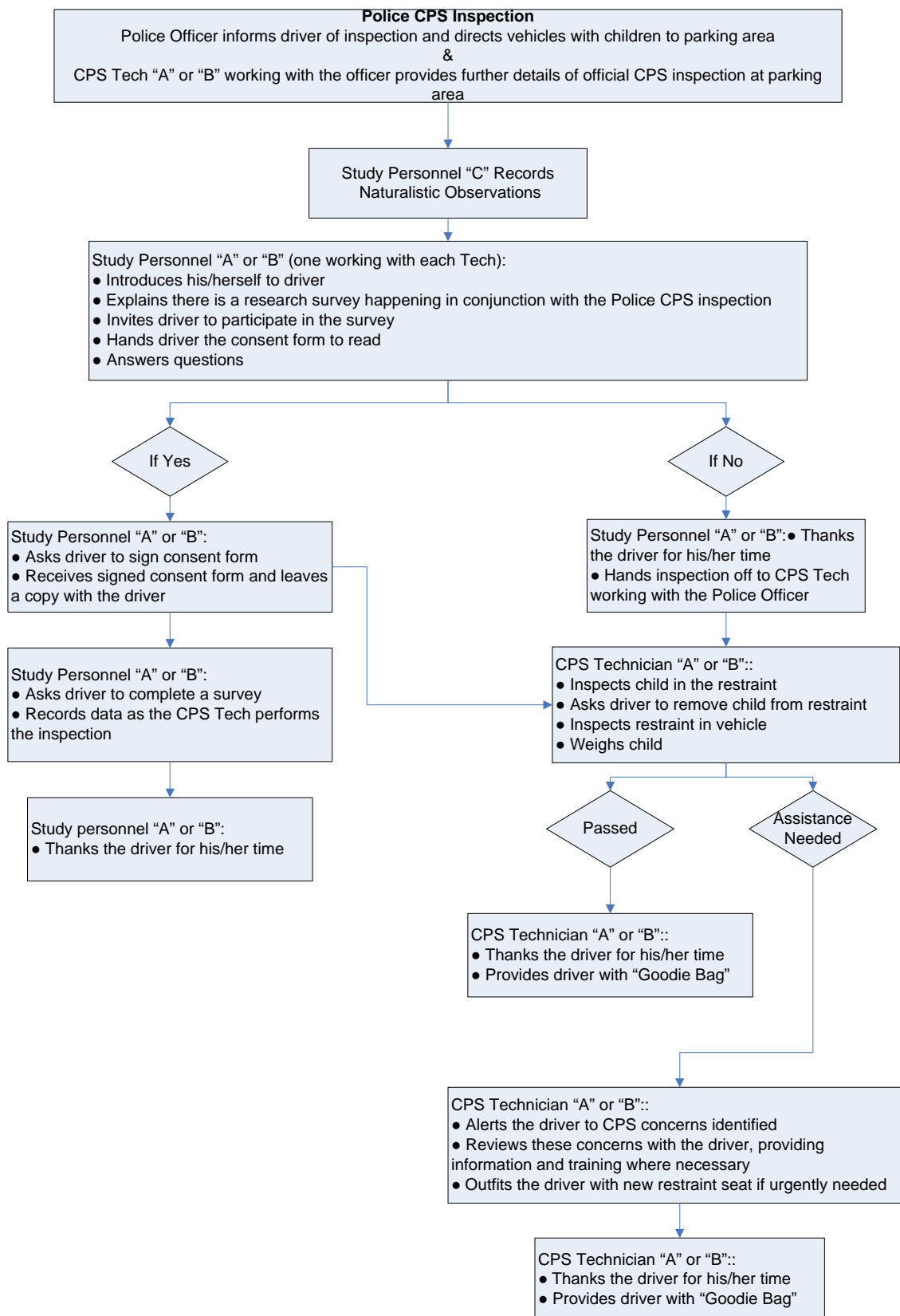
SECTION 6: ALL DRIVERS PLEASE ANSWER THE FOLLOWING:

- Are there times when you transport a child(ren) under 12 years old in the front seat of your vehicle?
☐ Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Always
 If yes, please indicate when you use the front seat for children:
 (You may check more than one reason)
☐ My vehicle has only one row of seats
☐ My child won't sit anywhere else
☐ I let my child sit in the front seat as a reward
☐ I like having my child sitting next to me
☐ I don't have enough back seats for children to sit in
☐ My child is big enough to sit safely in the front
☐ I like being able to see my child
- Are there times when a child under 8 uses only a seat belt when you are driving? ☐ Yes ☐ No
 If yes, please indicate when (you may check more than one)
☐ When I am transporting children other than mine
☐ On short trips in the city
☐ On short trips in the neighbourhood
☐ On the highway
☐ When I am transporting children older than 4½ years old
☐ Other
- How many times per week do you transport children?
☐ Less than once a week ☐ Once a week
☐ 2 - 3 times a week ☐ 4 - 6 times a week
☐ Every day ☐ Several times a day
- Where did you get information about vehicle safety for children?
 (Please check all that apply)
☐ Family, friends or neighbors ☐ Car Seat Instruction Manual
☐ Hospital ☐ Car Seat clinic
☐ Prenatal classes ☐ Family doctor or Pediatrician
☐ Provincial government ☐ Internet
☐ Transport Canada ☐ Other
 (1-800 line, pamphlet, website)
- Since you have started transporting children, would you say that your driving has changed?
☐ Definitely more cautious
☐ Somewhat more cautious
☐ Perhaps a little more cautious
☐ No, my driving habits have not changed
☐ No, I have always been cautious

SECTION 7: DEMOGRAPHIC INFORMATION OF DRIVER:

- Driver's age:
☐ Under 20
☐ 20-29
☐ 30-39
☐ 40-49
☐ 50-59
☐ Over 60
- Marital status:
☐ Single
☐ Married/Common Law
☐ Separated/Divorced
☐ Widowed
- Country of birth:
☐ Canada / USA → First Nation: ☐ Yes ☐ No
☐ Central and South America / Mexico
☐ Europe → ☐ East ☐ West
☐ Middle East
☐ Africa
☐ India / Pakistan
☐ Asia
☐ Australia
- Yearly Household Income:
☐ Under \$40,000
☐ \$40,001 - 60,000
☐ \$60,001 - 80,000
☐ Over \$80,000
- Highest level of education completed:
☐ Elementary school
☐ Some High School
☐ High School Graduate
☐ Some College/ University
☐ College Graduate
☐ University Graduate
- Have you ever attended a child passenger safety clinic?
☐ Yes
☐ No

Appendix 3.8 - Police CPS Inspection Flow Chart



Appendix 3.9 - Overview of Parking Lot Inspections

Table A3.9-1 – Overview of Parking Lot Inspections

Location	Vehicles Observed	Survey Participants	Expired Seats	Vehicles with Children (0-4 yrs) Travelling without a Car Seat
Fort Qu'Appelle	12	5	1	0
Weyburn	4	2	2	0
Biggar	11*	6	4**	2
Meadow Lake	5	4	0	1***
Total	32	17	7	3

* One vehicle had its child passenger seat inspected, although there was not a child in the vehicle at the time

** One child was travelling in an expired forward-facing seat, but the child had also outgrown the seat. A replacement seat could not be provided due the height mismatch.

*** An infant was riding on a parent's lap, however a new child passenger seat could not be provided as there was no space in the overcrowded vehicle.

Appendix 3.10 - The Meadow Lake Progress: Researchers check for child car seat safety

Researchers check for child car seat safety

By Mark Melnychuk

Posted 9 months ago

Meadow Lake drivers with babies on board their vehicles were asked to take part in a new survey on how well Saskatchewan motorists use child safety seats.

Researchers from Vancouver, B.C. conducted the survey in the parking lot of the Meadow Lake Mall on June 16. They were assisted by an RCMP officer who pulled over anyone carrying a child in their car. The city was one of four Saskatchewan communities to be included in the survey.

SGL summer students gave every parent a written survey. They also inspected child seats to see if they were installed properly and appropriate for the child's age, weight and height.

The survey was commissioned by the Ministry of Health's Acquired Brain Injury Partnership Project. The organization is doing the inspections to find out if their efforts to educate parents on proper child seat usage are paying off.

"We're hoping to find out whether what we're doing is making a difference," said Kelly Froehlich, a worker with the Ministry.

Bailey Edelman was one mom who was pulled over for an inspection. She found out her six-month old daughter Amaiah-Joy's seat was secured properly, but got some tips on how to make her ride a bit safer.

"I think its super important to be informed, especially if you're a new parent and you don't have that knowledge," said Edelman.

Other parents pulled over were not being so responsible. Researchers reported seeing one vehicle where a child was sitting on their parent's lap in the driver's seat, as well as a compact car that was holding four adults and two children.

"If an accident occurs, that's compromising your child's safety," said Dr. Ediriweera Desapiya, a research associate with B.C. Injury Research and Prevention Unit.

Any drivers not using a proper child seat were given a new one for free.

The few unsafe drivers that were spotted could be representative of a larger problem in Saskatchewan. A recent survey by Transport Canada found Saskatchewan had the country's lowest rate of correct child seat safety use at 53 per cent. The province is tied with Manitoba for having the highest rate of unrestrained child passengers at 8.7 per cent.

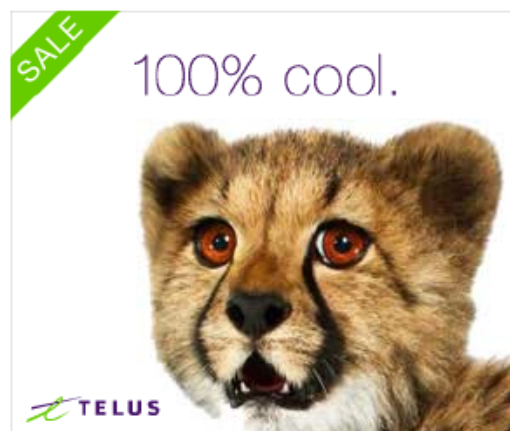
However, the provincial government doesn't believe the study got the most accurate picture of the province. That's why it's conducting its own studies in rural areas and First Nation communities.

While the science behind the design of child safety seats is top notch, Froehlich reminded parents that they still need to be careful.

"The seat is only as safe as the individual installing it," said Froehlich.



Toni Colquhoun makes sure six-month old Amaiah-Joy Edelman is strapped in safely at a child seat safety check held in Meadow Lake on June 16. Photo by Mark Melnychuk



Advertisement

Article ID# 3187115

Tools    

CHAPTER IV

SASKATCHEWAN CHILD PASSENGER SAFETY CLINIC CLIENT SURVEY

Abstract

Child passenger safety seat installation clinics, known as Car Seat Clinics, have become a key component in educating parents and caregivers on child occupant protection. Program evaluation is an important means of ensuring car seat clinics are meeting educational goals and providing measurable benefits to the public. This evaluation of the Car Seat Clinics run by the Saskatchewan Prevention Institute and Saskatchewan Government Insurance (SGI) describes who is attending these clinics in terms of basic demographic information (age group, sex, education, income). The child passenger safety knowledge of clients who recently attended a clinic was assessed, and client feedback regarding their clinic experience and suggestions for change collected.

Purpose

The specific objectives of this study are:

1. To determine who is attending the Child Passenger Safety Clinics in Saskatchewan.
2. To assess child passenger safety knowledge of clients who recently attended a Child Passenger Safety Clinic in Saskatchewan.
3. To collect client feedback regarding the Child Passenger Safety Clinics in Saskatchewan.

Methods

Study design

This is a cross-sectional study of parents and caregivers who attended Child Passenger Safety clinics from July 2010 to September 2011. Clinics are available throughout Saskatchewan. Parents and caregivers may attend by appointment or by drop-in to have their infant or child seat checked by trained volunteers, and

receive instruction on proper use and installation.

Inclusion/Exclusion Criteria

Inclusion criteria: Clients who attended Child Passenger Safety clinics offered via the Saskatchewan Prevention Institute from July 2010 to September 2011, who provided their contact information for the purposes of evaluation, and who are able to understand written and spoken English.

Exclusion criteria: Inability to understand written and spoken English.

Sample Size

Approximately 2,000 to 3,000 clients are seen each year at Child Passenger Safety Clinics throughout Saskatchewan. In order to attain a representative sample of this population, 400 clients who attended a clinic between July and December 2010 were to be recruited to participate in a post-clinic online or telephone survey. This six-month period was not sufficient to recruit 400 participants; therefore the study period was extended until September 30th, 2011.

Recruitment

Participants had been pre-recruited by SGI when attending a Child Passenger Safety Clinic. All participants attending a clinic receive a standardized 20-30 minute education session on the correct use of child passenger restraints. In addition, clients receive brochures and a booklet published by Saskatchewan Prevention Institute and SGI about correct child restraint use and traffic safety. Each session ends when the client is able to demonstrate correct child restraint use. Education sessions include hands-on training provided by a provincially certified Child Passenger Safety Technician who has completed standardized training plus ongoing

training developed by Saskatchewan Prevention Institute.

From July to December, 2010 clinic technicians distributed a request for contact information in regards to an upcoming evaluation by the BC Injury Research and Prevention Unit, on behalf of SGI. Following contact from this project team, either by e-mail or by telephone, clients were requested to consent to participate in this survey.

Clinic clients were contacted via telephone or e-mail, depending on the information they provided. Telephone contact was extremely difficult to establish, as many people did not answer their telephones, and although phone messages were left, potential participants were not expected to call back to British Columbia. To address this issue, a student residing in Saskatchewan was hired to complete recruitment, both by telephone and e-mail. Further, the chance to enter a draw for an *iPad 2* was introduced to the project in order to increase participation rates. The draw for the *iPad 2* was made at the ABI Advisory Group meeting in Saskatoon on February 28, 2012.

Survey Development

A questionnaire was used to collect demographic information from the study participants, including participants' age group, sex, ethnicity, educational level, income level, number and ages of children. The demographic variables selected correspond to those presented in the Community Profiles using 2006 Census information, publicly available aggregated data. These data will allow for the comparison of the clinic clients with the Saskatchewan population based on these community profiles. Further, relevant child seat knowledge was assessed, whether they received previous instruction on car seat use or installation, and feedback regarding the clinic experience will be compiled.

Data Collection

Clinic clients who consented to participate were asked to complete a standardized questionnaire via either online access (using FluidSurveys) or telephone interview. The follow-up period was 3 to 4 months following the clinic visit to

minimize the chances that the child may have switched from one seat type to another. If telephone interview was selected by the client, the interviewer was instructed to allow as much time as necessary for the participant to feel comfortable answering the questions. The interviewer repeated questions if requested by the participant. Data collected by telephone was entered directly into the FluidSurveys online questionnaire.

Analysis Plan

Descriptive data are presented as frequencies and percentages. Unstructured comments and suggestions are also presented.

Results

A total of 327 *Request for Contact Information* forms were completed at CPS Clinics and submitted to Saskatchewan Prevention Institute, and 140 (42.8%) Clinic Clients responded to the survey. Of these respondents, 53 percent (74) had attended the clinic by appointment as compared to attending by drop-in.

The majority (85%) of respondents were mothers, with 9 percent fathers and the remaining being an aunt, foster parents and a Program Supervisor for clients (Table 4.1). More than half (54%) were between the ages of 30 and 39 years, with 36 percent being 20 to 29 years of age. Almost all of the respondents self-identified as Caucasian (92%), with 4 percent self-identifying as Aboriginal and the remaining as Asian, Ukrainian or Multiple. Recent Immigrants since 2001 accounted for 3.5 percent of the sample. Nearly all respondents speak English in the home (98%), with others reporting German, Hindi and Cree. The sample reported high education levels, with 47 percent having received a university education and a further 26 percent with a college education. Annual income was reported to be \$60,000 or greater among 76 percent of respondents.

Over half of respondents (58%) had one child only, 30 percent had two children and 12 percent had up to five children. Clinic Clients attended the clinics to learn about rear-facing seats (79%), forward-facing seats (51%) and

booster seats (17%). Many respondents were interested in more than one seat type at the

time of the clinic.

Table 4.1 – Clinic Client demographic information (n=140)

Category	Frequency	Percent
Relationship to Child		
Mothers	119	85.0
Fathers	12	8.6
Other	8	5.6
Missing	1	0.7
Age		
<15 Years	2	1.4
15-19 Years	0	0.0
20-29 Years	50	35.7
30-39 Years	75	53.6
40-49 Years	8	5.7
50-79 Years	3	2.1
Missing	2	1.4
Marital Status		
Married/Common-law	132	94.3
Single	8	5.7
Race/Ethnicity		
Caucasian	129	92.1
Aboriginal	6	4.3
Other	3	2.1
Missing	2	1.4
Immigrant Status		
Non-immigrant	133	95.0
2001-2006	3	2.1
Since 2007	2	1.4
Missing	2	1.4
Language Spoken at Home		
English	137	97.9
Other	3	2.1
Education Level		
No certificate/diploma/degree	1	0.7
High school or equivalent	27	19.3
Apprentice/Trades/College	44	31.6
Some university	1	0.7
University	66	47.1
Missing	1	0.7
Income		
Less than \$40,000	12	8.6
\$40,000 - \$59,000	15	10.7
\$60,000 or more	106	75.7
Missing	7	5.0

For three-quarters of respondents, this had been their first clinic experience. For those clients who attended the CPS clinic for rear-facing seat installation and use, 77 percent self-rated their rear-facing seat knowledge as 8 or higher on a scale of 1 to 10 (Figure 4.1). For those who attended for forward-facing seats, 61 percent self-rated their knowledge as 8 or higher (Figure 4.2); and for booster seats, only 54 percent self-rated as 8 or higher (Figure 4.3).

For all respondents, 84 percent correctly identified the back middle seat as the safest location in the vehicle for a child to be placed. One-third (35%) reported having a child seated in the back middle seat, 69 percent had a child in the back passenger-side seat, and 35 percent had a child in the back driver-side seat. A third row back seat was also used for children by 6 percent of respondents. There were no children reported to be seated in the front seat.

The majority of respondents (84%) were currently driving the same vehicle that they had driven to the CPS Clinic. The oldest vehicles taken to the CPS clinics were from 1996. Nearly half (46%) of vehicles were from 2007 or newer.

For those attending the clinic in reference to rear-facing child passenger seats:

- 72% knew how to test if the seat is installed tightly enough
- 80% knew which harness slot should be used based on the child's shoulder level
- 67% knew how to test if the harness straps are tight enough
- 96% knew where the chest clip should be placed

- 60% knew when to move a child to a forward-facing seat

For those attending the clinic in reference to forward-facing child passenger seats:

- 59% knew if seat was installed tightly enough
- 49% knew which harness slot should be used
- 61% could tell if the harness was tight enough
- 89% knew where the chest clip should be
- 68% knew how to use the tether strap
- 61% knew how long to keep a child in a forward-facing seat
- 35% knew how to determine when a child has outgrown a seat

For those attending the clinic in reference to child passenger booster seats:

- 67% knew when to move a child from a booster seat to the seat belt
- 75% knew when a high-back booster seat should be used

Among all respondents, 78 percent rated their satisfaction with the clinic experience as a 9 or 10 out of 10 (Figure 4.4).

Three children (5%) were involved in a motor vehicle crash since the time of the clinic. No injuries were reported.

Figure 4.1 – Rear-facing child safety seat self-rated knowledge

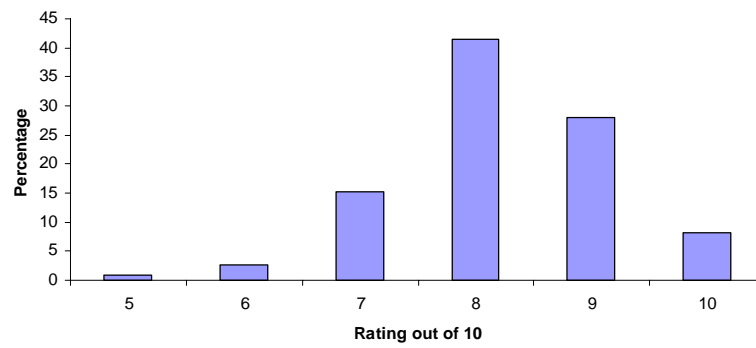


Figure 4.2 – Forward-facing child safety seat self-rated knowledge

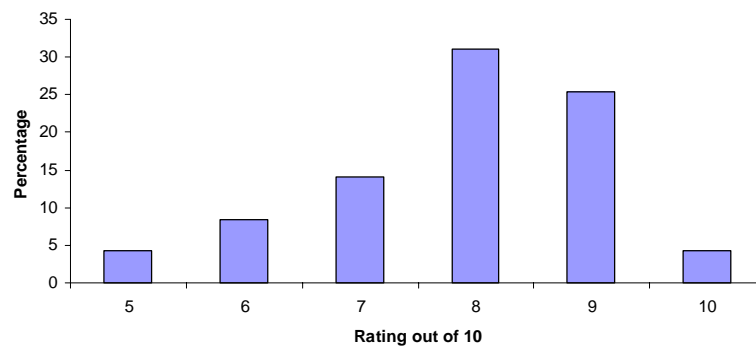


Figure 4.3 – Booster seat self-rated knowledge

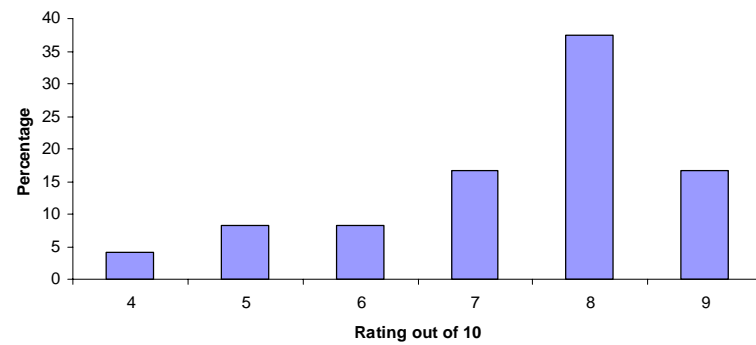
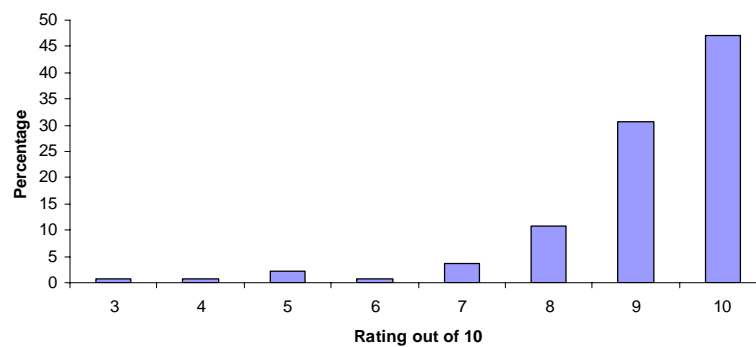


Figure 4.4 – Overall CPS clinic satisfaction



Comments

Comments regarding clients' Car Seat Clinic experiences included:

- Great that clinics are available in rural areas now.
- I always go. It makes me feel more confident in the safety of my children and my knowledge of the car seats we are using.
- I am happy with the clinic. I found out I was doing everything wrong. I really liked that the person made me do everything myself. This allowed me to learn a lot.
- I feel much more confident with child seats. I used to never want to take them out and have to put them back in - I always made my husband. I am the one that does this now.
- I forgot to ask what to do about the tether strap if there is no spot in vehicle to latch to. I haven't allowed them to travel in their grandparents' vehicles for this reason.
- I had a pleasant experience, and feel that my car seat is installed safely.
- I hope they continue with these clinics. I find it quite handy and both of my sons have attended them as well.
- I think it's great to have clinics available for parents. They were very helpful.
- I was very impressed with the facilitator's knowledge and everyone was really friendly. I had to wait an extremely long time, however. I think these types of clinics should be mandatory as so many people don't install their car seats correctly. While I drive the Ford Explorer more frequently, when I drive the other vehicle, it is nearly impossible to get the seatbelt and tether strap tight enough. When I asked the facilitator about this, he said my husband should do it; however, my husband is away at work 2 weeks out of every month.
- It was excellent. The staff was knowledgeable, friendly and helpful. They installed the car seat properly which I wasn't able to do myself. I will definitely go back when it's time for my granddaughter to go into a booster seat.
- It was very informative. I would like to attend again to ensure my daughter's seat is correctly installed for forward facing.
- The assistants were extremely helpful and full of information. I would definitely recommend this clinic to anyone/everyone I know!
- The clinic was very helpful and the person that conducted the clinic was very knowledgeable and answered all of our questions.
- The technicians were very helpful. The car seat we had purchased was not going to fit properly in our car, so they suggested numerous other makes and models that might work.
- They are very educational and I have learned something new with each one I have attended. More people should attend them!!!
- This clinic gave me peace of mind because I was afraid I wasn't putting the seat in properly.
- We were using a front-facing car seat for our 4 year old, not knowing until this clinic that it converted to a booster seat using the car's seatbelt. Was very impressed with the co-ordinators of this clinic and will go again in the future.

Other Feedback

- I was disappointed that I was not taken seriously about the point I made that my seat had been approved by the Yellowknife, NT fire department to use past its expiry date. The clinic host could not tell me why Saskatchewan would not do extensions and would not even consider doing an inspection like it - how come one group says it's safe and yet here (though it is in great shape to pass safety standards) it was disapproved only because of the expiry date stamped on the back. As a result I did go get a new seat because I did not trust your survey group to put a mark against me for using an expired seat. This can get expensive for young families that have children needing new seats every few years.

- I went to make sure that the seat we had purchased for my preemie was suitable for her; they hardly looked at the seat or my child in it. They took my 4 year old son out of his booster to see about him being without a booster (he is no where near ready) and wound up taking my booster apart and did not know how to put it back together, thank god I had my second one in the box of the truck as I had also been transporting my niece earlier on that day. Technicians should have more product knowledge!
- The ladies from SGI who completed the survey didn't speak to me much at all. They simply checked to see if the seat was in the vehicle properly. Most of the information I know was read from my user manual from my *Graco Snuggly* car seat or from my sister who previously had her infant in a rear facing seat.
- The ladies talked mostly about the exact car seat I had and not about the safety of others in different stages of growth.
- Thought it was odd to use swimming noodles to level the seat.
- Very tough to get an appointment, I waited for months, which is unacceptable in my opinion. I find the recommendation of using fingers to determine if a strap is tight enough, a poor choice. My fingers are much smaller than my husbands so whose fingers do we use. I found it humorous that I was able to get the car seat in tighter than the clinic but they claim that it was much better after they reinstalled it.

Suggestions

- I booked the clinic through SGI, and they stated that a child should remain rear-facing until the age of 2. Then when I arrived at the clinic, it was run through MD Ambulance, and they stated that a child should be moved forward facing once they have reached the age of one, or above 22lbs and can stand on their own. I feel that the two agencies should follow the same guidelines, as it makes it confusing for new parents.
- I found it a little frustrating that I had to remove and reinstall both car seats for them to be inspected. I had a two year old with me and I was 8 months pregnant. It would have been nice if they could have inspected them installed or assisted me in reinstalling them.
- It would be beneficial to have a list of when car seats "expire" since some car seats only have the date of manufacture, not the expiry date.
- The only reason I heard about it was I was driving around that day and heard on the radio. Possibly some different forms of advertising would help parents know when/where to attend in advance.
- Very informative and should be required before you leave the hospital as it is in Alberta then everyone out here would actually use car seats.

Key Point Summary

- Total of 140 respondents; response rate of 42.8%.
- 53% had attended the clinic by appointment vs. drop-in.
- 85% of clients were mothers; 9% fathers; remainder aunt, foster parents and Program Supervisor for clients.
- 54% between 30-39 years of age; 36% 20-29 years.
- 92% Caucasian; 4% self-identifying as Aboriginal; remainder Asian, Ukrainian or Multiple.
- 3.5% recent Immigrants since 2001.
- 98% speak English in the home; remainder speaking German, Hindi and Cree.
- High education levels, high income levels.
- First clinic experience for three-quarters of participants.
- Self-rated knowledge of 8 out of 10 or higher for 77% of participants attending for rear-facing seats; 61% for forward-facing and 54% for booster seat knowledge.
- 84% identified the back middle seat as the safest location in the vehicle; 35% reported having a child seated in the back middle seat.
- There were no children reported to be seated in the front seat.
- Nearly half (46%) of respondents are driving vehicles were from 2007 or newer.
- Basic installation and harnessing knowledge was higher among respondents attending for a rear-facing seat than for a forward-facing seat.
- Knowledge regarding how to determine if a seat is installed tightly enough was higher among respondents attending for a rear-facing seat (72%) than forward-facing seats (59%).
- Knowledge regarding which harness slot to use was higher for rear-facing seats (80%) than forward-facing seats (49%).
- Fewer than 70% of respondents knew how to test if the harness straps are tight enough for both seat types.
- Knowledge regarding the placement of chest clip was high for both rear-facing and forward-facing seats.
- 60% of respondents knew when to move a child from a rear-facing seat to a forward-facing seat.
- 67% knew when to move a child from a booster seat to the seat belt.
- 78% of all respondents rated their satisfaction with the clinic experience as a 9 or 10 out of 10.

Appendices

Appendix 4.1- Child Passenger Safety Clinic Questionnaire

Section 1 - Please complete

1. How did you access the child passenger safety clinic?
☐ By appointment
☐ At a drop-in clinic
2. What town or city do you live in? _____
3. What is your relationship to the child(ren) for whom you were attending the clinic?
☐ Mother ☐ Grandmother ☐ Caregiver
☐ Father ☐ Grandfather ☐ Other: _____
4. How many children do you have/transport? _____
5. What are the child(ren)'s age and weight?
_____ years _____ lbs _____ years _____ lbs
_____ years _____ lbs _____ years _____ lbs
_____ years _____ lbs _____ years _____ lbs
6. What type(s) of child passenger seats did you learn about? (check all that apply)
☐ Rear-facing
☐ Forward-facing
☐ Booster
7. Which age group you are in?
☐ < 15 yrs ☐ 30-39 yrs ☐ 60-69 yrs
☐ 15-19 yrs ☐ 40-49 yrs ☐ 70-79 yrs
☐ 20-29 yrs ☐ 50-59 yrs ☐ >=80 yrs
8. What is your current marital status?
☐ Single, divorced, widow
☐ Married
☐ Common-law
9. Are you a single parent?: ☐ Yes ☐ No
10. Which ethnic group do you belong to? (Check all that apply)
☐ Aboriginal ☐ Filipino ☐ South Asian
☐ Arab ☐ Japanese ☐ Southeast Asian
☐ Black ☐ Korean ☐ West Asian
☐ Caucasian ☐ Latin American ☐ Other _____
☐ Chinese

11. Are you a recent immigrant?

- ☐ Non-immigrant ☐ 1991-2000 ☐ Since 2007
☐ Before 1991 ☐ 2001 to 2006

12. What is the primary language spoken in your home? _____

13. Please indicate your highest level of education you have completed

- ☐ No certificate, diploma or degree
☐ High school certificate or equivalent
☐ Apprenticeship or trades certificate or diploma
☐ College, CEGEP or other non-university certificate or diploma
☐ University certificate or diploma below the Bachelor level
☐ University certificate, diploma or degree

14. Please indicate your family's income group

- ☐ Less than \$20,000 per year
☐ \$20,000 to 39,000
☐ \$40,000 to 59,000
☐ \$60,000 to 79,000
☐ \$80,000 or more

15. Is the vehicle you are currently driving the same one you brought to the clinic?

- ☐ Yes
☐ No If not, why not? _____

16. What is the year, make and model of the vehicle you currently transport your child/ren in?

17. Is this the first child car seat clinic you have attended? (Check one)

- ☐ Yes
☐ No

18. In general, where is the safest place in the vehicle for a child seat to be placed? (Check one)

- ☐ Front passenger seat
☐ Back seat, near the door
☐ Back seat, in the middle
☐ Do not know

19. In YOUR vehicle, where does the child/ren sit? (Check all that apply)

- ☐ Front passenger seat
☐ Front middle seat
☐ Back seat, driver side
☐ Back seat, passenger side
☐ Back seat, in the middle
☐ Third row seat

Section 2 – Please complete if you attended the clinic with a REAR-facing child seat

20. How would you rate your knowledge on using a rear-facing seat? (Circle one)

1	2	3	4	5	6	7	8	9	10
Low									High

21. How do you know if a rear-facing car seat is installed tightly enough?

- ☐ There is less than 1 inch of movement when the car seat is pulled toward the front of the vehicle
- ☐ There is no up and down movement
- ☐ There is less than 1 inch of movement when the car seat is pushed side to side
- ☐ Do not know

22. What harness slot should be used?

- ☐ It does not matter as long as they fit tightly
- ☐ At or BELOW the level of the shoulders
- ☐ At or ABOVE the level of the shoulders
- ☐ Do not know

23. How can you tell if the harness straps are tight enough?

- ☐ There is a slight indentation at the collar bone
- ☐ One finger can fit under the straps at the level of the shoulder
- ☐ Two fingers can fit under the straps at the level of the shoulder
- ☐ Do not know

24. Where should the chest clip be placed?

- ☐ Across the tummy
- ☐ At the level of the armpit
- ☐ As close to the chin/neck as possible
- ☐ It does not matter what level it is placed at as long as it holds the straps together
- ☐ Do not know

25. A child should stay in a rear-facing seat with a harness until:

- ☐ At least one year of age
- ☐ Until too tall for the seat
- ☐ Either of the above
- ☐ Do not know

Section 3 - Please complete if you attended the clinic with a FORWARD-facing child seat

26. How would you rate your knowledge on using a forward-facing seat? (Circle one)

1	2	3	4	5	6	7	8	9	10
Low									High

27. How do you know if a forward-facing car seat is installed tightly enough?

- ☐ There is less than 1 inch of movement when the car seat is pulled toward the front of the vehicle
- ☐ There is no up and down movement
- ☐ There is less than 1 inch of movement when the car seat is pushed side to side
- ☐ Do not know

28. What harness slot should be used?

- ☐ It does not matter as long as they fit tightly
- ☐ At or BELOW the level of the shoulders
- ☐ At or ABOVE the level of the shoulders
- ☐ Do not know

29. How can you tell if the harness straps are tight enough?

- ☐ There is a slight indentation at the collar bone
- ☐ One finger can fit under the straps at the level of the shoulder
- ☐ Two fingers can fit under the straps at the level of the shoulder
- ☐ Do not know

30. Where should the chest clip be placed?

- ☐ Across the tummy
- ☐ At the level of the armpit
- ☐ As close to the chin/neck as possible
- ☐ It does not matter what level it is placed at as long as it holds the straps together
- ☐ Do not know

31. Which of these statements best describes how to properly use the tether strap?

- ☐ It does not matter where the strap is hooked as long as you can tighten it
- ☐ Only needs to be used if your vehicle came equipped with an anchor bolt
- ☐ Must be hooked to an anchor bolt pre-determined by the vehicle manufacturer
- ☐ Do not need to use the tether strap as it is not required by law
- ☐ Do not know

32. A child should stay in a forward-facing seat with a harness until:

- ☐ At least 18 kg (40 lbs)
- ☐ Until too tall for the seat
- ☐ Either of the above
- ☐ Do not know

33. How do you best determine when a child has outgrown a forward-facing car seat based on their height?

- ☐ The feet should not touch the front vehicle seat
- ☐ The middle of the ears are above the top of the car seat shell
- ☐ The head is less than 1" below the top of the car seat shell
- ☐ Do not know

Section 4 - Please complete if you attended the clinic with a BOOSTER seat

34. How would you rate your knowledge on using a booster seat? (Circle one)

1	2	3	4	5	6	7	8	9	10	
Low										High

35. A child should stay in a booster seat until:

- ☐ At least 4 feet, 9 inches (145 cm) tall or a minimum of 9 years old
- ☐ Until too tall for the seat
- ☐ Either of the above
- ☐ Do not know

36. When should a high-back booster seat be used:

- ☐ When seated in the front seat
- ☐ When too young for a no-back booster
- ☐ When there is no headrest
- ☐ Do not know

Section 5 - Please complete

37. How would you rate your overall satisfaction with child seat clinic? (Circle one)

1	2	3	4	5	6	7	8	9	10
Low									High

38. Has your child been involved in a traffic crash since you attended the clinic?

- ☐ Yes
☐ No

If yes, was he or she hurt?

- ☐ Yes
☐ No

39. Do you have any further comments about the child seat clinic you attended?

Thank you for participating in this evaluation.

CHAPTER V

SASKATCHEWAN CHILD PASSENGER SAFETY TECHNICIAN SURVEY

Abstract

It is estimated that as many as one-third of Canadian children are not properly restrained. Using the best available evidence, trained Child Passenger Safety (CPS) Technicians support communities in reducing child safety seat misuse by educating parents and caregivers regarding correct installation and proper use of child passenger safety seat systems. The quality of instruction provided to parents and caregivers largely depends on the quality of training that CPS Technicians receive. Following the training period, a supervised clinic is held where the new Technicians perform child passenger seat checks. During these checks an instructor supervises, gives feedback, and signs-off on the Technician's work. There is no formal practical exam, but each Technician's skill is evaluated by instructors throughout the training period, consisting of both classroom instruction and hands-on practice. A score of 80 percent or higher is required on a written exam. The purpose of this study is to determine if CPS Technician training and support is sufficient for these individuals to perform their preventative work in the community. An online CPS Technician survey was developed. Survey questions included: the technician's socio-demographic and training experience; the technician's confidence level in training parents on different types of CPS seat installations; current technician-led community CPS activities; available technician support with regards to their community-based work; and opportunities for ongoing training. Results indicate that CPS Technicians are generally pleased with their training and support. Suggestions for improvement included

increased instructor to student ratio, more hands-on training, and more resources to support low socio-economic families.

Purpose

The purpose of this study is to ascertain if the Child Passenger Safety (CPS) Technician education and training is sufficient preparation and support for these individuals to perform their preventative work in the community effectively and efficiently.

Methods

Survey Development

A questionnaire was used to collect demographic information from currently certified CPS Technicians throughout Saskatchewan, including age group, sex and educational level (Appendix 5.1). Technicians were also asked which year they received their certification. Further, Technicians were asked about their training experience, their confidence levels in installing and instructing parents and caregivers regarding the different types of child safety seats, their activities as CPS Technicians in the community, opportunities for mentorship, and their satisfaction with ongoing training and support.

Data Collection

The Saskatchewan Prevention Institute provided e-mail contact information for all certified CPS Technicians, who then were invited to complete the online survey via FluidSurveys.

Analysis Plan

Descriptive data are presented as frequencies and percentages. Unstructured comments and suggestions are also presented.

Results

The CPS Technician survey was sent out to 165 Technicians currently certified in Saskatchewan and completed by 88 (53.3%). Of these, 18.1 percent (16) had been recently certified in 2010 or 2011, 40.9 percent (36) were certified between 2007 and 2009, and 38.6 percent (34) were certified in 2006 or earlier. Year of certification was not available for 2.3 percent (2). The following tables are based on the 86 technicians classified into these three groupings representing Technician Status: Recent Technicians, Established Technicians, and Long-term Technicians. Data not stratified by Technician Status is based on all 88 responses.

Technicians are located throughout Saskatchewan and are composed of people representing different sectors: Public Health, Community Health/Programming/Aboriginal, Maternal Child Health, Head Start/Aboriginal, Emergency Medical/Ambulance Technicians, Police, Fire, Daycare, Insurance Providers, Driver Examiners and Retail.

Age groups ranged from technicians in their 20's to those in their 60's (Table 5.1). The majority of Technicians are female (Table 5.2). Technicians range in their educational background, with the majority reporting post-secondary education (Table 5.3).

Participants indicated that they became CPS Technicians for many reasons. Half of the 86 respondents (50.0%) indicated that it was a position that needed filling at their workplace (31.3% Recent; 66.7% Experienced; 41.2% Long-term Techs). Workplace funding was available to support technician training for 33.7 percent (37.5%; 41.7%; 23.5%, respectively).

Approximately half of all respondents (52.3%) wanted to learn more about child passenger safety, 71.6 percent wanted to help parents and caregivers in their community, and 52.3percent wanted to reduce child safety seat misuse in their community.

Table 5.1 – Age groups of Certified Technicians by Technician Status

Age Group (years)	Recent Techs (n=16)	Established Techs (n=36)	Long-term Techs (n=34)	All Techs (n=86)
20-29	31.3% (5)	27.8% (10)		17.4% (15)
30-39	12.5% (2)	27.8% (10)	32.4% (11)	26.7% (23)
40-49	25.0% (4)	33.3% (12)	44.1% (15)	36.0% (31)
50-59	25.0% (4)	8.3% (3)	20.6% (7)	16.3% (14)
60-69		2.8% (1)		1.2% (1)

Table 5.2 – Sex of Certified Technicians by Technician Status

Sex	Recent Techs (n=16)	Established Techs (n=36)	Long-term Techs (n=34)	All Techs (n=86)
Female	93.8% (15)	72.2% (26)	64.7% (22)	73.3% (63)
Male	6.3% (1)	25.0% (9)	35.3% (12)	25.6% (22)
Missing		2.8% (1)		1.2% (1)

Table 5.3 – Education level of Certified Technicians by Technician Status

Education Level	Recent Techs (n=16)	Established Techs (n=36)	Long-term Techs (n=34)	All Techs (n=86)
No certificate/ diploma/degree		2.8 (1)		1.2% (1)
High school or equivalent	12.5% (2)	5.6% (2)	5.9% (2)	7.0% (6)
Apprenticeship/ trades certificate/ diploma	18.8% (3)	11.1% (4)	17.6% (6)	15.1% (13)
College/CEGEP/ other non-university certificate/diploma	25.0% (4)	44.4% (16)	35.3% (12)	37.2% (32)
University certificate/ diploma below Bachelor level	6.3% (1)	5.6% (2)		3.5% (3)
University certificate/ diploma/or degree	37.5% (6)	25.0% (9)	41.2% (14)	33.7% (29)
Missing		5.6% (2)		2.3% (2)

Approximately half of the Technicians participated in a 2 to 3 day training course to be certified (Table 5.4). Just over half of all respondents (55.7%) indicated that 2 to 3 days would be best for training, followed by 26.1 percent preferring 1 to 2 days, and 18.2 percent preferring 3 to 4 days.

The majority (95.3%) of Technicians feel that their initial training provided them with the necessary skill set to help parents and caregivers learn to properly restrain children in vehicles (100.0% Recent, 91.7% Established, 97.1% Long-term).

Areas for more emphasis during training as suggested by the respondents included: more hands-on training; using a wide variety of child passenger seats including new models with

different features; training based on scenarios representing more complicated situations; and training addressing child passenger safety for special needs children – where to start and where to go for more support.

All respondents indicated confidence in instructing parents and caregivers on how to install rear-facing infant seats, forward-facing seats, convertible seats, booster seats and combination seats (Table 5.5). Low confidence was indicated for child passenger safety seats for premature infants and special needs children. One respondent commented that techniques for tethering some child passenger seats can be unclear.

Table 5.4 – Number of Training Days for Certified Technicians by Technician Status

Days	Recent Techs (n=16)	Established Techs (n=36)	Long-term Techs (n=34)	All Techs (n=86)
1		5.6% (2)	8.8% (3)	5.8% (5)
1-2	12.5% (2)	25.0% (9)	44.1% (15)	30.2% (26)
2-3	87.5% (14)	63.9% (23)	20.6% (7)	51.2% (44)
>3		5.6% (2)	26.5% (9)	12.8% (11)

* Note: 1-day training courses for certification have not been offered. This may be confused with a Technician Update session.

Table 5.5 – Certified Technician Installation Confidence by Seat Type and by Technician Status

Seat Type/Confidence*		Recent Techs (n=16)	Established Techs (n=36)	Long-term Techs (n=34)	All Techs (n=86)
Rear	Yes	93.8% (15)	97.2% (35)	100% (34)	97.7% (84)
	No		5.6% (2)	2.9% (1)	3.5% (3)
Forward	Yes	87.5% (14)	94.4% (34)	100% (34)	95.3% (82)
	No	6.3% (1)	5.6% (2)	5.9% (2)	5.8% (5)
Convertible	Yes	87.5% (14)	88.9% (32)	91.2% (31)	89.5% (77)
	No	6.3% (1)	11.1% (4)	5.9% (2)	8.1% (7)
Booster	Yes	81.3% (13)	83.3% (30)	97.1% (33)	88.4% (76)
	No	6.3% (1)	2.8% (1)		2.3% (2)
Combo	Yes	87.5% (14)	75.0% (27)	94.1% (32)	84.9% (73)
	No	6.3% (1)	5.6% (2)		3.5% (3)
Premature	Yes	25.0% (4)	11.1% (4)	26.5% (9)	19.8% (17)
	No	62.5% (10)	75.0% (27)	70.6% (24)	70.9% (61)
Special Needs	Yes	6.3% (1)	5.6% (2)	11.8% (4)	8.1% (7)
	No	87.5% (14)	91.7% (33)	85.3% (29)	88.4% (76)

* Based on 2 different questions, therefore the 'Yes' and 'No' options are not mutually exclusive

Suggestions provided by respondents for overall improvement of the curriculum included:

- Streamline information with an emphasis on important data
- PowerPoint education showing 'how to' and what to look for
- More information on new seat designs on the market
- A better mix of classroom teaching followed by hands-on training, then more teaching, then more hands-on
- More hands-on training; combinations of different seats in different vehicles
- Have car seats that are appropriate to the clients, not only the expensive ones that few clients use
- An enclosed facility to support the hands-on training independent of weather conditions
- More refresher courses
- A 2-day refresher course every year for all technicians; mandatory refresher every 2 years
- Training on proper restraint for premature infants and special needs children
- Increase the teacher to student ratio through funding support more

instructors; smaller classes; more instructors

- Training on how to answer parents' questions
- Update DVD resources for Saskatchewan
- More hands-on in real world situations with mentors to increase confidence of newly trained technicians
- Create opportunities for peer support
- Create National Standards to teach from, not relying on Transport Canada to decide the curriculum without consulting others

The majority (77.3%) of respondents are actively conducting CPS Clinics in their community (93.8%; 77.8%; 73.5%). Of these, one quarter (25.6%) are conducting these clinics alone (37.5%; 33.3%; 11.8%). Most of the Recent Technicians and over half of the Established Technicians reported having conducted one to five clinics thus far, while nearly half of the Long-term Technicians reported conducting more than 15 clinics (Table 5.6).

Fewer than half (43.8%) of Recent Technicians have had the opportunity to have a mentor in their community, compared to one-third

(33.3%) of Established Technicians and 38.2 percent of Long-term Technicians. Comments related to mentoring opportunities demonstrated that many Technicians are unaware of mentoring opportunities. Few reported having the opportunity for a mentor, while one organization reported many in-house technicians implying potential mentorship opportunities.

Comments on the opportunity for conducting community-based CPS clinics indicated that there are some dedicated individuals striving to reach their own community through open clinics, booked appointments, pre-natal/hospital-based education and retail. Some Technicians indicated that they support clinics in other communities as well as their own.

Table 5.6 – Number of clinics conducted by Certified Technicians by Technician Status

Number of Clinics	Recent Techs (n=16)	Established Techs (n=36)	Long-term Techs (n=34)	All Techs (n=86)
1-5	93.8% (15)	55.6% (20)	8.8% (3)	44.2% (38)
6-10		19.4% (7)	14.7% (5)	14.0% (12)
11-15	6.3% (1)	8.3% (3)	26.5% (9)	15.1% (13)
>15		13.9% (5)	47.1% (16)	24.4% (21)
Missing		2.8% (1)	2.9% (1)	2.3% (2)

Table 5.7 – Number of seats inspected by Certified Technicians by Technician Status

Number of Seats	Recent Techs (n=16)	Established Techs (n=36)	Long-term Techs (n=34)	All Techs (n=86)
1-50	100% (16)	66.7% (24)		46.5% (40)
51-100		16.7% (6)	32.4% (11)	19.8% (17)
101-150		2.8% (1)	20.6% (7)	9.3% (8)
>150		13.9% (5)	47.1% (16)	24.4% (21)

The majority of Technicians (89.5%) reported having sufficient resources, materials and other support to conduct CPS clinics efficiently in their community (93.8%; 91.7%; 85.3%). Comments related to the potential for more resources, materials or other support included: a desire for more Technicians in the community willing and available to hold clinics or booked appointments, time off work to undertake Technician duties, a supply of car seats or financial support for the community, more community interest in keeping child passengers

safe, more interest on the side of enforcing CPS rules and regulations, and updates concerning the latest child passenger safety brochures available and recall lists.

Nearly two-thirds of Technicians (61.1%) reported receiving further training since being certified (37.5%; 61.1%; 73.5%), with 41.7 percent of Established Technicians and 67.6 percent of Long-term Technicians reporting having completed two or more supplemental training sessions.

Half of the Technicians (51.2%) reported that they provide advice over the telephone on how to install child safety seats correctly (43.8%; 52.8%; 52.9%). The majority of Technicians (88.4%) receive e-mail updates from the Saskatchewan Prevention Institute (75.0%; 91.7%; 91.2%). Half of the Technicians (50.0%) find these updates to be very useful (43.8%; 50.0%; 52.9%), while a further third (36.0%) find them to be somewhat useful (25.0%; 38.9%; 38.2%).

The majority of respondents (94.2%) believe that the Lower Universal Anchorage System has enhanced child safety seat installation in Saskatchewan (93.8%; 100%; 88.2%).

The following suggestions were made to enhance the structure and content of the upcoming Child Passenger Safety Technician Website:

Structure

- Parent/Caregiver sections
- Login section for Technicians for more technical advice
- Blog for Technicians to post questions/concerns, etc.
- Frequently Asked Questions
- Links

Information

- Updates: what is new, what has changed, easy access
- New Seat Types: information & photos about installation of new restraint systems
- Annual forum every April on all the changes made to the car seat guidelines
- Traffic Safety Act and Vehicle Equipment Regulations pertaining to child passenger safety
- Reference to any changes in the legislation for child seats
- Current information on changes to regulations or recommendations for car seat safety

Training Review

- A module of re-teaching
- Process of checking a seat

- Common tricks, tips and troubles (e.g. using pool noodles to help level a seat)
- Proper use and installation of tethers
- How to install seats in small truck with no adequate back seat
- Use of booster seats
- Common issues parents have with recommendations
- Installation information relevant to basic seats as well as newer/high-end seats

Recalls

- New recalls
- Current toll free numbers from Manufacturers
- Links to transportation site regarding recalls

Resources

- Accessing seats for low income families
- Promotional items for the parent packages
- Handouts for parents, e.g. new child passenger restraint laws
- Charts to break down age height and weight for each seat type

Schedules

- Drop-in clinics
- Refresher courses

Videos

- Teaching demo

Final comments from the Technicians concerning Child Passenger Safety Technician training in Saskatchewan included:

Program

- Very valuable course for the prevention of injury. I was very surprised at how poorly some of the seats are installed, even where parents did their best to research and install properly. I think this is an extremely important aspect to child safety. As a Paramedic, I regularly see lives saved by the use of child restraints as well as unfortunately lives lost for lack of use.
- I feel it's a great program. I really enjoy being involved with child passenger

safety. When I took my training I already had quite a bit of knowledge about car seats, whereas others had no previous experience with them. It was easier for me to learn having that base of knowledge already going into it, but I think for people who are really new to the world of car seats may benefit from a longer course.

- Travis Holeha has been extremely helpful and our office would be lost without him!

Technicians

- There needs to be more technicians out in the field where parents/caregivers can access the help and education about their children's seats.
- Are the nurses on the Mother/Baby units in the hospital certified in order to give guidance to the new parents prior to their newborn's discharge on their first ever ride in a vehicle? This is a key point of entry for this type of education.

Annual Update Sessions

- I like to attend the annual update, as I find that I get more confidence afterwards.
- Updates need to be in the early spring, like this year (2011), so it is before clinics are held, and technicians gain new knowledge for the season.
- I would like to see the yearly updates offered in Regina as well as Saskatoon, or maybe alternate between the two cities.
- I wish the update sessions in Saskatoon were on Monday or Friday as this would make it easier for me to attend.
- Would love to see an update training session come to Swift Current.

Recalls

- Would like the updated recalls sent out instead of going through Transport Canada.

Newsletters

- Still would like to receive the newsletter, last received Fall 2007.

- I would like to receive newsletters again.

Opportunities for Training

- I think that the Training provided is good and I think that Travis from the Saskatchewan Prevention Institute is very supportive.
- I have a boss who decides on if training is warranted, she is in charge of us.
- I feel confident installing special needs child restraints not because of the technician training but because I participated in special needs child restraint training.

Community Interest

- There needs to be more enforcement from Police to get more participation by community members. I live in a small community and it can sometimes be hard to reach our annual quota of 10 seats per calendar year. This should not be a problem, as we have over 5,000 people in our community.
- The clinics are okay for the parents/caregivers who willingly want to have their children safe. The other people who do not attend the clinics need to be persuaded to pull in by police. This however takes resources that are not always available in smaller communities.
- I provide education and information at Health & Safety Fairs and Prenatal Days in my community. I think that more information needs to get out to parents about the importance of having their children in child safety seats.
- Very useful, especially in the First Nation Community. Parents don't know how to use the car seat properly for their children.

Key Point Summary

- Tech Representing: Public Health; Community Health/Programming/ Aboriginal Maternal Child Health; Head Start/Aboriginal; Emergency Medical/Ambulance Technicians; Police/Fire; Daycare; Insurance Providers; Driver Examiners; and Retail.
- Ages ranged from those in their 20's to 60's; Majority are female (73%).
- Range in educational background with the majority reporting post secondary education.
- Became a Technician because: Position that needed filling at their workplace; Workplace funding was available; Wanted to learn more about child passenger safety; Wanted to help parents and caregivers in their community; and Wanted to reduce child safety seat misuse in their community.
- Half participated in a 2 to 3 day training course; 95% felt that initial training provided necessary skill set to help parents/caregivers learn to properly restrain children in vehicles.
- Areas for more emphasis: More hands-on training; Use wide variety of child passenger seats including new models with different features; Training based on scenarios representing more complicated situations; and Training addressing child passenger safety for special needs children – where to start and where to go for more support.
- All indicated confidence in instructing parents and caregivers on how to install rear-facing infant seats, forward-facing seats, convertible seats, booster seats and combination seats; Low confidence was indicated for premature infants and special needs children.
- Many suggestions offered for improvements, including: Mix of classroom teaching followed by hands-on training; Combinations of different seats in different vehicles; Enclosed facility to support the hands-on training (weather); Mandatory refresher every 2 years; Increase the teacher to student ratio; and Create opportunities for peer support.
- 77% actively conducting CPS Clinics in their community; one-quarter of these conducted by the Technician alone.
- 44% of new Technicians had the opportunity to have a mentor; Many Technicians are unaware of mentoring opportunities.
- Some dedicated individuals striving to reach the community through: Open clinics; Booked appointments; Pre-natal/hospital-based education; and Retail.
- 90% reported sufficient resources, materials and other support to conduct child passenger safety clinics efficiently.
- Desire for: More Technicians in the community willing and available to hold clinics or booked appointments; Time off work to undertake Technician duties; Supply of car seats or financial support for the community; More community interest in child passenger safety; More enforcement of child passenger safety rules/regulations; and Updates concerning the latest child passenger safety brochures available and recall lists.
- Website suggestions regarding: Structure in term of Parent Section, Q&A, Links; Information regarding updates, new seats, Traffic Safety Act, changes to legislation; Training Review such as common tricks, tips and troubles; How to install seats in small truck with no adequate back seat; Common issues with recommendations; Recalls; Resources regarding accessing seats for low income families; Charts to break down age height and weight for each seat type; Schedules; and Videos.

Appendices

Appendix 5.1- Child Passenger Safety Technician Questionnaire

1. Why did you become a child passenger safety technician? (Please check all that apply)
 - ☐ It was a position that needed filling at my workplace
 - ☐ There was funding available through my workplace to support the training
 - ☐ I wanted to learn more about child passenger safety
 - ☐ I wanted to help parents and care givers in my community
 - ☐ I wanted to reduce child safety seat misuse in my community
 - ☐ Other: _____

2. Which year did you receive your certification? _____
3. How many days was your initial training?
 - ☐ 1 day
 - ☐ 1-2 days
 - ☐ 2-3 days
 - ☐ >3 days
4. How many days do you think would be best for training?
 - ☐ 1 day
 - ☐ 1-2 days
 - ☐ 2-3 days
 - ☐ 3-4 days
5. Do you think that your initial training provided you with the necessary skill set to help parents and care givers learn to appropriately restrain their children in vehicles?
 - ☐ Yes
 - ☐ No

If **No**: In your opinion what specific areas need more emphasis during training?

6. What type(s) of seat(s) do you feel confident about teaching parents and caregivers about? (Please check all that apply)
 - ☐ Rear-facing infant seats
 - ☐ Forward-facing child restraint seats
 - ☐ Convertible rear-facing/forward-facing child restraint seats
 - ☐ Booster seats
 - ☐ Combination child restraint/booster seats
 - ☐ Restraint for premature infants
 - ☐ Restraint for special needs children
 - ☐ Other: _____

7. What type(s) of seat(s) do you not feel confident about teaching parents and caregivers about?

(Please check all that apply)

- ☐ Rear-facing infant seats
- ☐ Forward-facing child restraint seats
- ☐ Convertible rear-facing/forward-facing child restraint seats
- ☐ Booster seats
- ☐ Combination child restraint/booster seats
- ☐ Restraint for premature infants
- ☐ Restraint for special needs children
- ☐ Other: _____

8. How do you think the curriculum could be improved?

9. Do you currently conduct child passenger safety clinics in your community?

- ☐ Yes
- ☐ No

Comments: _____

If **Yes**: Do you conduct clinics alone or with another technician, or with a mentor?

- ☐ Alone
- ☐ With another technician
- ☐ With a mentor

10. Did you have the opportunity to have a mentor in your community?

- ☐ Yes
- ☐ No

Comments: _____

11. How many clinics have you conducted since being certified?

- ☐ 1-5
- ☐ 6-10
- ☐ 11-15
- ☐ 16 or more

12. Approximately, how many seats have you inspected?

- ☐ 1-50
- ☐ 51-100
- ☐ 101-150
- ☐ 150 or more

13. Do you have sufficient resources, materials and other support to conduct child passenger safety clinics efficiently in your community?

- ☐ Yes
- ☐ No

If **No**: What are you lacking in terms of resources, materials and other support?

14. Have you received further training since being certified?

- ☐ Yes
- ☐ No

If **Yes**: How many other training sessions have you participated in?

- ☐ 1
- ☐ 2-5
- ☐ More than 5

15. In addition to child passenger safety clinics, do you provide advice over the telephone on how to install child safety seats correctly?

- ☐ Yes
- ☐ No

16. Do you receive e-mail updates from the Saskatchewan Prevention Institute?

- ☐ Yes
- ☐ No

If **Yes**: Are these updates useful for your child passenger safety work?

- ☐ Very useful
- ☐ Somewhat useful
- ☐ Not useful

What content would you like to see on the upcoming Technician Website to enhance your child passenger safety work?

17. Do you think that the Lower Universal Anchorage System has enhanced child safety seat installation in Saskatchewan?

- ☐ Yes
- ☐ No

18. What town or city do you live in? _____

19. What is your current job? _____

20. Which age group are you in?

- | | | |
|------------------------------------|------------------------------------|------------------------------------|
| <input type="checkbox"/> < 15 yrs | <input type="checkbox"/> 30-39 yrs | <input type="checkbox"/> 60-69 yrs |
| <input type="checkbox"/> 15-19 yrs | <input type="checkbox"/> 40-49 yrs | <input type="checkbox"/> 70-79 yrs |
| <input type="checkbox"/> 20-29 yrs | <input type="checkbox"/> 50-59 yrs | <input type="checkbox"/> >=80 yrs |

21. Are you: ☐ male ☐ female

22. Please indicate the highest level of education you have completed

- ☐ No certificate, diploma or degree
- ☐ High school certificate or equivalent
- ☐ Apprenticeship or trades certificate or diploma
- ☐ College, CEGEP or other non-university certificate or diploma
- ☐ University certificate or diploma below the Bachelor level
- ☐ University certificate, diploma or degree

Do you have any further comments about the Child Passenger Safety Technician training in Saskatchewan?

CHAPTER VI

SECONDARY DATA ANALYSIS OF THE SASKATCHEWAN TRAFFIC ACCIDENT INFORMATION SYSTEM (TAIS) DATA

Abstract

Saskatchewan Government Insurance (SGI) collects and maintains a comprehensive database of traffic crashes in the province. Motor vehicle crash injury data for child occupants 0 to 12 years of age captured in the Traffic Accident Information System (TAIS) from 1988 to 2010 were used to describe child passenger injury, restraint use at the time of injury, driver demographics, and contributing factors to the crash. In addition, regression modelling was attempted to determine if there were any significant changes over time due to the Child Passenger Safety program that was established in 1997. The collision rates resulting in injury or death have decreased significantly from 1988 to 2011 for the general population and for children. The proportion of children ages 0 to 4 years and 5 to 8 years who were improperly restrained when they sustained a motor vehicle crash-related injury decreased from 1988 to 2011. Drivers involved in the crashes resulting in child passenger injury or death were found to be predominantly females aged 25-44 years. Contributing factors to single vehicle crashes causing child passenger injury or death include speed, inattentive driving, and impaired driving.

Purpose

The purpose of this study was to:

4. Describe the trends and patterns of motor vehicle crash-related injury among children ages 0 to 12 years, before and after the Child Passenger Safety program was initiated in 1997 (1988-2010).
5. Describe proper and improper child safety seat use among children ages 0 to 12 years injured in a motor vehicle crash from 1988 to 2010.
6. Describe driver demographics for recent (2006-2010) motor vehicle crashes resulting in child injury in terms of age and sex.
7. Describe contributing factors for recent (2006-2010) motor vehicle crashes resulting in child injury, by age and sex of driver, and by road authority.

Methods

Motor vehicle crash injury data for child occupants 0-12 years captured in the TAIS database from 1988 to 2010 were accessed from SGI.

Population rates were calculated using Statistics Canada population data for Saskatchewan.

The proportions of children ages 0 to 12 years either injured or killed in a motor vehicle crash are presented by year and type of child passenger restraint used.

Contributing factors related to the driver of the vehicle containing at least one child were isolated by focusing on single vehicle crashes only.

Results

Population Rates

Motor vehicle crash-related injury rates for children ages 0 to 12 years in Saskatchewan declined from 230.1 per 100,000 in 1988 to 114.2 per 100,000 in 2010 (Figure 6.1). This decline parallels the total population crash-related injury rates during this time period. A similar decline is observed among children ages 0 to 4 years, from 220.4 per 100,000 in 1988 to 84.4 per 100,000 in 2010 (Figure 6.2). All slopes were found to be statistically significant ($p=0.000$).

Figure 6.1: Rate of motor vehicle crashes causing injury or death by year, ages 0-12 years, SK, 1988-2010.

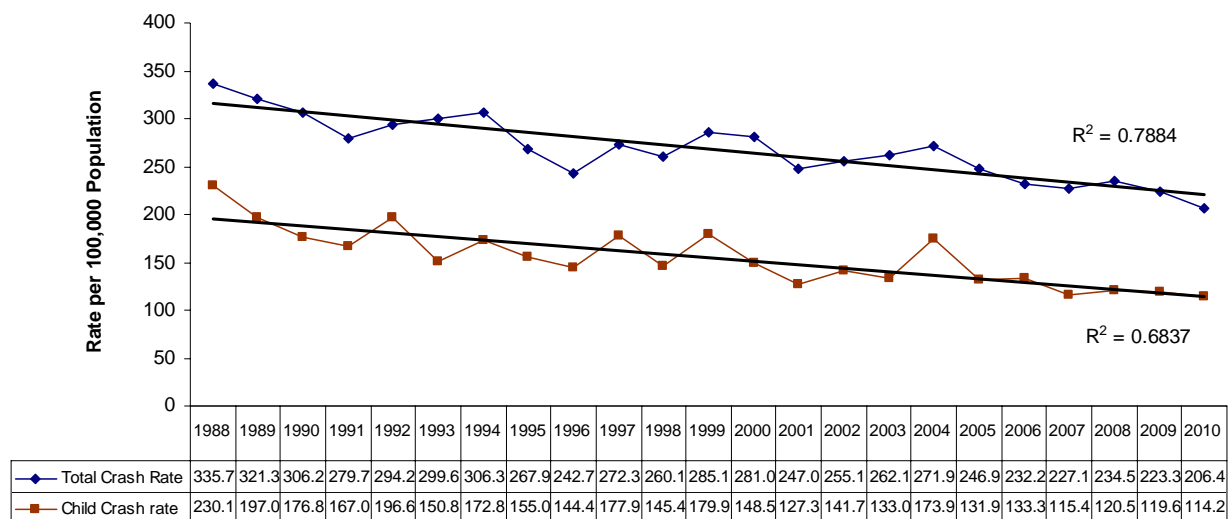
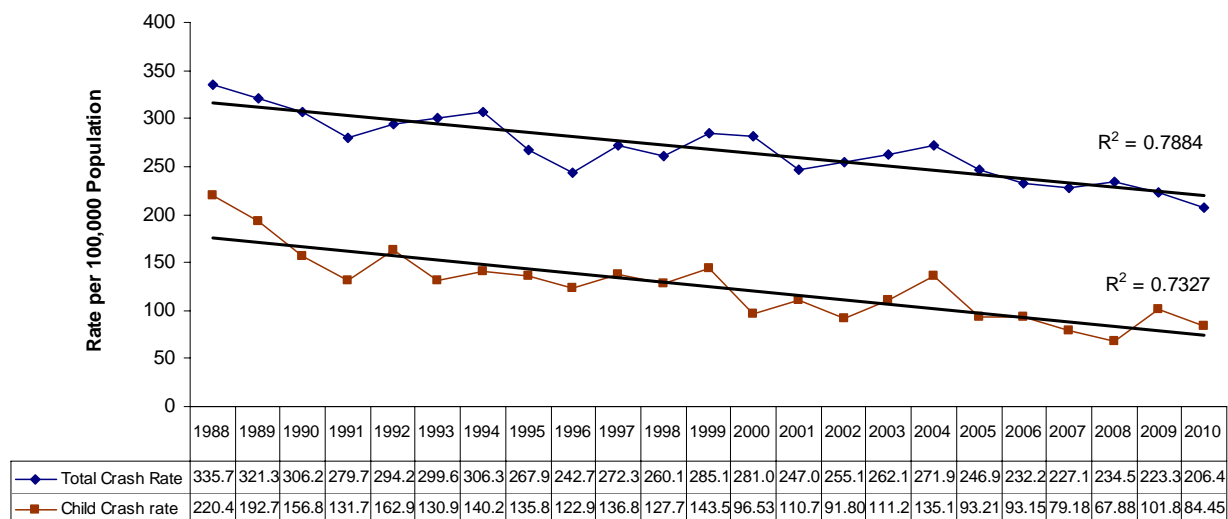


Figure 6.2: Rate of motor vehicle crashes causing injury or death by year, ages 0-4 years, SK, 1988-2010.



Improper Restraint Use

Proportions of improper restraint use among young children ages 0 to 4 years who sustained mild or moderate motor vehicle crash-related injuries declined from 75 percent in 1988 to 33 percent in 2010 (Figure 6.3). Improper use is defined based on the following TAIS categories: (1) no restraint use or improper use, (2) lap and shoulder belt with air bags, and (3) front-facing child safety seats without tether strap. The two slopes of this decline are both statistically significant ($p=0.000$), while the slope from 1998 to 2010 is seen to be slightly steeper than during the previous ten years; however the difference in slopes between the first ten years and the subsequent 13 years is not statistically significant. Rear-facing child safety seat use is seen to increase in more recent years.

Proportions of improper restraint use among young children ages 0 to 4 years who sustained major or fatal motor vehicle crash-related injuries declined from 86 percent in 1988 to 50 percent in 2010 (Figure 6.4). A lot of variation in proportions is observed throughout this time period due to small numbers.

Among children ages 5 to 9 years, proportions of improper restraint use among those who sustained mild or moderate motor vehicle crash-related injuries declined from 26 percent in 1988 to 7 percent in 2010 (Figure 6.5). It is also important to note that the highest proportions of restraint use for this age group is lap and shoulder belt use, with booster seat use increasing in more recent years.

Proportions of improper restraint use among children ages 5 to 9 years who sustained major or fatal motor vehicle crash-related injuries demonstrated large variations during the 23 year period (Figure 6.6). Improper use was generally higher than proper use, and there were no children restrained using booster seat.

Temporal patterns in proper restraint were analyzed; however there were no significant findings (Appendix 6.1).

Driver Demographics

There were a total of 976 motor vehicle crashes in Saskatchewan resulting in child injury (ages 0-12 years) or death from 2006 to 2010. Of these, 243 (24.9%) of the drivers were women aged 25 to 34 years; and a further 194 (19.9%) were women aged 35 to 44 years (Figure 6.7). For crashes resulting in children ages 0 to 4 years being injured, women ages 25 to 34 years account for 95 (35.3%) of 269 drivers (Figure 6.8).

Looking at single vehicle crashes only, again women ages 16 to 44 years are seen to represent 59.8 percent of all crashes resulting in injury among children ages 0 to 12 years, and 74.3 percent among children ages 0 to 4 years only (Figure 6.9).

Contributing Factors

Of the 269 single vehicle crashes resulting in child injury (ages 0-12 years), inattentive driving, impaired driving or speeding account for a total of 117 contributing factors involved. (Note: this may represent fewer than 117 individual crashes as some crashes may have had more than one contributing factor). The most prevalent contributing factor was speeding (47.9%), and 69.6 percent of these crashes involved female drivers (Figure 6.11).

Among the 46 cases of inattentive driving, male drivers aged 16 to 24 years accounted for 19.6 percent of incidents, followed by women in the same age group (17.4%) (Figure 6.12).

There were 15 incidents of impaired driving, with nearly half (7) occurring among males aged 16 to 24 years (Figure 6.13).

The remaining 56 contributing factors were incidents where speed contributed to the crash. Women ages 16 to 44 years accounted for 62.5 percent of these incidents (Figure 6.14).

Considered by where these motor vehicle crashes occurred, rural roads had the highest proportion of speed-related crashes (40.4%), whereas impaired-related and inattentive-related crashes were more prevalent on rural/urban highways (46.7% and 56.5%, respectively) (Figure 6.15).

Figure 6.3: Proportion of minor and moderate motor vehicle crash-related injuries by year and type of child passenger restraint used, ages 0-4 years, SK, 1988-2010.

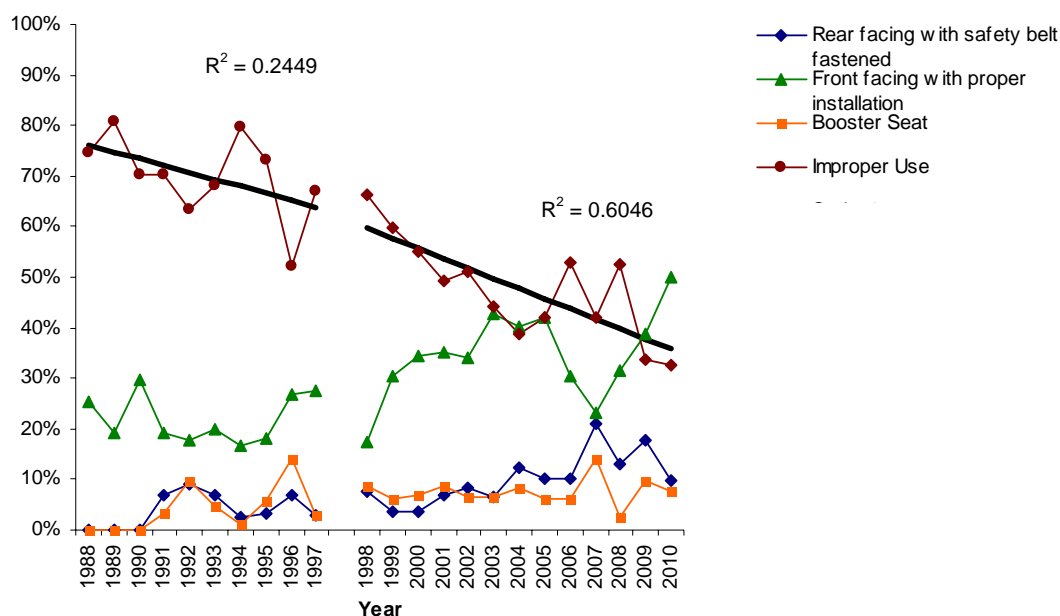
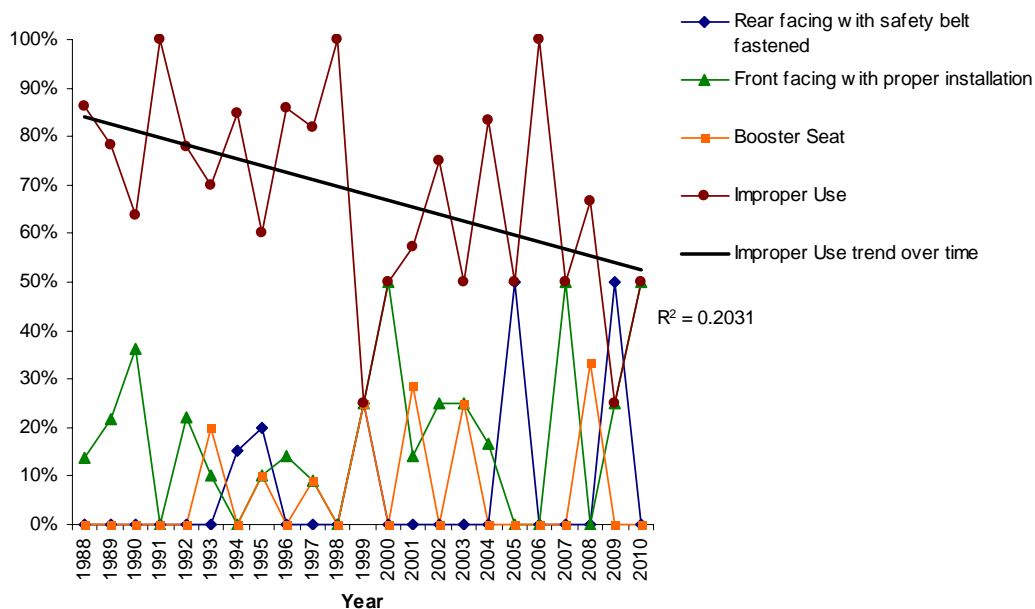


Figure 6.4: Percentage of major and fatal motor vehicle crash-related injuries by year and type of child passenger restraint used, ages 0-4 years, SK, 1988-2010.



Note: *Improper Use* includes: no restraint use or improper use, lap and shoulder belt with air bags, and child front-facing child safety seat without tether strap.

Figure 6.5: Proportion of minor and moderate motor vehicle crash-related injuries by year and type of child passenger restraint used, ages 5-9 years, SK, 1988-2010.

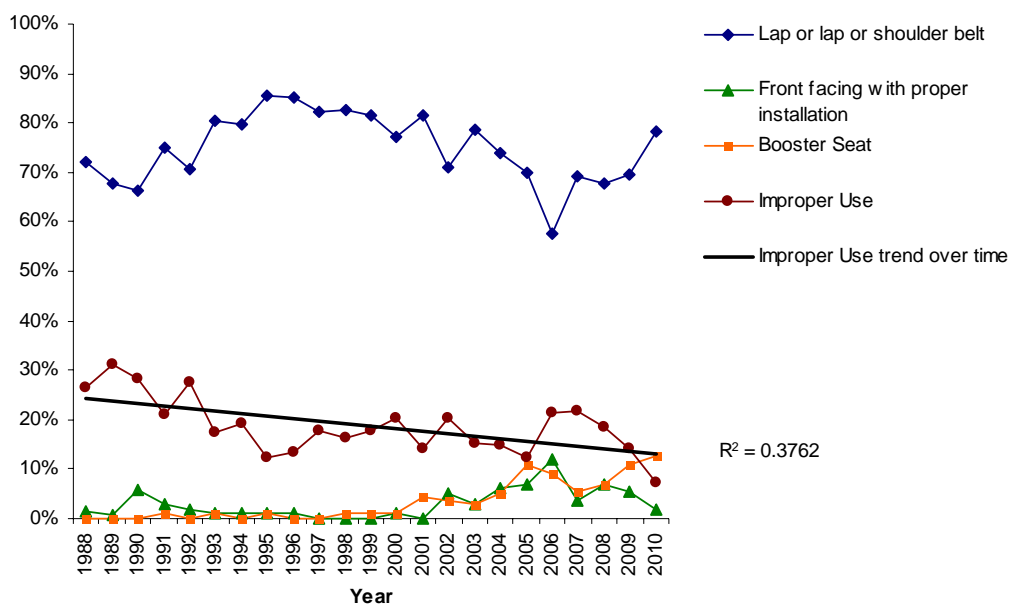
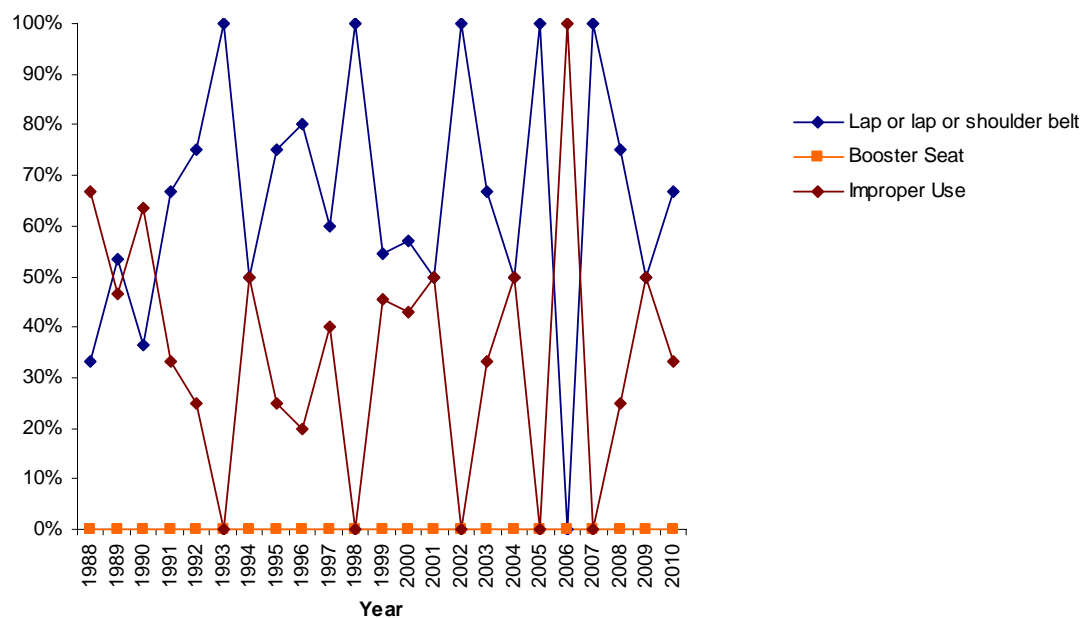


Figure 6.6: Percentage of major and fatal motor vehicle crash-related injuries by year and type of child passenger restraint used, ages 5-9 years, SK, 1988-2010.



Note: *Improper Use* includes: no restraint use or improper use, lap and shoulder belt with air bags, and child front-facing child safety seat without tether strap.

Figure 6.7: Number of motor vehicle crashes involving children ages 0-12 years by driver age and sex, SK, 2006-2010.

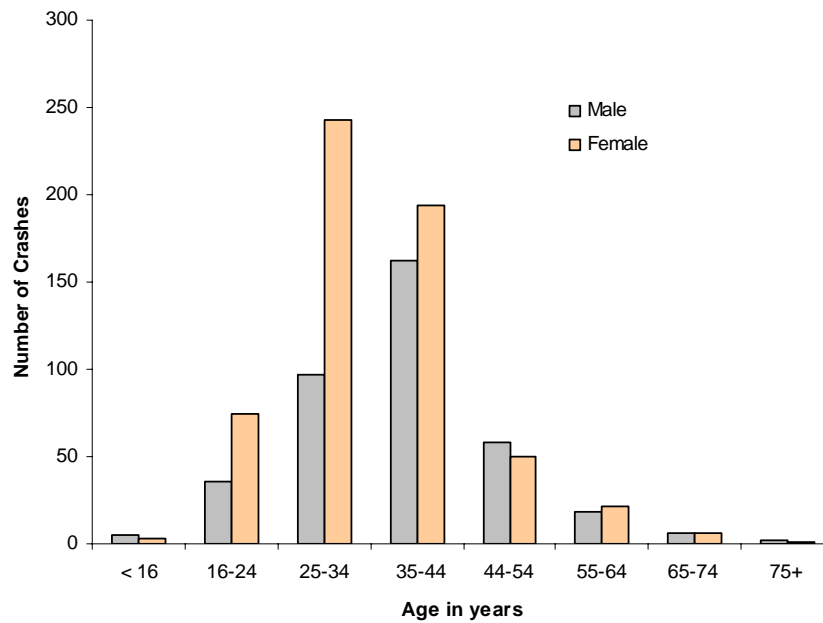
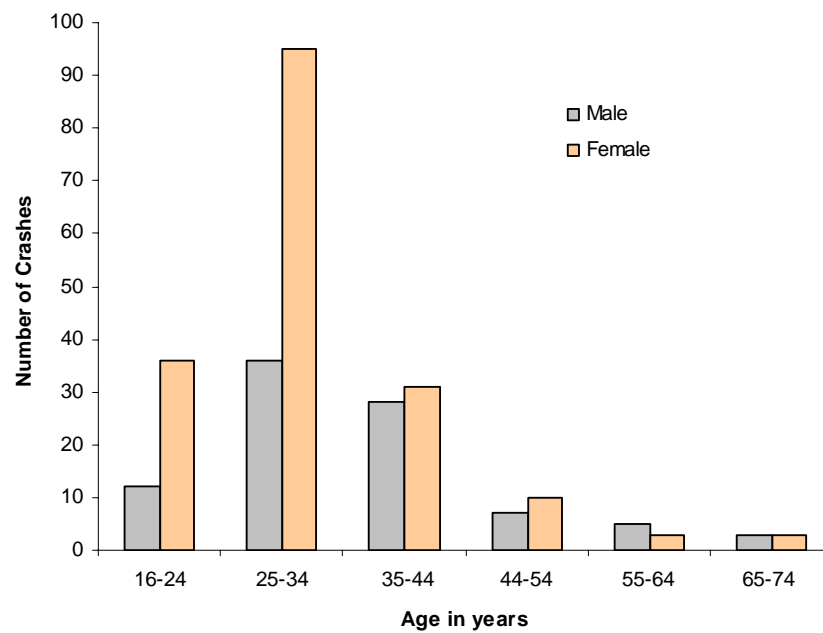


Figure 6.8: Number of motor vehicle crashes involving children ages 0-4 years by driver age and sex, SK, 2006-2010.



SINGLE VEHICLE CRASHES

Figure 6.9: Number of motor vehicle crashes involving children ages 0-12 years by driver age and sex, single vehicle crashes, SK, 2006-2010.

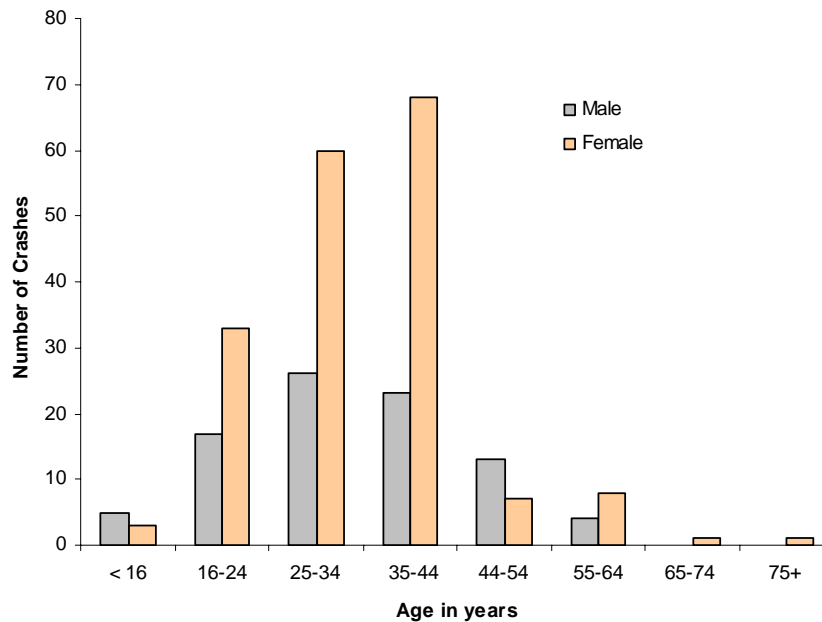


Figure 6.10: Number of motor vehicle crashes involving children ages 0-4 years by driver age and sex, single vehicle crashes, SK, 2006-2010.

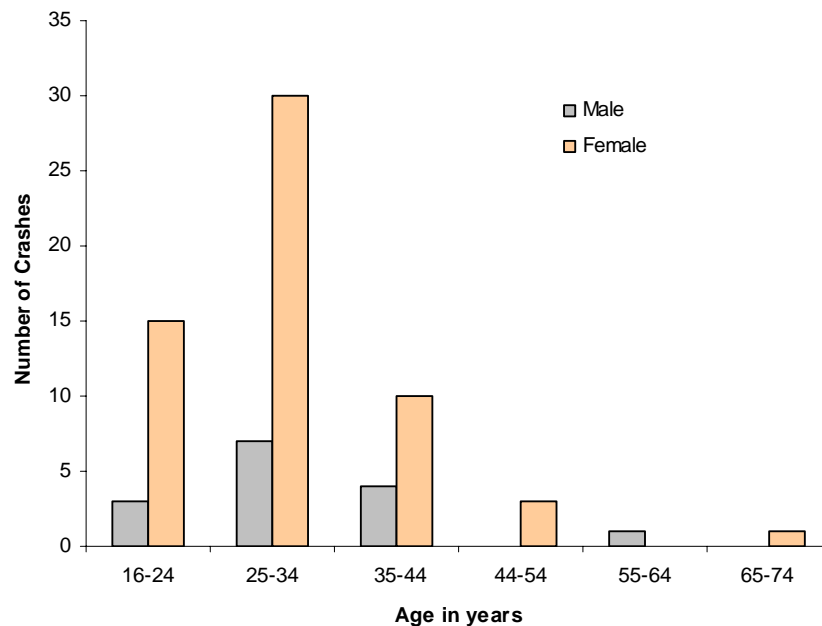


Figure 6.11: Number of motor vehicle crashes involving children ages 0-12 years by contributing factors and sex, single vehicle crashes, SK, 2006-2010.

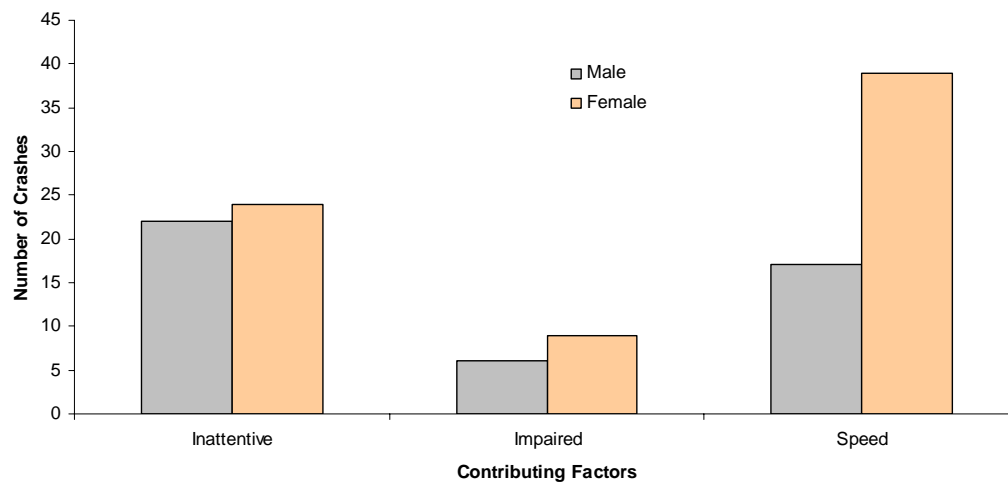


Figure 6.12: Number of inattentive-related motor vehicle crashes involving children ages 0-12 years by driver age and sex, single vehicle crashes, SK, 2006-2010.

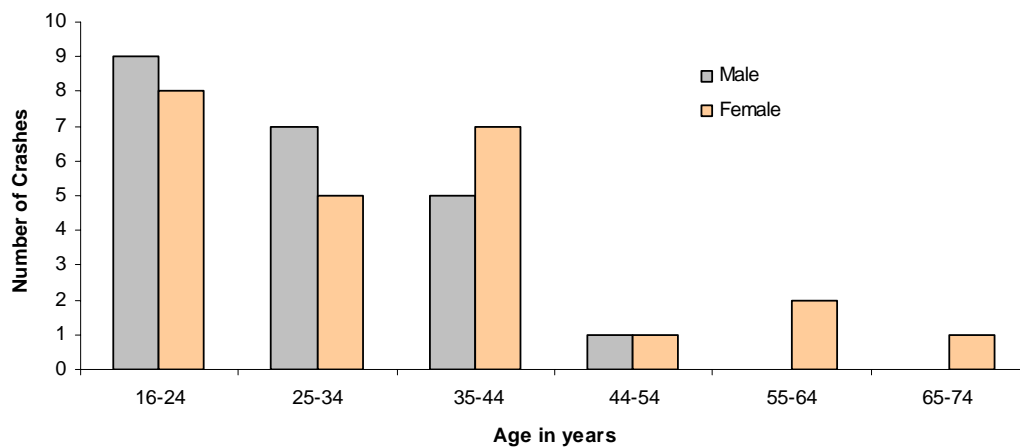


Figure 6.13: Number of impaired-related motor vehicle crashes involving children ages 0-12 years by driver age and sex, single vehicle crashes, SK, 2006-2010.

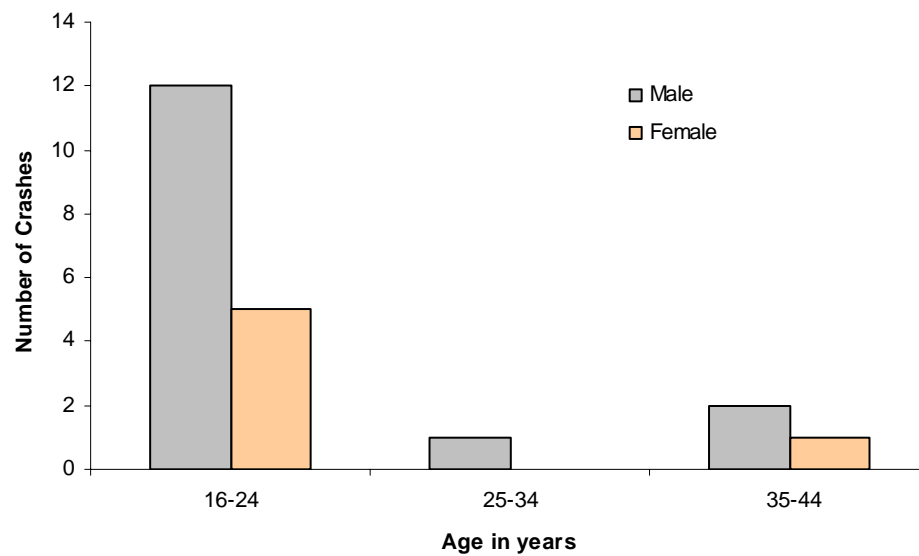


Figure 6.14: Number of speed-related motor vehicle crashes involving children ages 0-12 years by driver age and sex, single vehicle crashes, SK, 2006-2010.

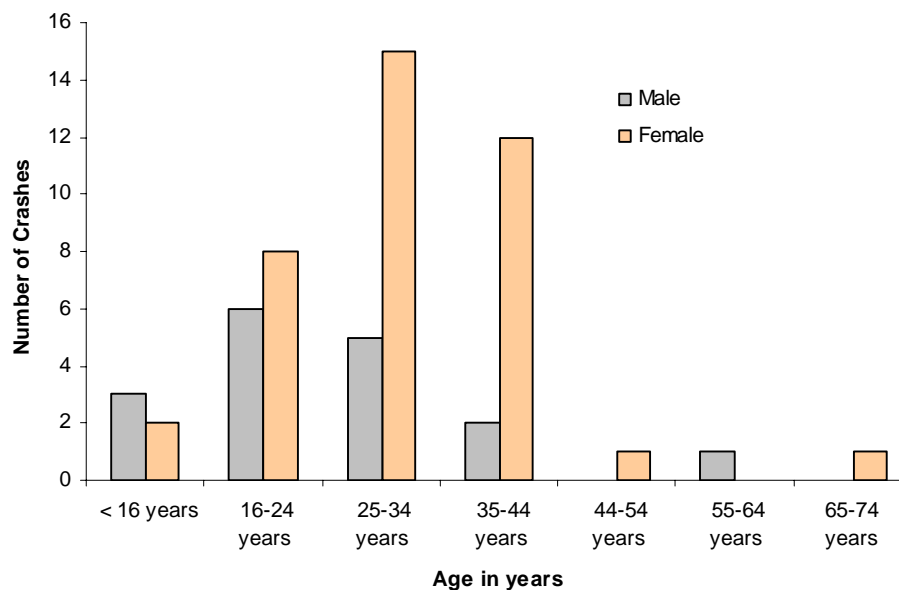
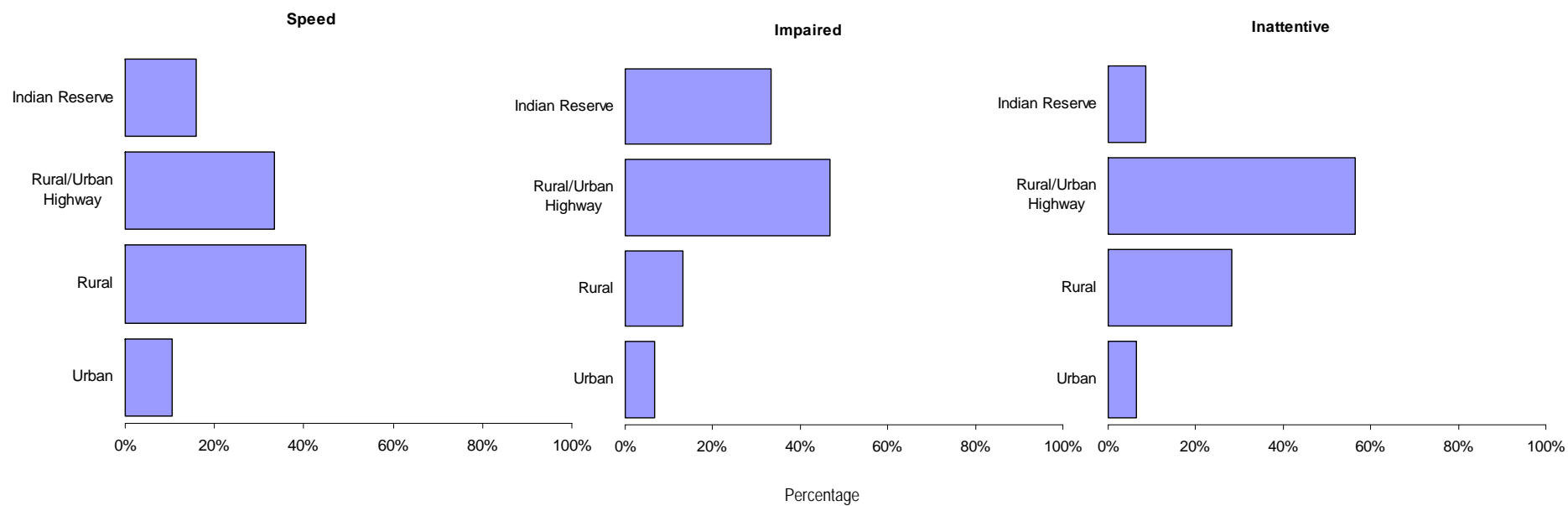


Figure 6.15: Proportion of motor vehicle crashes involving children ages 0- 12 years, by road authority, single vehicle crashes, SK, 2006-2010.



Key Point Summary

- Collision rates resulting in injury or death decreased significantly from 1988 to 2011 for general population and for children.
- Proportion of children 0-4 years and 5-8 years with motor vehicle crash-related injury who were improperly restrained decreased from 1988 to 2011.
- No booster seat use was detected for children 5-8 years with major or fatal motor vehicle crash-related injury.
- Drivers involved in crashes resulting in child passenger injury or death are predominantly females aged 25-44 years.
- Drivers of single vehicle crashes causing child passenger injury or death are predominantly younger females.
- Contributing factors to single vehicle crashes causing child passenger injury or death include speed, inattentive driving, and impaired driving.
- Female drivers aged 25-44 years are those predominantly involved in speed-related crashes causing child passenger injury or death.
- Younger male drivers aged 16-34 years and females aged 16-44 are those predominantly involved in inattentive-related crashes causing child passenger injury or death.
- Young male drivers aged 16-24 years are those predominantly involved in impaired-related crashes causing child passenger injury or death.
- The highest proportion of single vehicle speed-related crashes causing child passenger injury or death occurred on rural roads.
- The highest proportion of impaired-related crashes causing child passenger injury or death occurred on rural/urban highways.
- The highest proportion of inattentive-related crashes causing child passenger injury or death occurred on rural/urban highways.

Appendices

Appendix 6.1- Restraint use among children injured in motor vehicle crashes, Saskatchewan, 1988-2010

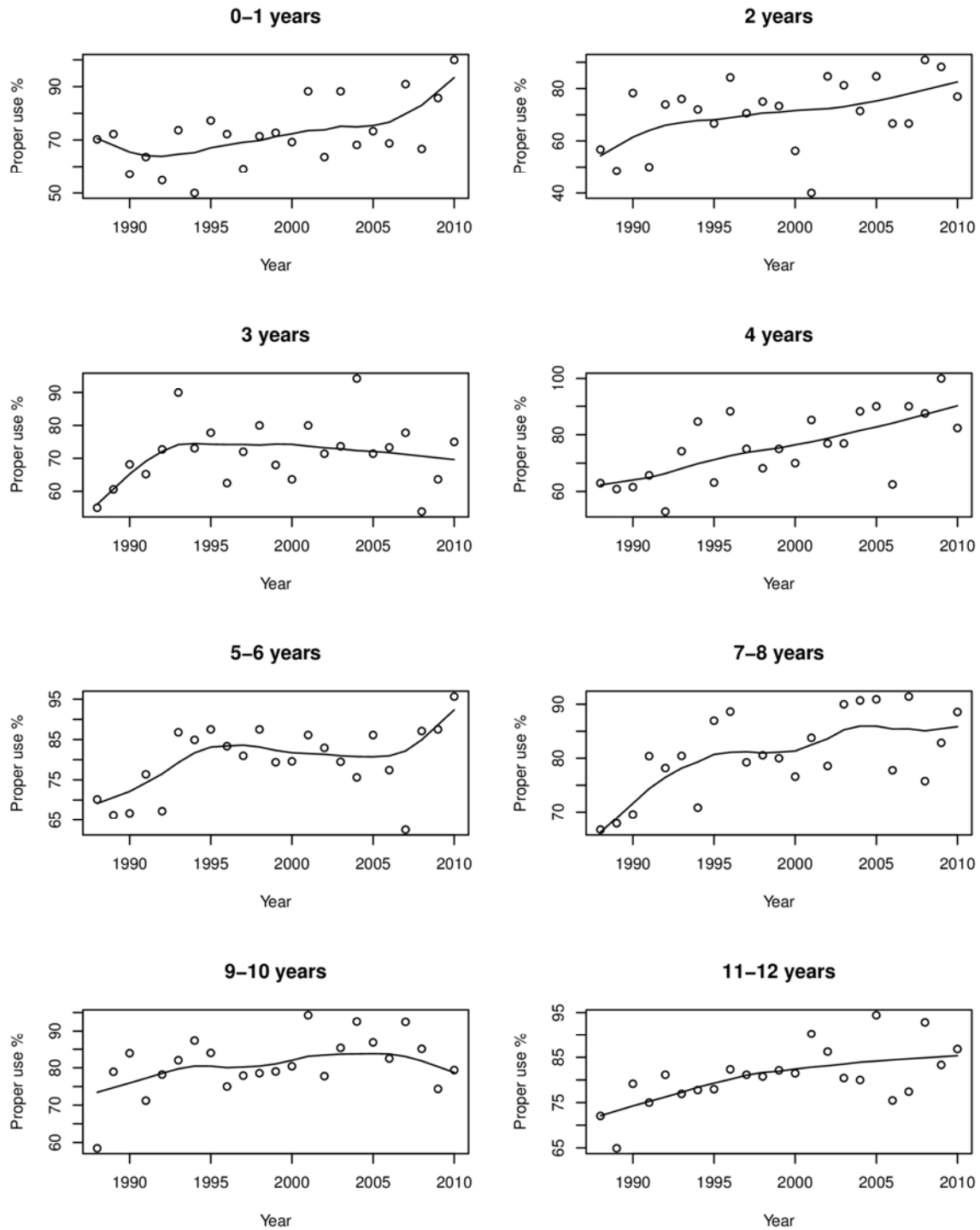
Background, Objectives

The following analysis is intended to examine temporal patterns in proper restraint use based on reported restraint use for injured children involved in motor vehicle crashes (MVC) in Saskatchewan between 1988 and 2010. While it is clear that injured children are very unlikely to represent anything like a random sample from the general population of children exposed to MVC risks, we proceed on the assumption that temporal trends in this highly select group may mirror that in the population. Considerable caution in interpreting the following results is urged, because of another important source of bias in the sample. Because only children with injuries are included there is a very strong bias towards under-reporting of proper restraint use. Properly restrained children are less prone to injuries and thus less prone to be included in the sample. Furthermore, this bias may tend to grow with improvements in injury prevention arising from improved restraint design and use.

Non-parametric fits

The following graphs describe the age-specific trends of proper restraint use prevalence, using non-parametric smoothers.

Non-parametric Fits by Age Group



There is no clear indication of any systematic change in 1998.

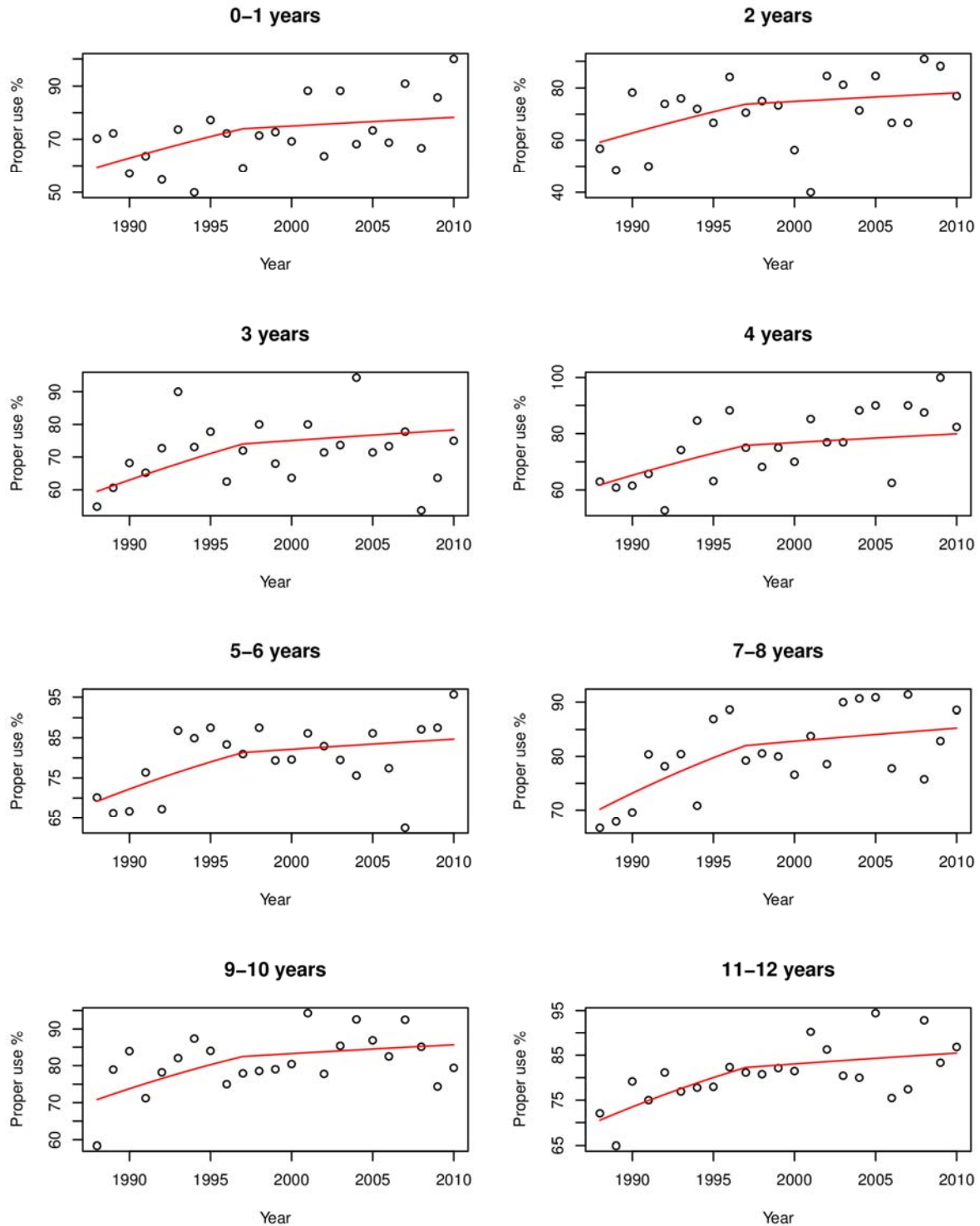
Analysis to detect change in 1998

To examine the potential of a change in trend at 1998, a *change point* model has been fitted using a time series logistic regression model. The output is below.

Fixed effects: cbind(proper, improper) ~ agegrp + year + I((year - 1997) * (year > 1997))

	Value	Std. Error	DF	t-value	p-value
(Intercept)	-145.93519	21.587492	174	-6.760173	0.0000
agegrp (omitted ...)					
year	0.07360	0.010834	174	6.793105	0.0000
I((year - 1997) * (year > 1997))	-0.05537	0.018032	174	-3.070730	0.0025

Fitted Trends from Changepoint model



The above fit indicates that the apparent growth in seatbelt use slowed after 1998. However, because of all the caveats surrounding interpretation of the data noted below, it would be risky to make any generalization to the overall population.

CHAPTER VII

SASKATCHEWAN CHILD PASSENGER SAFETY ECONOMIC ANALYSIS

Abstract

Child passenger injury is a leading cause of death and hospitalization in Saskatchewan. Policy makers are in need of better decision-making tools and more comprehensive information to assist them in allocating scarce resources more effectively in order to reduce this preventable injury. The purpose of this study is to quantify the direct costs of child passenger injury and mortality during both the pre-program period and the program period. This is accomplished by describing the number of child passenger injuries resulting in death, hospitalization, emergency room visit, or ambulance attendance from 1988 to 2010. The approach taken with respect to the estimation of the economic cost of child passenger injury allows for the determination of 'opportunity costs'. By translating child passenger injury and premature death into direct costs, estimates can be made which is an approximation of what would be gained if the injuries and deaths associated with these costs were prevented. However, the Child Passenger Safety program is only one of many contributing factors associated with the decrease in child passenger injury and death; therefore it is not possible to calculate a true return on investment for this program.

Purpose

The purpose of this study is to determine if the Saskatchewan Child Passenger Safety Program is cost-saving in terms of child passenger injury, and if there is a return on investment.

Methods

Injury Data

Injury data were provided by SGI and the SK Ministry of Health. The SGI TAIS database contains all child passenger injuries, classified as minor, moderate (non-incapacitating), major (incapacitating), major (unconsciousness) and fatal. Assumptions were made based on the TAIS data that major injury cases may be those who were treated and released from an emergency room; and that moderate injury may be those who were attended by ambulance only. There is potential overlap in costs between hospitalization cases and those classified as emergency room only cases. Also, emergency room and ambulance only cases may be under-reported.

The Ministry of Health provided vital statistics data for both mortality data and hospitalizations. The mortality data provided contained lower numbers than seen in the TAIS data, therefore two separate calculations have been performed.

The hospitalization data may be an over-estimation of child passenger injury, as a change in coding systems from the International Classification of Disease (ICD) version 9 to ICD-10 occurred in April, 2001. The numbers were flagged as records with any ICD-10-CA diagnosis code of V40 - V59 or ICD-9 diagnosis code of E810 - E819, E822 - E825. Child passengers injured while riding in a car, pick-up truck or van were the cases of interest, however those riding in heavy transport vehicles or buses (if any) could not be separated out from the data coded using ICD-9.

Direct Costs

Direct costs are defined as the value of goods and services for which payment was made and

resources used in treatment, care and rehabilitation related to illness or injury. In order to document the costs associated with child passenger injury, it is essential to have information on the complete episode associated with the events. This must cover the range of cases from those who die at the scene or at home, die upon arrival at hospital, are dealt with completely in a hospital setting to those which encompass institutional, ambulatory, rehabilitation, home care and other related costs over long periods of recovery or, in extreme cases, during the remaining period of an individuals' life expectancy.

The direct cost components related to child passenger injury in this study are organized and divided into four mutually exclusive categories to reflect the severity of injury: (1) fatal injury; (2) injury resulting in hospitalization with survival to discharge; (3) injuries that were treated in a hospital emergency room and released without hospitalization; and, (4) injury and involvement in motor vehicle crashes resulting in ambulance attendance, not transferred to hospital. Within some of these categories, insurance costs covered by SGI and additional health care costs are also applied. The total direct cost of child passenger injury is estimated by the sum of the costs in these four 'severity of injury' categories.

Direct cost components included in this study for each severity category are listed in Table 7.1. Sources of costing information for each element are presented in Table 7.2. Dollar values were provided in 2010 dollars, and converted to the appropriate year using the Bank of Canada conversion calculator (<http://www.bankofcanada.ca/rates/related/inflation-calculator/>).

Indirect Costs

Indirect costs can be calculated as the value of economic output lost because of illness, injury-related work disability, or premature death. These costs are not typically calculated for

children less than 15 years of age, as they have yet to enter the workforce. Indirect costs are not included in this analysis.

Program Costs

Programming costs for child passenger safety in Saskatchewan arise from SGI, the Saskatchewan Prevention Institute, and the Ministry of Health/ABI Partnership Project. The structure of these costs changed in 2008, increasing the SGI costs as funding for coordination was assumed, which was previously contained within the Saskatchewan Prevention Institute and the Ministry of Health/ABI Partnership Project budgets (Table 7.3).

The breakdown of child passenger safety program costs for SGI (since 2008) is provided in Table 7.4.

Calculating Costs and Savings

Additive costs were based on standard methodology. Total direct costs were calculated by multiplying the additive costs by the number of cases per year. As emergency and ambulance numbers are unconfirmed, costs were calculated as a range from zero cases accessing these services to all cases accessing these services.

It is important to note that based on the data availability, the pre-program period is 10 years in duration while the program period is 12 years. Also, the program was initiated in 1997, however in terms of injury data this start-up year has been included in the pre-program period. The program period for the injury data starts in 1998 once the program had been firmly established. In terms of the program costing information, the program period is 11 years, from 1997 to 2010.

The return on investment considers the declining injury rates, the current costs of child passenger injury and mortality, and the program costs. Calculations are made both excluding and including the estimated emergency room and ambulance costs.

Table 7.1: Components of child passenger injury costs

Costs	Fatal	Hospitalization	Emergency Room	Ambulance
Coroner	√			
Hospital	√	√		
Emergency Room	√	√	√	
Ambulance	*	*	√	√
Insurance	√	√		
Additional Direct Health Care Costs	√	√	√	

*Ambulance costs for deaths and hospitalizations are covered by the SGI Insurance costs.

Table 7.2: Child passenger injury costs sources and values in 2010 dollars.

Cost Source and Value	
Coroner	SK Coroners Service - \$1,748 per case <ul style="list-style-type: none"> Approximately 1,800 death investigations a year divided by the 2011/12 annual budget of \$3,147,000 (Salaries: \$1,471,000; Goods & Services: \$1,676,000)
Hospital	Canadian Institute of Health Information (CIHI) - \$5,187 per case
Emergency Room	SK Ministry of Health - \$206 per case Operating budget for the Pasqua and RGH emergency departments combined in 2010-2011 was \$19,032,387, divided by 92,313 patients
Ambulance	SK Ministry of Health - \$490 per call <ul style="list-style-type: none"> Average cost of an ambulance trip in SK for 2010-2011 based on total cost of road ambulance fee billings to patients divided by the total number of road ambulance trips for which a bill was generated
Insurance	SGI - \$140,000 per death; \$25,000 per hospitalization
Added Costs	<i>Economic Burden of Illness in Canada, 1998</i> , page 36: per capita cost for additional direct health care expenditures - \$943 in 1998 dollars (inflated to 2010 dollars)

Table 7.3: Average annual Child Passenger Safety Program costs

Item	Prior to 2008	Since 2008
SGI	\$154,996	\$227,996
Saskatchewan Prevention Institute - coordinator	\$20,000	
Ministry of Health/ABI Partnership Project – regional coordinator	\$20,000	
Ministry of Health/ABI Partnership Project – community grants	\$3,214	\$3,214
TOTAL	\$198,210	\$231,210

Table 7.4: Average Annual Costs of Child Passenger Safety Program to SGI

Item	Annual Cost
Staffing costs	\$ 48,696
Advertising	\$ 86,000
Clinic supplies(brochures, window clings, check sheets, bags)	\$ 16,300
SK Prevention Institute Position	\$ 73,000
Insurance Brokers Association of SK sponsorship	\$ 4,000
TOTAL	\$227,996

Calculating Costs and Cost Reductions

Additive costs were based on standard methodology. Total direct costs were calculated by multiplying the additive costs by the number of cases per year. As emergency and ambulance numbers are unconfirmed, costs were calculated as a range from zero cases accessing these services to all cases accessing these services.

It is important to note that based on the data availability, the pre-program period is 10 years in duration while the program period is 13 years. Also, the program was initiated in 1997, however in terms of injury data this start-up year has been included in the pre-program period. The program period for the injury data starts in 1998 once the program had been firmly established. In terms of the program costing information, the program period is 14 years, from 1997 to 2010.

The return on investment considers the declining injury rates, the current costs of child passenger injury and mortality, and the program costs. Calculations are made both excluding and including the estimated emergency room and ambulance costs.

Results

Child Passenger Injury

There were a total of 55 child passenger fatalities during the pre-program period from 1988 to 1997, and 38 fatalities during the program period from 1998 to 2010 according to the TAIS data, for a total difference of 17 lives. These numbers were more dramatic during the program period according to the vital statistics data, reporting 57 fatalities pre-program and 16 during the program period, for a total difference of 41 lives.

There were 831 hospitalizations due to child passenger injury in the pre-program period, and 456 in the program period, for a difference of 375. Emergency room visits were estimated at 295 pre-program and 131 program, for a difference of 164; and ambulance attended injuries were estimated at 1,341 pre-program and 557 during the program period, for a difference of 784.

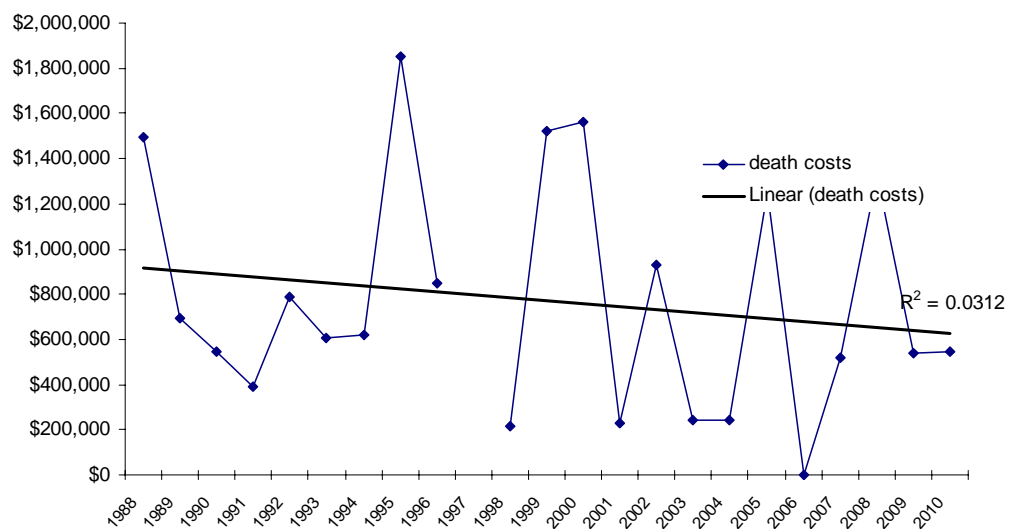
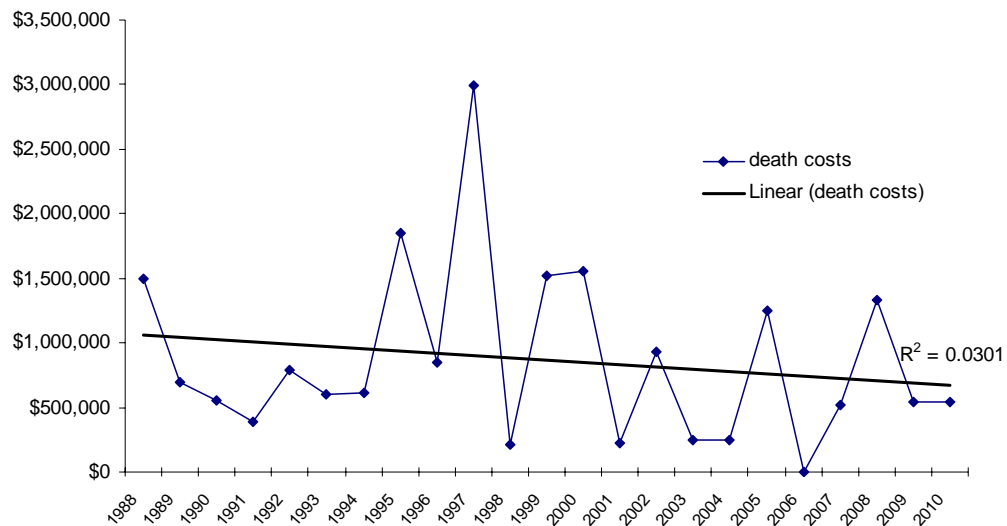
Direct Costs

The mortality costs for child passenger injury are seen to be variable from 1988 to 2010, due to small numbers. Costs calculated using the TAIS data does not demonstrate a temporal trend; while costs calculated using the Vital Statistics demonstrate an overall downward trend (Figures 7.1a & 7.1b; Appendices 7.1a & 7.1b). TAIS data demonstrate a high of \$2,992,005 in 1997 and a low of \$0 in 2006. The vital statistics data demonstrate a similar high of \$2,778,291 in 1997, but with lows of \$0 for 2003, 2006 and from 2008 to 2010.

Hospitalization, emergency room and ambulance costs for child passenger injury all demonstrate overall downward trends from 1988 to 2010 (Figures 7.2, 7.3 & 7.4; Appendices 7.2, 7.3 & 7.4). Hospitalization costs demonstrate a high of \$11,706,548 in 1988 and a low of \$3,548,928 in 2009. Emergency room costs reached a high of \$4,855,104 in 1988 and a low of \$726,081 in 2007. Ambulance costs ranged from a high of \$76,189 in 1988 to a low of \$12,026 in 2009.

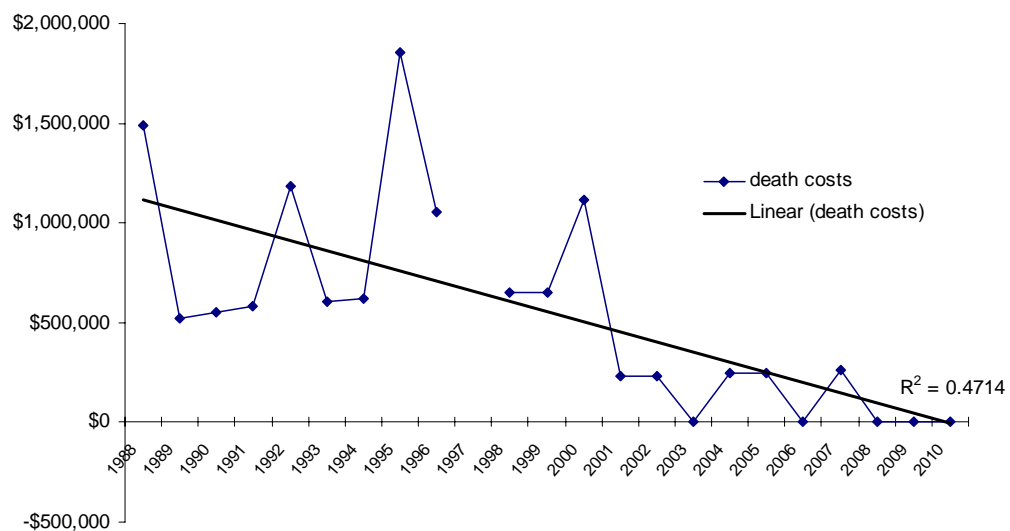
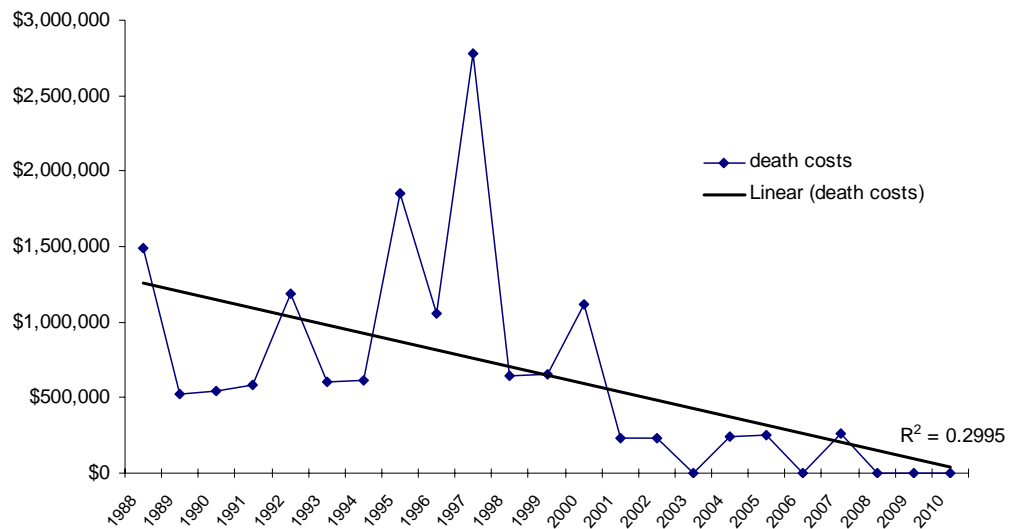
Total child passenger direct costs demonstrated overall downward trends from 1988 to 2010 (Figures 7.5a & 7.5b; Appendices 7.5a & 7.5b). The rate of decrease in costs is seen to slow, as illustrated by the slopes from 1988 to 1997 as compared to those from 1997 to 2010.

Figure 7.1a: Mortality costs, car, pick-up truck or van occupants, ages 0-12 years, SK, TAIS data 1988 – 2010.



Note: The slope is provided with and without the 1997 outlier. Variation among the years is due in part to small numbers.

Figure 7.1b: Mortality costs, car, pick-up truck or van occupants, ages 0-12 years, SK, Vital Statistics data 1988 – 2010.



Note: The slope is provided with and without the 1997 outlier. Variation among the years is due in part to small numbers.

Figure 7.2: Hospitalization costs, car, pick-up truck or van occupants, ages 0-12 years, SK, 1988/89 – 2010/11.

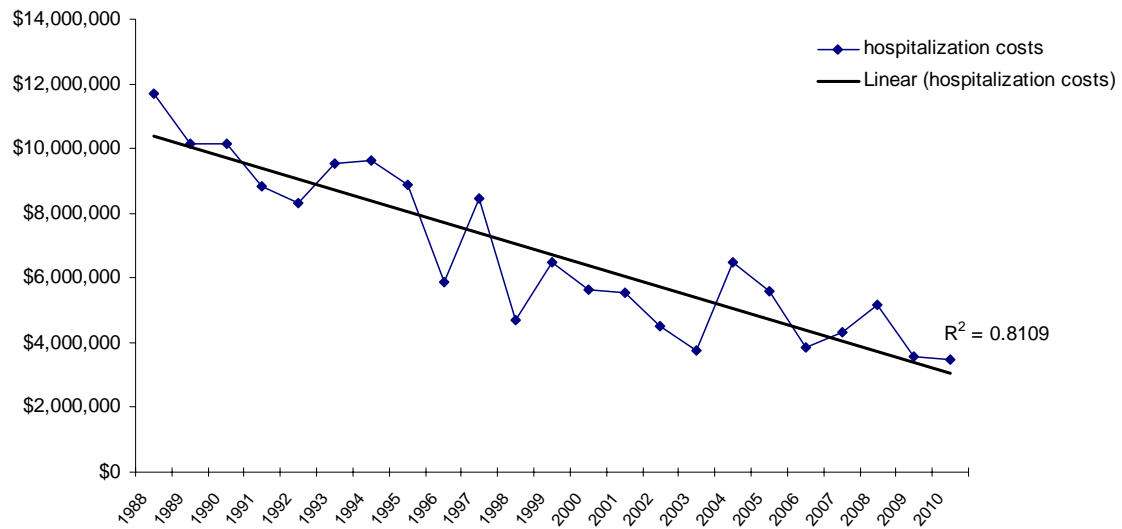


Figure 7.3: Emergency room costs, car, pick-up truck or van occupants, ages 0-12 years, SK, 1988 – 2010.

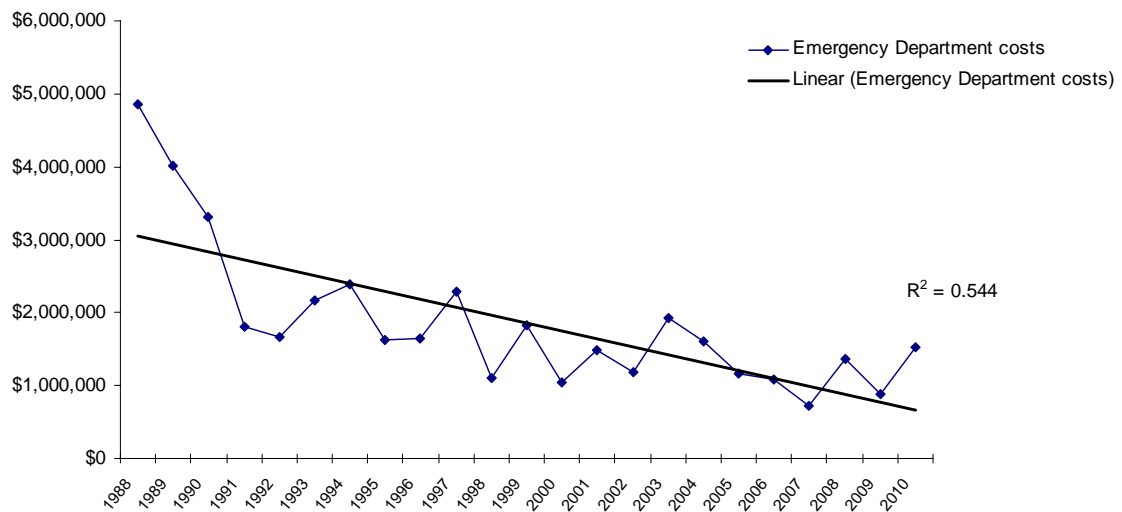


Figure 7.4: Ambulance care costs, car, pick-up truck or van occupants, ages 0-12 years, SK, 1988 – 2010.

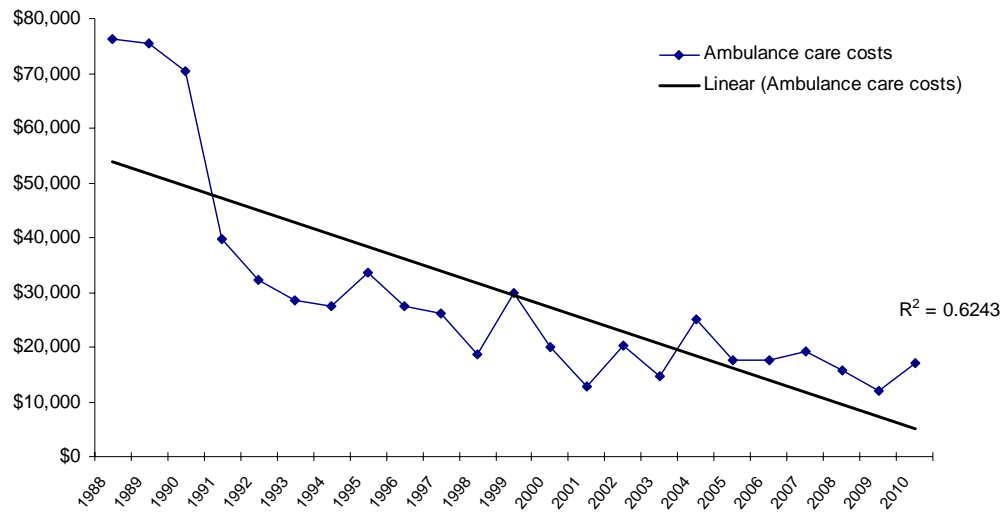


Figure 7.5a: Total direct costs, car, pick-up truck or van occupants, ages 0-12 years, SK, TAIS data 1988 – 2010.

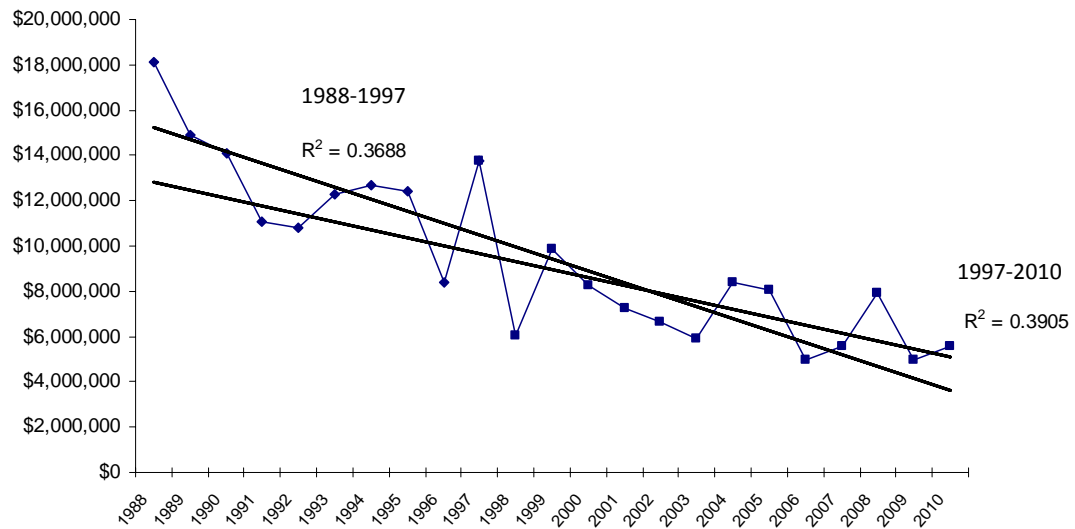
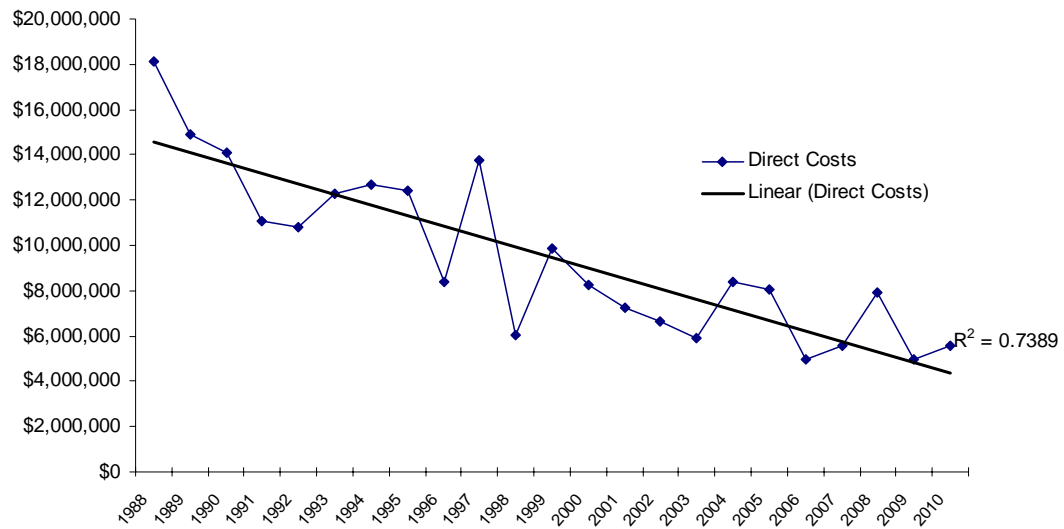
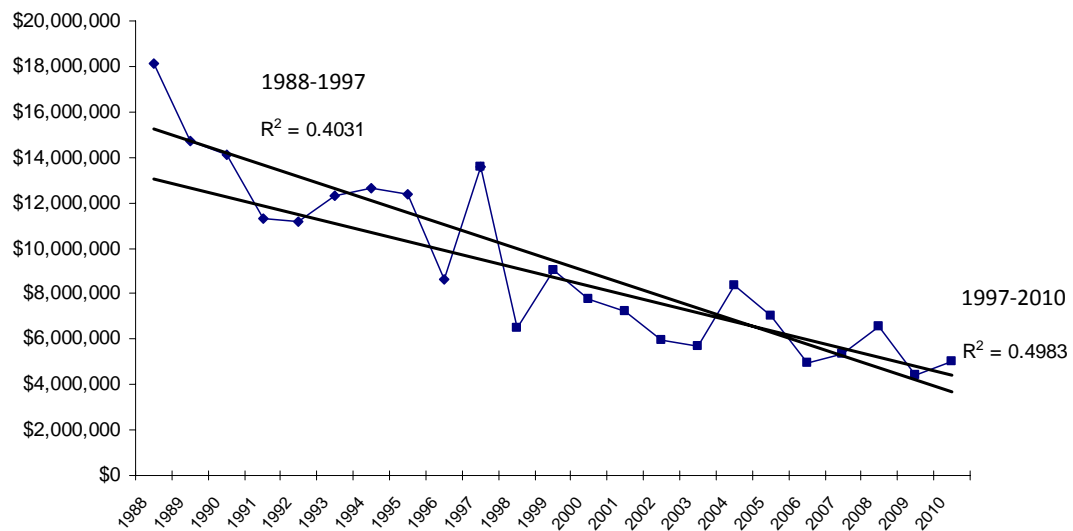
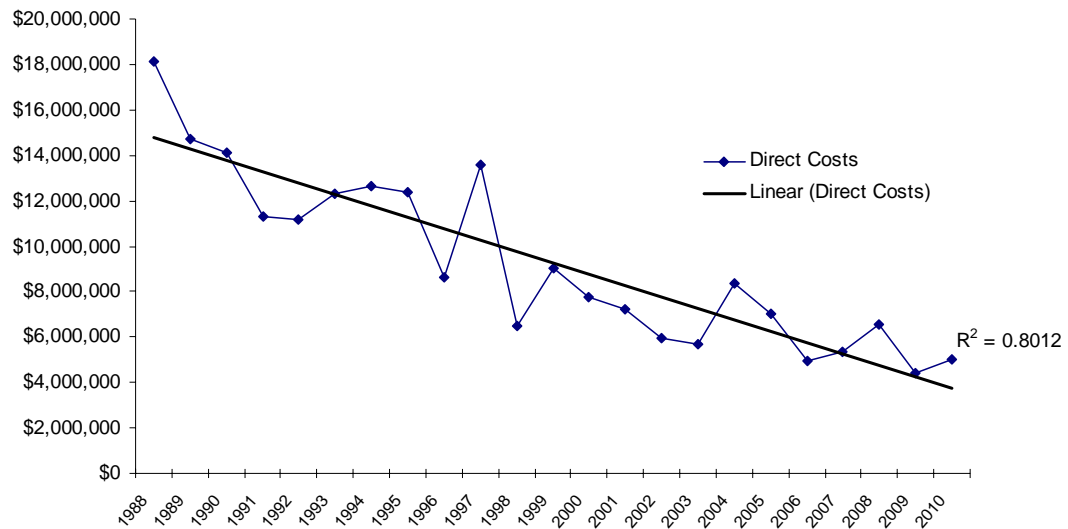


Figure 7.5b: Total direct costs, car, pick-up truck or van occupants, ages 0-12 years, SK, Vital Statistics data 1988 – 2010.



Costs and Cost Reductions

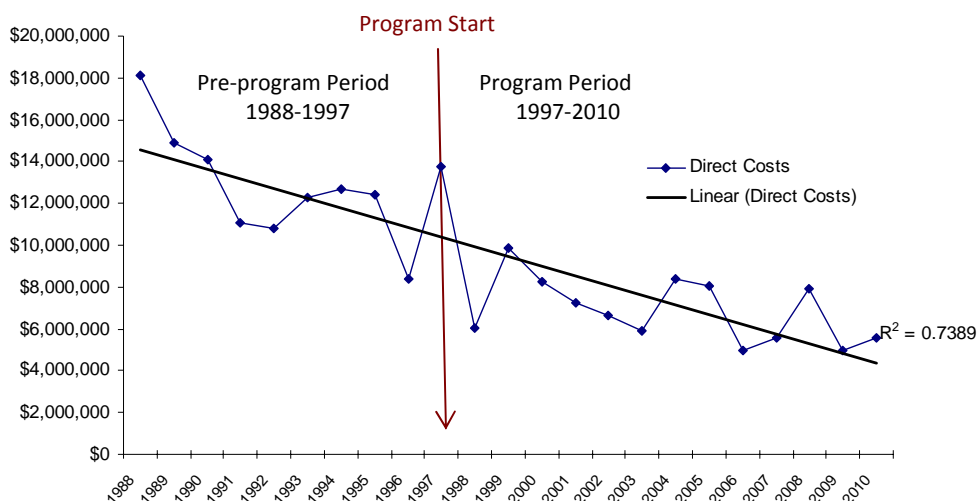
Total injury costs for the pre-program period (1988 – 1997) and the program period (1998–2010) are presented in Table 7.5a (TAIS mortality data) and Table 7.5b (Vital Statistics mortality data). It is not possible to know if the pre-program period trends would have continued in the absence of the Child Passenger Safety Program.

An overall decrease in direct costs of \$4,335,120.23 was observed during the pre-program period from 1988 to 1997, averaging at \$483,902.25 per year using the TAIS mortality data (Figure 7.6). The overall decrease in direct costs during the program period from 1997 to 2010 was observed to be \$8,225,028.71, with an average annual decrease of \$632,694.52. These numbers translate to \$4,568,834.90 and \$507,648.32 respectively for the pre-program period; and to \$8,559,147.56 and \$658,395.97 respectively for the program period, when using the Vital Statistics mortality data.

Using the TAIS mortality data, total pre-program direct costs totalled \$128,565,789.19 while direct costs during the program period totalled \$89,378,714.84, for a difference of \$39,187,074.35. Excluding the estimated emergency room and ambulance costs, these amounts decrease to \$102,356,952.38 and \$72,248,358.91 with a difference of \$30,108,593.47.

Using the Vital Statistics mortality data, total pre-program direct costs totalled \$128,980,657.19 while program costs totalled \$83,875,897.82, for a difference of \$45,104,759.37. Excluding the estimated emergency room and ambulance costs, these amounts decrease to \$102,771,820.38 and \$66,745,541.89, with a difference of \$36,026,278.49.

Figure 7.6: Total direct costs, TAIS data 1988 – 2010.



Return on Investment

Reductions to child passenger injury and mortality are influenced by more than just the Child Passenger Safety Program. Improvements to: roads; vehicles the child restraint systems themselves; driver behaviour such as speeding, driving under the influence, distracted driving; legislation and levels of enforcement and other factors have all contributed to the declining costs of child passenger injury and mortality. The magnitude of influence that this specific program plays in supporting these reductions is unknown, and therefore a true return on investment for the Child Passenger Safety Program is not possible.

Assuming that the Child Passenger Program was solely responsible for decreasing child passenger injury and death; the return on investment ranges from 10.48:1 when excluding the estimated emergency room and ambulance costs, to 13.64:1 when including these costs, based upon the TAIS data for measuring child passenger mortality. Therefore, for every dollar invested in prevention, there are \$10 to \$14 in direct health care costs avoided.

This range for the return on investment for every dollar invested in prevention increases when based upon the Vital Statistics data for measuring child passenger mortality. In this case, the return on investment ranges from 12.54:1 when excluding the estimated emergency room and ambulance costs, to 15.69: 1 when including these costs. Therefore, for every dollar invested in prevention, there are \$12 to \$16 in direct health care costs avoided.

The true return on investment for every dollar invested in the Child Passenger Safety program lies somewhere below these levels.

Table 7.5a: Total injury costs pre-program period and Child Passenger Safety program period, using TAIS mortality data.

	Pre-Program Costs 1988- 1997	Program Costs 1998-2010	Cost Reductions	Total Cases Pre	Total Cases Post	Change in Number	Reduction/Case
<i>Injury Costs</i>							
Death	\$10,830,928.91	\$9,135,199.65	\$1,695,729.26	55	38	17	\$99,748.78
Hospitalization	\$91,526,023.47	\$63,113,159.26	\$28,412,864.21	831	456	375	\$75,767.64
Emergency Department	\$25,771,535.65	\$16,890,020.66	\$8,881,514.99	295	131	164	\$54,155.58
Ambulance	\$437,301.16	\$240,335.27	\$196,965.89	1,341	557	784	\$251.23
Total Costs or Reductions	\$128,565,789.19	\$89,378,714.84	\$39,187,074.35	2,522	1,182	1,340	\$29,244.09

Table 7.5b: Total injury costs pre-program period and Child Passenger Safety program period, using Vital Statistics mortality data.

	Pre-Program Costs 1988- 1997	Program Costs 1998-2010	Cost Reductions	Total Cases Pre	Total Cases Post	Change in Number	Reduction/Case
<i>Injury Costs</i>							
Death	\$11,245,796.91	\$3,632,382.63	\$7,613,414.28	57	16	41	\$185,693.03
Hospitalization	\$91,526,023.47	\$63,113,159.26	\$28,412,864.21	831	456	375	\$75,767.64
Emergency Department	\$25,771,535.65	\$16,890,020.66	\$8,881,514.99	295	131	164	\$54,155.58
Ambulance	\$437,301.16	\$240,335.27	\$196,965.89	1,341	557	784	\$251.23
Total Costs or Reductions	\$128,980,657.19	\$83,875,897.82	\$45,104,759.37	2,524	1,160	1,364	\$33,068.01

Table 7.6: Total Child Passenger Safety Program costs 1997 – 2010.

	Program Costs 1997-2010
Community Grants	\$44,996.00
ABI Partnership Project Program Salaries	\$220,000.00
SK Prevention Institute Child Passenger Coordinator Salaries	\$220,000.00
SGI Annual Program Cost	\$2,388,944.00
Total Program Costs	\$2,873,940.00

Key Point Summary

Child Passenger Injury

- TAIS data captured 55 child passenger fatalities during the pre-program period; 38 fatalities during the program period; for a difference of 17 deaths.
- Vital Statistics captured 57 fatalities during the pre-program period; 16 fatalities during the program period; for a difference of 41 deaths.
- There were 831 child passenger injury hospitalizations in the pre-program period; 456 in the program period; for a difference of 375 hospitalizations.
- An estimated 295 child passenger injury emergency room visits occurred in the pre-program period; 131 during the program period; for a difference of 164 emergency room visits.
- An estimated 1,341 ambulance attended child passenger injuries occurred in the pre-program period; 557 during the program period; for a difference of 784 ambulance attended injuries.

Direct Costs

- Child passenger injury mortality costs calculated using the TAIS mortality data reached a high of \$3.0M in 1997; low of \$0 in 2006.
- Child passenger injury mortality costs calculated using the Vital Statistics mortality data reached a high of \$2.8M in 1997; lows of \$0 for 2003, 2006 and from 2008 to 2010.
- Child passenger injury hospitalization costs reached a high of \$11.7M in 1988; low of \$3.5M in 2009.
- Estimated child passenger injury emergency room costs reached a high of \$4.8M in 1988; low of \$0.7M in 2007.
- Estimated child passenger injury ambulance costs reached a high of \$76,000 in 1988; low of \$12,000 in 2009.
- Total direct costs of child passenger injury demonstrate a downward trend from 1988 to 2010.

- The declining costs demonstrate a reduced rate from the pre-program period to the program period.

Costs and Cost Reductions

- Overall decrease in direct costs of \$4.3M during the pre-program period using TAIS mortality data, averaging at \$484,000 per year.
- Overall decrease in direct costs of \$8.2M during the program period using TAIS mortality data, averaging \$633,000 per year.
- Overall decrease in direct costs of \$4.6M during the pre-program period using Vital Statistics mortality data, averaging at \$508,000 per year.
- Overall decrease in direct costs of \$8.6M during the program period using Vital Statistics mortality data, averaging \$658,000 per year.
- Total pre-program direct costs totalled \$128.6M and program costs totalled \$89.4M for a difference of \$39.2M, when using the TAIS mortality data.
- Excluding the estimated emergency room and ambulance costs, total pre-program direct costs totalled \$102.4M and program costs totalled \$77.2M for a difference of \$25.2M, when using the TAIS mortality data.
- Total pre-program direct costs totalled \$129.0M and program costs totalled \$83.9M for a difference of \$45.1M, when using Vital Statistics mortality data.
- Excluding the estimated emergency room and ambulance costs, total pre-program direct costs totalled \$102.8M and program costs totalled \$66.7M for a difference of \$36.0M, when using Vital Statistics mortality data.

Return on Investment

- A return on investment for the Saskatchewan Child Passenger Safety Program can not be calculated, as many other factors contribute to the declining costs in child passenger injury and mortality.

Appendices

Appendix 7.1a: Direct Costs for child passenger mortality, by year, using TAIS mortality data

DIRECT COSTS									
Year	1988	1989	1990	1991	1992	1993	1994	1995	1996
Cases per year	9	4	3	2	4	3	3	9	4
Coroner									
Cost per case	\$1,058.52	\$1,104.08	\$1,164.83	\$1,245.32	\$1,265.06	\$1,290.88	\$1,307.58	\$1,315.18	\$1,336.44
Cost per year	\$9,526.68	\$4,416.32	\$3,494.49	\$2,490.64	\$5,060.24	\$3,872.64	\$3,922.74	\$11,836.62	\$5,345.76
Hospital									
Cost per case	\$3,233.76	\$3,372.94	\$3,558.52	\$3,804.42	\$3,864.73	\$3,943.60	\$3,994.64	\$4,017.84	\$4,082.79
Cost per year	\$29,103.84	\$13,491.76	\$10,675.56	\$7,608.84	\$15,458.92	\$11,830.80	\$11,983.92	\$36,160.56	\$16,331.16
Emergency									
Cost per case	\$124.75	\$130.11	\$137.27	\$146.76	\$149.09	\$152.13	\$154.10	\$154.99	\$157.50
Cost per year	\$1,122.75	\$520.44	\$411.81	\$293.52	\$596.36	\$456.39	\$462.30	\$1,394.91	\$630.00
Insurance									
Cost per case	\$84,775.09	\$88,650.52	\$93,494.81	\$99,307.96	\$100,882.35	\$103,304.50	\$105,363.32	\$105,363.32	\$109,117.65
Cost per year	\$762,975.81	\$354,602.08	\$280,484.43	\$198,615.92	\$403,529.40	\$309,913.50	\$316,089.96	\$948,269.88	\$436,470.60
Additional									
Cost per case	\$76,677.67	\$79,978.00	\$84,378.44	\$90,209.02	\$91,639.16	\$93,509.35	\$94,719.47	\$95,269.53	\$96,809.68
Cost per year	\$690,099.03	\$319,912.00	\$253,135.32	\$180,418.04	\$366,556.64	\$280,528.05	\$284,158.41	\$857,425.77	\$387,238.72
Total	\$1,492,828.11	\$692,942.60	\$548,201.61	\$389,426.96	\$791,201.56	\$606,601.38	\$616,617.33	\$1,855,087.74	\$846,016.24

Appendix 7.1a: Mortality (TAIS) Continued

DIRECT COSTS									
Year	1997	1998	1999	2000	2001	2002	2003	2004	2005
Cases per year	14	1	7	7	1	4	1	1	5
Coroner									
Cost per case	\$1,365.29	\$1,380.48	\$1,389.59	\$1,419.97	\$1,462.49	\$1,482.23	\$1,549.05	\$1,568.80	\$1,599.17
Cost per year	\$19,114.06	\$1,380.48	\$9,727.13	\$9,939.79	\$1,462.49	\$5,928.92	\$1,549.05	\$1,568.80	\$7,995.85
Hospital									
Cost per case	\$4,170.94	\$4,217.34	\$4,245.17	\$4,337.97	\$4,467.87	\$4,528.19	\$4,732.33	\$4,792.64	\$4,885.43
Cost per year	\$58,393.16	\$4,217.34	\$29,716.19	\$30,365.79	\$4,467.87	\$18,112.76	\$4,732.33	\$4,792.64	\$24,427.15
Emergency									
Cost per case	\$160.90	\$162.69	\$163.76	\$167.34	\$172.35	\$174.68	\$182.55	\$184.88	\$188.46
Cost per year	\$2,252.60	\$162.69	\$1,146.32	\$1,171.38	\$172.35	\$698.72	\$182.55	\$184.88	\$942.30
Insurance									
Cost per case	\$109,117.65	\$110,207.61	\$110,934.26	\$113,961.94	\$117,231.83	\$118,927.34	\$124,498.27	\$125,346.02	\$128,010.38
Cost per year	\$1,527,647.10	\$110,207.61	\$776,539.82	\$797,733.58	\$117,231.83	\$475,709.36	\$124,498.27	\$125,346.02	\$640,051.90
Additional									
Cost per case	\$98,899.89	\$100,000.00	\$100,660.07	\$102,860.29	\$105,940.59	\$107,370.74	\$112,211.22	\$113,641.36	\$115,841.58
Cost per year	\$1,384,598.46	\$100,000.00	\$704,620.49	\$720,022.03	\$105,940.59	\$429,482.96	\$112,211.22	\$113,641.36	\$579,207.90
Total	\$2,992,005.38	\$215,968.12	\$1,521,749.95	\$1,559,232.57	\$229,275.13	\$929,932.72	\$243,173.42	\$245,533.70	\$1,252,625.10

Appendix 7.1a: Mortality (TAIS) Continued

DIRECT COSTS					
Year	2006	2007	2008	2009	2010
Cases per year	0	2	5	2	2
Coroner					
Cost per case	\$1,643.21	\$1,661.44	\$1,697.88	\$1,716.11	\$1,748.00
Cost per year	\$0.00	\$3,322.88	\$8,489.40	\$3,432.22	\$3,496.00
Hospital					
Cost per case	\$5,019.98	\$5,075.65	\$5,187.00	\$5,242.67	\$5,340.10
Cost per year	\$0.00	\$10,151.30	\$25,935.00	\$10,485.34	\$10,680.20
Emergency					
Cost per case	\$193.65	\$195.80	\$200.09	\$202.24	\$206.00
Cost per year	\$0.00	\$391.60	\$1,000.45	\$404.48	\$412.00
Insurance					
Cost per case	\$130,795.85	\$133,460.21	\$135,882.35	\$137,820.07	\$140,000
Cost per year	\$0.00	\$266,920.42	\$679,411.75	\$275,640.14	\$280,000.00
Additional					
Cost per case	\$119,031.90	\$120,352.04	\$122,992.30	\$124,312.43	\$126,622.66
Cost per year	\$0.00	\$240,704.08	\$614,961.50	\$248,624.86	\$253,245.32
Total	\$0.00	\$521,490.28	\$1,329,798.10	\$538,587.04	\$547,833.52

Appendix 7.1b: Direct Costs for child passenger mortality, by year, using Vital Statistics mortality data.

DIRECT COSTS									
Year	1988	1989	1990	1991	1992	1993	1994	1995	1996
Cases per year	9	3	3	3	6	3	3	9	5
Coroner									
Cost per case	\$1,058.52	\$1,104.08	\$1,164.83	\$1,245.32	\$1,265.06	\$1,290.88	\$1,307.58	\$1,315.18	\$1,336.44
Cost per year	\$9,526.68	\$3,312.24	\$3,494.49	\$3,735.96	\$7,590.36	\$3,872.64	\$3,922.74	\$11,836.62	\$6,682.20
Hospital									
Cost per case	\$3,233.76	\$3,372.94	\$3,558.52	\$3,804.42	\$3,864.73	\$3,943.60	\$3,994.64	\$4,017.84	\$4,082.79
Cost per year	\$29,103.84	\$10,118.82	\$10,675.56	\$11,413.26	\$23,188.38	\$11,830.80	\$11,983.92	\$36,160.56	\$20,413.95
Emergency									
Cost per case	\$124.75	\$130.11	\$137.27	\$146.76	\$149.09	\$152.13	\$154.10	\$154.99	\$157.50
Cost per year	\$1,122.75	\$390.33	\$411.81	\$440.28	\$894.54	\$456.39	\$462.30	\$1,394.91	\$787.50
Insurance									
Cost per case	\$84,775.09	\$88,650.52	\$93,494.81	\$99,307.96	\$100,882.35	\$103,304.50	\$105,363.32	\$105,363.32	\$109,117.65
Cost per year	\$762,975.81	\$265,951.56	\$280,484.43	\$297,923.88	\$605,294.10	\$309,913.50	\$316,089.96	\$948,269.88	\$545,588.25
Additional									
Cost per case	\$76,677.67	\$79,978.00	\$84,378.44	\$90,209.02	\$91,639.16	\$93,509.35	\$94,719.47	\$95,269.53	\$96,809.68
Cost per year	\$690,099.03	\$239,934.00	\$253,135.32	\$270,627.06	\$549,834.96	\$280,528.05	\$284,158.41	\$857,425.77	\$484,048.40
Total	\$1,492,828.11	\$519,706.95	\$548,201.61	\$584,140.44	\$1,186,802.34	\$606,601.38	\$616,617.33	\$1,855,087.74	\$1,057,520.30

Appendix 7.1b: Mortality (Vital Statistics) continued...

DIRECT COSTS									
Year	1997	1998	1999	2000	2001	2002	2003	2004	2005
Cases per year	13	3	3	5	1	1	0	1	1
Coroner									
Cost per case	\$1,365.29	\$1,380.48	\$1,389.59	\$1,419.97	\$1,462.49	\$1,482.23	\$1,549.05	\$1,568.80	\$1,599.17
Cost per year	\$17,748.77	\$4,141.44	\$4,168.77	\$7,099.85	\$1,462.49	\$1,482.23	\$0.00	\$1,568.80	\$1,599.17
Hospital									
Cost per case	\$4,170.94	\$4,217.34	\$4,245.17	\$4,337.97	\$4,467.87	\$4,528.19	\$4,732.33	\$4,792.64	\$4,885.43
Cost per year	\$54,222.22	\$12,652.02	\$12,735.51	\$21,689.85	\$4,467.87	\$4,528.19	\$0.00	\$4,792.64	\$4,885.43
Emergency									
Cost per case	\$160.90	\$162.69	\$163.76	\$167.34	\$172.35	\$174.68	\$182.55	\$184.88	\$188.46
Cost per year	\$2,091.70	\$488.07	\$491.28	\$836.70	\$172.35	\$174.68	\$0.00	\$184.88	\$188.46
Insurance									
Cost per case	\$109,117.65	\$110,207.61	\$110,934.26	\$113,961.94	\$117,231.83	\$118,927.34	\$124,498.27	\$125,346.02	\$128,010.38
Cost per year	\$1,418,529.45	\$330,622.83	\$332,802.78	\$569,809.70	\$117,231.83	\$118,927.34	\$0.00	\$125,346.02	\$128,010.38
Additional									
Cost per case	\$98,899.89	\$100,000.00	\$100,660.07	\$102,860.29	\$105,940.59	\$107,370.74	\$112,211.22	\$113,641.36	\$115,841.58
Cost per year	\$1,285,698.57	\$300,000.00	\$301,980.21	\$514,301.45	\$105,940.59	\$107,370.74	\$0.00	\$113,641.36	\$115,841.58
Total	\$2,778,290.71	\$647,904.36	\$652,178.55	\$1,113,737.55	\$229,275.13	\$232,483.18	\$0.00	\$245,533.70	\$250,525.02

Appendix 7.1b: Mortality (Vital Statistics) continued...

DIRECT COSTS					
Year	2006	2007	2008	2009	2010
Cases per year	0	1	0	0	0
Coroner					
Cost per case	\$1,643.21	\$1,661.44	\$1,697.88	\$1,716.11	\$1,748.00
Cost per year	\$0.00	\$1,661.44	\$0.00	\$0.00	\$0.00
Hospital					
Cost per case	\$5,019.98	\$5,075.65	\$5,187.00	\$5,242.67	\$5,340.10
Cost per year	\$0.00	\$5,075.65	\$0.00	\$0.00	\$0.00
Emergency					
Cost per case	\$193.65	\$195.80	\$200.09	\$202.24	\$206.00
Cost per year	\$0.00	\$195.80	\$0.00	\$0.00	\$0.00
Insurance					
Cost per case	\$130,795.85	\$133,460.21	\$135,882.35	\$137,820.07	\$140,000
Cost per year	\$0.00	\$133,460.21	\$0.00	\$0.00	\$0.00
Additional					
Cost per case	\$119,031.90	\$120,352.04	\$122,992.30	\$124,312.43	\$126,622.66
Cost per year	\$0.00	\$120,352.04	\$0.00	\$0.00	\$0.00
Total	\$0.00	\$260,745.14	\$0.00	\$0.00	\$0.00

Appendix 7.2: Direct Costs for child passenger hospitalization, by year

DIRECT COSTS									
Year	1988	1989	1990	1991	1992	1993	1994	1995	1996
Cases per year	123	102	97	79	73	82	82	75	49
Hospital									
Cost per case	\$3,233.76	\$3,372.94	\$3,558.52	\$3,804.42	\$3,864.73	\$3,943.60	\$3,994.64	\$4,017.84	\$4,082.79
Cost per year	\$397,752.48	\$344,039.88	\$345,176.44	\$300,549.18	\$282,125.29	\$323,375.20	\$327,560.48	\$301,338.00	\$200,056.71
Emergency									
Cost per case	\$124.75	\$130.11	\$137.27	\$146.76	\$149.09	\$152.13	\$154.10	\$154.99	\$157.50
Cost per year	\$15,344.25	\$13,271.22	\$13,315.19	\$11,594.04	\$10,883.57	\$12,474.66	\$12,636.20	\$11,624.25	\$7,717.50
Insurance									
Cost per case	\$15,139.01	\$15,790.62	\$16,659.43	\$17,810.60	\$18,092.96	\$18,462.21	\$18,701.13	\$18,809.73	\$19,113.81
Cost per year	\$1,862,098.23	\$1,610,642.93	\$1,615,964.42	\$1,407,037.32	\$1,320,786.30	\$1,513,900.97	\$1,533,492.58	\$1,410,729.83	\$936,576.89
Additional									
Cost per case	\$76,677.67	\$79,978.00	\$84,378.44	\$90,209.02	\$91,639.16	\$93,509.35	\$94,719.47	\$95,269.53	\$96,809.68
Cost per year	\$9,431,353.41	\$8,157,756.00	\$8,184,708.68	\$7,126,512.58	\$6,689,658.68	\$7,667,766.70	\$7,766,996.54	\$7,145,214.75	\$4,743,674.32
Total	\$11,706,548.37	\$10,125,710.03	\$10,159,164.73	\$8,845,693.12	\$8,303,453.84	\$9,517,517.53	\$9,640,685.80	\$8,868,906.83	\$5,888,025.42

Note: Ambulance costs for hospitalizations are covered by the SGI Insurance costs.

Appendix 7.2: Hospitalization continued...

DIRECT COSTS									
Year	1997	1998	1999	2000	2001	2002	2003	2004	2005
Cases per year	69	38	52	44	42	34	27	46	39
Hospital									
Cost per case	\$4,170.94	\$4,217.34	\$4,245.17	\$4,337.97	\$4,467.87	\$4,528.19	\$4,732.33	\$4,792.64	\$4,885.43
Cost per year	\$287,794.86	\$160,258.92	\$220,748.84	\$190,870.68	\$187,650.54	\$153,958.46	\$127,772.91	\$220,461.44	\$190,531.77
Emergency									
Cost per case	\$160.90	\$162.69	\$163.76	\$167.34	\$172.35	\$174.68	\$182.55	\$184.88	\$188.46
Cost per year	\$15,344.25	\$13,271.22	\$13,315.19	\$11,594.04	\$10,883.57	\$12,474.66	\$12,636.20	\$11,624.25	\$7,717.50
Insurance									
Cost per case	\$19,526.50	\$19,743.70	\$19,874.02	\$20,308.43	\$20,916.59	\$21,198.96	\$22,154.65	\$22,437.01	\$22,871.42
Cost per year	\$1,347,328.43	\$750,260.64	\$1,033,449.20	\$893,570.79	\$878,496.95	\$720,764.54	\$598,175.50	\$1,032,102.51	\$891,985.22
Additional									
Cost per case	\$98,899.89	\$100,000.00	\$100,660.07	\$102,860.29	\$105,940.59	\$107,370.74	\$112,211.22	\$113,641.36	\$115,841.58
Cost per year	\$6,824,092.41	\$3,800,000.00	\$5,234,323.64	\$4,525,852.76	\$4,449,504.78	\$3,650,605.16	\$3,029,702.94	\$5,227,502.56	\$4,517,821.62
Total	\$8,470,317.80	\$4,716,701.78	\$6,497,037.20	\$5,617,657.19	\$5,522,890.97	\$4,531,267.28	\$3,760,580.20	\$6,488,570.99	\$5,607,688.55

Appendix 7.2: Hospitalization continued...

DIRECT COSTS					
Year	2006	2007	2008	2009	2010
Cases per year	26	29	34	23	22
Hospital					
Cost per case	\$5,019.98	\$5,075.65	\$5,187.00	\$5,242.67	\$5,340.10
Cost per year	\$130,519.48	\$147,193.85	\$176,358.00	\$120,581.41	\$117,482.20
Emergency					
Cost per case	\$193.65	\$195.80	\$200.09	\$202.24	\$206.00
Cost per year	\$5,034.90	\$5,678.20	\$6,803.06	\$4,651.52	\$4,532.00
Insurance					
Cost per case	\$23,501.30	\$23,761.95	\$24,283.23	\$24,543.88	\$25,000.00
Cost per year	\$611,033.88	\$689,096.43	\$825,629.89	\$564,509.13	\$550,000.00
Additional					
Cost per case	\$119,031.90	\$120,352.04	\$122,992.30	\$124,312.43	\$126,622.66
Cost per year	\$3,094,829.40	\$3,490,209.16	\$4,181,738.20	\$2,859,185.89	\$2,785,698.52
Total	\$3,841,417.66	\$4,332,177.64	\$5,190,529.15	\$3,548,927.95	\$3,457,712.72

Appendix 7.3: Direct Costs for child passenger emergency room visits, by year

DIRECT COSTS									
Year	1988	1989	1990	1991	1992	1993	1994	1995	1996
Cases per year	63	50	39	20	18	23	25	17	17
Emergency									
Cost per case	\$124.75	\$130.11	\$137.27	\$146.76	\$149.09	\$152.13	\$154.10	\$154.99	\$157.50
Cost per year	\$7,859.25	\$6,505.50	\$5,353.53	\$2,935.20	\$2,683.62	\$3,498.99	\$3,852.50	\$2,634.83	\$2,677.50
Ambulance									
Cost per case	\$262.72	\$309.50	\$326.52	\$349.09	\$354.62	\$361.86	\$366.54	\$368.67	\$374.63
Cost per year	\$16,551.36	\$15,475.00	\$12,734.28	\$6,981.80	\$6,383.16	\$8,322.78	\$9,163.50	\$6,267.39	\$6,368.71
Additional									
Cost per case	\$76,677.67	\$79,978.00	\$84,378.44	\$90,209.02	\$91,639.16	\$93,509.35	\$94,719.47	\$95,269.53	\$96,809.68
Cost per year	\$4,830,693.21	\$3,998,900.00	\$3,290,759.16	\$1,804,180.40	\$1,649,504.88	\$2,150,715.05	\$2,367,986.75	\$1,619,582.01	\$1,645,764.56
Total	\$4,855,103.82	\$4,020,880.50	\$3,308,846.97	\$1,814,097.40	\$1,658,571.66	\$2,162,536.82	\$2,381,002.75	\$1,628,484.23	\$1,654,810.77

Appendix 7.3: Emergency room continued...

DIRECT COSTS									
Year	1997	1998	1999	2000	2001	2002	2003	2004	2005
Cases per year	23	11	18	10	14	11	17	14	10
Emergency									
Cost per case	\$160.90	\$162.69	\$163.76	\$167.34	\$172.35	\$174.68	\$182.55	\$184.88	\$188.46
Cost per year	\$3,700.70	\$1,789.59	\$2,947.68	\$1,673.40	\$2,412.90	\$1,921.48	\$3,103.35	\$2,588.32	\$1,884.60
Ambulance									
Cost per case	\$382.72	\$386.98	\$389.53	\$398.05	\$409.97	\$415.50	\$434.23	\$439.77	\$448.28
Cost per year	\$8,802.56	\$4,256.78	\$7,011.54	\$3,980.50	\$5,739.58	\$4,570.50	\$7,381.91	\$6,156.78	\$4,482.80
Additional									
Cost per case	\$98,899.89	\$100,000.00	\$100,660.07	\$102,860.29	\$105,940.59	\$107,370.74	\$112,211.22	\$113,641.36	\$115,841.58
Cost per year	\$2,274,697.47	\$1,100,000.00	\$1,811,881.26	\$1,028,602.90	\$1,483,168.26	\$1,181,078.14	\$1,907,590.74	\$1,590,979.04	\$1,158,415.80
Total	\$2,287,200.73	\$1,106,046.37	\$1,821,840.48	\$1,034,256.80	\$1,491,320.74	\$1,187,570.12	\$1,918,076.00	\$1,599,724.14	\$1,164,783.20

Appendix 7.3: Emergency room continued...

DIRECT COSTS					
Year	2006	2007	2008	2009	2010
Cases per year	9	6	11	7	12
Emergency					
Cost per case	\$193.65	\$195.80	\$200.09	\$202.24	\$206.00
Cost per year	\$1,742.85	\$1,174.80	\$2,200.99	\$1,415.68	\$2,472.00
Ambulance					
Cost per case	\$460.63	\$465.73	\$475.95	\$481.06	\$490.00
Cost per year	\$4,145.67	\$2,794.38	\$5,235.45	\$3,367.42	\$5,880.00
Additional					
Cost per case	\$119,031.90	\$120,352.04	\$122,992.30	\$124,312.43	\$126,622.66
Cost per year	\$1,071,287.10	\$722,112.24	\$1,352,915.30	\$870,187.01	\$1,519,471.92
Total	\$1,077,175.62	\$726,081.42	\$1,360,351.74	\$874,970.11	\$1,527,823.92

Appendix 7.4: Direct Costs for child passenger ambulance services, by year

DIRECT COSTS									
Year	1988	1989	1990	1991	1992	1993	1994	1995	1996
Cases per year	290	244	216	114	91	79	75	91	73
Ambulance									
Cost per case	\$262.72	\$309.50	\$326.52	\$349.09	\$354.62	\$361.86	\$366.54	\$368.67	\$374.63
Cost per year	\$76,188.80	\$75,518.00	\$70,528.32	\$39,796.26	\$32,270.42	\$28,586.94	\$27,490.50	\$33,548.97	\$27,347.99
Total	\$76,188.80	\$75,518.00	\$70,528.32	\$39,796.26	\$32,270.42	\$28,586.94	\$27,490.50	\$33,548.97	\$27,347.99

Appendix 7.4: Ambulance continued...

DIRECT COSTS									
Year	1997	1998	1999	2000	2001	2002	2003	2004	2005
Cases per year	68	48	77	50	31	49	34	57	39
Ambulance									
Cost per case	\$382.72	\$386.98	\$389.53	\$398.05	\$409.97	\$415.50	\$434.23	\$439.77	\$448.28
Cost per year	\$26,024.96	\$18,575.04	\$29,993.81	\$19,902.50	\$12,709.07	\$20,359.50	\$14,763.82	\$25,066.89	\$17,482.92
Total	\$26,024.96	\$18,575.04	\$29,993.81	\$19,902.50	\$12,709.07	\$20,359.50	\$14,763.82	\$25,066.89	\$17,482.92

Appendix 7.4: Ambulance continued...

DIRECT COSTS					
Year	2006	2007	2008	2009	2010
Cases per year	38	41	33	25	35
Ambulance					
Cost per case	\$460.63	\$465.73	\$475.95	\$481.06	\$490.00
Cost per year	\$17,503.94	\$19,094.93	\$15,706.35	\$12,026.50	\$17,150.00
Total	\$17,503.94	\$19,094.93	\$15,706.35	\$12,026.50	\$17,150.00

Appendix 7.5a: Total Direct Costs for child passenger injury and death (TAIS mortality data), by year

DIRECT COSTS								
Year	1988	1989	1990	1991	1992	1993	1994	1995
Total	\$18,130,669.10	\$14,915,051.13	\$14,086,741.63	\$11,089,013.74	\$10,785,497.48	\$12,315,242.67	\$12,665,796.38	\$12,386,027.77

Appendix 7.5a: Total Direct Costs (TAIS mortality data) continued...

DIRECT COSTS								
Year	1996	1997	1998	1999	2000	2001	2002	2003
Total	\$8,416,200.42	\$13,775,548.87	\$6,057,291.31	\$9,870,621.44	\$8,231,049.06	\$7,256,195.91	\$6,669,129.62	\$5,936,593.44

Appendix 7.5a: Total Direct Costs (TAIS mortality data) continued...

DIRECT COSTS							
Year	2004	2005	2006	2007	2008	2009	2010
Total	\$8,358,895.72	\$8,042,579.77	\$4,936,097.22	\$5,598,844.27	\$7,896,385.34	\$4,974,511.60	\$5,550,520.16

Appendix 7.5b: Total Direct Costs for child passenger injury and death (Vital Stats mortality data), by year

DIRECT COSTS								
Year	1988	1989	1990	1991	1992	1993	1994	1995
Total	\$18,130,669.10	\$14,741,815.48	\$14,086,741.63	\$11,283,727.22	\$11,181,098.26	\$12,315,242.67	\$12,665,796.38	\$12,386,027.77

Appendix 7.5b: Total Direct Costs (Vital Stats mortality data) continued...

DIRECT COSTS								
Year	1996	1997	1998	1999	2000	2001	2002	2003
Total	\$8,627,704.48	\$13,561,834.20	\$6,489,227.55	\$9,001,050.04	\$7,785,554.04	\$7,256,195.91	\$5,971,680.08	\$5,693,420.02

Appendix 7.5b: Total Direct Costs (Vital Stats mortality data) continued...

DIRECT COSTS							
Year	2004	2005	2006	2007	2008	2009	2010
Total	\$8,358,895.72	\$7,040,479.69	\$4,936,097.22	\$5,338,099.13	\$6,566,587.24	\$4,435,924.56	\$5,002,686.64

DISCUSSION & RECOMMENDATIONS

Introduction

The purpose of this evaluation is to examine how the Saskatchewan model for supporting child passenger safety compares to currently accepted best-practices; determine the effectiveness of the various elements of the Saskatchewan model; and describe the match between the burden of child passenger injury and mortality and the Saskatchewan model.

In this section, the following six questions are answered based upon two years' work and data collection (see Chapters I to VII):

1. How does the Saskatchewan model compare to international best-practices?
2. Does the Saskatchewan model increase usage of child passenger restraints?
3. Does the Saskatchewan model increase PROPER usage of child passenger restraints (to be assessed with both increased knowledge of proper usage AND improved behaviour)?
4. Do the demographics of caregivers involved in Saskatchewan interventions match the demographics of the Saskatchewan population? Are there segments of the population being missed?
5. Is there a match between the caregivers targeted by the Saskatchewan model, and the parents/guardians of the children

injured in motor vehicle collisions? If not, what other method (from the international best-practice review) could be used to target these parents/guardians?

6. What is the cost-effectiveness of the Saskatchewan model?
 - a. Are the interventions cost-saving measures?
 - b. Is there a return on investment of the interventions being used to improve child passenger safety?

Recommendations for Saskatchewan are offered based on this work, towards the enhancement of child passenger safety.

Further, the American Academy of Pediatrics Policy Statement on Child Passenger Safety is appended in Appendix 8.1; a review of the literature pertaining to the cost-effectiveness of child passenger safety systems is presented in Appendix 8.2; and a review of what works for child passenger safety seat distribution is summarized, and resources for developing a distribution program are included in Appendix 8.3.

1. How does the Saskatchewan model compare to international best-practices?

The Saskatchewan model for child passenger safety is based primarily upon the education of the parents and caregivers of young children. This education is provided by certified Child Passenger Safety Technicians via appointment, drop-in clinics, and telephone; along with resources (printed/video) available from the Saskatchewan Prevention Institute. Secondary to education, some distribution of free or discounted seats is offered through community grants provided by the ABI Partnership Project and SGI, and work by First Nations and Inuit Health (FNIH) in conjunction with the Saskatchewan Prevention Institute and SGI.

The systematic review of the literature found that the available evidence focuses on specific interventions with short-term outcomes, rather than larger, long-term programming. For example, the ability of a home safety visit targeted to families attending a Head Start preschool to increase booster seat use from baseline to 3-months post visit.

No evidence was found evaluating the use of certified Child Passenger Safety Technicians in delivering education, or the evaluation of Technician training. In order to address this gap, a survey of the certified Saskatchewan Child Passenger Safety Technicians was included as part of this program evaluation to ascertain if the current Child Passenger Safety Technician education and training in Saskatchewan is sufficient preparation and support for these individuals to perform their preventative work in the community effectively and efficiently (Chapter V).

The systematic review confirmed that education alone is not effective in enhancing child passenger safety. A multifaceted approach that includes education coupled with other interventions was demonstrated most likely to be effective in promoting child passenger safety. This approach emphasizes a systems

approach to improving road safety and questions an over-reliance on education.

Specifically, strong evidence was found supporting the effectiveness of child passenger safety education when coupled with either incentive/distribution programs or enforcement campaigns.

A similar systematic review evaluating education-only interventions for child passenger safety reached similar conclusions. Zaza et al. (2001) found strong evidence for safety seat legislation and distribution coupled with education programs, sufficient evidence for community-wide information coupled with enhanced education campaigns, and economic incentives coupled with education programs. Insufficient evidence was found for education-only programs.

Key Point Summary

- The Saskatchewan model for child passenger safety is primarily education focused.
- The Saskatchewan model is uniquely focused on certifying Child Passenger Safety Technicians to deliver education to the parents and caregivers of young children.
- Some distribution of free or discounted child safety seats is available through community grants and FNIH.
- International evidence focuses on short-term interventions rather than long-term programming. Consequently, comparisons to, and conclusions with regard to the Saskatchewan program, are difficult.
- Education coupled with another component (e.g. enforcement, distribution) is more effective than education alone.

2. Does the Saskatchewan model increase usage of child passenger restraints?

Child passenger restraint use has been measured in the Transport Canada roadside surveys in 1997 (Transport Canada, 1998), 2006 (Snowdon et al., 2006) and most recently in 2010 (Snowdon et al., 2010). Of these three surveys, only the 2010 survey reported the proportion of Saskatchewan child passengers to be unrestrained, at 8.7 percent. Overall, the nation proportions of unrestrained children have decreased since 1997:

- 1997: 12.9%
- 2006: 5.4%
- 2010: 4.2%

According to SGI TAIS data, among children sustaining mild or moderate injury in a motor vehicle crash, the proportion of improper restraint use, which includes non-use, was observed to decrease between 1988 and 2010 for both age groups – 0 to 4 years and 5 to 9 years. Furthermore, the use of rear-facing seats was seen to increase in recent years among the 0 to 4 year olds, along with an increase in the use of booster seats among the 5 to 9 year olds.

Therefore, the Saskatchewan model is associated with a decrease in number of children not restrained, who are the target audience of this project.

Key Point Summary

- National proportions of unrestrained children seen to decline from 12.9% in 1997 to 5.4% in 2006 to 4.2% in 2010.
- The proportion of Saskatchewan child passengers unrestrained according to the 2010 survey was 8.7%.
- The proportion of children 0-4 years and 5-8 years with motor vehicle crash-related injury who were improperly restrained decreased between 1988 and 2011 (TAIS data).
- The Saskatchewan model is associated with a decrease in number of children not restrained, who are the target audience of this project.

3. Does the Saskatchewan model increase PROPER usage of child passenger restraints?

Behaviour

The rate of correct use of child passenger safety seats in Saskatchewan has continuously declined since the 1997 Transport Canada survey was conducted (Table 8.1). At that time, proper use of proper restraints was estimated to be 81.2 percent for all age groups in Saskatchewan (Transport Canada, 1998). Since then, the definitions of both 'proper use' and 'appropriate restraint' have changed, and the provincial rate has decreased significantly to a weighted estimate of 59.7 percent in 2006 (Snowdon et al., 2006). Currently, the rate is estimated to be 53.5 percent among all age groups in Saskatchewan (Snowdon et al., 2010).

Table 8.1: Transport Canada roadside surveys of overall correct child passenger restraint use for 1997 (Transport Canada, 1998), 2006 (Snowdon et al., 2006), and 2010 (Snowdon et al., 2010) in Western Canada: SK, MB, AB and BC:

Province	1997	2006	2010
SK	81.2%	69.7%	53.5%
MB	81.3%	55.0%	57.2%
AB	77.2%	64.0%	71.2%
BC	80.6%	56.3%	68.2%

It is important to recognize that although the Transport Canada roadside surveys typically use students trained to estimate child age and to identify use of the right seat for that child, and the correct use of that seat, in Saskatchewan, the 2010 survey was conducted by certified Child Passenger Safety Technicians. This came about as the Transport Canada study had difficulty in finding a local coordinator in Saskatchewan, thus providing the BC Injury Research and Prevention Unit the opportunity to partner with Transport Canada in conducting this work in conjunction with this program evaluation.

Working with contacts at the Saskatchewan Prevention Institute and SGI, technicians and trained SGI summer students undertook the roadside data collection. The lower rates of correct child passenger restraint use observed in Saskatchewan during the 2010 survey may in part be due to a more critical eye than was used in the other provinces.

Another key point affecting the measurement of correct child passenger restraint use in Saskatchewan is the absence of a booster seat law in this province. Although legally correct, the use of seat belts is generally no longer deemed appropriate use among children over 40lbs until they have attained one of the following:

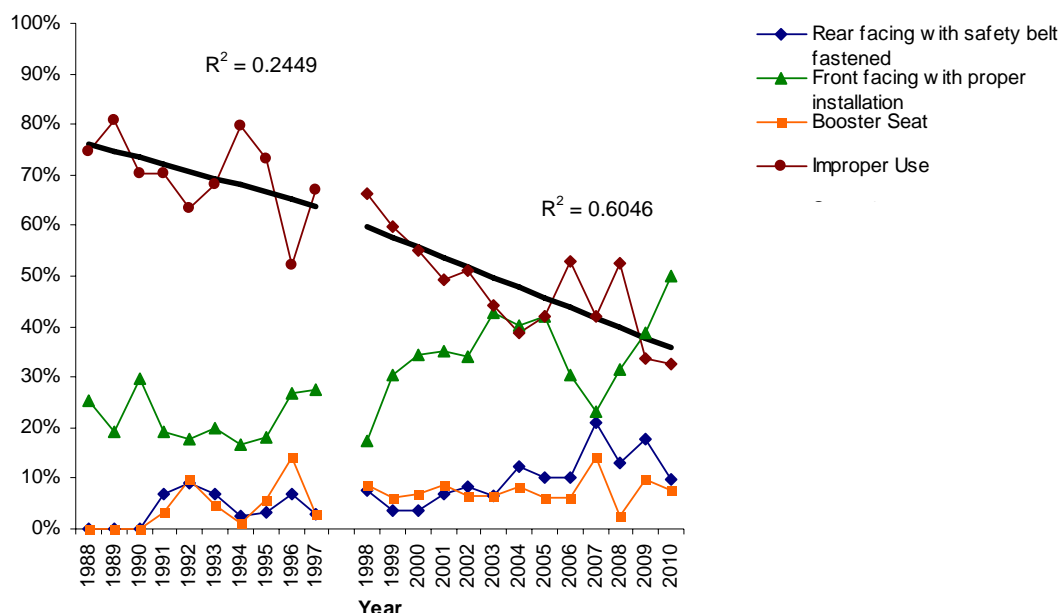
- 80lbs in weight
- 4'9" in height
- 9 years of age

British Columbia adopted its booster seat legislation in 2008, while Saskatchewan, Manitoba and Alberta continue to have no provincial law.

The SGI TAIS data for the period 1988 to 2010, where proper use is determined by the attending police officer at the crash site, demonstrates a decrease in inappropriate restraint use among children injured or killed in a motor vehicle crash. While there is an overall decrease in improper use, minor and moderate injury to 0 to 4 year olds demonstrates a higher rate of decline during the program period, visualized by a shift in slope in Figure 8.1. However, small numbers limit the ability to support this positive trend through statistical analysis.

A limitation of the TAIS data is that it only captures children who were injured in a crash. As restraint use is intended to prevent injury, it is more likely that proper use was seen among children who were in a motor vehicle crash who did not sustain an injury.

Figure 8.1: Proportion of minor and moderate motor vehicle crash-related injuries by year and type of child passenger restraint used, ages 0-4 years, SK, TAIS 1988-2010.



Knowledge

The Parking Lot Inspection conducted for this evaluation (Chapter III) only recruited a small sample of 17 drivers with child passengers in rural Saskatchewan. The majority of participants had not attended a child passenger safety clinic. None of these participants were able to identify all of the criteria for moving a child from a rear-facing infant seat to a forward-facing seat. Less than half of the drivers with forward-facing seats (5 of 11) had correctly anchored the tether strap for their forward-facing child seat.

Among the participants with rear-facing seats, the Universal Anchorage System (UAS) routing was an issue as well as the tightness of UAS or seat belts used to install the seat. Fewer than half (3 of 8) of the infants had their harnesses sufficiently snug, and 5 did not have the chest clip in the correct location.

Among the 11 participants with forward-facing seats, almost all were correctly routed with the UAS or seat belts, but not all were sufficiently tight. All harnesses were fastened although one

was not properly positioned over the shoulders. Most of the harnesses were not sufficiently snug and more than half of the chest clips were not in the correct position. Fewer than half (5 of 11) of the tether straps were correctly anchored to the vehicle.

There has been one recent telephone survey by the Saskatoon Prevention Institute, and two student-lead evaluations of Child Passenger Safety Clinics looking at the change in knowledge of the clinic clients. The Saskatchewan Prevention Institute (2004) conducted a post-clinic telephone survey in 2004 to measure the perceived usefulness and change in knowledge and behaviour one year after attending a car seat clinic (Saskatchewan Prevention Institute, 2004). A total of 150 participants reported a perceived increase in knowledge from an average score of 6.03 out of 10 at pre-clinic to 8.58 at post-clinic; with 62 percent reporting post-clinic that they had changed how they install their child safety seat in the vehicle and 43 percent how they secure their child in the seat.

Wallace (2006) evaluated clinics held by the Saskatoon Public Health Services, while Trinder (2007) evaluated child passenger safety clinics encompassing all of Saskatchewan. Both studies employed a pre-post survey design, although Trinder allowed respondents to answer “I do not know” on the true/false knowledge questions, which had not been available on Wallace’s survey. Both studies found that participants reported a high self-perceived knowledge of child passenger safety following their clinic experience, yet actual knowledge remained low for some specific elements such as knowing if the seat was installed sufficiently tight.

The Child Passenger Safety Clinic Client Survey conducted for this evaluation (Chapter IV) found that this had been the first clinic experience for three-quarters of participants. Seventy-seven percent of participants attending for rear-facing seats self-rated their child passenger safety knowledge at 8 out of 10 or higher. This proportion dropped to 61 percent for participants attending for forward-facing seats, and 54 percent for those with booster seats.

Basic installation and harnessing knowledge was higher among respondents attending for a rear-facing seat than for a forward-facing seat. Knowledge regarding how to determine if a seat was installed tightly enough was higher among respondents attending for a rear-facing seat (72%) than forward-facing seats (59%). Knowledge regarding which harness slot to use was higher for rear-facing seats (80%) than forward-facing seats (49%). Fewer than 70 percent of respondents knew how to test whether the harness straps were tight enough for both seat types. Knowledge regarding the placement of the chest clip was high for both rear-facing and forward-facing seats.

Sixty percent of respondents knew when to move a child from a rear-facing seat to a forward-facing seat; while 67 percent knew when to move a child from a booster seat to the seat belt.

Key Point Summary

- According to Transport Canada, the rate of correct use of child passenger safety seats in Saskatchewan has continuously declined since the 1997; however, the definition for correct use has also changed over the years.
- Observers in Saskatchewan in the 2010 Transport Canada roadside survey may have been more critical with regard to what constitutes correct use.
- Low proportions of proper use among 5-9 year olds may be related to the lack of a booster seat law in Saskatchewan.
- TAIS data indicates a decrease in improper use over time among children injured or killed in a motor vehicle crash.
- The majority of respondents of a Parking Lot Inspection in rural Saskatchewan had not attended a child passenger safety clinic; issues found with child seat use included UAS routing, tightness of UAS/seat belts; insufficiently snug harnesses, location of chest clips; anchoring tether straps for forward-facing seats.
- Saskatchewan Prevention Institute Child Passenger Safety Clinic post-clinic telephone survey conducted in 2004 found that clients perceived an increase of knowledge from an average score of 6.03 out of 10 at pre-clinic to 8.58 at post-clinic; with 62% reporting a change in how they installed their child safety seat post-clinic and 43% in how they secured their child.
- Two student-lead client pre-post evaluations in 2006 and 2007 found that Saskatchewan participants reported a high self-perceived knowledge of child passenger safety following their clinic experience, yet actual knowledge remained low for some specific elements such as knowing if the seat was installed sufficiently tight.
- Current client post-evaluation found that participants attending for rear-facing seats had higher knowledge of how to install the safety seat and how to secure the child properly than those clients with forward-facing seats; only 60% of clients with rear-facing seats knew when to move a child from rear-facing to forward-facing.

4. Do the demographics of caregivers involved in Saskatchewan interventions match the demographics of the Saskatchewan population? Are there segments of the population being missed?

The Saskatchewan Child Passenger Safety program targets the parents and caregivers of children between the ages of 0 and 4 years.

FNIH is currently partnering with the Saskatchewan Prevention Institute to provide child passenger safety Technician mentoring and updating in First Nations communities. Two child passenger car seats are also provided to each of these Technicians to take back to their communities.

According to the 2006 Census data for Saskatchewan (Statistics Canada, 2007):

- There were approximately 57,500 children between the ages of 0 and 4 years old; and 61,070 children ages 5 to 9 years.
- 94.0% of the population spoke English only in the home, 4.0% French, and 4.9% spoke an “other” language.
- 14.9% of the population were Aboriginal, and 5.0% were immigrants.
- 16.8% of the immigrant population arrived in Saskatchewan after the year 2000.
- 17.1% of residents aged 15 to 54 years had a University education, with a further 14.6% with a College education.
- 16.7% of Census Families were lone-parent families
- The median annual income of all “couple household with children” was \$76,494; and of lone-parent families was \$29,547

From the Child Passenger Clinic Client Survey (Chapter IV), respondents of the survey were:

- Mothers (85.0%); fathers (8.6%); and others including aunt, foster parents and Program Supervisor for clients.
- 94.3% were in married or common-law relationships
- Between 30-39 years of age (53.6%) and 20-29 years (35.7%).
- Caucasian (92.1%) and self-identified Aboriginal (4.3%), with the remainder Asian, Ukrainian or Multiple.

- Recent Immigrants since 2001 accounted for 3.5 percent.
- English was spoken in the home among 97.9% with the remainder speaking German, Hindi and Cree.
- Highly educated, with 79.4% with Apprentice, Trades, College or University
- High income levels, with 75.7% with an annual income of \$60,000 or more.

Table 8.2: Comparison of 2006 Census population in Saskatchewan with the participants of the Child Passenger Safety Clinic Client Survey.

2006 Census	Clinic Client Survey
94.0% English	97.9% English
14.9% Aboriginal	4.3% Aboriginal
5.0% Immigrant	3.5% Immigrant
31.7% High Education	79.4% High Education
16.7% Single Parents	5.7% Single Parents

Comparing the survey demographics with the 2006 Census for Saskatchewan (Table 8.2), it appears that the lower socioeconomic status population, consisting of lower education levels, lower income and single parents, may not be accessing the services of the Child Passenger Safety Clinics to the same degree as their wealthier, more educated married counterparts. Further, although the Aboriginal community makes up 14.9 percent of the population, only four percent of the Child Passenger Safety Clinic Client survey self-identified as Aboriginal. Recent immigrants may also be a vulnerable population with regard to child passenger safety, however the proportion of the Saskatchewan population (5.0%) and of the proportion completing the survey (3.5%) are very similar.

Key Point Summary

- The Saskatchewan Child Passenger Safety program targets the parents and caregivers of children ages 0-4 years.
- The majority of respondents of the Child Passenger Safety Clinic Client Survey were well-educated with high income; primarily Caucasian with 4% Aboriginal, and 3.5% of the sample were recent immigrants.
- The segments of the population that may be missed by the Child Passenger Safety Program include lower socioeconomic families and Aboriginal families.
- New Immigrant families appear to be availing themselves of this resource, although this needs to be confirmed.

5. Is there a match between the caregivers targeted by the Saskatchewan model, and the parents/guardians of the children injured in motor vehicle collisions? If not, what other method (from the international best-practice review) could be used to target these parents/ guardians?

The SGI TAIS data analysis (Chapter VI) revealed that the drivers involved in crashes resulting in child passenger injury or death are predominantly females aged 25 to 44 years; while the drivers of single vehicle crashes causing child passenger injury or death are predominantly younger females. No other demographic or socioeconomic information pertaining to these drivers is available.

Contributing factors to single vehicle crashes causing child passenger injury or death include speed, inattentive driving, and impaired driving. Looking at single vehicle crashes only, female drivers aged 25 to 44 years are predominantly involved in speed-related crashes causing child passenger injury or death. Younger male drivers aged 16 to 34 years and females aged 16 to 44 are predominantly involved in inattentive-related crashes; and young male drivers aged 16 to 24 years are predominantly involved in impaired-related crashes causing child passenger injury or death.

Regarding the roadways where child passengers are injured in conjunction with these three contributing factors, the highest proportion of single vehicle speed-related crashes causing child passenger injury or death occurred on rural roads. The highest proportion of impaired-related crashes causing child passenger injury or death occurred on rural/urban highways; and the highest proportion of inattentive-related crashes causing child passenger injury or death occurred on rural/urban highways.

The Systematic Review of the Literature (Chapter I) did not reveal any specific target populations for child passenger safety programming, nor methods for targeting specific populations, where the particular risk factors revealed in Saskatchewan were specifically associated with child passenger injury and death.

There are several potential methods that can be used for targeting the Child Passenger Safety Program to the parents and guardians of young children in Saskatchewan. To reach new parents, a closer association could be established with hospitals and Public Health units. To reach the Aboriginal or immigrant population, partnering with one or more Aboriginal-serving and Immigrant-serving organizations such as Friendship Centres will support the adaptation of the Child Passenger Safety Program in culturally appropriate and language-specific manners.

For the distribution of discounted or free safety seats to low socioeconomic families, a partnership could be established with an existing aligned NGO, such as the Saskatchewan Abilities Council. This could entail conducting an environmental scan to determine where current loaner programs are operating, and how to combine resources to fill-in the currently disparate coverage in Saskatchewan.

Key Point Summary

- Drivers involved in motor vehicle crashes where a child passenger is injured are women ages 16-44 years; men 16-44 years.
- No information on other demographics or socioeconomic information is available concerning the parents or guardians of children injured in motor vehicle crashes.
- The systematic review of the literature did not reveal specific methods for targeting segments of the populations at higher risk.
- Potential methods for targeting the Child Passenger Safety Program are: Closer association with hospitals and Public Health units for all new parents; Partner with Aboriginal and Immigrant-serving organizations (e.g. Friendship Centres); Partner with an existing aligned NGO (e.g. SK Abilities Council) for the distribution of child safety seats to lower socioeconomic populations.

6. What is the cost-effectiveness of the Saskatchewan model?

Are the interventions cost-saving measures? Is there a return on investment of the interventions being used to improve child passenger safety?

The program costs of the Saskatchewan child passenger safety model include costs to SGI, the Saskatchewan Prevention Institute, and to the Ministry of Health/ABI Partnership. Costs to SGI include staffing costs including program coordination, advertising, materials and supplies, and Insurance Brokers Association of Saskatchewan sponsorship. Program co-ordination is shared between the Saskatchewan Prevention Institute and the Ministry of Health/ABI Partnership, and these costs were taken over by SGI in 2008. Costs to the Ministry of Health/ABI Partnership also include community grants. Total program costs are calculated to be \$231,210 annually.

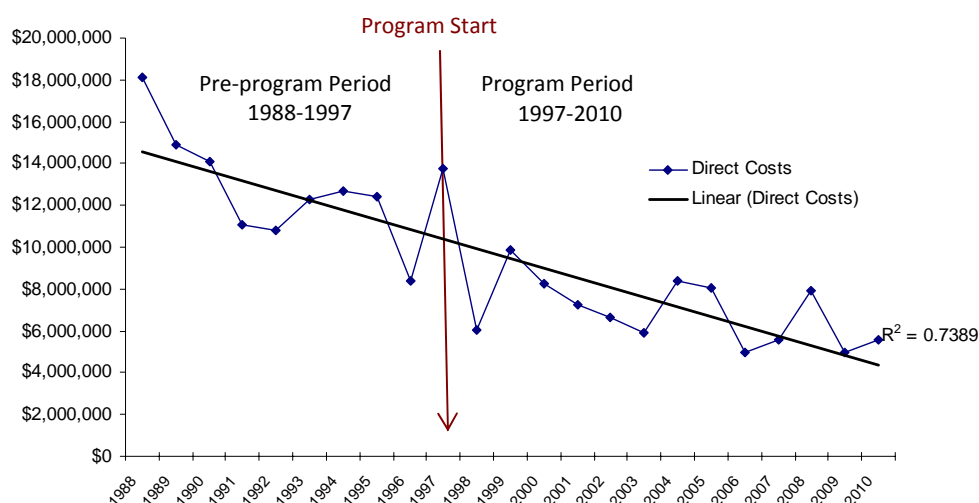
Comparing the 13 years of data during the program period to the previous 10-year pre-program (Table 8.2), there were 17 to 41 fewer deaths (according to TAIS vs. Vital Statistics mortality data), 375 fewer hospitalizations, an estimated 164 fewer emergency room visits, and an estimated 784 fewer ambulance attended child passenger injuries.

Within the pre-program period from 1988 to 1997, total direct costs decreased by a range of \$4.3M to \$8.2M (using the TAIS vs. Vital Statistics mortality data). These amounts average to \$484,000 to \$633,000 of costs avoided per year. Comparatively, during the program period from 1997 to 2010, these total direct costs avoided increased to a range of \$4.6M to \$8.6M, averaging \$508,000 to \$658,000 per year.

Comparing the program period to the pre-program period overall, the total direct costs of medical care for child passenger injury and mortality decreased by \$39.2M when using the TAIS mortality data. This increased to \$45.1M in total direct costs avoided using the Vital Statistics mortality data.

Taking a more conservative approach to calculating the direct costs by excluding estimates for emergency room and ambulance care, costs avoided of \$25.2M (TAIS mortality data) and \$36.0M (Vital Statistics mortality data) are still achieved.

Figure 8.2: Total direct costs, TAIS data 1988 – 2010.



An important consideration in the calculations of this economic burden of child passenger injury is that there are no indirect and intangible costs included, such as the monetary value of a child's life. For adults, one way to estimate the value of a life is to calculate potential income during their lifetime period. For example, for the families of victims of 9/11, compensation to families was primarily based upon likely future earnings and estimating the market price of lost services (Zelizer, 2007). However, in this human capital method of valuation, a child's future earnings are discounted because the child is not currently productive and the value of his or her future earnings has not been established. Conversely, considering the sentimental value of children has led to an increase in the economic value of a lost child. This controversial debate: devaluing a child's life versus profiting from a child's life has left this issue unresolved. Thus, indirect costs are not typically included for children. If indirect costs were included, the cost savings and return on investment would increase significantly.

A true return on investment for the Saskatchewan Child Passenger Safety Program can not be calculated as there are a multitude of other factors that may be contributing to the declining costs in child passenger injury and mortality. These other factors include resources invested in improvements to roads, vehicle improvements, promoting improved driver behaviour, legislation and increased enforcement, improvements to health care, and other programming that may contribute to improving child passenger safety.

Assuming that the Child Passenger Safety program was the major contributing factor in the reduction of child passenger injury and death, the return on investment is in the range of \$12 to \$16 of costs avoided for every dollar invested in prevention. The true return on investment for every dollar invested in the Child Passenger Safety program lies somewhere below this range.

What is known about the effectiveness of child passenger safety initiatives is that the use of restraint systems is the single most effective means of reducing fatal and nonfatal injuries in motor vehicle crashes, and that child safety seat laws are the most effective intervention to increase child safety seat use (Zaza et al., 2001). The Saskatchewan Seat Belt Regulations have required that children less than 18 kilograms be restrained in an appropriate child restraint system at least since 1983 (Govt. of Saskatchewan, 1997).

It is also known that improvements in behaviour become more difficult to achieve the higher the baseline of this behaviour in the population (Shults et al., 2004). The continued downward trend of child passenger injuries and deaths from 1988 to 2010 – more than 20 years after child passenger safety legislation – as well as the continued decrease to total direct costs of child passenger injury, suggests that legislation alone is not responsible for this continued improvement. Further, evidence from the Systematic Review (Chapter 1) supports the need for coupling differing types of interventions, such as legislation and enforcement reinforced with education and/or distribution (Zaza et al. 2001).

An example of this is presented by Ekman et al. (2001), looking at the long-term effects of legislation and local promotion of child restraint use in Sweden. Study communities who implemented an organized safety-promotion program showed greater improvement in child passenger restraint use following the child passenger safety legislation than the rest of Sweden.

Please see Appendix 8.2 for a brief review of the literature regarding the cost-effectiveness of other initiatives that have addressed child passenger safety.

Ultimately, it is not possible to determine if the Child Passenger Safety program is a cost-saving measure, however there is strong evidence supporting its contribution to child passenger safety in Saskatchewan.

Key Point Summary

- Total Child Passenger Safety program costs are calculated to be \$231,210 annually.
- The program period saw 17 to 41 fewer deaths, 375 fewer hospitalizations, 164 fewer emergency room visits, and 784 fewer ambulance attended child passenger injuries than the pre-program period.
- Total direct costs decreased by a range of \$4.3M to \$8.2M within the pre-program period; and by a range of \$4.6M to \$8.6M during the program period.
- A range of cost reductions from \$25.2M to \$45.1M were calculated for the direct costs for child passenger injury and mortality medical care, comparing the program period to the pre-program period.
- The inclusion of indirect costs of child passenger injury and mortality would see significantly increased savings and return on investment.
- A return on investment ranging from \$12 to \$16 of costs avoided for every \$1 invested in child passenger safety was found, with the caveat that the Child Passenger Safety program is not the only factor involved in increased child passenger safety in Saskatchewan.
- Although it is not possible to determine if the Child Passenger Safety program is a cost-saving measure, there is strong evidence supporting its contribution to child passenger safety in Saskatchewan.

Recommendations

The Saskatchewan Child Passenger Safety Program is a valuable program with a trained cadre of well over 100 passionate volunteers. Through the Child Passenger Safety Clinics, Technicians work with parents and caregivers of young children, educating them on the importance of child passenger safety and providing practical instruction for the installation of safety seats and their use. This model is also supplemented with limited distribution of free or discounted child safety seats available through community grants and a partnership with FNIH. Overall, child passenger safety seats are being used in Saskatchewan, and are protecting children from motor vehicle crash injuries. An exception to this is the low usage of booster seats among 5 to 9 year olds.

Among those children who are injured in motor vehicle crashes, improper child passenger restraint is decreasing. Some segments of the target demographic warrant focused efforts in order to be reached, and include low socioeconomic families, Aboriginal and Immigrant families.

This program has demonstrated savings in direct medical costs due to reduced numbers of child passenger injuries and deaths, and a return on investment ranging from \$9 to \$15 of costs avoided for every \$1 invested in prevention.

The current Saskatchewan Child Passenger Safety model focuses on technician training, parent and caregiver education with limited car seat distribution through the community grants program as well as through First Nations and Inuit Health.

Recommendations for enhancing child passenger safety promotion through:

Education

- Use social media to the fullest. Credible information can be disseminated via social media: YouTube channel, Facebook, Twitter and LinkedIn. The Saskatchewan Prevention Institute has accounts with all four of these social media platforms. Current videos posted on YouTube focus on fetal alcohol syndrome and smoking/second hand smoke prevention.
<http://www.youtube.com/user/PreventionInstitute1>
<http://www.facebook.com/SaskatchewanPreventionInstitute>
<http://twitter.com/#!/SkPrevention>
<http://ca.linkedin.com/pub/communication-department/33/276/594>
- Enlist the support of 'Mommy Bloggers'. Young female drivers were seen to be involved in single vehicle crashes where a child was injured. The influence of Mommy Bloggers should not be underestimated in their ability to influence behaviour among their peers. This is a credible audience for spreading child passenger safety messages and being part of the solution.
- Develop web-based/DVD instructional videos, e.g. Step 1, 2, 3 on how to install a car seat; how to adjust the straps securing your child, etc.
- Increase police education. The Child Safety Link located in the Maritimes has Child Passenger Safety Information and Resources for Enforcement Personnel, such as laminated resource cards detailing the child passenger laws and safety recommendations
<http://professional.childsafetylink.ca/child-passenger-safety/enforcement>
- Review the upcoming Child Passenger Safety Tool Box for its potential to support or enhance Child Passenger Safety Technician training. Currently in development by Dr. Beth Bruce as part of AUTO 21, this online toolbox will be targeted to professionals working in child passenger safety.

Equipment Incentive/Distribution

- Formalize distribution programs. Limited distribution currently takes place through the use of community grants and work with FNIH. A provincially co-ordinated program targeted at low socioeconomic families, Aboriginal and recent Immigrant families for the distribution of discounted or free child safety seats, should be considered. See Appendix 8.3 for a review of what works for child passenger safety seat distribution is summarized, and resources for developing a distribution program.
- Utilize child seats that will serve the passenger safety needs of the child over several years, e.g. convertible (rear to forward-facing), or combination (forward-facing to booster seats), or 3-in-1 seats.
- Partner with the Saskatchewan Abilities Council, who has an established Special Needs Equipment Loan Program, including retail items. Depots are currently located in Prince Albert, Regina, Saskatoon (central warehouse), Swift Current and Yorkton.
<http://www.abilitiescouncil.sk.ca/index.cfm>
- Partner with Aboriginal organizations such as Friendship Centres. A full list of Aboriginal organizations in Saskatchewan is available at <http://www.fnmr.gov.sk.ca/community/directory/>.
- Partner with Immigrant organizations providing services to new immigrants to Saskatchewan, e.g.

In Regina –

Regina Open Door Society Inc.

<http://rods.sk.ca/index.php?p=Home>

Regina Immigrant Women Centre

<http://www.iwsregina.org/>

In Saskatoon –

Global Gathering Place

<http://www.globalgatheringplace.com/>

International Women of Saskatoon

<http://www.internationalwomenofsaskatoon.org/>

Saskatchewan Intercultural Association Inc.

<http://saskintercultural.org/>

Saskatoon Open Door Society

<http://www.sods.sk.ca/>

Other Locations –

Moose Jaw Multicultural Council

<http://www.mjmcinc.ca/>

YWCA Prince Albert Settlement Services

<http://ywcaprincealbert.ca/ProgramsandServices/RefugeesImmigrantsandNewcomers.aspx>

Enforcement / Enactment

- Increase enforcement and child passenger safety blitzes. Re-establish partnerships with the RCMP and municipal police forces to increase the profile of child passenger safety and the enforcement of child passenger safety seat use.
- Support the enactment of legislation of booster seat use for children ages 5 to 9 years of age. Political lobbying is required to support a provincial politician. Other provinces have typically passed this law with little adversity when backed by a legislative champion.

References

- Ekman R, Welander G, Svanström L & Schelp L (2001). Long-term effects of legislation and local promotion of child restraint use in motor vehicles in Sweden. *Accident Analysis and Prevention* 33:793–797.
- Government of Saskatchewan (1997). *The Seat Belt Regulations (Repealed)*. Regina, Saskatchewan.
- Saskatchewan Prevention Institute (2004). *Saskatchewan Car Seat Clinic Evaluation Phone Survey*. Saskatoon, SK.
- Shults RA, Nichols JL, Dinh-Zarr TB, Sleet DA & Elder RW (2004). Effectiveness of primary enforcement safety belt laws and enhanced enforcement of safety belt laws: A summary of the Guide to Community Preventive Services systematic reviews. *Journal of Safety Research* 35:189– 196.
- Snowdon A, Hussein A & Ahmed E (2010). *Technical Report: Canadian National Survey on Child Restraint use 2010 Completed for Transport Canada, in partnership with AUTO21*.
- Snowdon A, Hussein A, Ahmed E, Kolga C & Howard A (2006). *Technical Report: Canadian National Survey on Child Restraint use 2006 Completed for Transport Canada, in partnership with AUTO21*.
- Statistics Canada (2007). *Saskatchewan (Code47) (table). 2006 Community Profiles. 2006 Census. Statistics Canada Catalogue no. 92-591-XWE. Ottawa. Released March 13, 2007*.
- Transport Canada (1998). *Child Restraint Use in Canada: 1997 Survey Data, TP2436, 1998*, http://www.tc.gc.ca/eng/roadsafety/tp-tp2436-cl9804-menu_e-151.htm (accessed March 21, 2012).
- Trinder K, Supervisors Morrison M, Locke L, and Carr T. (2007). *Evaluation of the Influence of Saskatchewan Car Seat Clinics on Caregiver Knowledge and Behaviour*. August 2007.
- Wallace J (2006). *Program Evaluation of the Saskatoon Car Seat Clinics*. First Nations University of Canada; Saskatoon Public Health Services, Safe Communities Department.
- Zaza S, Sleet DA, Thompson RS, Sosin DM, Bolen JC; Task Force on Community Preventive Services (2001). *Reviews of evidence regarding interventions to increase use of child safety seats*. *Am J Prev Med*. 21(4 Suppl):31-47.
- Zelizer VA (2007). *Pricing a Child's Life*. Huffington Post, 09/06/07. http://www.huffingtonpost.com/viviana-a-zelizer/pricing-a-childs-life_b_63381.html. (accessed March 6, 2010)

Appendices

Appendix 8.1

American Academy of Pediatrics

Policy Statement—Child Passenger Safety

<http://pediatrics.aappublications.org/content/early/2011/03/21/peds.2011-0213>

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COMMITTEE ON INJURY, VIOLENCE, AND POISON PREVENTION
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Policy Statement—Child Passenger Safety

abstract

FREE

Child passenger safety has dramatically evolved over the past decade; however, motor vehicle crashes continue to be the leading cause of death of children 4 years and older. This policy statement provides 4 evidence-based recommendations for best practices in the choice of a child restraint system to optimize safety in passenger vehicles for children from birth through adolescence: (1) rear-facing car safety seats for most infants up to 2 years of age; (2) forward-facing car safety seats for most children through 4 years of age; (3) belt-positioning booster seats for most children through 8 years of age; and (4) lap-and-shoulder seat belts for all who have outgrown booster seats. In addition, a fifth evidence-based recommendation is for all children younger than 13 years to ride in the rear seats of vehicles. It is important to note that every transition is associated with some decrease in protection; therefore, parents should be encouraged to delay these transitions for as long as possible. These recommendations are presented in the form of an algorithm that is intended to facilitate implementation of the recommendations by pediatricians to their patients and families and should cover most situations that pediatricians will encounter in practice. The American Academy of Pediatrics urges all pediatricians to know and promote these recommendations as part of child passenger safety anticipatory guidance at every health-supervision visit. *Pediatrics* 2011;127:788–793

Improved vehicle crashworthiness and greater use of child restraint systems have significantly affected the safety of children in automobiles. Major shifts in child restraint use, particularly the use of booster seats among older children, have occurred in response to public education programs and enhancements to child restraint laws in nearly every state.^{1–3} In addition, there has been a substantial increase in scientific evidence on which to base recommendations for best practices in child passenger safety. Current estimates of child restraint effectiveness indicate that child safety seats reduce the risk of injury by 71% to 82%^{4,5} and reduce the risk of death by 28% when compared with those for children of similar ages in seat belts.⁶ Booster seats reduce the risk of nonfatal injury among 4- to 8-year-olds by 45% compared with seat belts.⁷ Despite this progress, approximately 1500 children younger than 16 years die in motor vehicle crashes each year in the United States, nearly half of whom were completely unrestrained.⁸

The American Academy of Pediatrics (AAP) strongly supports optimal safety for children and adolescents of all ages during all forms of travel.

COMMITTEE ON INJURY, VIOLENCE, AND POISON PREVENTION

KEY WORDS

child passenger safety, motor vehicle crash, child restraint system

ABBREVIATIONS

AAP—American Academy of Pediatrics

CSS—car safety seat

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This policy statement provides 5 evidence-based recommendations for best practices to optimize safety in pas-

senger vehicles for all children, from birth through adolescence (a summary of recommendations is listed in Table 1):

1. All infants and toddlers should ride in a rear-facing car safety seat (CSS) until they are 2 years of age

TABLE 1 Summary of Best-Practice Recommendations

Best-Practice Recommendation	Complementary Information
<div> 1. Best-practice recommendation Infant-only or convertible CSS used rear-facing </div> <p>All infants and toddlers should ride in a rear-facing car safety seat (CSS) until they are 2 y of age or until they reach the highest weight or height allowed by the manufacturer of their CSS.</p>	<p>Infant-only seats usually have a handle for carrying and can be snapped in and out of a base that is installed in the vehicle. They can only be used rear-facing. Convertible CSSs can be used either forward- or rear-facing and typically have higher rear-facing weight and height limits than infant-only seats.</p> <p>When children using infant-only seats reach the highest weight for their seat, they should continue to ride rear-facing in a convertible seat for as long as possible. Most currently available convertible seats can be used rear-facing to at least 35 lb.</p> <p>Combination CSSs are seats that can be used forward-facing with a harness system and then, when the child exceeds the height or weight limit for the harness, as a booster seat with the harness removed.</p>
<div> 2. Best-practice recommendation Convertible or combination CSS used forward-facing </div> <p>All children 2 y or older, or those younger than 2 y who have outgrown the rear-facing weight or height limit for their CSS, should use a forward-facing CSS with a harness for as long as possible, up to the highest weight or height allowed by the manufacturer of their CSS.</p>	<p>Several models of convertible and combination CSSs can accommodate children up to 65 or 80 lb when used forward-facing. The lowest maximum weight limit for currently available forward-facing CSSs is 40 lb.</p>
<div> 3. Best-practice recommendation Belt-positioning booster seat </div> <p>All children whose weight or height is above the forward-facing limit for their CSS should use a belt-positioning booster seat until the vehicle lap-and-shoulder seat belt fits properly, typically when they have reached 4 feet 9 inches in height and are between 8 and 12 y of age.</p>	<p>There is a safety advantage for young children to remain in CSSs with a harness for as long as possible before transitioning to booster seats.</p>
<div> 4. Best-practice recommendation Lap-and-shoulder vehicle seat belt </div> <p>When children are old enough and large enough to use the vehicle seat belt alone, they should always use lap-and-shoulder seat belts for optimal protection.</p>	<p>Booster seats function by positioning the child so that both the lap and shoulder portions of the vehicle seat belt fit properly; the lap portion of the belt should fit low across the hips and pelvis, and the shoulder portion should fit across the middle of the shoulder and chest. They come in both high-back (a seat back that extends up beyond the child's head) and backless models.</p> <p>The lap portion of the belt should fit low across the hips and pelvis, and the shoulder portion should fit across the middle of the shoulder and chest when the child sits with his or her back against the vehicle seat back. If they do not, then the child is likely too small to use the vehicle seat belt alone and should continue to use a belt-positioning booster seat.</p>
<div> 5. Best-practice recommendation All children younger than 13 y should be restrained in the rear seats of vehicles for optimal protection. </div> <p>All children younger than 13 y should be restrained in the rear seats of vehicles for optimal protection.</p>	<p>CSSs should be installed tightly either with the vehicle seat belt or with the LATCH system, if available. LATCH is a system of attaching a CSS to the vehicle that does not use the seat belt. It was designed to ease installation of the CSS. Whether parents use LATCH or the seat belt, they should always ensure a tight installation of the CSS into the vehicle.</p>

LATCH indicates lower anchors and tethers for children.

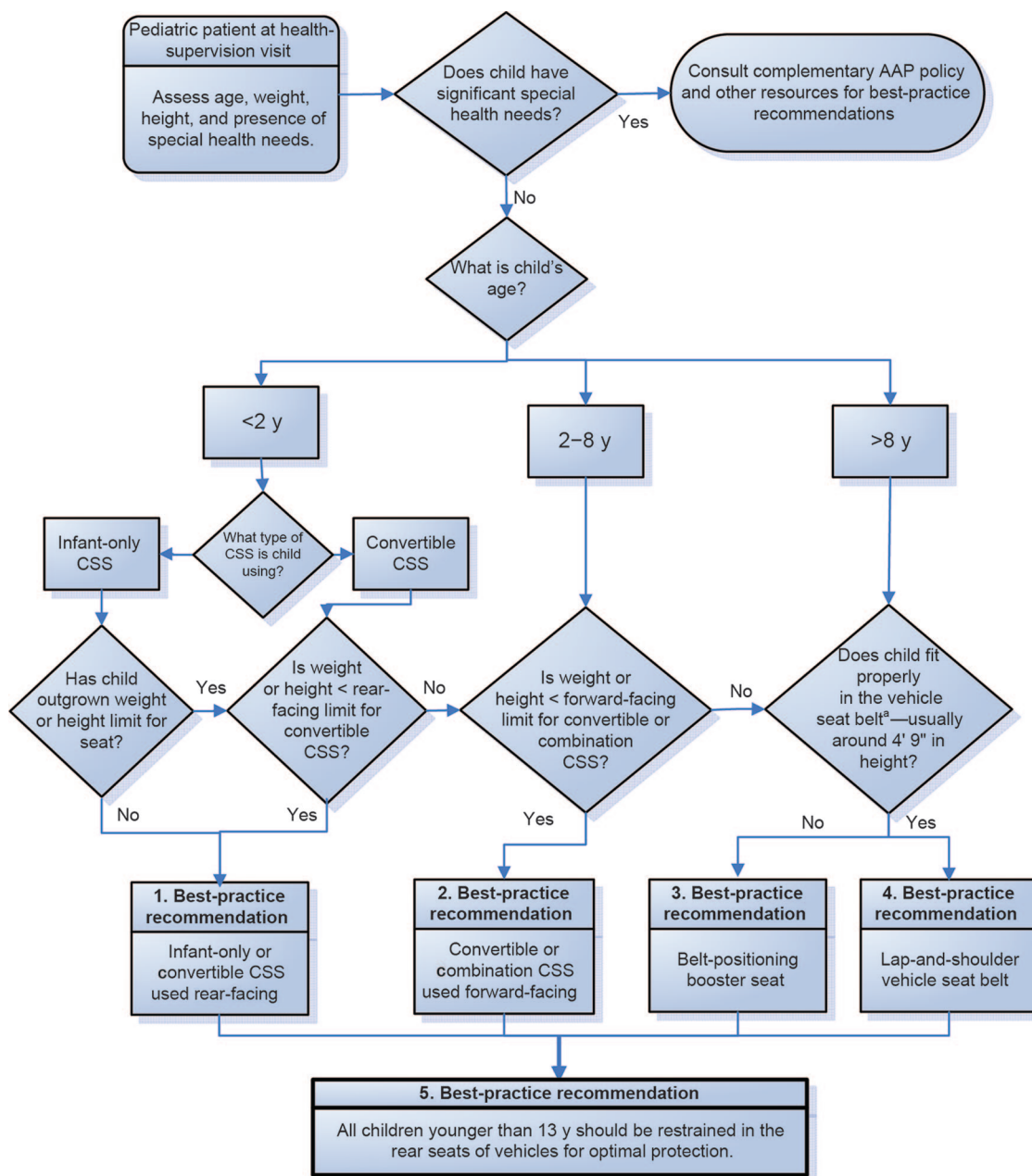


FIGURE 1

Algorithm to guide the implementation of best-practice recommendations for optimal child passenger safety (see Table 1 for a summary of recommendations and Table 2 for definitions and explanations).

- or until they reach the highest weight or height allowed by the manufacturer of their CSS.
- 2. All children 2 years or older, or those younger than 2 years who have outgrown the rear-facing weight or height limit for their CSS, should use a forward-facing CSS with a harness for as long as possible, up to the highest weight or height allowed by the manufacturer of their CSS.
- 3. All children whose weight or height is above the forward-facing limit for their CSS should use a belt-positioning booster seat until the vehicle lap-and-shoulder seat belt fits properly, typically when they have reached 4 feet 9 inches in height and are between 8 and 12 years of age.
- 4. When children are old enough and large enough to use the vehicle seat belt alone, they should always use lap-and-shoulder seat belts for optimal protection.
- 5. All children younger than 13 years should be restrained in the rear

TABLE 2 Explanations of Decision Points and Additional Resources

	<p>Children with certain temporary or permanent physical and behavioral conditions such as altered muscle tone, decreased neurologic control, skeletal abnormalities, or airway compromise may preclude the use of regular CSSs and may require the use of regular CSSs may require specialized restraint systems.</p>
	<p>The AAP has issued a policy statement that provides specific guidance on best-practice recommendations for children with special health care needs (www.pediatrics.org/cgi/content/full/pediatrics%3B104/4/988). To locate a child passenger safety technician in your area with special training in special health needs, go to http://cert.safekids.org.</p>
	<p>Infants younger than 2 y have relatively large heads and several structural features of their neck and spine that place them at particularly high risk of head and spine injuries in motor vehicle crashes. Rear-facing CSSs provide optimal support to the head and spine in the event of a crash, and evidence indicates that this benefit extends to children up to 2 y of age or longer.</p> <p>Children who are 2 y of age or older and small for age may need to be evaluated like children younger than 2 y. Consult a child passenger safety technician with enhanced training in special needs or other resources for assistance.</p>
	<p>The AAP annually updates information on child restraint systems currently available in the United States (http://aap.org/family/carseatguide.htm). More recent products have higher weight limits and should be used when possible. In general, children should remain in a child restraint system until they outgrow the weight or height limits for its intended use.</p>
	<p>Most children 2 to 8 y of age are not large enough to fit properly in the vehicle seat belt and will require a CSS or booster seat for optimal restraint. A belt-positioning booster seat positions a child so that the lap and shoulder portions of the seat belt fit properly: the lap portion low across the hips and pelvis and the shoulder portion across the middle of the shoulder and chest.</p> <p>Most children shorter than 4 feet 9 inches in height will not fit properly in vehicle lap-and-shoulder seat belts.</p> <p>These 3 questions are an evaluation to determine whether a child is ready to be restrained by the vehicle seat belt without a booster seat. If the answer is “no” to any of these questions, the child should use a booster seat:</p> <ul style="list-style-type: none"> Is the child tall enough to sit against the vehicle seat back with his or her knees bent at the edge of the vehicle seat without slouching and stay in this position comfortably throughout the trip? Does the shoulder belt lie across the middle of the chest and shoulder, not against the neck or face? Is the lap belt low and snug across the upper thighs, not the abdomen?

seats of vehicles for optimal protection.

It should be noted that the recommendation that all children younger than 2 years be restrained in an infant-only or convertible CSS used rear-facing represents a significant change from previous AAP policy and is based on new data from the United States⁹ as well as extensive experi-

ence in Sweden.^{10,11} It is important to note that most currently available CSSs have weight limits for rear-facing use that can accommodate the new recommendations.¹²

Certain considerations contained in this policy statement are relevant to commercial airline travel as well and are noted in the accompanying technical report.¹³ Other AAP policy statements pro-

vide specific recommendations to optimize safety for preterm and low birth weight infants,¹⁴ children in school buses,¹⁵ and children using other forms of travel and recreational vehicles.^{16–18} In addition, complementary AAP policy statements provide recommendations for teenaged drivers¹⁹ and the safe transport of newborn infants²⁰ and children with special health care needs.^{21,22}

Pediatricians play a critical role in promoting child passenger safety. To facilitate their widespread implementation in practice, evidence-based recommendations for optimal protection of children of all ages in passenger vehicles are presented in the form of an algorithm (Fig 1) with an accompanying table of explanations and definitions (Table 2). A summary of the evidence in support of these recommendations is provided in the accompanying technical report.¹³ Because pediatricians are a trusted source of information to parents, every pediatrician must maintain a basic level of knowledge of these best-practice recommendations and promote and document them at every health-supervision visit. Prevention of motor vehicle crash injury is unique in health-supervision topics, because it is the only topic recommended at every health-supervision visit by *Bright Futures*.²³ Pediatricians can also use this information to promote child passenger safety public education, legislation, and regulation at local, state, and national levels through a variety of advocacy activities, including ensuring that their state's child passenger safety law is in better alignment with

the best-practice recommendations promoted in this policy statement.

Because motor vehicle safety for children is multifaceted and will continue to evolve, all pediatricians should familiarize themselves with additional resources to address unique situations for their patients that may not be covered by the algorithm and to maintain current knowledge. In particular, many communities have child passenger safety technicians who have completed a standardized National Highway Traffic Safety Administration (NHTSA) course and who can provide hands-on advice and guidance to families. In most communities, child passenger safety technicians work at formal inspection stations; a list of these stations is available at www.seat-check.org. If your community does not have an inspection station, you can find a child passenger safety technician in your area on the National Child Passenger Safety Certification Web site (<http://cert.safekids.org>) or the NHTSA child safety seat inspection station locator (www.nhtsa.dot.gov/cps/cpsfitting/index.cfm). Car seat checkup events are updated at www.safekidsweb.org/events/events.asp. In addition, additional resources for pediatricians and families can be found at

www.aap.org or www.healthychildren.org.

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REFERENCES

- Durbin DR, Kallan MJ, Winston FK. Trends in booster seat use among young children in crashes. *Pediatrics*. 2001;108(6). Available at: www.pediatrics.org/cgi/content/full/108/6/e109
- Winston FK, Chen IG, Elliott MR, Arbogast KB, Durbin DR. Recent trends in child restraint practices in the United States. *Pediatrics*. 2004;113(5). Available at: www.pediatrics.org/cgi/content/full/113/5/e458
- Insurance Institute for Highway Safety. Child restraint/belt use laws. Available at: www.iihs.org/laws/restraintoverview.aspx. Accessed August 17, 2010
- Arbogast KB, Durbin DR, Cornejo RA, Kallan MJ, Winston FK. An evaluation of the effectiveness of forward facing child restraint systems. *Accid Anal Prev*. 2004;36(4):585–589
- Zaloshnja E, Miller TR, Hendrie D. Effectiveness of child safety seats vs safety belts for children aged 2 to 3 years. *Arch Pediatr Adolesc Med*. 2007;161(1):65–68
- Elliott MR, Kallan MJ, Durbin DR, Winston FK. Effectiveness of child safety seats vs seat belts in reducing risk for death in children in passenger vehicle crashes [published correction appears in *Arch Pediatr Adolesc Med*. 2006;160(9):952]. *Arch Pediatr Adolesc Med*. 2006;160(6):617–621
- Arbogast KB, Jermakian JS, Kallan MJ, Durbin DR. Effectiveness of belt positioning booster seats: an updated assessment. *Pediatrics*. 2009;124(5):1281–1286
- National Highway Traffic Safety Administration. FARS encyclopedia. Available at: www.fars.nhtsa.dot.gov. Accessed August 17, 2010
- Henary B, Sherwood CP, Crandall JR, et al. Car safety seats for children: rear facing for best protection. *Inj Prev*. 2007;13(6):398–402
- Isaksson-Hellman I, Jakobsson L, Gustafsson C, Norin HA. Trends and effects of child restraint systems based on Volvo's Swedish accident database. In: *Proceedings of Child Occupant Protection 2nd Symposium*. Warrendale, PA: Society of Automotive Engineers Inc; 1997:316
- Jakobsson L, Isaksson-Hellman I, Lundell B. Safety for the growing child: experiences from Swedish accident data [Abstr 05-0330]. In: *Proceedings: 19th International Technical Conference on the Enhanced Safety of Vehicles*. Washington, DC: National Highway Traffic Safety Administration; 2005

12. American Academy of Pediatrics. Car safety seats: product listing for 2011. Available at: www.healthychildren.org/carseatlist. Accessed January 7, 2011
13. Durbin DR; American Academy of Pediatrics, Committee on Injury, Violence, and Poison Prevention. Technical report: child passenger safety. *Pediatrics*. 2011;127(4). Available at: www.pediatrics.org/cgi/content/full/127/4/eXXX
14. Bull MJ, Engle WA; American Academy of Pediatrics, Committee on Injury, Violence, and Poison Prevention and Committee on Fetus and Newborn. Safe transportation of preterm and low birth weight infants at hospital discharge. *Pediatrics*. 2009;123(5):1424–1429
15. American Academy of Pediatrics, Committee on Injury, Violence, and Poison Prevention, Council on School Health. School transportation safety. *Pediatrics*. 2007;120(1):213–220
16. American Academy of Pediatrics, Committee on Injury and Poison Prevention. All-terrain vehicle injury prevention: two-, three-, and four-wheeled unlicensed motor vehicles. *Pediatrics*. 2000;105(6):1352–1354
17. American Academy of Pediatrics, Committee on Injury and Poison Prevention. Bicycle helmets. *Pediatrics*. 2001;108(4):1030–1032
18. American Academy of Pediatrics, Committee on Injury and Poison Prevention. Personal watercraft use by children and adolescents. *Pediatrics*. 2000;105(2):452–453
19. American Academy of Pediatrics, Committee on Injury, Violence, and Poison Prevention and Committee on Adolescence. The teen driver. *Pediatrics*. 2006;118(6):2570–2581
20. American Academy of Pediatrics, Committee on Injury and Poison Prevention. Safe transportation of newborns at hospital discharge. *Pediatrics*. 1999;104(4):986–987
21. American Academy of Pediatrics, Committee on Injury and Poison Prevention. School bus transportation of children with special health care needs. *Pediatrics*. 2001;108(2):516–518
22. American Academy of Pediatrics, Committee on Injury and Poison Prevention. Transporting children with special health care needs. *Pediatrics*. 1999;104(4 pt 1):988–992
23. American Academy of Pediatrics. *Bright Futures*: health care professionals tools and resources Web site. Available at: <http://brightfutures.aap.org>. Accessed August 17, 2010

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Appendix 8.2

Review of the literature pertaining to the cost-effectiveness of child passenger safety systems

There are no recent Canadian data on the costs of unintentional child injury, but a recent evaluation in the United States (US) has shown that the medical costs and losses in productivity as a result of all injuries among 0 to 14 year olds are in the range of \$50 billion (Doll, 2007). A survey conducted in the late 1990s on the costs of childhood unintentional injuries and the cost-effectiveness of interventions to prevent them showed that approximately 15 percent of medical spending resulted from an injury (Doll, 2007). The same study found that seven child injury safety measures including child safety seats had similar cost-effectiveness ratios to other well accepted strategies to prevent childhood illness. The implementation of this strategy with regards to booster seat legislation is not yet widespread in Canada.

According to the evidence, booster seat use and booster seat laws for children aged 4 to 7 years has a cost avoidance of \$1,845 per seat, a return investment of 9.4:1 for booster seat use (Table 8.2.1), while further evidence demonstrates that booster seat laws offer a return investment of 8.6 to 1 (Miller, Zaloshnja & Hendrie, 2006). In addition, Zaloshnja et al. (2007) found that child safety seats were more effective than lap-shoulder belts in preventing injury and death among children. Further, a cost-effective analysis by Goldstein et al. (2008) on a child restraint system disbursement/education program in 15 states in the US found that the program could reduce medical costs by \$1 million, parental work loss by \$94,000, and future productivity costs by \$2.7 million annually. The cost-effectiveness of the program was reportedly similar to the federal vaccines for children program (Goldstein et al., 2008). Importantly, this study finds Medicaid reimbursement for disbursement and education to be a cost-effective means of reducing injuries and considers such efforts an

important potential strategy for addressing injury disparities among low-income children.

While interventions can aid in the prevention of injuries, they also need to be cost-effective since resources are limited (Gyllensvärd, 2010). Available evidence strongly indicates that cost-effective strategies for the prevention of child occupant injury can save not only lives but direct health care costs as well (Table 8.2.1).

References

- Doll LS, Bonzo SE, Mercy JA & Sleet DA, eds. (2007) Handbook of injury and violence prevention. Atlanta, GA, Springer.
- Goldstein JA, Winston FK, Kallan MJ, Branas CC, Schwartz JS (2008). Medicaid-based child restraint system disbursement and education and the vaccines for children program: comparative cost-effectiveness. *Ambul Pediatr.* 8(1):58-65.
- Gyllensvärd H (2010). Cost-effectiveness of injury prevention - a systematic review of municipality based interventions. *Cost Eff Resour Alloc.* 10(8):17.
- Lindqvist K and Lindholm L (2001). A cost-benefit analysis of the community-based injury prevention programme in Motala, Sweden--a WHO Safe Community. *Public Health* 115(5):317-22.
- Miller TR, Zaloshnja E, Hendrie D (2006). Cost-outcome analysis of booster seats for auto occupants aged 4 to 7 years. *Pediatrics.* 118(5):1994-8.
- Zaloshnja E, Miller TR, Hendrie D (2007). Effectiveness of child safety seats vs. safety belts for children aged 2 to 3 years. *Arch Pediatr Adolesc Med.* 161(1):65-8.

Table 8.2.1: Summary evidence re the cost-effectiveness of child safety seats related interventions.

Author/ design	Population/ Study Time Period	Intervention/ Comparison	Analysis/Outcome	Reported Findings	Summary
Lindqvist & Lindholm (2001)	Motala, Sweden 1983-1989 Pre-intervention: October 1, 1983 – September 30, 1984 Post intervention: January 1, 1989 – December 31, 1989	Intervention: Safe Communities approach focussed on two risk populations (Children/ teenagers and elderly) and three risk environments (traffic safety, sports/ recreation and workplace). Formed self regulatory local action groups containing a facilitator and representatives from local organizations that managed injuries. Both passive and active interventions were introduced. Comparison: Mjölby in Östergötland.	Cost-benefit analysis Information about the place of injury, course of events, type and severity of injury and patients suggestions about possible preventive measures were inquired from all patients contacting health care units in the area. Also hospital discharge data from all hospitals were collected.	13% decrease in injured people in experiment group while a 2% increase of injured people in control group. 20 million decrease in injury cost. Intervention cost-effective.	Intervention is cost-effective
Miller, Zaloshnja & Hendrie (2006)	USA- Children age 4-7 years olds in USA	Cost-outcome analyses of booster seat use and of booster seat laws for children aged 4 to 7 years.	Net cost per quality adjusted life year saved, benefit cost ratio and net savings per seat. Seat cost of booster seats were estimated using Web and retailer data in USA. Costs of passing and enforcing a legal mandate were estimated as a percentage of the costs of seat use in	Booster seat use & booster seat laws for children 4-7 years has a cost avoidance of \$1,845 per seat, a return investment of 9.4 to 1 for booster seat use while further evidence shows that booster seat use laws offer a return investment of 8.6 to 1.	Both use of booster seats and booster seat laws are cost effective
Zaloshnja, Miller & Hendrie, (2007)	Toddlers who were sitting in rear vehicle seats based on US data on a nationally representative sample. 1998 – 2004	Intervention: Child safety seat Comparison: seat belt	Presence of any injury after a crash.	The adjusted odds of injury were 81.8% lower for toddlers in child seats than belted toddlers.	Intervention is cost-effective
Goldstein, Winston, Kallan, Branas & Schwartz (2008)	New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, West Virginia, North Carolina, District of Columbia, Ohio, Michigan, Indiana, Illinois, California, Nevada, Arizona 1999-2003	Intervention: universal Medicaid-based disbursement and education program. Comparison: Vaccines for children programme.	Cost-effective analysis Cost per life saved, death, serious injury and minor injury averted, medical parental work loss and future productivity loss costs averted.	The program could have a cost avoidance of over \$1 million per 100,000 children. Data similar to published vaccination cost-effectiveness data.	Intervention is cost-effective

Appendix 8.3

Review of what works for child passenger safety seat distribution

The US National Highway Traffic Safety Administration (NHTSA) has engaged in programming to increase the use of child passenger safety seats in order to reduce the burden of child passenger injury and mortality. The National Child Safety Seat Distribution Program provided seats to low income families and to children with special needs. Seats were disseminated via non-profit organizations. An evaluation of this program produced the following results (NHTSA, 1999):

- Over half of the distribution sites were medical-related.
- Less than half of sites had staff trained in child passenger safety before engaging in distribution.
- 80% of sites had staff trained in child passenger safety once seats were available for distribution.
- 95% of sites assessed needs of recipients prior to providing a seat.
- 91% of sites trained recipients in seat use.
- Distribution at medical-related sites (hospitals, Public Health) were found to be most likely to have trained staff and child passenger programming in place; and were most likely to have contact with qualified recipients.
- Distribution at non-medical sites was successful if they were able to identify low income families, committed to staff training, and provided recipient training.

Reference

National Highway Traffic Safety Administration (NHTSA) (1999). Child Safety Seat Distribution: What Works? *Ann Emerg Med* September 34:403-404.

Child Safety Link Car Seat Distribution Program

As part of the support for changes to car seat and booster seat regulations, Child Safety Link received a one-time allocation of funds from the Nova Scotia Department of Health and Wellness to provide car seats to people who needed them.

A survey of Family Resource Centres was conducted to determine if there was a need for child safety seat distribution, and if these resource centers would be willing to partner with Child Safety Link. An advertisement to family resource centres, a grant application form and a program guide were developed in total \$800 grants were provided to each centre that applied.

The target audience for the seats is defined in the program manual.

Costs incurred for this car seat distribution in addition to the grants provided included:

- Staff time to conduct the survey; produce and distribute electronic documents; receive, review and process applications; produce a legal agreement for signatures by resource centers; answer questions from resource centers; support from the accounting department to distribute cheques; and compiling the summary reports when the program wraps up.
- The cost of print materials and the “Kids that Click” DVDs (Safe Kids Canada <http://www.safekidscanada.ca/OrderCentre/tabid/157/CategoryID/14/List/1/Level/a/productid/8/Language/en-CA/Default.aspx>) to go to each recipient of a car seat.

(Personal communication, Kim Mundle, Car Seat Safety Specialist, Child Safety Link, IWK Health Centre)

The Car Seat Grants Program Guide and manual are available at

<http://professional.childsafetylink.ca/child-passenger-safety/grants>

Ride Safe Child Passenger Safety Program

The Ride Safe Child Passenger Safety Program, developed by the , US Department of Health and Human Services, Indian Health Service, aims to increase the use of child passenger safety seats within the Indigenous population of the US. This program for Tribal Communities targets the families of children aged 3 to 5 years attending Head Start programs. It includes child passenger safety training for Head Start staff, child passenger education for parents and caregivers, distribution of child safety seats, home visits to reinforce education and child seat use, data collection and the promotion of community awareness around reducing the burden of child passenger injury by using safety seats.

The full Ride Safe Program Manual is available at <http://www.ihs.gov/MedicalPrograms/InjuryPrevention/index.cfm?module=toolbox&option=ride>