CHANGES IN PARENTS’ RISK PERCEPTION FOLLOWING MEDICALLY ATTENDED INJURIES

by

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Abstract

Unintentional injuries are the leading cause of death for Canadian children aged 1 to 14 years and an important public health concern. Given that parental behaviour is a key determinant of these incidents, this study examines parents’ perception of injury risk and their decision to take preventive action after medically attended injuries (MAIs) to their children. The present study examined parents’ perceived risk of injury and their likelihood of engaging in safety behaviour, approximately the day of the injury, as well as one month, four months, and 12 months later. Longitudinal analysis with mixed models was performed to examine changes in parents’ judgments of injury risk and likelihood to search injury prevention information. A sample of 39 fathers and 132 mothers (total 171) were included in the study. Parents of children who had a history of MAIs before enrolling in the study reported a higher perceived risk of the same and of any injury. Further, the perceived risk of any injury for parents of children without a history of injuries decreased over time, indicating that the first MAI to a child has a transient effect on perception of injury. There was insufficient statistical power to examine if parents were more likely to engage in safety behaviour after their child sustained a MAI. Findings are discussed in light of previous research, and implications for prevention of injury recurrence are described.
Preface

The present document reports a study conducted alongside the BC Child and Youth Burden of Injury study led by Dr. Mariana Brussoni and funded by the Canadian Institutes of Health Research. This study, however, is independent from the Burden of Injury research project and, at this moment, has not been partly or wholly published elsewhere.

The BC Child and Youth Burden of Injury study was approved by the Research Ethics Board of the University of British Columbia and the BC Children’s and Women’s Hospital, certificate number H09-01627. Approval to conduct the present study alongside the BC Child and Youth Burden of Injury was obtained on 14 November 2011 and subsequently on 8 June 2012.
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I owe special gratitude to my wife for her financial and moral support throughout my master studies. Our conversations over tea and doughnuts helped me deal with the theoretical challenges of my research.
To Andrea, the main source of happiness in my life
1 Introduction

Unintentional injuries are the leading cause of death for Canadian children aged 1 to 14 years. Because children's risk of unintentional injury is significantly influenced by parental behaviour, it is important to understand the factors that influence their decision to take preventive measures against child injuries. The present study examines whether children’s medically-attended injuries (MAIs) increase their parents’ perception of injury risk and, in turn, make them more likely to take preventive action.

Previous research shows that injury experiences prompt changes in perceptions of risk and preventive behaviour. A “before-and-after” study showed that alpine skiers and snowboarders who sustained injuries in the 2007/2008 ski season were more likely to wear protective equipment the following year. A cross-sectional paediatric injury study reported that parents whose child had sustained a MAI in the previous year were more likely to report higher scores of perceived risk of injury, compared with parents whose child had not sustained an injury in the previous year. More recently, a case control study, where parents of children who had sustained a MAI in a playground were compared with a matched sample of parents of children who had not, found that parents of children who sustained a MAI: (a) had an increased perception of risk of injuries, (b) believed that the potential injury was more severe, (c) had more concern about their child’s risky behaviours, and (d) attributed MAI to their own behaviours as well as their child’s.
Although the previous studies suggest that MAI sensitize parents to children’s risk of injury, it still is unclear whether changes in risk perception are accompanied by changes in behaviour. This is important because previous studies suggest that experiencing an injury to one’s child does not necessarily lead to parents’ decision to prevent recurrence. Further, the influence of MAIs on risk perception and preventive behaviour may be transient. Findings in decision research indicate that, in contexts of repeated decisions, recent outcomes have more influence on people’s choices than earlier ones. This implies that MAIs to children may have an impact on parents’ risk perception and behaviour in the short term, but not in the long term. Accordingly, the present study is motivated by the following questions:

1. Do MAIs increase parents’ perception of their child’s injury risk?
2. Do MAIs influence parents’ preventive behaviour?
3. Is this effect temporary or permanent?
4. Is there a teachable moment following a MAI where interventions to promote child injury prevention among parents are optimally effective?

The present thesis addresses these questions, by first exploring the epidemiology and aetiology of childhood unintentional injuries (section 2.1), where the incidence and main determinants of childhood injuries are discussed. Next, literature of parental perception of injury risk and its relationship with safety behaviour is reviewed (section 2.2). Then, relevant judgment and decision making theories are discussed, in order to introduce concepts that will become part of the hypothesis proposed in this study (section 2.3). Following, the literature is integrated in a summary that contextualizes the research question and its importance for child injury prevention research. In the same section a hypothesis is described and justified (section 2.4). After stating the objectives of the study (section 2.5), the document continues with a description
of the methods (section 3), a presentation of the results (section 4), and a discussion of the findings and implications for injury prevention (section 5).
2 Theoretical Background

2.1 Epidemiology of childhood injuries

Injuries are the leading cause of death, disability and morbidity in children and youth around the globe. According to the World Report on Child Injury Prevention, injuries cause 950,000 deaths in people younger than 18 years old, each year. Of those fatalities, 90% were caused by unintentional injuries. In Canada, unintentional injuries are the leading cause of death for children 1 to 19 years old. Moreover, unintentional injuries are the primary cause of hospitalization among children 10 to 14 years old, and second among 5 to 9 and 15 to 19 year olds.

2.1.1 Leading causes of injury death and hospitalization for Canadian children

Table 2.1 describes the leading causes of injury death for Canadian children 0 to 19 years for 2005 (the most recent year reported). Among all injury deaths, 59% were caused by Motor Vehicle Collisions (MVC) and 13% resulted from drowning or suffocation. While fatalities caused by MVC, unintentional poisoning and falls affected mostly 15 to 19 year olds, suffocation occurred mainly among infants, and drowning was more frequent among 1 to 9 and 15 to 19 year olds.
Table 2.1 Leading causes of injury death for Canadian children 0 to 19 years old\(^a\)

<table>
<thead>
<tr>
<th>Type of Injury</th>
<th>&lt;1 Years</th>
<th>1-9 years</th>
<th>10-14 years</th>
<th>15-19 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor Vehicle Collisions</td>
<td>0</td>
<td>48 (1.5)</td>
<td>50 (2.4)</td>
<td>324 (14.9)</td>
</tr>
<tr>
<td>Falls</td>
<td>6 (0.2)</td>
<td></td>
<td></td>
<td>10 (0.5)</td>
</tr>
<tr>
<td>Poisoning</td>
<td></td>
<td></td>
<td></td>
<td>20 (0.9)</td>
</tr>
<tr>
<td>Suffocation</td>
<td>15 (4.4)</td>
<td>7 (0.2)</td>
<td>6 (0.3)</td>
<td>7 (0.3)</td>
</tr>
<tr>
<td>Drowning</td>
<td>36 (1.1)</td>
<td>11 (0.5)</td>
<td>30 (1.4)</td>
<td></td>
</tr>
<tr>
<td>Burns</td>
<td>10 (0.3)</td>
<td></td>
<td>6 (0.3)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>29 (0.9)</td>
<td>18 (0.8)</td>
<td>62 (2.8)</td>
<td></td>
</tr>
</tbody>
</table>

\(a = \text{counts (crude rates per 100,000); b=small number or zero. Source: Public Health Agency of Canada.}\)\(^{10}\)

Table 2.2 describes leading causes of injury hospitalization among Canadian children 0 to 19 years old, for 2005 and 2006 (the most recent years reported).\(^{10}\) Unintentional falls are the leading cause of injury hospitalization across all age groups. While MVC affect mostly older children and youth between 10 and 19 years, burns tend to occur more often among children 0 to 9 years old.

Table 2.2 Leading causes of injury hospitalization for Canadian children 0 to 19 years old\(^a\)

<table>
<thead>
<tr>
<th>Type of Injury</th>
<th>&lt;1 Years</th>
<th>1-9 years</th>
<th>10-14 years</th>
<th>15-19 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Falls</td>
<td>605 (175.0)</td>
<td>4,893 (151.6)</td>
<td>3,020 (142.6)</td>
<td>2,279 (104.1)</td>
</tr>
<tr>
<td>Motor Vehicle Collisions</td>
<td>32 (9.3)</td>
<td>517 (16.0)</td>
<td>635 (30.0)</td>
<td>2,368 (108.1)</td>
</tr>
<tr>
<td>Blunt force trauma</td>
<td>39 (11.3)</td>
<td>732 (22.7)</td>
<td>1,037 (49.0)</td>
<td>1,416 (64.7)</td>
</tr>
<tr>
<td>Poisoning</td>
<td>80 (23.1)</td>
<td>882 (26.7)</td>
<td>185 (8.7)</td>
<td>484 (22.1)</td>
</tr>
<tr>
<td>Burns</td>
<td>76 (22.0)</td>
<td>391 (12.1)</td>
<td>90 (4.2)</td>
<td>126 (5.8)</td>
</tr>
<tr>
<td>Other</td>
<td>405 (117.2)</td>
<td>2,970 (92.0)</td>
<td>2,417 (114.1)</td>
<td>3,483 (159.1)</td>
</tr>
</tbody>
</table>

\(a = \text{counts (crude rates per 100,000). Source: Public Health Agency of Canada.}\)\(^{10}\)

2.1.2 Aetiology of unintentional injuries

The aetiology of unintentional paediatric injuries is highly complex, as it involves interaction between many determinants of health, including socioeconomic status (SES), physical and social environment (e.g., neighbourhood and housing), and individual risk factors (e.g., parent gender and behaviour).\(^{11-13}\) Understanding of the causal pathways describing how these determinants influence parents’ perception of child injury risk and safety behaviour is
limited. In this thesis, only three determinants will be considered, because they have been explored in more detail in the literature: SES, parent gender, and child gender.

Regarding the influence of SES on child injury, two causal pathways have been proposed. First, from a behavioural ecology perspective, individuals from lower SES engage in less preventive health behaviours because, compared to their high SES peers, they are exposed to more risks that cannot be changed by individual conduct. For example, children from lower SES backgrounds are more likely to live in areas with limited playground space and with high traffic concentration, which exposes them to higher risk of pedestrian injuries. Because of these environmental barriers over which parents have little control, lower SES parents obtain fewer benefits from teaching their children to stay away from traffic, compared to parents of higher SES; as a result, they have less incentive to engage in preventive behaviour. Second, the psychological perspective comes to a similar conclusion via different mechanisms. Compared with people from higher SES backgrounds, people of lower SES are believed to have higher levels of a personality trait termed present fatalistic time perspective. This trait is associated with a tendency to make decisions based on the belief that they are subject to external, uncontrollable forces; that nothing one does makes a difference in one’s life. Parents exhibiting this trait, for example, would be less likely to take preventive action against child injuries, because they attribute these incidents to causes out of their control.

Parents’ gender can also influence their perceived injury risk and preventive behaviour. In particular, culturally dominant conceptualizations of masculinity and femininity shape heterosexual fathers and mothers roles at home, and are associated with different views of what constitutes childcare. Even in settings where fathers are increasingly participating in household and child care tasks, fathers’ involvement predominates in recreational parenting.
Furthermore, fathers tend to have less child safety concerns than mothers.\textsuperscript{19} In contrast, mothers remain in charge of child and house related chores, and are still primarily burdened with the responsibility for child safety.\textsuperscript{17} These differences between fathers and mothers may also reflect gender differences in risk assessment: women tend to perceive greater likelihood of negative outcomes and expect less enjoyment from activities that entail health risks.\textsuperscript{20} Based on these findings, it is reasonable to expect that fathers and mothers differ in their perception of child injury risk and their reactions to MAIs sustained by their children.

With regards to child gender, literature suggests that parents (both fathers and mothers) socialize their children differently regarding injuries. Parents tend to tolerate and even encourage their sons to engage in behaviour that can lead to injury; in contrast, daughters are taught to evaluate their vulnerability to potential injuries, to proceed cautiously, or to avoid behaviour that can lead to an injury.\textsuperscript{21, 22} Differences in the ways boys and girls are socialized regarding injuries and injury-related behaviours could be associated with parents’ perceived risk of child injuries and their preventive behaviour. For example, previous studies have shown that that mothers expect their sons to sustain more injuries, engage in more risky behaviour, and be less compliant than daughters.\textsuperscript{21, 22} Given these expectations, mothers (and possibly fathers) could report a higher perceived risk of injury for their sons than for their daughters, while simultaneously reporting less willingness to change their behaviour after an injury to their son compared to their daughter.

In short, the aetiology of unintentional child injuries is complex. Although researchers recognize that factors at the societal, neighbourhood, household and individual levels can influence pediatric injury risk, there is little understanding about the causal mechanisms underlying these relationships. In this study, three of these determinants will be considered,
because there are theoretical reasons that justify their relevance: SES, parent gender, and child gender.

2.2 Perception of risk and parental behaviour

Because parental behaviour influences the incidence of child injuries,\textsuperscript{2, 23-25} many prevention and research efforts focus on parents’ attitudes and knowledge relevant to child injury prevention. In particular, parental perception of child injury risk is regarded by some researchers as relevant and important in the development of interventions to promote injury prevention behaviours among parents.\textsuperscript{4, 26} This view is widely supported by evidence: among parents’ of children 0 to 24 months, perceived risk of unintentional poisonings is associated with preventive behaviours, such as storing cleaning products and medication in a safe manner. Among parents of children 0 to 4 years, risk perception influences protective behaviour against burns, cuts and falls (i.e., for example, having safety plugs in electric outlets or installing safety gates on the stairs).\textsuperscript{26-28} Further, higher perception of risk is associated with higher supervision of school-aged children in different pedestrian environments (residential and commercial with low and high traffic).\textsuperscript{29, 30}

Despite the considerable evidence indicating that parents’ perceived risk of child injuries is associated with preventive behaviour,\textsuperscript{26-30} other studies suggest that there is more to this relationship than we currently understand. First, two survey studies with parents of preschoolers, school-aged children and adolescents found no association between risk perception and preventive behaviour, across a wide variety of injury risks (crashes, pedestrian, bicycle, burns, cuts, falls, poisonings, choking and suffocation).\textsuperscript{31, 32} These contradictory results can be explained by invoking the \textit{optimism bias}.\textsuperscript{33, 34} In this context, optimism bias refers to parents’ tendency to believe their child is less susceptible to a given risk than other children.
Thus, it is possible that the two studies asking parents to provide general ratings of injury risk for any child failed to detect a relationship between perceived risk and behaviour, because parents were influenced by the optimism bias. Indeed, one of the studies that found no association between perceived risk and parents’ behaviour used scenarios to elicit a rating of general injury risk, rather than specifically for the respondent’s child. Second, the relationship between perceived risk and parents’ behaviour appears to be bidirectional. Specifically, the perception of injury risk is reported to decrease when parents engage in supervision. Among parents of toddlers, safely storing poisonous products significantly decreases perceived risk, and among parents of preschoolers, safety behaviours decrease the perceived risk of a wide range of injuries, including falls, poisonings, burns, cuts, and fractures. Third, parents’ risk perception can be simultaneously influenced by many factors, and, for some of them, there are contradictory findings: (a) Optimism bias, as previously mentioned, leads parents to underestimate their child’s risk of injury. (b) Perceived risk of injury seems to decrease with child’s age; however, one study did not find evidence of this relationship. (c) Perceived risk also decreases as parents’ sense of control over the injury increases. (d) Perceived risk of injury recurrence increases with the severity of the injury. Finally, (e) parents’ perceived risk of injury increases if the parent observes his or her child manipulating hazardous objects; if the parent has knowledge of a child injury occurring in the neighborhood; or if the child had previous injuries. Nevertheless, the relationship between previous injuries, perceived risk of injury and parental safety behaviour is unclear: one study found that child injury experience is unrelated to supervision choices, and another found that, in general, mothers did not deploy a preventive initiative in response to child injury (both serious or minor).

To summarize, parental perception of child injury risk seems to play an important role in injury prevention, because it informs parents’ safety behaviour. Nonetheless, the causal
relationship between the two is difficult to study because it seems to be bidirectional: risk perception influences safety behaviour and safety behaviour influences risk perception. Further difficulties arise because parents’ perceived risk of child injuries can be influenced by many psychological and situational factors that can operate simultaneously and in opposite directions: parents’ tendency to believe their child is less susceptible to injuries, their sense of control over the situations that can cause an injury to their child, whether their child has sustained injuries in the past, and the age of their child.

2.3 Decision theory and childhood injuries

Despite the importance that researchers have ascribed to parental perception of injury risk, few studies on child injury prevention have used psychological theories of risk or judgment and decision making to give meaning to the evidence summarized in the previous section. This is surprising because advances in this field during the past four decades can provide relevant and useful insight into parents’ perception of injury risk and safety behaviour. One important example is the work by Paul Slovic and colleagues. Slovic found that risk perception among the general public depends on a number of criteria that are unrelated to experts’ views of risk. 41 People tend to regard as “more risky” hazards that are seen as dreadful, uncontrollable, globally catastrophic, affecting many individuals, with fatal consequences, not equitable, not easily reduced, involuntary, and posing risk to future generations. On the other hand, individuals tend to regard as less risky hazards that are not dreadful, controllable, not globally catastrophic, affecting a few individuals, not fatal, equitable, easily reduced, voluntary, and not posing risk to future generations. For example, skiing, home trampolines, motor vehicles, power mowers, and indeed, most injury related hazards, are seen as considerably less risky than nuclear reactor accidents. The reason is that most injuries affect only a handful of individuals at a time, usually have no fatal consequences, are easily reduced, and involve voluntary exposure. Slovic termed
this group of hazard characteristics the “dread factor.” He also outlined another group of characteristics termed “unknown risk,” which further illuminate the way people understand risk. If hazards are observable, known to the exposed, of immediate effect, known to science and have existed for a long time, then they are perceived as less risky. The converse, of course, is also true. Thus, injuries score low in both “dread” and “unknown risk” factors, helping understand why injuries receive so little attention from the general public.

Other findings in judgment and decision making research are also relevant to child injury prevention. Psychologists Amos Tversky and Daniel Kahneman have shown that, when making judgments about probability, people rely on heuristics; “rules of thumb” that enable them to quickly and efficiently solve problems and make judgments about likelihood of events. One heuristic, termed availability, explains why people often overestimate the likelihood of rare events: events are judged as more likely to occur when instances of that event are easier to remember; that is, when they are more available in memory. The availability heuristic could explain why perception of child injury risk increases when parents become aware of a child injury occurring in the neighborhood. In effect, knowledge of child injuries close to home could make them more available in memory and, in turn, increase the perceived likelihood of their occurrence.

In addition, the availability heuristic implies that event characteristics that affect memory also affect people’s judgments of probability. Of particular importance in this study, is recency: recent events are easier to remember than older ones and, as a result, they tend to have more weight on peoples’ judgment of risk and behaviour. For example, due to recency a parent would be more likely to supervise his or her toddler more closely the day after the child sustained an injury than eight or twelve months later.
Another heuristic that is relevant for this study is *representativeness*, which consists in judging that an event belongs to a category based on whether the event has the characteristics of the most representative element in that category. For example, the representative heuristics leads people to believe that the following sequence of six coin tosses, T-H-T-H-T-T, is more likely to occur than the sequence, T-T-T-T-T-T. Objectively, both sequences of coin tosses have exactly the same probability of occurrence. People tend to believe that one is more likely than the other because the first looks closer to a typical sequence of events determined by chance, while the latter looks as though it was intentionally chosen. Importantly, the representativeness heuristic helps explain a very common example of faulty reasoning: the *gambler’s fallacy*. The gambler’s fallacy refers to people’s tendency to believe that, if a rare event is determined by chance, then it is unlikely to occur twice in a row. The gambler’s fallacy suggests that people who believe that injuries are determined by chance do not expect, for example, to sustain two separate injuries in two consecutive days: a wrist fracture one day and an ankle fracture the next. The gambler’s fallacy is an important concept for this thesis, and its relevance will be evident in section 2.4.

Finally, research on the role of emotions in judgment is also relevant and useful in injury prevention. The *affect heuristic* hypothesis implies that people think and act upon risk in two basic ways: through logic, reason and analysis, and through emotional reactions. Slovic and colleagues have shown that, in people’s minds, risk and benefits are negatively correlated: high risk is associated with low benefit and low risk is associated with high benefit. More importantly, they have demonstrated that this correlation is associated with positive and negative affect (i.e., good-bad, nice-awful). If information on a hazard describes only its benefits (without giving any information about probability), then the hazard has a positive affective evaluation and it is judged as having low risk. Conversely, if information about a hazard elicits a
negative affective evaluation, its associated risk is rated as high.\textsuperscript{45} For example, if parents believe that minor injuries bring about developmental benefits for children, then they will associate them with positive affect and will judge them as having low risk. On the other hand, if parents construe minor injuries as painful for their child, then parents will tend to associate them with negative affect and judge them as having high risk.

In summary, judgment and decision making theories can shed some light on parents’ perception of child injury risk and its relationship with behaviour, by increasing understanding of the psychological mechanisms underlying risk perception and the decision to take preventive action. The notions of availability, representativeness and gambler’s fallacy are of particular relevance in this thesis, because they constitute the building blocks of the \textit{coexistence hypothesis}, which guides this study. The following section describes said hypothesis and its potential to explain how experience shapes parents’ risk perception as well as their decision to take preventive action against injuries.

\section{2.4 Study rationale and hypothesis}

The literature summarized in this chapter indicates that unintentional childhood injury is an important and preventable health concern in Canada. Research indicates that the incidence of child injuries is influenced by multiple factors, including SES, neighborhood and housing, child behaviour, and parental safety behaviour. Because the latter is often the focus of many prevention initiatives,\textsuperscript{13,26} it is important to identify and understand what factors prompt parents to take preventive measures against injuries. Substantial evidence suggests that parents’ perceived risk of child injuries is relevant in influencing parents’ actions.\textsuperscript{26-28,29,30} However, some studies contradict this conclusion.\textsuperscript{31,32} Furthermore, having a child sustain an injury, which
should confirm vulnerability to injuries, is not associated with parental safety behaviour.\textsuperscript{5,46} This suggests that a piece of the puzzle is still missing.\textsuperscript{13}

It has been suggested that parents’ causal attribution to injuries is the missing link between perceived risk of child injury and parental safety behaviour, and between experiencing an injury to one’s child and taking preventive measures to prevent recurrence.\textsuperscript{13} In effect, parents who attribute injuries to chance or bad luck are unlikely to change their behaviour, even if their perceived risk of injury is high, or even after their child has sustained an injury. In contrast, parents who attribute injuries to behaviour (theirs or their child’s) are likely to engage in safety behaviours, when their perception of injury risk is high, or after their child has been unintentionally hurt. Although this account is reasonable, no study to date has empirically tested it in the context of MAI. Consequently, the present study examines the relationship between parents’ perceived risk of injury, their beliefs about the causes of injuries (i.e., whether they are controllable or the result of bad luck), and their decision to take preventive measures.

The relationship between parental perceptions of injury risk, causal attributions, and safety behaviour, in the context of MAI, can be understood in terms of the \textit{coexistence hypothesis}, a proposition originated within judgement and decision making research. The coexistence hypothesis was originally postulated to explain a paradoxical effect: soon after experiencing a rare, adverse event (e.g. barely surviving a terrorist attack), people seem to behave more cautiously, but report that the chances of experiencing the same event are low. In other words, shortly after experiencing an adverse event, people behave as if the adverse event were more likely to happen, but believe that the event is unlikely to recur. To explain this puzzling effect, proponents of the coexistence hypothesis make three key assumptions: first, in the few days following an adverse event, like experiencing a MAI to one’s child, the incident is
more available in memory, or salient, due to recency (see section 2.3). Second, the recency of a MAI has two distinct effects on risk perception and behaviour: on one hand, behaviour is subject to \textit{positive recency}; that is, a recent MAI makes parents behave as if MAIs are more likely to recur. On the other hand, risk perception is subject to \textit{negative recency}; that is, a recent MAI triggers the gambler’s fallacy (the belief that two rare events are unlikely to occur in a row, see section 2.3), leading parents to believe that their child is unlikely to sustain another MAI. Third, because these two effects depend on recency, they have a short duration.

Importantly, the coexistence hypothesis further assumes that this effect tends to occur in situations where people are unsure if those events are caused by chance or by behaviour.\textsuperscript{6} If, for example, parents were absolutely convinced that their conduct determines the occurrence of MAI to their children, then they would become more cautious shortly after their child sustains one, when the incident is still easily available in their memory. However, twelve months later, when the MAI is less available in memory, they would be less cautious (see Figure 2.1 A). On the other hand, if parents were absolutely convinced that injuries to their children occurred entirely by chance, then shortly after their child sustains a MAI they will be influenced by the gambler’s fallacy (see section 2.3). That is, they would believe that, shortly after the injury, their child is less likely to sustain another MAI (see Figure 2.1 B). If parents have ambiguous views as to whether the MAI was determined by chance or behaviour, it is likely that parents experience both effects simultaneously; hence the name, coexistence hypothesis (see Figure 2.1 C).
The coexistence hypothesis provides a sophisticated account of changes in parents’ perceived injury risk and safety behaviour following MAI. Importantly, it also describes how parents’ causal attributions of injury, a proposed link between risk perception and preventive action,\textsuperscript{13} moderates the relationship between perception of injury risk and preventive behaviour. Accordingly, the following predictions will be tested:

\textit{Prediction 1}: Following a MAI to their child, parents who perceive high control over the injury are likely to experience a \textit{positive recency} effect. That is, in the few weeks after the injury, they are going to report higher perceived risk of the same and any injury, and higher likelihood of engaging in safety behaviour than 12 months later.

\textit{Prediction 2}: Following a MAI to their child, parents who perceive low control over the injury are likely to experience negative recency. That is, in the few weeks after the injury, they are going to report lower perceived risk of the same and any injury, and lower likelihood of engaging in safety behaviour than 12 months later.

\begin{figure}
\centering
\includegraphics[width=\textwidth]{figure2.png}
\caption{Illustration of the coexistence hypothesis}
\end{figure}

\begin{itemize}
\item Parent’s likelihood to take preventive action
\item Perceived risk of injury
\end{itemize}

* Figures not drawn to scale.
Prediction 3: Following a MAI to their child, parents' who are ambiguous as to whether they can control injuries are likely to exhibit a coexistence effect; that is, they will be more likely to engage in safety behaviour shortly after the injury than twelve months later and, at the same time, they will report a lower perceived risk of child injury compared to 12 months later (i.e., their perception of risk will be consistent with the gambler's fallacy).

2.5 Study objectives

In light of the hypothesis and predictions discussed in the previous section, the present study seeks to:

1. Examine whether parents' perception of injury risk and safety behaviour are subject to recency effects (positive or negative) following a MAI to their children

2. Explore if perceived control over the injury plays a role in the relationship between MAIs to children, parents' perceived risk of injury and their decision to take preventive action.
3 Methods

Data for this study were collected alongside Dr. Brussoni’s Child and Youth Burden of Injury (BOI) longitudinal study, which examines how pediatric injuries impact children and their parents. The BOI surveys parents and children and evaluates children’s health related quality of life, post traumatic stress symptoms, and time missing from school or work as a result of the injury. Participants completed a baseline survey and three follow up surveys approximately one, four, and 12 months after the injury. Of note, the questions specific to this thesis were added to the survey package 11 months after data collection for the BOI had already started. The BOI and the present study were approved by the University of British Columbia/Children’s and Women’s Health Centre of BC Research Ethics Board.

3.1 Participants

Only parents participating in the BOI study were surveyed, since this study focused on their behaviour and perception of injury risk. Consequently, participants in this study included parents of children 0 to 16 years who attended the BC Children’s Hospital for treatment for an injury between February of 2011 and December 2012. Participants were eligible if they were the parents of the child and residents of British Columbia who spoke and read English. Parents of children with disabilities, or whose children sustained injuries with permanent consequences (loss of an organ or limb) were not included in the study.
3.2 Measures

3.2.1 Outcome measures

To measure perceived risk of the same injury, parents were asked to report the chance of this event happening again to their child, using a 7-point Likert scale from “Very low” to “Very high.” To examine whether the effect of experiencing a MAI to one’s child generalized to the perceived risk of any injury happening again to their child, using a 7-point Likert scale from “Very low” to “Very high.” These items were specifically developed for this study, based on theoretical, methodological and practical reasons: first, the theoretical concepts of recency and gambler’s fallacy refer specifically to people’s subjective judgments of likelihood of occurrence, irrespective of the value (e.g., undesirable, dreadful) ascribed to the event; thus, outcome measures used here focus on judgments of likelihood, rather than judgements of risk like the ones used in previous studies. Second, this distinction between likelihood and undesirability (or severity) is important in child injury prevention, because previous research indicates that parents do not necessarily regard child injuries as undesirable or dreadful events. On the contrary, some parents view them as “a natural part of growing up.” Third, measures of parental perception of injury risk must refer specifically to the parent’s child, in order to avoid potential confounding effects caused by the optimism bias (see section 2.2). For this reason, scales of risk perception based on scenarios or that measure a general perception of risk were avoided. To measure behaviour change following MAI, parents were asked to report if they had searched for information related to child injury prevention in the previous four weeks (see Appendix).
3.2.2 Predictors

Time elapsed after the injury, the main predictor, was measured in days. To measure parents’ perceived control over the injury, the survey included an item asking parents to report how much control they felt they had to prevent the injury. Parents were asked to provide their response using a 7-point Likert scale, from “Not controllable at all” to “Totally controllable.” Parents were also asked to report if they were present when the injury occurred in order to account for injuries that took place while the child was under someone else’s care (e.g., daycare, school, summer camp). In these situations, a parent may have reported low control, not because he or she believes that injuries result from chance, but simply because he or she was not present and could do nothing to stop or change the events that led to the injury. Finally, this question was included in baseline and all follow-up questionnaires, in case parents’ judgments about the controllability changed over time (see Appendix).

3.2.3 Control variables

Because perception of child injury risk can be influenced by many factors (see section 2.2), the present study also controlled for the following potential confounders:

Very unusual circumstances were also considered in this study, because they might not prompt any change in perceived risk. If, for example, a parent believes that the MAI was the result of an unfortunate chain of coincidences (e.g., getting hit by a duck while riding a rollercoaster), their perception of risk of injury recurrence and possibly, their behaviour, would not change at all. That is, injuries that occurred under very unusual circumstances could be perceived as very unlikely, even after experiencing one. Hence, parents were asked to report if they thought the incident was a “freak accident.” This was measured as a dichotomous (Yes/No)
variable. Because parents’ judgments about the circumstances of the injury could change over time, these items were included in baseline and follow-up questionnaire packages.

A dichotomous variable indicating whether the child was hospitalized while the parent was completing the questionnaire was also included. This variable served to control for potential confounding effects due to hospitalization: parents who filled out the questionnaire while their child was hospitalized, could have reported a lower perceived injury risk, because their child was on a bed most of the time, and with limited ability to engage physical activities. Some children were hospitalized for more than 30 days after injury, thus hospitalization status was recorded at baseline and at each follow-up measurement occasion.

The severity of the injury, which seems to increase parents’ perceived risk of injury recurrence to their children after a MAI,\(^5\) was measured as the number of days the child was affected by the injury as reported by the parent in the BOI questionnaire. In this questionnaire, parents were asked to report whether their child had completely recovered; parents who responded affirmatively were then asked to report the number of days the child was affected by the injury.

Some items from the BOI questionnaire were used to control for other potential influences on perception of risk: whether the child had a history of injuries before the parent enrolled in the study, which was measured as a dichotomous variable; child age measured in years, child gender, parent gender, and SES (see section 2.2). SES was measured with two separate survey items: (1) a 5-level ordinal variable indicating annual household income from less than $14,999 to more than $80,000; and (2) a 7-level ordinal variable from “some high school completed” to “post-graduate degree completed.” The BOI also includes two measures
of health related quality of life, and a measure of Post-Traumatic Stress Disorder. However, these data were not used in the present thesis (for a sample of the BOI questionnaire see Appendix).

It is important to note that, in this study, a wide age range of children (0 to 16) was examined, because there seems to be little agreement among parents regarding a cut-off age at which they can or should influence their children’s risk of injury. For example, one study shows that there is wide variability in parents’ opinion regarding the ages at which children should be allowed to bathe, cross streets, and cycle without supervision. Furthermore, parents’ opinions regarding the amount of adult supervision for a child vary according to the perceived risk associated with the environment (e.g., home, street) and the specific situation.

3.3 Procedures

This is a longitudinal study involving a total of four measurement occasions: baseline, one month, four months and twelve months. These uneven time intervals were adequate to test recency effects, because it predicts that most of the change would occur within a few weeks after the injury. Parents of non-hospitalized children were approached by a Research Assistant (RA) in the Emergency Department (ED) of the BC Children’s Hospital, after he or she consulted the hospital activity logs to confirm the child was there for an injury. After confirming that potential participant parents met inclusion criteria, the RA would explain the study and provide a consent form. Parents who consented to participate were asked to provide contact information, and were given a questionnaire package to fill out.

Parents of hospitalized children were recruited by an RA in the BC Children’s Hospital wards. The RA examined the hospital activity log to confirm that the child was hospitalized
primarily for an injury and then consulted the nurse in charge of the child to determine whether it was appropriate to approach the family. If the nurse approved, the RA would talk to the family and would follow the same procedure described above. Most baseline measures were taken the day the child attended the hospital. However, in some cases, parents opted to take the questionnaire home and mailed the completed questionnaire and consent form days or weeks after attending the hospital. Some of the parents who were recruited in the hospital wards completed the questionnaire on any day during hospitalization.

Although follow-up measures were intended to be taken at approximately one month, four months, and twelve months later, timing of follow questionnaires varied. Section 4.2 describes in detail the timing of baseline and follow up measurements relative to injury date. Follow-up questionnaires were mailed with a prepaid self-addressed envelope and a link to an online version of the survey in case parents preferred to fill out the questionnaire online. Approximately one week later, an RA would follow-up with a phone call to remind parents to return the questionnaire. Participants were given a $2.00 dollar gift card for each questionnaire they completed.

3.4 Statistical analysis

Data screening (descriptive statistics, normality tests, identification of outliers) and analysis of the changes in parental safety behaviour after MAI were conducted in IBM SPSS Statistics 21. However, data exploration and analysis of changes in perceived risk of injury were conducted in R nlme package, because the IBM SPSS Statistics 21 led to non-convergence, even with only one predictor (i.e., time). Of note, time elapsed after the injury was recoded from days into months, because parameter estimates were too small.
3.4.1 Longitudinal analysis of perceived risk of the same and any injury

Mixed effects models were used to analyze time-dependent changes in the perceived risk of the same and any injury, using the R nlme package and following the general analysis strategy proposed by Singer and Willet. First a 2-level model with repeated measures clustered within individuals was formulated: at level 1, changes in parents’ perceived risk of the same and any injury were assumed to change over time in a linear fashion. At level 2, individuals were assumed to have different trajectories (i.e., patterns of time-dependent change), with different intercepts (i.e., baseline perception of risk) and different slopes (rate of change in his or her perception of risk). Figure 3.1 exemplifies these assumptions.

![Figure 3.1 Specification of mixed-effects model: an example](image)

Analysis proceeded by fitting an unconditional means model, which is a model with no predictors. The unconditional means model estimates a grand mean across all individuals and time points, as well as the variance within individuals, irrespective of time, and the variance
between individuals. Results of this model were used to estimate the Intraclass Correlation Coefficient (ICC), which is a measure of the amount of variance that can be attributed to individual differences, ICC = \( \sigma^2 \) within individuals :\( \div (\sigma^2 \) within individuals + \( \sigma^2 \) between individuals). As suggested by Shek\textsuperscript{53} an ICC of 0.25 or above is considered high enough to justify a mixed models approach.

Once a mixed models approach was justified, an Unconditional Growth Model was fitted with random intercepts and random slopes. Differences between individuals’ perception of risk at baseline and their rate of change were accounted for in the model as variance in intercepts and variance in slopes, respectively. This is represented in Figure 3.1, where each panel describes each parent’s trajectory with its own intercept and slope. At this stage, three parameters were examined to make decisions as to whether or not to continue the analysis and in which direction: the residual variance, intercept variance and slope variance. Residual variance summarizes the residuals of all individuals’ risk perception scores around each of their trajectories. In Figure 3.1, they are represented by the dots around the trajectory in each panel. If, after introducing time as a predictor, there was still residual variance left, then there was reason to introduce time variant predictors: parent’s perceived control over the injury, whether the parent considers the incident a freak accident, and whether the child was hospitalized when the parent completed the questionnaire. Intercept variance and slope variance summarize between-parent differences perception of injury risk at baseline, and (3) between-parent differences in the rates at which their perception of injury risk changes over time. These between-parent differences are illustrated by the different trajectories presented in Figure 3.1. If, after introducing time as a predictor, there was still variance left in these two parameters, then there was reason to introduce time invariant predictors: severity of the injury, child age and
gender, whether he or she had a history of injuries before joining the study, his or her parent’s
gender and education, the annual income of his or her family.

Once further analysis was justified, predictors where added to the model. The main
predictor variable, time (which was already introduced in the Unconditional Growth Model), was
kept even when its effects were not significant. Next, the predictions were tested by examining
moderating effects of perceived control on the relationship between time and perceived risk of
the same and of any injury. Specifically, main effects of time and perceived control were tested
separately and, second, the main effects and the interaction were tested simultaneously.
Following, the other time variant predictor, believing that the injury was caused by a “freak
accident,” was entered. Subsequently, time invariant predictors were entered one by one,
starting with the ones that, according to theory and exploratory analysis, were expected to
influence the elevation of the trajectory, but not the slope (i.e., variables were not expected to
interact with time). Finally, variables that, according to theory and exploratory analysis, were
expected to interact with time were entered as interaction terms along with their main effects. All
models were fitted in the same data set, using Maximum Likelihood estimation, and specifying
an unstructured covariance structure, which is the one that provides the best fit.52, 53

Single parameter tests for the fixed effects were tested using t-values\textsuperscript{i} calculated by the
\textit{lme} procedure in the R \textit{nlme} package. Single parameters tests for the variance components,
like the z-statistic, were not used, because there is disagreement regarding their validity.52, 54 In
fact, some statistical applications, like R \textit{nlme}, do not include it in the output.52 In contrast,
Singer and Willet\textsuperscript{52} and Hox\textsuperscript{54} agree that the \textit{deviance-based} hypothesis testing is preferable.

\textsuperscript{i} Different software packages refer to this statistic in inconsistent ways (e.g., \textit{t-statistic}, \textit{quasi-}\textit{t-statistic}, \textit{t}-
\textit{ratio}). For this reason, in this document the term used in each of the two software packages (R \textit{nlme} and
IBM SPSS Statistics) will be used.
The deviance test uses a parameter called deviance to compare two models; if one model fits significantly better than the other, then the better model should have a lower deviance. The difference (i.e., subtraction) between the deviances of two models follows a $\chi^2$ distribution. For this reason, the variance components of the better model are considered significant (non-zero), if said difference exceeds the critical $\chi^2$ value for a number of degrees of freedom equal to the difference in the number of parameters of the two models being compared. The deviance test requires that: (a) the models being compared come from exactly the same dataset, (b) that one be reducible to the other (or nested within the other), and (c) that the same method of estimation (maximum likelihood or restricted maximum likelihood) be used. For this reason, model building and testing was conducted progressively, adding one predictor at a time, keeping the same sample in each model, and using the same estimation method. Deviance test was conducted every time a new predictor was entered in the model. In a first path, predictors that had no significant effect were kept in the model until all predictors were entered. In a second and third path, predictors that were significant in previous paths were the first to be entered and tested for significance, followed by the predictors that were not significant in previous paths. Predictors with consistently non-significant effects were removed from the model, and predictors found to be multivariably significant were kept in the model.

### 3.4.2 Longitudinal analysis of behaviour change

Time-dependent changes in parent’s probability to have searched for child injury prevention information (measured as a dummy variable) were modeled using GENLINMIX procedure in IBM SPSS 21. Because only eight parents reported that they had searched for information on preventing child injuries only once (a total of eight events), a Poisson distribution with a log link function was specified. There was insufficient power to detect effects, so this portion of the statistical analysis is not reported.
4 Results

As noted in the introduction, data collection for this thesis is still ongoing, and thus, results should be taken as preliminary. As of November the 1st 2013 there were still 102 participants scheduled to receive the 1-month follow-up questionnaire, 34 participants to receive the 4-month follow-up and 26 parents to receive the 12-month follow-up.

4.1 Sample composition

Table 4.1 shows the composition of the final sample by demographic characteristics. Responses to income and education questions were collapsed into two and three groups respectively, because there were categories with few individuals (less than 15% of the total sample). Univariate Chi Square tests were used to determine if participants are evenly distributed in the sample according parent’s gender, gender of the child, age of the child, and socioeconomic status. Study participants were mostly mothers ($\chi^2 (1, N = 171) = 51.4, p = .000$) of boys ($\chi^2 (1, N = 171) = 10.3, p = .001$), reporting high yearly income ($\chi^2 (1, N = 171) = 62.5, p = .000$) and high education level ($\chi^2 (1, N = 171) = 20.9, p = .000$).
Table 4.1 Sample composition by demographic variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Perceived Risk</th>
<th>Information search</th>
<th>Parent gender</th>
<th>**</th>
<th>***</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency (%)</td>
<td>Frequency (%)</td>
<td>Fathers</td>
<td>39</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mothers</td>
<td>132</td>
<td>77</td>
</tr>
<tr>
<td>Child gender</td>
<td>**</td>
<td>**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Girls</td>
<td>65 (38)</td>
<td>35 (35)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Boys</td>
<td>106 (62)</td>
<td>64 (64)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yearly household income</td>
<td>***</td>
<td>**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$80,000 or greater</td>
<td>115 (67)</td>
<td>65 (66)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than $80,000</td>
<td>56 (33)</td>
<td>34 (34)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education level</td>
<td>***</td>
<td>***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>University degree or higher</td>
<td>105 (61)</td>
<td>60 (61)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diploma from trade school or college</td>
<td>37 (22)</td>
<td>22 (22)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some trade school, college or university</td>
<td>29 (17)</td>
<td>17 (17)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>171</td>
<td>99</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Univariate Chi Square tests: **Statistically significant at the .01 level; ***Statistically significant at the .001 level

Comparison of the total sample of participants in the BOI study versus non-participants according to child age and gender, as well as by hospitalization (whether the child was admitted for treatment of the injury) indicates that: parents of younger children were significantly less likely to participate: $t(666)=3.446, p < .01, N=668$. The mean child age of non-participant parents was 7.0 years while for participant parents it was 8.2 years. No association was found between agreeing to participate and having a boy or a girl attending the hospital: $\chi^2(1, N = 743) = .39, p = .530$; or between agreeing to participate and having the child hospitalized for the injury: $\chi^2(1, N = 687) = 1.76, p = .184$. 
4.2 Time between measurement occasions

Although measurement occasions were planned at 0 days after the injury, and then one, four and 12 months later for all participants, the resulting dataset had varying occasions. Because parents were allowed to take questionnaire package with them and complete it at home, some parents had their baseline measure weeks after the injury. Also, some parents were late to return the follow-up questionnaire packages, which also increased time between observations. For example, one final follow-up package was received 537 days after injury. As shown in Table 4.2, the minimum, maximum and mean time between measurement occasions from the date of injury varied considerably.

Table 4.2 Timing of measurement occasions from injury date

<table>
<thead>
<tr>
<th>Measurement occasion</th>
<th>Minimum (days)</th>
<th>Maximum (days)</th>
<th>Mean (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Perceived risk data set</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>0</td>
<td>52</td>
<td>3.1</td>
</tr>
<tr>
<td>Follow-up 1 (one month)</td>
<td>25</td>
<td>145</td>
<td>43.0</td>
</tr>
<tr>
<td>Follow-up 2 (four months)</td>
<td>84</td>
<td>196</td>
<td>132.1</td>
</tr>
<tr>
<td>Follow-up 3 (12 months)</td>
<td>167</td>
<td>537</td>
<td>375.3</td>
</tr>
<tr>
<td><strong>Information search data set</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Follow-up 1 (one month)</td>
<td>25</td>
<td>82</td>
<td>40.7</td>
</tr>
<tr>
<td>Follow-up 2 (four months)</td>
<td>107</td>
<td>096</td>
<td>132.3</td>
</tr>
<tr>
<td>Follow-up 3 (12 months)</td>
<td>167</td>
<td>418</td>
<td>374.0</td>
</tr>
</tbody>
</table>

4.3 Missing data

Analysis using mixed models assumes that missing data be Missing At Random (MAR)\(^{56}\); that is, independent of the unobserved values.\(^{54}\) There are three considerations regarding missing data in this study: first, data for this thesis were collected alongside the BOI study, and survey questions for the thesis were added 11 months after it had started. As a result, some respondents were missing baseline, one month, and/or four month observations. For example, in Table 4.3, participants 1 through 6 have missing measurement occasions, simply because they were not given the questions for this study at those time points. This
pattern of missing can be assumed to be MAR, because their “missingness” does not depend on the variable being observed.

<table>
<thead>
<tr>
<th>Participant</th>
<th>Baseline</th>
<th>One month</th>
<th>4 months</th>
<th>12 Months</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Missing</td>
<td>Missing</td>
<td>Missing</td>
<td>Observation</td>
</tr>
<tr>
<td>2</td>
<td>Missing</td>
<td>Missing</td>
<td>Observation</td>
<td>Observation</td>
</tr>
<tr>
<td>3</td>
<td>Missing</td>
<td>Observation</td>
<td>Observation</td>
<td>Observation</td>
</tr>
<tr>
<td>4</td>
<td>Father</td>
<td>Mother</td>
<td>Mother</td>
<td>Father</td>
</tr>
<tr>
<td>5</td>
<td>Father</td>
<td>Mother</td>
<td>Mother</td>
<td>Mother</td>
</tr>
<tr>
<td>6</td>
<td>Mother</td>
<td>Mother</td>
<td>Father</td>
<td>Father</td>
</tr>
<tr>
<td>7</td>
<td>Observation</td>
<td>Observation</td>
<td>Observation</td>
<td>Missing</td>
</tr>
<tr>
<td>8</td>
<td>Observation</td>
<td>Observation</td>
<td>Missing</td>
<td>Missing</td>
</tr>
<tr>
<td>9</td>
<td>Observation</td>
<td>Missing</td>
<td>Missing</td>
<td>Missing</td>
</tr>
</tbody>
</table>

Second, some observations are missing because they were unusable and had to be deleted. As exemplified by participants 4 through 6 in Table 4.3, different parents responded to the questionnaire at each time point, but this study requires that the same person answer all questions. In these cases, observations from the parent with more data points or with the baseline observation were kept. In other cases, both parents filled out one of the follow-up survey thus rendering it unusable. These missing observations can be assumed to be MAR because they do not depend on the variable being observed, even though the pattern of missing could depend on participants’ characteristics. For example, parents who took turns to fill out the questionnaires could be more likely to share responsibilities related to their children’s active play and safety. Mothers in these families could participate more in active, potentially risky play, while fathers could share the responsibility of child safety. As a result, these participants could have exhibited different perceptions of injury risk and safety behaviours compared to parents who did not take turns to fill out the questionnaire.
Finally, the most important pattern of missing data in longitudinal studies is participant attrition, as illustrated with participants 7 through 9 in Table 4.3. Although data collection is still in progress, as a matter of exercise, a logistic regression was performed to examine if parents' characteristics were associated with their likelihood of having abandoned the study at any point after baseline. These results should not be taken as definitive and are likely to provide a conservative assessment. Table 4.4 below summarizes the parameters of the model, which indicate that no important characteristics are significantly associated with participant attrition.

### Table 4.4 Association between parent characteristics and attrition

<table>
<thead>
<tr>
<th>Parameter</th>
<th>B</th>
<th>s.e.</th>
<th>95% Wald Test</th>
<th>Hypothesis Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>-.367</td>
<td>.1442</td>
<td>-.649 to -.084</td>
<td>6.464</td>
</tr>
<tr>
<td>Severity of the injury (days it affected the child)</td>
<td>.011</td>
<td>.0098</td>
<td>-.009 to .030</td>
<td>1.153</td>
</tr>
<tr>
<td>Hospitalized</td>
<td>.220</td>
<td>.7384</td>
<td>-.122 to 1.667</td>
<td>.089</td>
</tr>
<tr>
<td>Child gender (boy =1 girl=0)</td>
<td>-.751</td>
<td>.4861</td>
<td>-.1.704 to .201</td>
<td>2.389</td>
</tr>
<tr>
<td>Child age at injury (years)</td>
<td>.089</td>
<td>.0515</td>
<td>-.012 to .190</td>
<td>2.964</td>
</tr>
<tr>
<td>Child has a history of injuries (yes=1; no=0)</td>
<td>.225</td>
<td>.5645</td>
<td>-.881 to 1.332</td>
<td>.160</td>
</tr>
<tr>
<td>Parent gender (mother = 1, father = 0)</td>
<td>.726</td>
<td>.4718</td>
<td>-.199 to 1.651</td>
<td>2.368</td>
</tr>
<tr>
<td>Income (above $80,000 = 1, below =0)</td>
<td>.386</td>
<td>.5201</td>
<td>-.633 to 1.406</td>
<td>.552</td>
</tr>
<tr>
<td>Some high school, trade or college</td>
<td>.804</td>
<td>.7485</td>
<td>-.663 to 2.271</td>
<td>1.154</td>
</tr>
<tr>
<td>Completed high school, trade or college</td>
<td>.870</td>
<td>.6578</td>
<td>-.419 to 2.159</td>
<td>1.750</td>
</tr>
<tr>
<td>University degree or higher</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

s.e. = standard error; d.f. = degrees of freedom; p = significance; a = reference group for education level.

### 4.4 Descriptive statistics

Table 4.5 presents the mean and standard deviation of the main continuous variables. The minimum number of days the child was affected by the injury was 0 and the maximum was 126 (not shown in table). Four outliers with injuries that affected the child for more than 250 days were removed after it was confirmed that they corresponded to unique cases of very severe injuries (e.g., multiple, internal, intracranial or lower extremity injuries). On average, the perceived risk of the same injury, the perceived risk of any injury and the perceived control over the injury incident change very little over time. Of note, the perceived controllability was
generally low. The median perceived control remained between 1.5 and 2.0 on a 7-point Likert scale across all measurement occasions (not shown in table).

Table 4.5 Mean and standard deviation of main continuous variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injury severity (days the child was affected)</td>
<td>24.6 (29.9)</td>
</tr>
<tr>
<td>Child age at the date of the injury</td>
<td>7.4 (4.8)</td>
</tr>
<tr>
<td>Perceived risk of the same injury</td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>3.5 (1.9)</td>
</tr>
<tr>
<td>One month</td>
<td>3.5 (1.9)</td>
</tr>
<tr>
<td>Four months</td>
<td>3.6 (1.7)</td>
</tr>
<tr>
<td>12 months</td>
<td>3.2 (1.6)</td>
</tr>
<tr>
<td>Perceived risk of any injury</td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>4.5 (1.6)</td>
</tr>
<tr>
<td>One month</td>
<td>4.6 (1.6)</td>
</tr>
<tr>
<td>Four months</td>
<td>4.4 (1.5)</td>
</tr>
<tr>
<td>12 months</td>
<td>4.0 (1.5)</td>
</tr>
<tr>
<td>Perceived control over the incident</td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>2.6 (2.1)</td>
</tr>
<tr>
<td>One month</td>
<td>2.7 (1.8)</td>
</tr>
<tr>
<td>Four months</td>
<td>2.7 (1.9)</td>
</tr>
<tr>
<td>12 months</td>
<td>2.5 (1.7)</td>
</tr>
</tbody>
</table>

Table 4.6 presents the absolute and relative frequencies of responses to main categorical variables. In the final sample, after removing outliers only two parents filled out the baseline questionnaire while their child was hospitalized. Approximately one fifth of the parents reported that their child had a history of injuries before enrolling in the study. Since the variables “this incident was a freak accident” and “has searched for injury prevention information in the past four weeks” are time variant, they have some missing observations in some time points. Of note, eight parents reported that they had searched for injury prevention information and, as a result, there was not enough power to properly analyze changes in parents’ safety behaviour after a MAI.
Table 4.6 Descriptive statistics of main categorical variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Yes (%)</th>
<th>No (%)</th>
<th>Missing (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Was the child was hospitalized during survey completion</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>2 (1)</td>
<td>169 (99)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>One month</td>
<td>0 (0)</td>
<td>171 (100)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Four months</td>
<td>0 (0)</td>
<td>171 (100)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>12 months</td>
<td>0 (0)</td>
<td>171 (100)</td>
<td>0 (0)</td>
</tr>
<tr>
<td><strong>Child has history of injuries</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>37 (22)</td>
<td>134 (78)</td>
<td>0</td>
</tr>
<tr>
<td><strong>Was the parent with the child when the injury occurred?</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>50 (29)</td>
<td>97 (57)</td>
<td>24 (14)</td>
</tr>
<tr>
<td><strong>This incident was a freak accident</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>24 (15)</td>
<td>25 (14)</td>
<td>122 (71)</td>
</tr>
<tr>
<td>One month</td>
<td>37 (22)</td>
<td>21 (12)</td>
<td>113 (66)</td>
</tr>
<tr>
<td>Four months</td>
<td>64 (37)</td>
<td>37 (22)</td>
<td>70 (41)</td>
</tr>
<tr>
<td>12 months</td>
<td>93 (54)</td>
<td>50 (29)</td>
<td>28 (17)</td>
</tr>
<tr>
<td><strong>Has searched for injury prevention information</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One month</td>
<td>1 (0.6)</td>
<td>12 (16)</td>
<td>158 (92)</td>
</tr>
<tr>
<td>Four months</td>
<td>3 (2)</td>
<td>28 (16)</td>
<td>140 (82)</td>
</tr>
<tr>
<td>12 months</td>
<td>4 (2)</td>
<td>82 (48)</td>
<td>85 (50)</td>
</tr>
</tbody>
</table>

4.5 Perceived risk of the same injury

According to *Prediction 1*, the perceived risk of the same injury should decrease over time for parents who report high control over the MAI. According to *Prediction 2*, the perceived risk of the same injury should increase over time for parents who report low control over the MAI (See section 2.4 in page 13). To test these two predictions, a longitudinal analysis with mixed effects models was conducted. All models were fitted in the same data set of 171 parents and 346 observations (an average of two observations per parent), with random intercepts, using Maximum Likelihood Estimation, and specifying an unstructured covariance structure. The variable, “Was the parent with the child when the injury occurred?” was not included in the analysis, because it had too many missing observations (14%).
Figure 4.1 presents the spaghetti plot for the perceived risk of the same injury. This plot showed that there is within- and between-individual variance in perceived risk of the same injury over time. This provided initial indication that a mixed models approach was appropriate.

Longitudinal analysis with mixed models began with an Unconditional Means Model (see section 3.4, on page 23), which is the first model presented in Table 4.7. Because the Unconditional Means Model has no predictors, the only fixed effect reported is the intercept, which corresponds to the mean perceived risk of the same injury across all parents and all time points irrespective of time (the grand mean). The intercept or grand mean is 3.318 on a 7-point Likert scale, and, according to the t-value, it is significant (p<.001). The top panel of Table 4.7, under Random Effects, shows the residual variance which summarizes the perceived risk of the same injury around each parent’s mean; intercept variance represents the between-subject variance around the grand mean. The ICC (not shown in the table) was .543, indicating that
54% percent of the total variance observed in the sample is explained by between-individual differences. Since it is above 25%, the ICC confirmed the initial conclusion that mixed effects approach was justified.\textsuperscript{53} Because the within-subject variance suggested that there still was variability in individuals' trajectories that could be further explained, time was introduced as a predictor in the Unconditional Growth Model.

<p>| Table 4.7  Mixed effects models changes in parents' perceived risk of the same injury |
|---------------------------------------|---------------------------------|-----------------|-----------------|------------------|</p>
<table>
<thead>
<tr>
<th></th>
<th>Unconditional Means model</th>
<th>Unconditional Growth Model</th>
<th>Model A</th>
<th>Model B</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Random Effects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residual variance (within-subject)</td>
<td>1.329</td>
<td>1.321</td>
<td>1.331</td>
<td>1.322</td>
</tr>
<tr>
<td>Intercept variance (between-subjects)</td>
<td>1.577</td>
<td>1.559</td>
<td>1.480</td>
<td>1.237</td>
</tr>
<tr>
<td><strong>Fixed effects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>3.318***</td>
<td>3.506***</td>
<td>3.738***</td>
<td>2.737***</td>
</tr>
<tr>
<td>\textit{Standard error}</td>
<td>0.118</td>
<td>0.163</td>
<td>0.197</td>
<td>0.333</td>
</tr>
<tr>
<td>Time (rate of change over time)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>\textit{Standard error}</td>
<td>-0.025</td>
<td>-0.023</td>
<td>0.015</td>
<td>0.024</td>
</tr>
<tr>
<td>Injury seen as a freak accident</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>\textit{Standard error}</td>
<td>-0.381*</td>
<td>-0.330</td>
<td>0.187</td>
<td>0.184</td>
</tr>
<tr>
<td>Child is a boy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>\textit{Standard error}</td>
<td>0.705*</td>
<td>0.324</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child is a boy*Time</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>\textit{Standard error}</td>
<td>-0.061*</td>
<td>0.030</td>
<td></td>
<td></td>
</tr>
<tr>
<td>History of injuries before the study</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>\textit{Standard error}</td>
<td>0.831**</td>
<td>0.268</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child age (in years)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>\textit{Standard error}</td>
<td>0.047*</td>
<td>0.023</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Model Fit</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deviance</td>
<td>1278.509</td>
<td>1275.714</td>
<td>1271.629</td>
<td>1250.542</td>
</tr>
<tr>
<td>\textit{Difference}</td>
<td>2.795</td>
<td>6.880**</td>
<td>21.087**</td>
<td></td>
</tr>
<tr>
<td>Degrees of freedom</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Akaike Information Coefficient</td>
<td>1284.509</td>
<td>1283.714</td>
<td>1281.629</td>
<td>1268.542</td>
</tr>
<tr>
<td>Bayesian Information Coefficient</td>
<td>1296.048</td>
<td>1299.100</td>
<td>1300.861</td>
<td>1303.160</td>
</tr>
</tbody>
</table>

\textsuperscript{*} = Statistically significant at the 0.05 level; \textsuperscript{**} = Statistically significant at the 0.001 level; \textsuperscript{a} = compared with Unconditional Means Model; \textsuperscript{b} = compared with Model A.

The Unconditional Growth Model includes time as the only predictor. Time was rescaled to months, because model parameters, particularly slope and slope variance were too small. The residual variance decreased by 6%, compared with the Unconditional Growth Model, indicating that introducing time as a predictor improved model fit. The intercept variance
changed because the intercept no longer represents the grand mean (perceived risk of the same injury across all individuals and time points). Instead, the intercept now represents the estimated perceived risk of the same injury at time zero; that is, at baseline. The t-value indicated that the effect of time was not significant. Also, the Deviance test reported in the bottom panel of the table showed that the difference in deviance between the Unconditional Growth Model and the Unconditional Means Model was not significant. Prediction 1 and Prediction 2 (see section 2.4 on page 13) imply that perceived control over the MAI moderates the relationship between time and perceived risk of injury: higher control should be associated with a downward trend in the perceived risk of the same injury, while low control should be associated with an upward trend. However, no moderating effects between perceived control, time and perceived risk of the same injury were found.

Although the relationships predicted were not significant, additional models were fit, because exploratory analysis revealed potential interactions between time and the other predictors (i.e., child gender, SES, history of injuries and perceived the incident as a freak accident). Model A includes parents’ belief that the injury was a freak accident, a time varying predictor. The Deviance test indicated that all parameters of this model were statistically significant (p<.05). In Model B, time-invariant predictors were introduced: history of injuries before the study, child age and child gender, as well as a cross-level interaction between time and child gender. Compared to Model A, Model B decreased the within-individuals variance, as well as between-individual variance in intercepts. Further, the deviance test indicated that all parameters in Model B are significant (p<.05). Cohen’s $f^2 .006$, the ratio of the residual variance explained to the residual variance not explained (not shown in table), indicates that there was insufficient power to detect any effect (a small effect should be at least .02).
The middle panel in Table 4.7 shows the fixed effects of each model. The stars next to some fixed effects parameters signal significance according to the \( t \)-value and indicate that the parameter is non-zero. Fixed effects for the final model, Model B, are presented visually, in Figure 4.2. In both panels, A and B, the average parent of a boy showed higher perceived risk of the same injury at baseline compared to the average parent of a girl; .705 points higher on a 7-point Likert scale to be more precise (see Table 4.7 on page 36). In addition, the perceived risk of the same injury increased over time for the average parent of a girl, while it decreased over time for the average parent of a boy. Comparison of panel A with B indicates that the average parent whose child had a history of injuries before the study, had an overall higher perceived risk of the same injury regardless of the gender of the child; that is, a higher elevation.

![Figure 4.2 Changes in mean perceived risk of the same injury by gender of the child](image)

Table 4.7 also shows other significant effects that were detected, but not included in Figure 4.2. For the average parent who thinks the injury incident as a freak accident, the perceived risk of the same injury at baseline was slightly, significantly lower. The perceived risk of the same injury at baseline was .831 higher (on a 7-point Likert scale) for the average parent
whose child had a history of injuries before the study, compared with the parent of a child who does not. Finally, child age increased the perceived risk of the same injury by .05; this implies that the difference in perceived risk of the same injury for the average parent of a 16 year old girl at baseline (and keeping all other variables at the 0) compared with the average parent of a 1 month old female infant, would be .800 on a 7-point Likert scale. Since only two parents filled out questionnaires while their child was hospitalized at only one time point, this variable was not included in the analysis. The bottom part of Table 4.7 also reports the Akaike Information Coefficient and the Bayesian Information Coefficient, which indicate model fit; the smaller the indicator the better the model fit. No multicollinearity among predictors was detected.

In summary, analysis revealed that following MAI to children, parents’ perceived risk of the same injury (injury recurrence) was subject to a recency effect (refer to section 2.4 Study rationale and hypothesis, on page 13). This effect was moderated by the gender of the child. The perceived risk of the same injury for the average parent of a boy changed over time in a manner consistent with positive recency (i.e., it had a negative slope). In contrast, the perceived risk of the same injury for the average parent of a girl changed over time in a manner consistent with negative recency (i.e., it had a positive slope). The age of the children and whether they had a history of injuries before their parent enrolled in the study were associated with a higher perceived risk of the same injury. Finally, regarding the injury as a “freak accident” was associated with a slightly lower perceived risk of the same injury at baseline.

4.6 Perceived risk of any injury

According to Prediction 1 (see section 2.4 in page 13), the perceived risk of any injury should decrease over time for parents who report high control over the MAI. According to Prediction 2, the perceived risk of the any injury should increase over time for parents who
report low control over the MAI. To test these two predictions, a longitudinal analysis of parents' perceived risk of any injury was conducted, using a mixed models approach. All models were fitted in the same data set of 171 parents and 346 observations (an average of two observations per parent), using Maximum Likelihood Estimation, random intercepts, and an unstructured covariance structure. These specifications were retained throughout the entire analysis, because the Deviance test requires all models being compared to have the same specifications. The variable, “Was the parent with the child when the injury occurred?” was not included in the analysis, because it had too many missing observations (14%).

Figure 4.3 presents the spaghetti plot of individual change over time in perceived risk of the same injury. This figure provided initial justification of a mixed models approach, as it shows that there is within- and between-individual variance in perceived risk of the same injury over time.

Figure 4.3 Spaghetti plot of perceived risk of any injury
Table 4.8 presents results of data analysis through linear mixed models. Each column summarizes model information starting with the Unconditional Means Model, which has no predictors. Because the Unconditional Means Model has no predictors, the only fixed effect reported is the intercept, which corresponds to the mean perceived risk of any injury across all parents and all time points irrespective of time (the grand mean). The intercept or grand mean is 4.179 on a 7-point Likert scale and it is significant \( p<.000 \). In the top panel of Table 4.8, under Random Effects, the residual variance is a summary of the variance in perceived risk of any injury around each parent’s mean; intercept variance represents the between-subject variance around the grand mean. The ICC (not shown in the table) indicates that 66% percent of the total variance observed in the sample is explained by between-individual differences. Because it is above 25%, the ICC confirms the initial conclusion that mixed effects approach is justified.\(^{53}\) Because the within-subject variance suggested that there still was variability in individuals’ trajectories that could be further explained, time was introduced as a predictor.

The Unconditional Growth Model includes time as the only predictor. Consistent with the previous analysis, time was rescaled to months to avoid extremely small parameters. Adding time as predictor reduced residual variance by 6% and the variance at the intercept by a modest 1%. Prediction 1 and Prediction 2 imply that higher control should be associated with a negative slope in the perceived risk of any injury, while low control should be associated with a positive slope (i.e., controllability moderates the relationship between time and perceived risk of injury). However, no moderating effects between perceived control, time and perceived risk of the same injury were found. The middle panel in Table 4.8 shows the fixed effects for the Unconditional Growth Model, and indicates that the perceived risk of any injury decreased by .046 on 7-point Likert scale. This implies that after 12 months, the perceived risk of any injury for the average
parent would have decreased by .055 on 7-point Likert scale. The t-value and the Deviance test, (in the bottom panel of Table 4.8) indicate that this effect is significant (p<.001).

**Table 4.8 Mixed effects models of changes in parents’ perceived risk of any injury**

<table>
<thead>
<tr>
<th></th>
<th>Unconditional Means Model</th>
<th>Unconditional Growth Model</th>
<th>Model C</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Random Effects</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residual variance (within-subjects)</td>
<td>0.821</td>
<td>0.768</td>
<td>0.746</td>
</tr>
<tr>
<td>Intercept variance (between-subjects)</td>
<td>1.608</td>
<td>1.592</td>
<td>1.417</td>
</tr>
<tr>
<td><strong>Fixed Effects</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>4.179***</td>
<td>4.540***</td>
<td>4.159***</td>
</tr>
<tr>
<td><strong>Standard error</strong></td>
<td>0.111</td>
<td>0.266</td>
<td></td>
</tr>
<tr>
<td>Time (rate of change over time)</td>
<td>-0.046***</td>
<td>-0.072**</td>
<td></td>
</tr>
<tr>
<td><strong>Standard error</strong></td>
<td>0.012</td>
<td>0.022</td>
<td></td>
</tr>
<tr>
<td>History of injuries before the study</td>
<td>0.354</td>
<td>0.329</td>
<td></td>
</tr>
<tr>
<td><strong>Standard error</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>History of injuries before the study *time</td>
<td>0.062*</td>
<td>0.028</td>
<td></td>
</tr>
<tr>
<td><strong>Standard error</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income more than $80,000 per year</td>
<td>0.447</td>
<td>0.305</td>
<td></td>
</tr>
<tr>
<td><strong>Standard error</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income more than $80,000 per year*time</td>
<td>0.021</td>
<td>0.025</td>
<td></td>
</tr>
<tr>
<td><strong>Model Fit</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deviance</td>
<td>1173.087</td>
<td>1157.694</td>
<td>1136.022</td>
</tr>
<tr>
<td><strong>Difference</strong></td>
<td>15.393***</td>
<td>21.673***</td>
<td></td>
</tr>
<tr>
<td>Degrees of freedom</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Akaike Information Coefficient</td>
<td>1179.087</td>
<td>1165.694</td>
<td>1152.022</td>
</tr>
<tr>
<td>Bayesian Information Coefficient</td>
<td>1190.626</td>
<td>1181.080</td>
<td>1182.793</td>
</tr>
</tbody>
</table>

* = Statistically significant at the .05 level; *** = Statistically significant at the .001 level; a = compared with Unconditional Means Model; a = compared with Model A.

Model C, the last model, includes, as predictors, child’s history of injuries before the study and annual family income, as well as their interactions with time. Introducing these variables further reduced the residual and the slope variances, and the Deviance test indicates that all parameters of this model are significant (p<.000). Cohen’s $f^2$.10 (not shown in table), indicates that predictors in this model have a small effect size ($0.02 \leq f^2 < 0.15$). The fixed effects are illustrated in Figure 4.4. Both panels A and B show that, the perceived risk of any injury is higher at baseline for parent of a child who had a history of injuries before the study, compared
with the parent of child who did not. Moreover, the perceived risk of any injury for the average parent of a child with a history of injuries remained virtually the same. In contrast, the perceived risk of any injury for the average parent of a child without a history of injuries decreased over time (i.e., had a negative slope). The deviance test indicates that these effects are significant ($p < .000$). The bottom part of Table 4.8 also reports the Akaike Information Coefficient and the Bayesian Information Coefficient, which indicate model fit; the smaller the indicator the better the model fit. No multicollinearity among predictors was detected.

<table>
<thead>
<tr>
<th>Income $80,000 per year or more</th>
<th>Income less than $80,000 per year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>A</strong></td>
<td><strong>B</strong></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="image" alt="Figure 4.4 Changes in mean perceived risk of any injury by history of injuries" /></td>
<td></td>
</tr>
</tbody>
</table>

Model C also includes annual family income as a predictor, and its interaction with time. As shown in Figure 4.4, the average parent of higher SES (more than $80,000 per year) tends to have a higher perceived risk of any injury, particularly if his or her child has no previous history of injuries before the study. Since only two parents filled out questionnaires while their child was hospitalized at only one time point, this variable was not included in the analysis. No other variables had significant effects.
In summary, analysis revealed that the effects MAI to children on their parents perception of injury risk, generalize to other injuries. In effect, the perceived risk of any injury was subject to positive recency (refer to section 2.4 Study rationale and hypothesis, on page 13), particularly for the average parent whose child did not have a history of injuries before enrolling in the study. In other words, if a child sustains a MAI for the first time, the perceived risk of injury for the average parent is subject to recency effects. In addition, high socioeconomic status was associated with an overall higher perceived risk of any injury.

4.7 Information search

Due to insufficient power, predictions involving parental preventive behaviour (searching for information on child injury prevention) were not tested.
5 Discussion

Although interventions to change parents’ safety practices around injuries often target their perception of risk, the factors that influence risk perception and its relation with behaviour are little understood. The present study attempted to shed some light on this knowledge gap, by testing the following predictions: (a) parents who report high control over the MAI would be more likely to exhibit a negative slope in their perceived risk of the same or any injury; (b) conversely, parents who report low control over the MAI would be more likely to exhibit a positive slope in their perceived risk of the same injury; and (c) parents who are ambiguous as to whether they can control the MAI would exhibit a coexistence effect: a positive slope in their perceived risk of the same and any injury, accompanied by a negative slope in their likelihood of searching for information on child injury prevention.

Results indicate that controllability was not associated with the perceived risk of the same or any injury and, more importantly, did not moderate the relationship between time and the perceived risk of the same or any injury, or between time and parents’ likelihood of searching for information on child injury prevention. Nevertheless, the present study produced other findings that are worth discussing: (a) experiencing more than one MAI to a child increases the parent’s perceived risk of the same and any injury, independently of recency effects, either positive (decreasing over time) or negative (increasing overtime); (b) the perceived risk of any injury is subject to positive recency for parents of children who had their
first MAI (i.e., decreases over time after the incident); (c) believing the MAI was a “freak accident” was associated with a slightly lower perceived risk of the same injury for the average parent; (d) the gender of the child seems to moderate the relationship between time and perceived risk of the same injury (i.e., the slope is negative for boys and positive for girls). Child age and socioeconomic status were positively associated with the perceived risk of the same and of any injury, respectively.

Although some of the findings described in the previous paragraph from the present study lead to definitive conclusions, other results are inconsistent with previous findings or theory, or imply puzzling questions. For this reason, the present section has been divided into seven parts that discuss: findings interpretable based on theory and previous studies, findings that are inconsistent with theory and previous research, inconclusive findings, study limitations and strengths, future directions, implications for public health, and conclusions.

5.1 Findings that are interpretable based on theory and previous studies

Study results suggest that experiencing more than one MAI to a child is associated with sustained changes in the perceived risk of the same and of any injury. In effect, the average parent of a child with a history of injuries before enrolling in the study had higher perceived risk of the same and of any injury across all time points, irrespective of gender and age of the child, SES, and whether the injury was seen as a “freak accident.” This effect was not associated with perceived control over the injury, education level, or the number of days the injury affected the child (as reported by the parent). This is consistent with two previous studies that examine parental perception of injury risk after a MAI: First, a cross-sectional study where Glik et al. surveyed 1,247 mothers with children aged six months to five years. Among other topics, Glik et al. asked participating mothers about their perception of injury risk for their child and whether
their child had sustained a MAI in the previous year. Mothers whose child had sustained a MAI in the previous year tended to report significantly higher scores of perceived risk of injury, compared with mothers whose child had not sustained an injury in the previous year. Second, a case control study where Morrongiello et al.\textsuperscript{5} compared 55 parents of children who had sustained a MAI in a playground (cases) with a matched sample of 55 parents of children who had never experienced a MAI in a playground (controls). Results indicated that case parents reported higher ratings of likelihood of injuries than controls. Importantly, the study also demonstrated that this effect was detectable even eight months after the injury.\textsuperscript{5} The present study adds to previous findings by demonstrating that:

- Experiencing more than one MAI to a child increases his or her parents’ perceived risk of the same and of any injury, independently of recency effects, either positive (decreasing over time) or negative (increasing overtime).
- The effect MAI to children on parental perception of injury risk seems to generalize from one specific injury to any possible injury.
- The perceived risk of any injury is subject to positive recency for parents of children who had their first MAI (i.e., decreases over time after the incident).

In addition, viewing the MAI as a “freak accident” was associated with a slightly lower perceived risk of the same injury for the average parent. This is consistent with theory, because the expression “freak accident” commonly refers to extremely unlikely and unusual events.\textsuperscript{58} Thus, it is reasonable to find that parents are less likely to expect the same MAI to recur shortly after it happens.
In short, this is the first study to examine parental perception of injury risk following MAI to children using a longitudinal design. Results confirm previous findings indicating that MAI is associated with higher perceived risk of injury. Moreover, the present study shows that experiencing a MAI increases perceived risk of child injuries in general, and that this effect is subject to positive recency if it is the first injury.

5.2 Findings that are inconsistent with theory and previous research

5.2.1 Gamblers’ fallacy for parents of girls, but not for parents of boys?

Study results indicate, that the perceived risk of the same injury increased overtime for the average parent of a girl, indicating negative recency effects, but decreased overtime for the average parent of a boy, indicating positive recency. Based on these findings, it is tempting to use the term gamblers’ fallacy to label the negative recency effect found for parents of girls. However, this interpretation conflicts with the coexistence hypothesis and previous research: the coexistence hypothesis implies that, after experiencing an adverse event, people are likely to exhibit negative recency if they believe that the event was determined by chance, or if they are unsure as to whether the event is determined by chance or behaviour. On the other hand, previous research on child injury prevention suggest that parents tend to attribute boys’ injuries to luck or fate. Thus, previous research would predict parents of boys should have exhibited negative recency, which was not the case. One possible, simple explanation is that parents regard behaviour by daughters as more open to influence and behaviour change, and therefore they expect girls to be more cautious shortly after the injury.
5.2.2 Child age and perceived risk of injury

The age of the child was directly associated with parents’ perceived risk of the same injury: the older the child, the higher the perceived risk. This result contradicts findings from two previous studies, which indicate that perceived risk decreases with the age of the child: Beirens, Brug, van Beeck, Dekker, den Hertog and Raat,\textsuperscript{27} and Lam.\textsuperscript{30} However, important differences between the studies may explain these inconsistent findings. Beirens et al.\textsuperscript{27} focused specifically on unintentional injuries due to falls in a sample of parents of children 0 to 4 years old. Since children typically learn how to walk and retain balance during these years, it is understandable that parental perceived risk of fall related injuries decreases with child age. Lam\textsuperscript{30} studied parents of children 4 to 12 years old, but focused only on unintentional child pedestrian injuries. Parental perception of risk of unintentional child pedestrian injuries decreased, as the children developed and were expected and able to manage risks on the road.\textsuperscript{30} The present study differs from the previous two in that its sample included parents of children of a wider age range (0 to 16) and included all kinds of injuries. It is possible that, for certain types of injuries and across a longer age span, the association between perceived injury risk and child age is positive, because older children can typically engage in a wider range of activities that, in turn, entail risk of a wider range of injuries (e.g., competitive sports, camping, biking to school, and swimming).

5.2.3 Socioeconomic status and health behaviour

The perceived risk of any injury was higher for parents of high SES, compared with parents of medium or low SES (annual household income above and below $80,000, respectively). This finding could be surprising, considering the environmental approach presented in section 2.1.2 Aetiology of unintentional injuries: if children of low SES are more exposed to injury hazards and, ceteris paribus, are more likely to be injured, then why do they exhibit a lower perceived risk? However, it is important to note that 67% of parents in the
sample are from high socioeconomic status (yearly family income $80,000 of or above). Further, only 6% of parents reported a yearly family income below $30,000 (not shown in Table 4.1, page 29). Consequently, interpretations that apply to parents of low SES are unlikely to apply in this sample.

5.3 Inconclusive findings

In addition to studying changes in perceived risk of injury following a MAI, the present study also seeks to examine the relationship between perceived risk and behaviour, and specifically, to test if perceived control over the injury mediates this relationship. Unfortunately, it was not possible to conduct this analysis for two reasons: first, the overall perceived control over the injury was low and 24 (14%) parents did not indicate whether they were present with the child at the time of injury. The latter piece of information was essential to determine whether parents reported low control, not because they believe the incident was non-preventable, but because the injury took place while the child was in someone else’s care (e.g., nanny, school, daycare, friend’s home). As a result, it was difficult to establish if the main condition of the coexistence hypothesis was met (i.e., being unsure if injuries occur by chance or are somewhat related to behaviour).

Second, only eight parents reported having searched for information on injury prevention. Although this suggests that parents are unlikely to engage in safety behaviour after their child sustains a MAI, drawing such a conclusion would be premature. Parents who did not seek prevention information could have engaged in other types of safety behaviour: increasing supervision, using or encouraging use of safety equipment, or establishing new rules for the children.
5.4 Study limitations and strengths

Results from this study must be interpreted in light of the characteristics of the sample, which comprised parents of medium to high SES (high education and income levels). This is not surprising, because high SES has been linked to participation in population based studies. Further, parents of younger children were less likely to participate, possibly because younger children need attention from parents while in the hospital. As a result, parents with younger children could have found it more difficult complete the survey. It is also possible that parents of younger children may have blamed themselves or felt more responsible for injuries to their child and, thus, were more reticent to participate in the study.

Despite these limitations to generalizability, sample distribution by child and parent gender reflect population characteristics: the large presence of parents of boys in the sample compared to parents of girls echoes the overrepresentation of male children in unintentional injuries found in previous studies. In fact, the proportions of parents of boys and parents of girls in the sample are very close to the proportions of injured boys and injured girls in British Columbia during 2010 and 2011: 66% and 34%, respectively. In addition, the greater proportion of mothers in the sample is consistent with the prevalent distribution of parenting roles in families with heterosexual parents. For example, findings from a qualitative study on parents attitudes towards child safety, found that in heterosexual couples with children responsibility for child safety tends to fall to mothers, not fathers. Further, a survey study with Canadian parents found that fathers were less likely to know about child safety seats than mothers.

Another potential limitation of this study is the use of single-item Likert scales and the focus on parents' perceived risk of the same and of any injury. Because this study used only
one item, it is difficult to establish validity and reliability of the measures. Similarly, the use of a single self-reported measure of behaviour (searching information on injury prevention), also limits study results, because it excludes other changes in behaviour, like increased supervision. As discussed in section 3.2.1 (page 19), the number and quality of outcome measures was limited by the fact that this study was conducted alongside another investigation that already included several questionnaires. It is also important to note that the Cohen’s $f^2$ for the perceived risk of same injury was below the range of small effects and, thus, may indicate low power to detect an effect. Moreover, the Cohen’s $f^2$ has been found to overestimate the size of the effect in longitudinal studies.$^{57}$

To the extent of the author’s knowledge, this is the first time that a theory of judgement and decision making has been used to address research questions in child injury prevention. Importantly judgment and decision making theories were used to derive testable predictions about parents’ perception of child injury risk and behaviour. This innovative approach to child injury prevention was fruitful, because it unveiled several puzzling questions regarding differences in the way parents react to MAIs sustained by boys and girls, and the influence of socioeconomic status

In addition, the present study involved documentation and testing of an extensive list of factors previously known to influence parental perception of injury risk: child age and gender, parent gender, SES and education, and optimism bias. Moreover, the present study also controlled for other potential influences: (a) severity of injuries was included in the analysis as parent-reported number days the child was affected by the injury; (b) recency was tested through a longitudinal design; (c) judgments placed on injuries (“Injuries are natural part of life”) controlled by eliciting judgments of likelihood instead of judgments of risk; and (d) the influence
of very unusual occurrences was taken into account by asking parents if they believe the injury resulted from a “freak accident.” Optimism bias was also controlled by asking parents to report the perceived risk of injury to their child. Finally, the present study benefits from the advantages of using correlated observations, which increase statistical power.

5.5 Future directions

The first and obvious sequel to the present study is a final definitive analysis once data collection is completed. A new examination of parents’ likelihood of searching for information of injury prevention will also be conducted, along with a moderation analysis with perceived control as a potential moderator between perceived risk of the same or any injury and searching for information on child injury prevention.

Further, given the number of surprising results, the present study lays out several research questions that need to be pursued: Why does parents’ perceived risk of the same injury seem subject to positive recency for boys and to negative recency for girls? Is this difference related to cognitive processes, like attributing injuries to chance or behaviour? Is it related to gender stereotypes and expectations by parents? Can it be explained by emotional theories of risk? Furthermore, what is the relationship between child age and perceived risk of injury? Is it positive for certain injuries and negative for others? Is it non-linear? Finally, what is the relationship between SES and perceived risk of child injury?

5.6 Implications for public health

MAIs increase parents’ perceived risk of injury to their children. This change seems permanent for parents of children who have sustained more than one injury, but temporary for parents whose child has sustained his or her first injury or. It unclear whether these changes in
perceived risk of injury were accompanied by changes in behaviour, and if there is a teachable moment at which prevention interventions would be more effective to change behaviour. Assuming that perceived risk of injury determines parental safety behaviour, findings from the present study provide several important guidelines for public health interventions aimed at preventing injury recurrence: first, social marketing and education campaigns could be targeted by children’s history of injuries. On one hand, parents whose child has sustained more than one injury may benefit more from messages that emphasize behaviour change rather than risk perception, because they tend to exhibit a higher and more stable perceived risk of injuries. On the other hand, parents whose child has had his or her first injury may benefit more from messages that emphasize both risk perception and behaviour. Moreover, the latter segment is more likely to require exposure to prevention messages during the year following a MAI, in order to counter recency effects. Findings also suggest that social marketing and education campaigns could benefit from segmenting target audiences by age and gender of the child. Using qualitative methods with a subsample from this study, it is possible to study parents’ beliefs and values around injuries to boys, girls, infants, preschoolers, and school-aged children. This information could further inform communication strategies for each of these groups.

In addition, current findings question the effectiveness of deploying interventions in hospitals where children are being treated for injuries. Mothers are more likely to be with their child in these situations, but, compared to fathers, they have less influence on children’s active (and potentially risky) play. Moreover, their influence on fathers’ behaviour might be limited, because fathers report continued engagement in activities that entail risk of injury, despite mothers’ safety concerns. Future studies should explore other ways to effectively reach fathers using public health interventions.
5.7 Conclusions

This is the first longitudinal study on parents’ perception of child injury risk following a MAI. As such, this study has the statistical advantages of repeated measures, while allowing for an examination of association between variables within a temporal context. Importantly, this is the first time that a hypothesis from judgement decision making research has been used to explain the relationship between perceived control, perceived risk of injury, and safety behaviour in the context of child injury prevention.

Regarding the initial questions that motivated the present study, (whether MAIs increase parents’ perception of their child’s injury risk and influence parents’ preventive behaviour), findings indicate that MAIs indeed increase parents’ perception of their child’s injury risk. This effect seems permanent for parents whose child has sustained more than one MAI, and temporary for parents whose child has sustained his or her first injury. Although it was not possible to explore whether MAIs prompt preventive behaviour among parents, the present study produced other findings: first, the impact of MAIs on parents’ perceptions of injury risk differs by the gender of the child. The perceived risk of the same injury decreases over time for parents of boys and increases over time for the parents of girls; and second, higher SES is associated with a higher perceived risk of the same injury. As for the final question (whether there is a teachable moment to prevent injury recurrence), some of these findings can be used in the development of targeted initiatives to prevent injury recurrence: parents of children who had sustained their first MAI may need interventions that counter recency effects, while parents whose child has sustained more than one MAI may need interventions that focus on promoting behaviour change.
References

17. Brussoni M, Creighton G, Olsen L, Oliffe JL. I'm Having to Learn That he is Just as Concerned that our Children Survive their Childhood as I am": Heterosexual Gender Relations in and Around Childhood Risk and Safety. Qualitative Health Research (In press).


Appendix: Sample questionnaires

Child and Youth
Burden of Injury Research Study

Questionnaire 1:
Baseline Assessment for PARENTS

Thank you for your help with the Child and Youth Burden of Injury research study. This is the first Questionnaire of up to 4 that you will receive over the span of one year. It asks a series of questions about your child’s health before the injury. We would be grateful if you would be willing to complete this questionnaire and send it back to us in the prepaid addressed envelope within the next 3-4 days. To thank you there is a $2 gift voucher in the envelope.

You also have the option to complete the questionnaire online. Simply go to the website: www.tinyurl.com/parent-9 and follow the instructions. Your Web ID for the online questionnaire is found at the top, right hand corner of this page.

We have also enclosed a package for your child to fill out. If your child is unable to complete this on their own, we would appreciate that you help the child complete their questionnaire.

In about 1 month, we will send you Questionnaire 2 to complete.
If you have any questions about the study please contact me at xxx-xxxx

Thank you very much for taking part in this study.
Today’s Date: __________________________ (dd/mm/yyyy)

PART 1

1. Child’s Birth Date:

______________________________ (dd/mm/yyyy)

2. Is the child:     male ☐    female ☐

The following questions ask about where and how your child’s injury occurred.
3. What type of activity was your child doing when they were injured? *(Please tick one box only)*

- a. Education?
- b. Sports or exercise at a school?
- c. Sports or exercise at a club/ gym?
- d. General leisure/entertainment/shopping?
- e. Paid work?
- f. Unpaid/ Voluntary work?
- g. Housework (e.g. home and garden maintenance)?
- h. Other? Please specify: ________________________________
4. Please provide further details of what your child was doing at the time of the injury. For example: fell down stairs at home, cut hand with saw at work, pushed off swing in playground

5. Where did the injury happen? (Please tick one box only)

- a. At School

- b. In your own home

- c. In some other person’s home

- d. In a residential home

- e. At work

- f. On a public road or on a pavement

- g. In an entertainment area (e.g. cinema, café)

- h. Countryside (e.g. open land, beach and sea)

- i. Sports grounds/centres

- j. Public buildings (e.g. shops, library)

- k. Some other area, please give details:
6. Was a motor vehicle involved in your child’s accident?
   Yes □ No □

   If yes, was your child a…? (tick one box only)
   Pediatric □
   Driver □
   Passenger □
   Cyclist □
   Other road user □

7. Was your child’s injury caused by an…? (Please tick one box only)
   Accident □
   Deliberate violence □
   Uncertain if accident or deliberate □
   Unknown □
8. a. Were you with your child when he or she was injured?
   Yes □ No □

   b. Please provide further details:

9. a. Were you also injured during the same incident?
   Yes □ No □

   b. Please provide further details:

Please think about the events that led to your child’s injury and answer the following questions.

10. Would you say this incident was a “freak event”?
    Yes □ No □

11. How much control did you feel you had to stop the event from happening?

    _______ _______ _______ _______ _______ _______ _______ _______
    1 2 3 4 5 6 7

    Uncontrollable

12. How much of a chance do you think the event could happen to your child again?

    _______ _______ _______ _______ _______ _______ _______ _______
    1 2 3 4 5 6 7
13. *In general, the chance of your child being injured again in the future is:*

Very low  
1  2  3  4  5  6  7  Very high

The next group of questions are about your child’s health before the injury.

14. Before your child’s injury did they suffer from a disability or long term health problem that limited their normal activities?

Yes ☐ No ☐

15. In the 4 weeks before your child was injured on how many days did ill health restrict their normal activities?  

________________________ days

In the 4 weeks before your child was injured on how many days did they miss attending school or some other form of education because of ill health?

________________________ days
PART 2

By placing a tick in one box in each group below, please indicate which statements best describe your child’s health state on the day before they were injured.

a. Mobility

No problems in walking about

Some problems in walking about

Confined to bed

b. Self-Care

No problems with self-care

Some problems washing or dressing himself/herself

Unable to wash or dress himself/herself

c. Usual Activities (e.g. work, study, housework, family or leisure activities)

No problems with performing his/her usual activities

Some problems with performing his/her usual activities

Unable to perform his/her usual activities

d. Pain/Discomfort

No pain or discomfort

Moderate pain or discomfort
Extreme pain or discomfort

e. Anxiety/Depression
Not anxious or depressed
Moderately anxious or depressed
Extremely anxious or depressed
To help people say how good or bad your child’s health state was, we have drawn a scale (rather like a thermometer) on which the best state you can imagine is marked 100 and the worst state you can imagine is marked 0.

We would like you to indicate on this scale how good or bad your child’s health was on the day before they were injured, in your opinion. Please do this by drawing a line from the box below to whichever point on the scale indicates how good or bad your child/teenager’s health state was the day before they were injured.
PART 3

DIRECTIONS

On the following page is a list of things that might be a problem for your child.

Please tell us how much of a problem each one has been for your child in the ONE month before they were injured by circling:

0 if it is never a problem
1 if it is almost never a problem
2 if it is sometimes a problem
3 if it is often a problem
4 if it is almost always a problem

There are no right or wrong answers.
If you do not understand a question, please ask for help.
In the past **ONE month**, how much of a **problem** has your teen had with …

<table>
<thead>
<tr>
<th>PHYSICAL FUNCTIONING (problems with...)</th>
<th>Never</th>
<th>Almost Never</th>
<th>Sometimes</th>
<th>Often</th>
<th>Almost Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Walking more than one block</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2. Running</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3. Participating in sports activity or exercise</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4. Lifting something heavy</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5. Taking a bath or shower by him or herself</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6. Doing chores around the house</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>7. Having hurts or aches</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>8. Low energy level</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EMOTIONAL FUNCTIONING (problems with...)</th>
<th>Never</th>
<th>Almost Never</th>
<th>Sometimes</th>
<th>Often</th>
<th>Almost Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Feeling afraid or scared</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2. Feeling sad or blue</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3. Feeling angry</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4. Trouble sleeping</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5. Worrying about what will happen to him or her</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SOCIAL FUNCTIONING (problems with...)</th>
<th>Never</th>
<th>Almost Never</th>
<th>Sometimes</th>
<th>Often</th>
<th>Almost Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Getting along with other teens</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2. Other teens not wanting to be his or her friend</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3. Getting teased by other teens</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4. Not able to do things that other teens his or her age can do</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5. Keeping up with other teens</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SCHOOL FUNCTIONING (problems with...)</th>
<th>Never</th>
<th>Almost Never</th>
<th>Sometimes</th>
<th>Often</th>
<th>Almost Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Paying attention in class</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2. Forgetting things</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3. Keeping up with schoolwork</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4. Missing school because of not feeling well</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5. Missing school to go to the doctor or hospital</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
PART 5

To enable us to access your child’s Medical Services Plan and PharmaCare data, we require your child’s Personal Health Number. Please enter it in the spaces below:

___ ___ ___ ___   ___ ___ ___   ___ ___ ___

We would like to examine the long term effect of injury in people with different backgrounds. Your answers to these questions would greatly help us to understand how injury affects different groups and communities and would be very much appreciated. All answers will be treated as strictly confidential and will be held securely and will not be stored with information that can identify your name or address.

*If you do not wish to answer any of these questions then please leave that question blank.*

1. Are you the injured child’s…..

   mother       □

   father       □

   other caregiver (please give details) □

   __________________________

2. Currently, you and the child’s other parent are:
Living together and legally married or in common-law relationship

No longer living together, but have previously been married or common-law partners

Living apart and have never lived together as a couple

Never had a relationship as a couple

Other parent is deceased

3. Your child lives: (please choose one)

With both parents

Mostly with mother

Mostly with father

Equally with each parent (e.g., shared custody)
4. Do you currently rent or own your home?

Rent  [ ]  

Own  [ ]  

5. How many people usually live at your address, including yourself?

Number of people: ______________________

6. What is the primary language/s that you speak at home? (For example: French, Mandarin, Urdu)

________________________________________________________________________
7. What is the highest grade or level of education you have attended or completed?

- Some high school
- Graduated high school
- Some - trade school, college or university
- Diploma from trade school or college
- University degree (e.g., Bachelor's or undergraduate degree)
- Post-graduate degree (e.g., Master's and/or Doctorate degree)

8. What is the highest grade or level of education the child’s other parent attended or completed?

- Some high school
- Graduated high school
- Some - trade school, college or university
- Diploma from trade school or college
- University degree (e.g., Bachelor’s or undergraduate degree)
9. What is your best estimate of the total income of all members of your household from all sources last year before taxes and deductions? Was the total household income:

- $14,999 or less
- between $15,000 and $29,999
- between $30,000 and $59,999
- between $60,000 and $79,999
- $80,000 or greater

10. Has your injured child had any other injuries in the last 12 months that required medical attention by a doctor, nurse, or dentist?

Yes □ No □
If yes, how many injuries? _______________

Please describe the most serious injury and how it happened:
Thank you very much for your help. Please return this questionnaire and consent form in the prepaid envelope by the end of the week. We look forward to hearing from you.
Child and Youth
Burden of Injury Research Study

Questionnaire 2:
1 Month Assessment for PARENTS

Thank you for your help with the Child and Youth Burden of Injury research study. You completed the first questionnaire about 1 month ago and we would like to thank you. This is Questionnaire 2. It asks you how the injury has affected you and the injured child over the last month. We would be grateful if you would be willing to complete this questionnaire.

You also have the option to complete the questionnaire online.

Simply go to the website: www.tinyurl.com/parent-response and follow the instructions. Your Web ID for the online questionnaire is found at the top, right hand corner of this page.

We have also enclosed a package for your child to fill out. If your child is unable to complete this on their own, we would appreciate that you help the child complete their questionnaire. Please send these both back to us in the prepaid addressed envelope by the end of this week.

To thank you we have sent you a $2 gift voucher.
In about 3 months we will send you Questionnaire 3 to complete.

If you have any questions about the study please contact me at xxx-xxxx.

Thank you very much for taking part in this study.
Today’s Date: __________________________ (dd/mm/yyyy)

PART 1

We are interested in learning how your child’s injury has impacted your family’s paid and unpaid activities.

1. In the last 4 weeks how much time have you missed from paid work due to caring for your child or taking him/her to medical appointments as a result of the injury?
   _____________ hours/days (please circle one)

2. If applicable, in the last 4 weeks how much time has the child’s other parent or caregiver missed from paid work due to caring for your child or taking him/her to medical appointments as a result of the injury?
   _____________ hours/days (please circle one)
3. In the last 4 weeks, on how many days did the injury restrict your child’s normal activities?

__________________ days

4. In the last 4 weeks, on how many days did your child miss school or work because of the injury?

__________________ days

5. In the last 4 weeks, have you searched for information about preventing injuries to your child?

Yes [ ] No [ ]

Now (today) do you feel your child’s injury is still affecting them in anyway? (Please tick one box only)

Yes, the injury still affects my child. [ ]

No, my child has completely recovered. [ ]

If your child has completely recovered, how long did the injury affect them for?

__________________ days

Please think about the events that led to your child’s injury and answer the following questions.
1. Would you say this incident was a “freak event”?

Yes ☐ No ☐

2. How much control did you feel you had to stop the event from happening?

1  2  3  4  5  6  7
Uncontrollable  Totally controllable

3. How much of a chance do you think the event could happen to your child again?

1  2  3  4  5  6  7
Very low  Very high

4. *In general*, the chance of your child being injured again in the future is:

1  2  3  4  5  6  7
Very low  Very high

**PART 2**

In the following questions please indicate which statements best describe your child’s health state *today*. Placing a tick in one box in each group below.

**Mobility**

No problems in walking about ☐
Some problems in walking about

Confined to bed

**Self-Care**

No problems with self-care

Some problems washing or dressing himself/herself

Unable to wash or dress himself/herself

**Usual Activities** *(e.g. work, study, housework, family or leisure activities)*

No problems with performing usual activities

Some problems with performing usual activities

Unable to perform usual activities

**Pain/Discomfort**

No pain or discomfort

Moderate pain or discomfort

Extreme pain or discomfort
Anxiety/Depression

Not anxious or depressed

Moderately anxious or depressed

Extremely anxious or depressed
To help people say how good or bad a health state is, we have drawn a scale (rather like a thermometer) on which the best state you can imagine is marked 100 and the worst state you can imagine is marked 0.

We would like you to indicate on this scale how good or bad your child’s health is today, in your opinion. Please do this by drawing a line from the box below to whichever point on the scale indicates how good or bad their health state is today.

Your child’s own health state
DIRECTIONS

On the following page is a list of things that might be a problem for your child. Please tell us how much of a problem each one has been for your child.

During the past ONE month by circling:

0 if it is never a problem
1 if it is almost never a problem
2 if it is sometimes a problem
3 if it is often a problem
4 if it is almost always a problem

There are no right or wrong answers.
If you do not understand a question, please ask for help.
In the past **ONE month**, how much of a **problem** has your teen had with …

### PHYSICAL FUNCTIONING  
**problems with…**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Never</th>
<th>Almost</th>
<th>Sometimes</th>
<th>Often</th>
<th>Almost</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Walking more than one block</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>2. Running</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>3. Participating in sports activity or exercise</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>4. Lifting something heavy</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5. Taking a bath or shower by him or herself</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>6. Doing chores around the house</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>7. Having hurts or aches</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>8. Low energy level</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

### EMOTIONAL FUNCTIONING  
**problems with…**

<table>
<thead>
<tr>
<th>Feeling</th>
<th>Never</th>
<th>Almost</th>
<th>Sometimes</th>
<th>Often</th>
<th>Almost</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Feeling afraid or scared</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>2. Feeling sad or blue</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>3. Feeling angry</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>4. Trouble sleeping</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5. Worrying about what will happen to him or her</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

### SOCIAL FUNCTIONING  
**problems with…**

| Getting along with other teens                                         | 0     | 1      | 2         | 3     | 4      |
| 2. Other teens not wanting to be his or her friend                     | 0     | 1      | 2         | 3     | 4      |
| 3. Getting teased by other teens                                       | 0     | 1      | 2         | 3     | 4      |
| 4. Not able to do things that other teens his or her age can do        | 0     | 1      | 2         | 3     | 4      |
| 5. Keeping up with other teens                                        | 0     | 1      | 2         | 3     | 4      |

### SCHOOL FUNCTIONING  
**problems with…**

| Paying attention in class                                              | 0     | 1      | 2         | 3     | 4      |
| 2. Forgetting things                                                  | 0     | 1      | 2         | 3     | 4      |
| 3. Keeping up with schoolwork                                          | 0     | 1      | 2         | 3     | 4      |
| 4. Missing school because of not feeling well                          | 0     | 1      | 2         | 3     | 4      |
| 5. Missing school to go to the doctor or hospital                      | 0     | 1      | 2         | 3     | 4      |
**PART 4**

**INSTRUCTIONS:** This section is about how you may have been affected by your child’s injury. Below is a list of problems and complaints that people sometimes have in response to stressful experiences. Please read each one carefully, put an X in the box to indicate how much you have been bothered by that problem in the past month.

<table>
<thead>
<tr>
<th></th>
<th>Not at all</th>
<th>A little bit</th>
<th>Moderately</th>
<th>Quite a bit</th>
<th>Extremely</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Repeated, disturbing <em>memories, thoughts, or images</em> of the stressful experience?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2. Repeated, disturbing <em>dreams</em> of the stressful experience?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3. Suddenly <em>acting or feeling</em> as if the stressful experience were <em>happening again</em> (as if you were reliving it)?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4. Feeling very upset when <em>something reminded you</em> of the stressful experience?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5. Having <em>physical reactions</em> (e.g., heart pounding, trouble breathing, sweating) when <em>something reminded you</em> of the stressful experience?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6. Avoiding <em>thinking about</em> or <em>talking about</em> the stressful experience or avoiding <em>having feelings</em> related to it?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>7. Avoiding <em>activities or situations</em> because they <em>reminded you</em> of the stressful experience?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>8. Trouble <em>remembering important parts</em> of the stressful experience?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>9. <em>Loss of interest</em> in activities that you used to enjoy?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Not at all</td>
<td>A little bit</td>
<td>Moderately</td>
<td>Quite a bit</td>
<td>Extremely</td>
</tr>
<tr>
<td>---</td>
<td>------------</td>
<td>--------------</td>
<td>-------------</td>
<td>-------------</td>
<td>-----------</td>
</tr>
<tr>
<td>10. Feeling <em>distant</em> or <em>cut off</em> from other people?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>11. Feeling <em>emotionally numb</em> or being unable to have loving feelings for those close to you?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>12. Feeling as if your <em>future</em> will somehow be <em>cut short</em>?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>13. Trouble <em>falling</em> or <em>staying asleep</em>?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>14. Feeling <em>irritable</em> or having <em>angry outbursts</em>?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>15. Having <em>difficulty concentrating</em>?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>16. Being &quot;<em>super-alert</em>&quot; or watchful or on guard?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>17. Feeling <em>jumpy</em> or easily startled?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
Are you the injured child’s.....

Mother

Father

Other caregiver (please give details)

______________________________

If your address or circumstances have changed please let us know your new contact details:

____________________________________

____________________________________

____________________________________
Thank you very much for your help. Please return this questionnaire and consent form in the prepaid envelope by the end of the week. We look forward to hearing from you.