

THE ECONOMIC BURDEN OF UNINTENTIONAL INJURY IN MANITOBA

Report prepared on behalf of

IMPACT

the injury prevention centre of Children's Hospital

by

SMARTRISK



SAUVE-QUI-PENSE

preventing injury with smart thinking

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The Economic Burden of Unintentional Injury in Manitoba

based on the study "The Economic Burden of Unintentional Injury in Canada" by SMARTRISK

Study conducted by The Hygeia Group: Terry Albert and Eden Cloutier

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ISBN 1-894828-36-4

ACKNOWLEDGEMENTS

The authors would like to acknowledge the enormous contributions of the Manitoba Injury Prevention Strategy Development Committee who provided oversight, guidance and assistance on all aspects of this project.

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In addition, we would like to acknowledge the hard work of Deborah Malazdrewicz, Manager, Decision Support Services, and Penny Brown, Decision Support Analyst, of Health Information Management Branch, Manitoba Health in providing us with the necessary data. We would also like to thank Michael Gemar, I.T. Support, SMARTRISK for the desktop publishing of the final report. Finally, this project would not have been possible without the generous support of Royal & SunAlliance Insurance Company of Canada.

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INTRODUCTION

Injury has recently been identified as a major public health problem in Canada and a significant threat to the economy, health care system and overall quality of life (SMARTRISK, 1998). Although the greatest cost of injury is in human suffering and loss, the financial costs are far from trivial. A 1998 study estimated the cost of unintentional injury in Canada as approximately \$8.7 billion (SMARTRISK, 1998)¹. Nationally, injury ranks third behind cardiovascular and musculoskeletal disease in terms of societal economic burden (Health Canada, 1997), yet it ranks last in terms of research funding and persists as a predominantly hidden epidemic.

There are two categories of injury: unintentional and intentional (murder, acts of violence and suicide). Unintentional injuries, which are very responsive to prevention, include falls, motor vehicle crashes, railway and pedestrian injuries, drowning and suffocation, poisoning and fires. Intentional injuries were not addressed in this study.

Other countries have recognized injuries as a major threat to human health and well-being and they have devised action-oriented responses. The United States now have a National Centre for Injury Prevention and Control (Sleet et al., 1998) and the British government has identified injury as one of four health priorities along with heart and stroke, cancer, and mental health (Department of Health, 1998).

In Canada, the provinces are essential partners in injury prevention. They coordinate, train, and provide data and technical assistance at the local level, which is where injury control efforts must ultimately be based. It is at the local level that needs are identified, data collected, community support garnered, and interventions implemented. British Columbia, Alberta, Quebec, Ontario and the Atlantic Provinces have established centers of expertise on injury, and several jurisdictions are implementing comprehensive injury prevention strategies.

THE MANITOBA CONTEXT

Manitoba Health, in partnership with other government departments, the Regional Health Authorities (RHAs) and other key stakeholders, has initiated action toward a provincial multi-sectoral strategy to reduce and prevent both unintentional and intentional injuries in Manitoba. IMPACT, the injury prevention centre of Children's Hospital, has been asked to lead this process. The Manitoba Injury Prevention Strategy Development Committee has provided direction and guidance to IMPACT for the strategy development process. The committee was appointed in March 2002 and is mandated to lay the groundwork to establish a provincial injury prevention strategy.

A background discussion paper was commissioned to serve as a launching point for

TABLE 1

Summary of Unintentional Injury Findings, Manitoba 1999-2002²

Injury Deaths	Hospitalized Injuries	Non-Hospitalized Injuries	Total Injuries	Injuries Resulting in Partial Permanent Disability	Injuries Resulting in Total Permanent Disability	Total Annual Cost
438	9,473	148,296	158,207	3,272	248	\$819 Million

¹ The Economic Burden of Unintentional Injury in Manitoba is based on a more comprehensive review of the literature which is available from the SMARTRISK Web site: www.smartrisk.ca/library.html

² Non-hospitalized injuries and injuries resulting in permanent/partial disability were estimated. Refer to Appendix C and D for methodological detail.

a discussion between Manitoba Health, RHAs and stakeholder organizations about what services, support and information they need to effectively address injury reduction in their respective regions or injury areas. This paper summarized the conceptual approach and policy context for an injury prevention strategy; described the injury problem in Manitoba over the past 10 years; and provided options for how to structure a provincial program to lead, coordinate and implement a provincial injury prevention strategy. Subsequently, a stakeholder survey was conducted as a means to initiate planning discussions. The primary purpose of the survey was to obtain feedback from provincial stakeholders regarding a recommended provincial injury prevention program model.

The people of Manitoba are aware that injuries kill and disable people every day. They also understand that injuries cost money. But do the people of Manitoba know how much money is spent on injuries? In partnership with SMARTRISK, IMPACT and the Manitoba Injury Prevention Strategy Committee decided to conduct a study on the economic burden of unintentional injury in Manitoba, to determine the health care costs and other societal costs associated with unintentional injuries and to bring this public health threat to the forefront of public policy.

This report goes beyond the economic consequences of injuries to proposing solutions to reduce the associated human pain, suffering and grief through proposing enhancements to the existing investments, policies and programs in injury prevention and control throughout the province. The ultimate goal is to build upon Manitoba's existing capacity in injury prevention towards a truly integrated and coordinated injury prevention and control strategy both within the province and nationally.

It is expected that the results of this study will provide the necessary economic rationale and impetus for policy makers, providers, managers and citizens to make recommendations needed to bring injury prevention to the forefront of public policy discussions, as well as to improve existing

treatment and rehabilitation approaches. These discussions would encompass behavioural changes, programming initiatives, communications strategies, engineering strategies, legislative, regulatory and enforcement initiatives, community outreach programs, age-specific injury education initiatives and an extension of injury prevention networks and coalitions that would be necessary to bring about significant reductions in unintentional injuries. In addition, recommendations for improving the measurement and reporting of injury information could be important by-products of this study.

APPROACH TO THE STUDY³

Economic burden of illness or cost of illness (COI) studies are used to characterize the economic dimensions of health problems/ conditions for planning, budgeting and priority setting. Often, the economic burden of a specific illness is compared to the gain, or return on investment, available from prevention and control programs.

COI studies generally follow two approaches - incidence or prevalence costing. The latter captures all costs incurred in a given year. The major limitation with this approach is that the full episode of illness, which may span multiple years or a full lifespan, is not captured. The incidence costing method assigns all costs (present and future) to the year in which the injury occurred. Thus, for all injuries occurring in a given year, both present and future costs associated with an injury are captured, with future costs being discounted to a present value. Hence, with this approach, the cost of an injury occurrence (i.e. full episode) can be compared to the cost associated with the prevention of that injury. Prevention costs are actually investments. For example, 1 dollar spent on bicycle helmets averts 29 dollars in injury costs (CDC, 2000). Cost-of-illness studies generally measure both direct costs and indirect costs. Direct costs could be generally considered health care costs. These would also include goods such as medications, prostheses, and services such as health care provider consultations involved in treatment and rehabilitation.

³ For a more detailed description of the methodology and construction of the ERAT, see Appendix C.

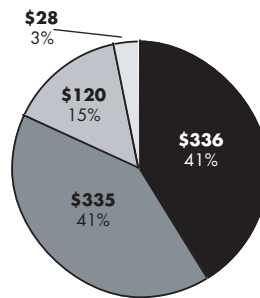
Indirect costs are societal productivity losses which accrue from the individual's inability to perform activities as a result of injury. Indirect costs are generally captured through measuring foregone/lost income. As well as these economic costs there are certain intangible costs associated with injuries such as pain and suffering, economic dependence and social isolation. While these costs are difficult to quantify in economic terms, they are costs nonetheless and should at least be identified. This study did not attempt to quantify these latter costs and, hence, the indirect costs cited should be considered conservative.

ESTIMATION OF NON-HOSPITALIZED INJURIES

The vast majority of injury data in Canada relate to inpatient hospital stays. Given that there was not a comprehensive data set available to provide national incidence estimates for non-hospitalized injury, it was necessary to search the literature for alternative data sources. As noted in Appendix C, the Miller et al. (1995) study is one such source which found, based on a ratio of non-hospitalized unintentional injury cases to hospitalized cases, the incidence for non-

FIGURE 1

Total Costs by Injury Type (Millions \$)
(total costs = \$819)

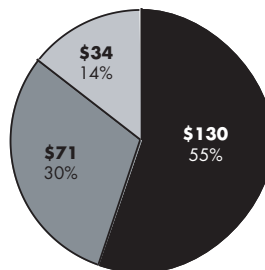


■ Other ■ Falls ■ Motor Vehicle ■ Poisoning

Note: "Other" includes drowning, suffocation, and fires

FIGURE 2

Indirect Disability Costs by Injury Type (Millions \$)
(total indirect disability costs = \$235)



■ Other ■ Falls ■ Motor Vehicle

FIGURE 3

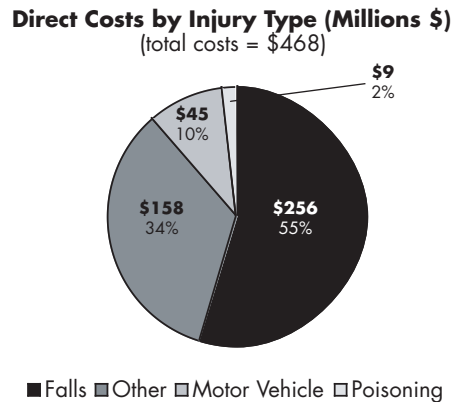
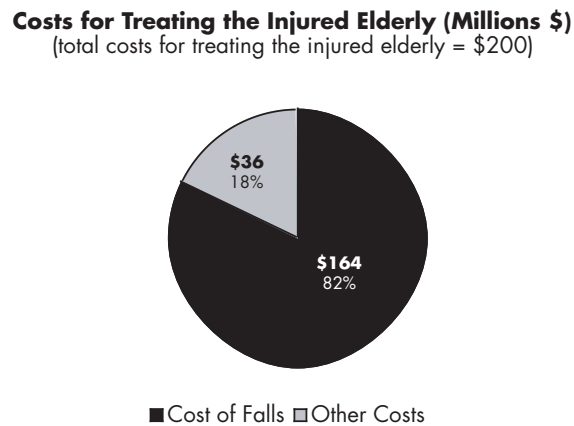


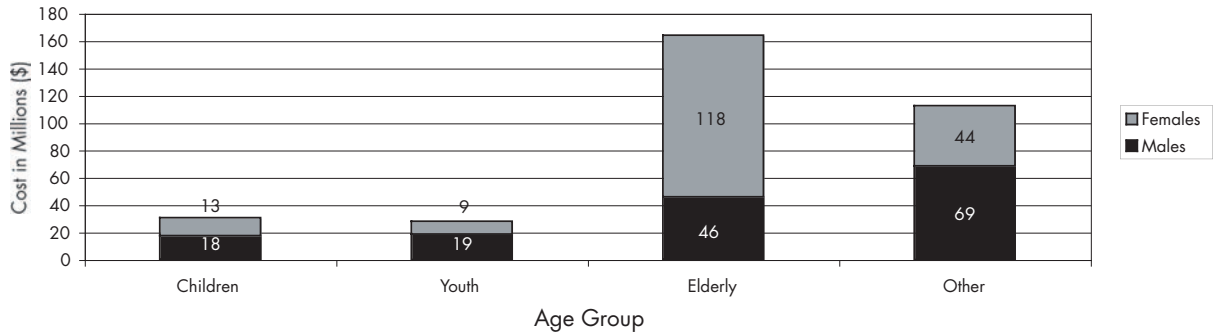
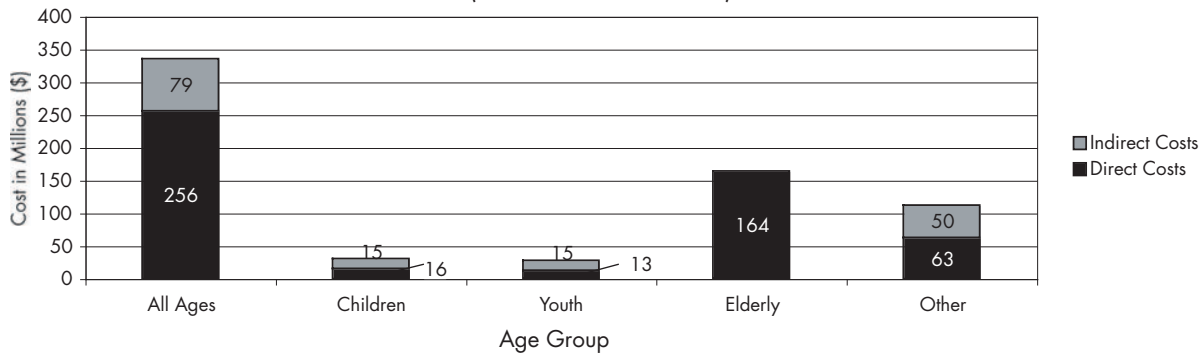
FIGURE 4



hospitalized unintentional injury for Canada in 1995-96 was calculated.

This significant data book also provided the data necessary to calculate the ratio of the costs of non-hospitalized unintentional injury to the costs of hospitalized unintentional injury. This ratio was used to estimate the direct costs of non-hospitalized unintentional injury in Canada. These variables were used to construct an Electronic Resource Allocation Tool (ERAT) for Manitoba which embodies a classification and costing framework designed

around existing provincial injury data and data available from the injury costing literature. In essence, the ERAT combines existing data with variables from the literature in order to model full episodic costs for various injuries ranging from falls to motor vehicle crashes to drownings. The ERAT is a flexible tool that can be updated as more/better data become available and according to changes in population, injury incidence and treatment patterns/costs.

FIGURE 5**Total Costs of Falls by Gender and Age Group (Millions \$)**
(total costs of falls = \$335)**FIGURE 6****Direct and Indirect Costs of Falls by Age Group (Millions \$)**
(total costs of falls = \$335)

RESULTS⁴

The results highlight a crucial issue. If these injuries are largely preventable, then how much more money and how many more lives could Manitoba save by enhancing existing strategic prevention programs? To demonstrate, the study offers examples of prevention strategies showing the extent to which Manitoba could save money and lives.

TOTAL COSTS

It is estimated that in 1999 - 2000 preventable injuries cost the people of

Manitoba \$819 million or approximately \$716 for every citizen. Falls accounted for \$335 million or 41 per cent of the total amount. Motor vehicle crashes cost \$120 million or roughly 15 per cent of the \$819 million. Poisonings cost about \$28 million or close to 3 per cent of the total amount. The remaining 41 per cent of total costs can be attributed to drownings, fires, and a range of other injuries not specified by hospital classification systems (see fig. 1). On average, each injury generates about \$5,179 in direct and indirect costs.

⁴ Tables detailing the results of the study are appended

DIRECT COSTS

The 158,207 injuries in 1999 - 2000 were estimated to account for \$468 million in direct health care costs (see fig. 2). The most costly injuries were falls, totalling almost \$256 million or 55 percent of total direct costs, and motor vehicle crashes at \$45 million or 10 percent of direct costs (see fig. 3). The people of Manitoba

spent \$9 million treating patients for poisoning (2% of total direct costs).

These three types of injury - falls, motor vehicle crashes and poisoning - accounted for about 67 per cent of direct costs. Caring for the injured elderly (>65 years) amounted to \$200 million or 43 percent of the \$468 million in direct costs. Roughly \$164 million (82 per cent)

FIGURE 7

Sources of Indirect Costs (Millions \$)
(total indirect costs = \$352)

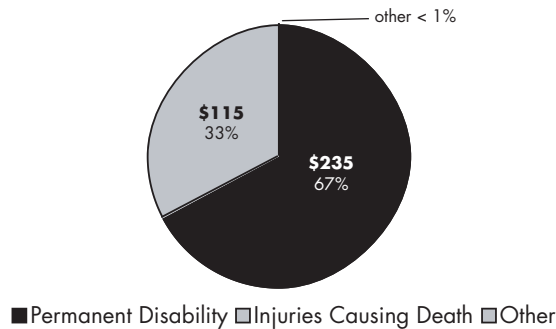
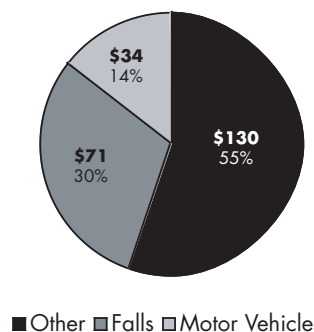


FIGURE 8

Indirect Disability Costs by Injury Type (Millions \$)
(total indirect disability costs = \$235)



of the direct cost of elder injuries is attributable to falls (see fig. 4) where approximately 72 percent of the costs (almost \$118 million) are generated by falls among elderly women (see fig. 5). Treating children and youth for falls cost almost \$29 million or 9 per cent of the total fall amount, with males representing 21 per cent more cases than females (See fig. 6 and 9).

Although only 6 percent of patients injured ended up in hospital, the cost of hospitalization generated 24 per cent or nearly \$86 million of the \$352 million spent on direct costs. However, 94 per cent of the injuries assessed were not hospitalized, accounting for 76 per cent or an estimated \$266 million of the total direct costs.

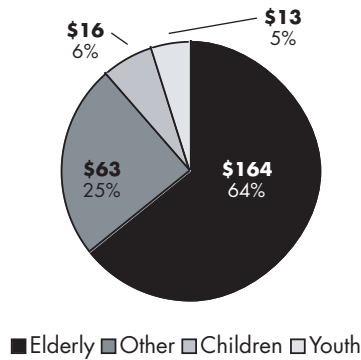
INDIRECT COSTS

The 3,958 injuries that led to permanent disability or death amounted to an estimated \$352 million in indirect costs (See fig. 2). Permanent disability caused the greatest losses in productivity, amounting to almost \$235 million or 67 per cent of indirect costs. Injuries causing death accounted for about \$115 million of the \$352 million total (See fig. 7).

The two most significant types of injury causing permanent disability were falls and motor vehicle crashes generating about \$105 million in indirect costs. Falls accounted for \$71 million (30 per cent). Motor vehicle crashes cost \$34 million (14 per cent) of the total disability-related indirect costs (See fig. 8).

FIGURE 9

Direct Costs of Falls by Age Group (Millions \$)
(direct costs of falls = \$256)



DISCUSSION

THE COST OF A SILENT EPIDEMIC

The staggering costs uncovered by this study demonstrate that Manitoba is suffering from an injury epidemic that is part of a pan-Canadian public health threat. The problem stems from a universal misunderstanding and misuse of the word 'accident.' Injuries sustained by falls or motor vehicle crashes are often not seen as the result of predictable events but rather to be the result of 'accidents' or 'acts of fate'. Yet when someone suffers from heart disease or cancer, high cholesterol and smoking are identified as possible predictable causes. The government of Manitoba has recognized that health policy must first acknowledge that injuries are predictable and preventable. Injuries are not accidents, and investing in injury prevention can save money and lives. The people of Manitoba do not need to spend over 800 million dollars each year on nearly 160,000 injuries that could have been largely prevented in the first place.

INJURY PREVENTION CUTS COSTS

There is a stark contrast between the cost of preventing injuries and the cost of treating injuries. Prevention costs less⁵:

- \$1 spent on smoke alarms saves \$69
- \$1 spent on bicycle helmets saves \$29
- \$1 spent on child safety seats saves \$32
- \$1 spent on road safety improvements saves \$3
- \$1 spent on prevention counseling by pediatricians saves \$10
- \$1 spent on poison control services saves \$7

The Manitoba government and the broader injury prevention community has invested in programs and strategies to tackle the injury problem. How much money could enhancement of current injury prevention programs save the people of Manitoba? The following scenarios illustrate how targeting the most costly causes of injury combined

with the most vulnerable population groups can generate real savings. Combined, these conservative injury reduction targets could produce about \$64 million in savings annually. More savings could be available through the development of an injury prevention and control strategy. For example, an across the board injury reduction target of 30% could produce over \$246 million in savings.

FALLS AMONG THE ELDERLY

This study has shown that \$164 million of the \$256 million in direct costs spent on falls was devoted to treating falls among the elderly (see fig. 9). It is estimated that about 40 per cent of falls leading to hospitalization are the result of hip fractures, and that the number of hip fractures in Canada will increase dramatically from 23,375 in 1993 to over 88,000 cases by the year 2041 as the Canadian population ages (Papadimitropoulos et al., 1997).

These are falls that can be prevented by recognizing risk factors such as a history of falls, impairment related to cognition, balance and gait, low body mass index, the misuse of medications and hazards in the home. By targeting these risk factors through prevention programs, setting a hospitalization reduction target of 20 per cent could lead to over 660 fewer hospital stays and 160 fewer elderly people of Manitoba permanently disabled. The overall savings could amount to almost \$22 million annually.

FALLS FOR THOSE 0 TO 9 YEARS OF AGE

Injuries from falls of those 0 to 9 years of age cost the people of Manitoba \$16 million every year. These are falls that can be prevented by redesigning the structure of playgrounds, targeting hazards in the home and by simply teaching children how to fall.

If these types of prevention strategies reduce the incidence of falls by 20 per cent for those aged 0-9, there would be 60 fewer hospitalized cases in Manitoba, over 520 fewer non-hospitalized injuries, and over 20 fewer injuries leading to permanent disability. The net savings could total over \$6 million every year.

⁵ Centers for Disease Control and Prevention (2000). Working to Prevent and Control Injury in the United States - Fact Book for the Year 2000. National Center for Injury Prevention and Control, Atlanta. (these are direct cost savings per injury)

PREVENTING MOTOR VEHICLE CRASHES

Wearing seat belts and installing air bags can reduce motor vehicle injuries by 61 per cent. Drinking and driving is responsible for about 40 per cent of all fatal motor vehicle crashes. It is estimated that mortality can be reduced by 20 per cent through a reduction in drunk driving. Reducing speed limits by 10 km an hour could lead to a 15 per cent decrease in mortality, with the number of deaths lowered and severity of injury reduced. In a scenario in which a comprehensive injury prevention strategy produced the above reductions together with a further 10 per cent reduction in crashes caused by poor road design and maintenance, and based on the assumption that 20 per cent of those injured end up in hospital, there would be about 42 fewer deaths each year.

PUTTING A PRICE TAG ON PREVENTION

Preventing injuries saves money and lives. The goal of reducing costs and human suffering can be reached by integrating existing government and community-based programs into a provincial injury prevention strategy. A recent study estimated that endocrine and related diseases (diabetes is a major disease within this broad category) costs the Canadian economy \$3.5 billion annually (Health Canada, 2002). In response, governments and non-governmental organizations devised and funded a five year, \$115 million Canadian Diabetes Strategy. This adds to the list of several national strategies for various health conditions. A key question emerges: are the economic costs of unintentional injury comparable to other priority areas?

Nationally, the annual societal costs for unintentional injury amount to almost \$9 billion. In comparison to other health conditions, unintentional injury would rank in the top five in terms of societal economic burden. In Britain, unintentional injury was established as one of the top five national health priorities. The issue is not investing in one health problem at the expense of another. Rather, the key issue is the funding and formulation of a strategy. We know that strategies are essential to the control of many health problems.

The findings of this study point to the pay-offs that Manitoba could reap through investing in a provincial injury prevention strategy. Importantly, a provincial strategy could be substantially enhanced through integration with a national strategy. At this point in time, Canada does not have a national strategy for injury prevention and control.

THE POLICY CONTEXT

Progress towards developing a national injury prevention strategy has been made in the past, but it has not moved forward. For example, strategists working in 1991 on a project entitled "A Safer Canada: Year 2000 Injury Control Objectives" developed a series of prevention objectives. They recommended that the Government of Canada recognize injuries as a major cause of death and disability that requires a national prevention strategy. They encouraged the development of national injury control objectives for the purpose of stimulating projects across the country. They also called for the establishment of a national injury surveillance system.

None of the recommendations has been fully realized. Manitoba can become a leader. The results of The Economic Burden of Unintentional Injury in Manitoba demonstrate that a provincial injury prevention strategy is not only essential, it is integral to the fight against this silent epidemic.

While it goes without saying that the primary goal is to reduce human pain and suffering, the societal implications also have to be made clear. Unintentional injury is the number one killer of young Canadians (Health Canada, 2000). As our population ages and as we move towards a new economy, Manitoba's and Canada's future is dependent on this shrinking body of human capital. We can ill afford the current losses in face of the demographic and economic changes that lie ahead.

RECOMMENDING A PROVINCIAL INJURY PREVENTION STRATEGY

Preventable injuries harm and end the lives of many people in Manitoba and exact a heavy toll on the province's limited health and financial resources. A provincial injury prevention strategy will allow for a more

coordinated approach, including the setting of provincial goals and targets, the development of strategies to achieve those targets, and the identification of agencies to implement those strategies.

This strategy must be guided by strong leadership and supported by varied collaborative efforts across injury prevention groups. Collaboration will guarantee the establishment of priorities and will ensure diverse and innovative approaches to prevention. The causes of injury are multi-factorial; the most effective approaches to both preventing an injury and minimizing its impact are efforts that involve various sectors and disciplines.

An injury prevention and control program needs to ensure the coordination, collaboration, and cooperation of government departments, partner organizations, and disciplines to decrease the number of injuries. These can include health systems, housing, education, the physical environment, and the work environment, psychosocial environments, recreation, manufacturing, transportation and justice.

As well, injury prevention programs must incorporate existing community networks, such as public health clinics, school health education programs, and social service agencies. An injury prevention program that encourages intersectoral action is an essential strategy for decreasing the injury problem in Manitoba.

The foundation for a strong and coordinated provincial injury prevention strategy could be built on the following elements:

1 LEADERSHIP AND COORDINATION

One of the problems in reducing the number of injuries in Manitoba to date has been a lack of a comprehensive injury infrastructure. While injury prevention has been designated a core health service for RHAs, until now there has been no comprehensive infrastructure to support such work.

A commitment to develop a provincial injury prevention strategy will allow for a more coordinated approach, including the setting of provincial goals and targets, the development of strategies to achieve those targets, and the

identification of agencies to implement those strategies.

Recommended planning elements for a provincial program structure include developing: articulated values and principles to guide the work of the program; an accountability framework; an advisory structure; linkages and structures that stimulate and support capacity development for research; a framework to develop provincial standards; and parameters to guide funding relationships.

2 COMPREHENSIVE PROGRAMMING

- Strategic planning, including establishing priority injury areas, populations, and targets.
- Identification, selection, and implementation of strategies for specific injury areas based on the best scientific evidence, and translation of known evidence into action.
- Capacity-building and program support for injury prevention practitioners and organizations.
- Community mobilization to extend and support existing injury prevention networks and coalitions, including private, not for profit and public partners.
- Engineering strategies designed to reduce the likelihood and severity of injury.
- Legislative and regulatory initiatives at all government levels.

3 PROVINCIAL INJURY SURVEILLANCE SYSTEM

Data is the lifeline of any injury prevention strategy. Surveillance is akin to “switching on the lights”. Manitoba currently has some of the components necessary to support the implementation of a comprehensive provincial injury surveillance system that would ideally be linked to a national system. In order to prevent an injury, members of a provincial strategic coalition must know who is getting injured. They also need to know how they are getting injured and what happens to them after they are hurt. They must know the age, sex, and the socio-economic status of the injured person. These variables will influence specific injury prevention strategies targeting high-risk population groups as well as the most common and costly causes of injury.

4 RESEARCH AND EVALUATION

Finally, this study points to the urgent need for further research into all aspects of preventing injuries including the epidemiology of preventable injury as well as ongoing evaluation of prevention initiatives. Cost-benefit projections for proposed cost-cutting prevention strategies need to be developed as well as cost-benefit evaluation for programs already in place. The provincial injury prevention strategy will provide leadership harnessed by strong collaboration, supported by excellent data and surveillance systems, and kept alive by sophisticated research and evaluation programs. By investing in an injury prevention strategy, Manitoba will no longer be able to call the injury epidemic 'silent'.

CONCLUSION

Every hour of every day, 18 people in Manitoba are unintentionally injured (over 400/day), roughly 1 person in Manitoba dies daily from these injuries and over 3,500 are disabled every year. Overall, almost 160,000 residents of Manitoba are injured each year.

The rationale is clear. This economic burden study presents an opportunity and a challenge to enhance existing injury prevention programs and policies to ultimately improve the quality of life of the people of Manitoba.

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APPENDIX B

DETAILED TABLES

TABLE 1

Deaths Resulting from Unintentional Injury
Distribution by Major Category
Manitoba, 1999-2000

Major Cause of Death	Number	% Distribution
Falls	145	33.1%
Motor Vehicle Crashes	109	24.9%
Poisoning	43	9.8%
Drowning and Suffocation	40	9.1%
Fires	25	5.7%
Air & Space	10	2.3%
Water Transport	3	0.7%
Railway	1	0.2%
Other	62	14.2%
Total	438	100.0%

TABLE 2

Unintentional Injuries Resulting in Hospitalization
Distribution by Major Category
Manitoba, 1999-2000

Major Cause	Number	% Distribution
Falls	5,271	55.6%
Motor Vehicle Crashes	1,050	11.1%
Poisoning	276	2.9%
Fires	134	1.4%
Pedal Cycle	106	1.1%
Drowning and Suffocation	20	0.2%
Water Transport	18	0.2%
Railway	8	0.1%
Air & Space	7	0.1%
Other	2,583	27.3%
Total	9,473	100.0%

TABLE 3

Unintentional Injuries Resulting in Non-Hospitalization
Distribution by Major Category
Manitoba, 1999-2000

Major Cause	Number	% Distribution
Falls	59,247	40.0%
Motor Vehicle Crashes	8,710	5.9%
Poisoning	3,095	2.1%
Fires	2,963	2.0%
Pedal Cycle	1,197	0.8%
Water Transport	280	0.2%
Railway	148	0.1%
Drowning and Suffocation	89	0.1%
Air & Space	87	0.1%
Other	72,480	48.9%
Total	148,296	100.0%

TABLE 4

**Unintentional Injuries Resulting in Disability
Distribution by Major Category**
Manitoba, 1999-2000

Major Cause	Partial Permanent Disability	Total Permanent Disability
Falls	1,922	137
Motor Vehicle Crashes	251	35
Fires	67	3
Poisoning	57	2
Pedal Cycle	36	3
Water Transport	6	1
Drowning and Suffocation	4	2
Railway	3	0
Air & Space	2	0
Other	925	64
Total	3,273	247

TABLE 5

**Direct Costs (\$Thousands) Resulting from Unintentional Injury
Distribution by Major Cause of Injury and Type of Expenditure**
Manitoba, 1999-2000

Expenditure Category	Motor Vehicle Crashes	Falls	Drowning and Suffocation	Poisoning	Fires	Other	Total
Hospitalized Cases							
<i>Hospital</i>	6,920.5	60,199.0	115.6	994.5	2,718.1	15,064.1	86,011.8
<i>Medical</i>	6,051.1	46,382.8	102.3	709.7	1,121.9	12,060.6	66,428.4
<i>Rehabilitation</i>	448.6	3,004.2	22.0	79.6	82.9	969.3	4,606.6
Sub-Total	13,420.3	109,586.0	239.9	1,783.7	3,922.9	28,094.0	157,046.8
Non-Hospitalized Cases							
<i>Medical</i>	3,699.3	53,952.5	215.1	2,320.2	2,757.9	35,972.1	98,917.2
<i>Rehabilitation</i>	244.4	3,575.6	23.0	44.7	444.0	3,051.9	7,383.7
Sub-Total	3,943.7	57,528.2	238.1	2,364.9	3,201.9	39,024.0	106,300.9
Permanent Disability	27,615.6	88,900.5	813.6	4,498.3	3,972.1	78,446.3	204,246.3
Total Direct	44,979.6	256,014.6	1,291.6	8,646.9	11,096.8	145,564.3	467,594.0

TABLE 6

**Indirect Costs (\$Thousands) Resulting from Unintentional Injury
Distribution by Major Cause of Injury and Type of Expenditure**
Manitoba, 1999-2000

Category of Productivity Loss	Motor Vehicle Crashes	Falls	Drowning and Suffocation	Poisoning	Fires	Other	Total
Morbidity Costs							
<i>Cases While Hospitalized</i>	396.6	876.1	0.4	38.6	105.0	607.3	2,024.1
<i>Partial Permanent Disability</i>	18,265.7	48,152.7	311.0	3,601.7	6,076.2	86,849.5	163,256.7
<i>Total Permanent Disability</i>	15,584.3	23,122.6	1,008.0	655.1	1,755.7	29,459.3	71,585.0
Sub-Total	34,246.6	72,151.4	1,319.4	4,295.4	7,936.9	116,916.1	236,865.9
Mortality Costs	40,862.0	7,247.8	18,549.3	15,428.2	12,833.7	20,048.1	114,969.0
Total Costs	75,108.5	79,399.2	19,868.7	19,723.6	20,770.6	136,964.2	351,834.9

TABLE 7

Total Economic Costs (\$Thousands) Resulting from Unintentional Injury
Distribution by Major Cause of Injury and Type of Expenditure
 Manitoba, 1999-2000

Cost Category	Motor Vehicle Crashes	Falls	Drowning and Suffocation	Poisoning	Fires	Other	Total
Direct Costs							
<i>Hospitalized Cases</i>	13,420.3	109,586.0	239.9	1,783.7	3,922.9	28,094.0	157,046.8
<i>Non-Hospitalized Cases</i>	3,943.7	57,528.2	238.1	2,364.9	3,201.9	39,024.0	106,300.9
<i>Disability</i>	27,615.6	88,900.5	813.6	4,498.3	3,972.1	78,446.3	204,246.3
Total Direct	44,979.6	256,014.6	1,291.6	8,646.9	11,096.8	145,564.3	467,594.0
Indirect Costs							
<i>Morbidity Costs</i>	34,246.6	72,151.4	1,319.4	4,295.4	7,936.9	116,916.1	236,865.9
<i>Mortality Costs</i>	40,862.0	7,247.8	18,549.3	15,428.2	12,833.7	20,048.1	114,969.0
Total Indirect	75,108.5	79,399.2	19,868.7	19,723.6	20,770.6	136,964.2	351,834.9
Total Costs	120,088.2	335,413.9	21,160.3	28,370.5	31,867.4	282,528.6	819,428.8

TABLE 8

Summary of Total Economic Costs Resulting from Unintentional Injury
Distribution by Major Cause of Injury
 Manitoba, 1999-2000

Cause of Injury	Total Cost	Direct Cost	Indirect Cost
Falls	335,413,862	256,014,647	79,399,214
Motor Vehicle	120,088,158	44,979,622	75,108,536
Fires	31,867,447	11,096,834	20,770,613
Poisoning	28,370,509	8,646,942	19,723,567
Drowning and Suffocatio	21,160,305	1,291,612	19,868,693
Pedal Cycle	9,014,344	4,631,428	4,382,916
Air and Space	5,006,113	757,112	4,249,001
Water Transport	3,280,134	736,524	2,543,609
Railway	1,678,968	805,742	873,227
Other	263,549,006	138,633,529	124,915,477
Total	819,428,846	467,593,993	351,834,853

TABLE 9

Percent Distribution of Total Costs
Distribution by Major Cause of Injury
 Manitoba, 1999-2000

Cause of Injury	Total Cost	% of Total
Falls	335,413,862	40.9%
Motor Vehicle	120,088,158	14.7%
Fires	31,867,447	3.9%
Poisoning	28,370,509	3.5%
Drowning and Suffocatio	21,160,305	2.6%
Pedal Cycle	9,014,344	1.1%
Air and Space	5,006,113	0.6%
Water Transport	3,280,134	0.4%
Railway	1,678,968	0.2%
Other	263,549,006	32.2%
Total	819,428,846	100.0%

TABLE 10

Scenario: Population Effects on Economic Costs of Unintentional Injury
Manitoba

Year	Population	Total Cost \$ Millions	Direct Cost \$ Millions	Indirect Cost \$ Millions
1999/2000	1,144,424	\$819.4	\$467.6	\$351.8
2010	1,251,152	\$920.7	\$553.2	\$367.5
% Increase	9.3%	12.4%	18.3%	4.4%

SENSITIVITY TABLES

Change of Discount Rate

Discount Rate	Total Cost \$ Millions	Direct Cost \$ Millions	Indirect Cost \$ Millions
3% (Base Case)	\$819.4	\$467.6	\$351.8
5%	\$667.8	\$408.0	\$259.8
% Change	-18.5%	-12.7%	-26.2%

Change of Unemployment Rate

Unemployment Rate	Total Cost \$ Millions	Direct Cost \$ Millions	Indirect Cost \$ Millions
5.67% (Base Case)	\$819.4	\$467.6	\$351.8
4.67%	\$823.2	\$467.6	\$355.6
% Increase	0.5%	N/A	1.1%

APPENDIX C

THE ELECTRONIC RESOURCE ALLOCATION TOOL

The ERAT (Electronic Resource Allocation Tool) consists of a series of spreadsheets designed to calculate the incidence costs of unintentional injury. The tool was created to fulfill two major objectives:

- to supply modeling and estimation techniques required to fill critical gaps in the available data in Canada
- to serve as a resource tool that can be used by researchers and public health officials at provincial and local levels to support resource allocation, policy development and decision-making.

MODELING AND ESTIMATION TECHNIQUES

While evaluating The Economic Burden of Unintentional Injury in Canada, the study researchers discovered significant gaps in data currently available. They found that detailed data are only available for deaths and injuries that result in a hospitalized inpatient stay. Injuries that are not treated in a hospital or are only treated in the emergency/outpatient department are not captured or reported through a central body. Furthermore, there is a large data gap for hospitalized injuries that require on-going care outside a hospital setting for either a short period or for a longer term of permanent disability.

Overall, the data gaps point towards two key analytical challenges:

- estimating the type, number and cost of nonhospitalized injuries
- building the full episode of care for hospitalized injuries resulting in short-term and long-term disabilities.

The analytic strategy used to address these methodological problems involved an extensive search through scientific literature to find numbers and ratios that could be used to fill the data gaps. For example, in an American study the researchers found a ratio of hospitalized to non-hospitalized injury. Since Canada has very good information on hospitalized injury available from the

Canadian Institute of Health Information, the study researchers were able to apply this ratio to produce an estimate of the number and type of non-hospitalized injuries.

THE ERAT: A RESOURCE TOOL

Meeting the second objective was entirely dependent on completing the first objective since the latter was essentially a test of the analytic tool at the national level. In order to enable the application of the tool at other levels, it was necessary to allow for the customization of some parameters in the analytical framework or spreadsheet to reflect local conditions (e.g., population size and mix, injury incidence, etc.) Once adjusted, the tool calculates total costs as well as costs for each injury type. The resource tool has been designed to allow for constant updating of current injury and cost information.

APPENDIX D METHODOLOGY AND DATA APPENDIX

This study was conducted using an incidence costing approach. That is, the incident population of Manitoba residents injured in 1999/2000 was costed over the lifetime of injured individuals. The costs, both direct and indirect, were discounted to a present value in 1997 at 3% per annum. Indirect costs included only foregone earnings calculated as average earnings, adjusted by the participation rate and unemployment rate, over the relevant period within the working-life of an individual from age 18 to 64 inclusive. Data from the Statistics Canada CANSIM database on participation rates, unemployment rates and average earnings was used in these calculations. A real wage growth rate of 1% per year was assumed. Details on the incidence costing methodology are given in *The Economic Burden of Unintentional Injury in Canada*, pp. 15-20.

MORTALITY

Manitoba Health provided mortality data from Vital Statistics. The data file included the number of cases and average age grouped by external causes of death (ICD-9 E-codes), age and gender categories. Population denominators, for the covered population, by age and gender were also provided. Mortality costs were restricted to indirect costs related to earnings lost due to death, over what would have been the remaining working-life of individuals had they lived.

HOSPITALIZED INJURIES

Manitoba Health provided acute hospital separation data for all injury hospitalizations of provincial residents. The data included number of cases, average age, average provincial RGN cost, average length of stay, grouped by external causes of injury (ICD-9 E-codes), age and gender categories. Manitoba Health provided population denominators, for the covered population, by age and gender.

Hospital costs were estimated using the average inpatient cost per weighted case, and the inpatient average RGN cost. Medical and rehabilitation costs were calculated using hospital costs in conjunction with the distribution of ICD-9 N-codes by ICD-9 E-codes derived from CIHI hospital data, and

Table 5.6 of the *Databook on Nonfatal Injury*. Indirect costs were limited to lost earnings during hospitalization.

NON-HOSPITALIZED INJURIES

Non-hospitalized injuries were estimated using local hospitalized injuries in conjunction with the distribution of ICD-9 N-codes by ICD-9 E-codes derived from CIHI hospital data, and Table 4.3 of the *Databook on Nonfatal Injury*.

Medical and rehabilitation costs were calculated using the provincial hospital costs in conjunction with the distribution of ICD-9 N-codes by ICD-9 E-codes derived from CIHI hospital data, and Tables 5.6 and 5.9 of the *Databook on Nonfatal Injury*.

DISABILITY

Partial permanent and total permanent disability from injury was estimated using both hospitalized and non-hospitalized injury in conjunction with the distribution of ICD-9 N-codes by ICD-9 E-codes derived from CIHI hospital data, and Tables 4.12 and 4.15 of the *Databook on Nonfatal Injury*.

Long-term medical costs were calculated using hospital costs in conjunction with Tables 3.1 and 3.2 of the *Databook on Nonfatal Injury*, while the indirect cost associated with income loss was assumed to be 100% for total permanent disability, and 17% for partial permanent disability.

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