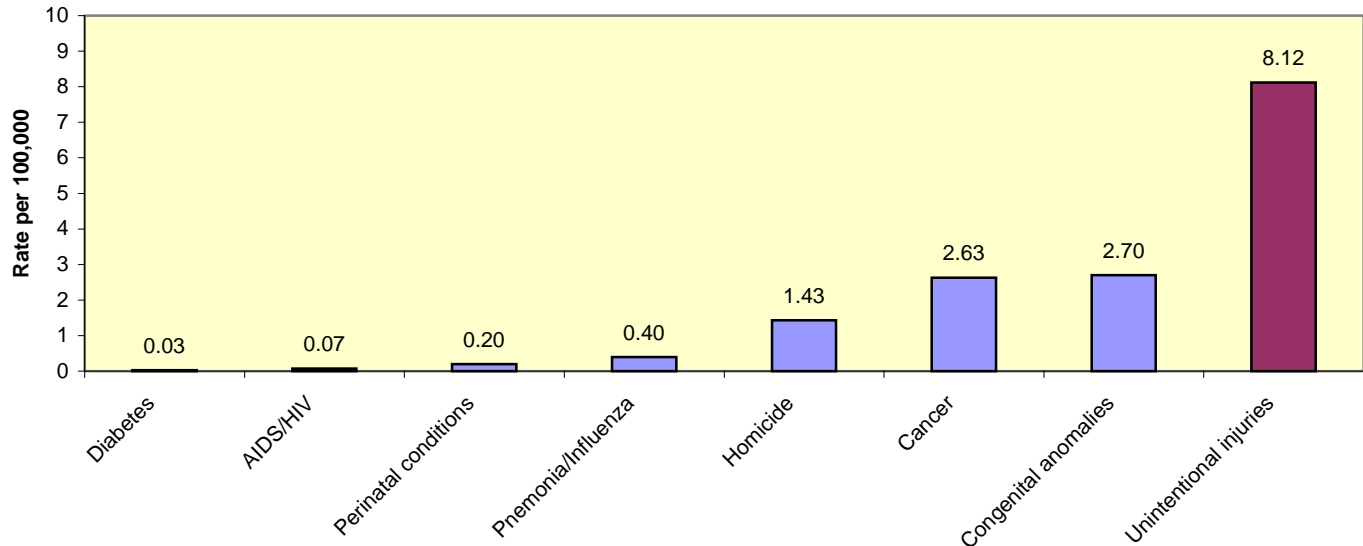


CHILDHOOD INJURY IN MINNESOTA

Figure 1. Causes of Death, 1-9 Year Old Minnesotans, 1995-99



Source: Minnesota Department of Health Center for Health Statistics

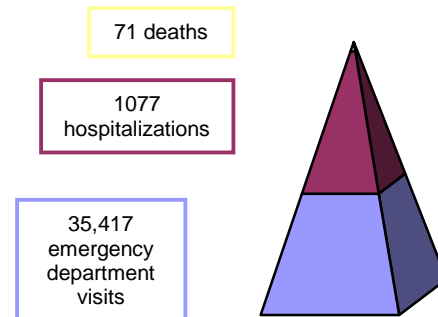
Overview

Unintentional injury is the leading cause of death for children ages 1-9 years in Minnesota, accounting for over 35% of all deaths in this age group from 1995-1999 (Figure 1) (1). While the number of deaths is striking, it only begins to describe the burden of injury on population health. Vital statistics capture only the “tip of the iceberg,” or the most extreme cases, of unintentional injury. A multitude of less severe injury problems occurs each year. In 1999, unintentional injuries to 0-9 year old children in Minnesota resulted in 71 deaths, 1077 hospitalizations, and 35,417 emergency room visits (Figure 2) (1,2). These numbers do not include the numerous injuries that were treated through first aid in a clinic, school nurse’s office, or at home. Also overlooked are those injuries that were not treated at all.

In the 1998 Minnesota Student Survey, 34% of 6th grade females and 39% of 6th grade males reported receiving some type of medical care from a medically trained professional for an injury in the 12 months prior to the survey (3). Again, these results likely underestimate the actual injury burden in the state.

The financial cost of unintentional injuries is another way of demonstrating their significance. Researchers have estimated that in 1996, \$39 billion was spent nationwide on medical costs, other resource costs, and productivity costs of unintentional injuries to 0-9 year old children (4). Based on Minnesota’s share of the 0-9 year old population in 1996, the Minnesota cost of these injuries can be synthetically estimated at \$703 million.

Figure 2. Reported Unintentional Injuries to 0-9 Year Old Minnesotans, 1999

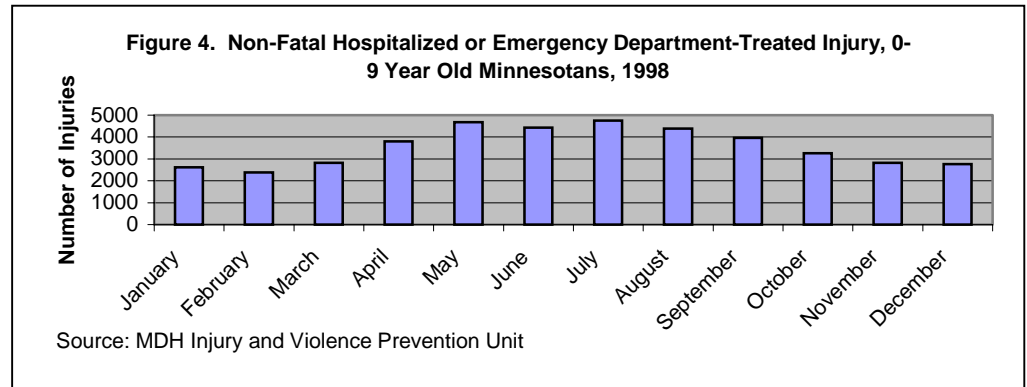
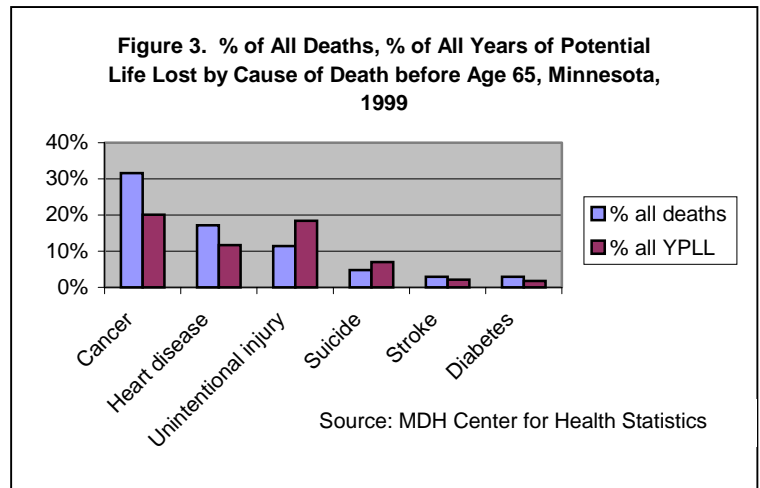


Source: MDH Center for Health Statistics & Injury and Violence Prevention Unit

The burden of unintentional injury is disproportionately carried by children. This can be demonstrated by Years of Potential Life Lost (YPLL), a measure of premature mortality. In 1999, unintentional injury accounted for 11.4% of all deaths in Minnesota before age 65 and 18.4% of all YPLL before age 65 (Figure 3).

Unintentional injuries to children are reported at high levels throughout the year. However, as shown in Figure 4, more non-fatal injuries were reported during the warmer months of 1998 (2). A more detailed analysis might show that different types of injuries occur at different times of the year.

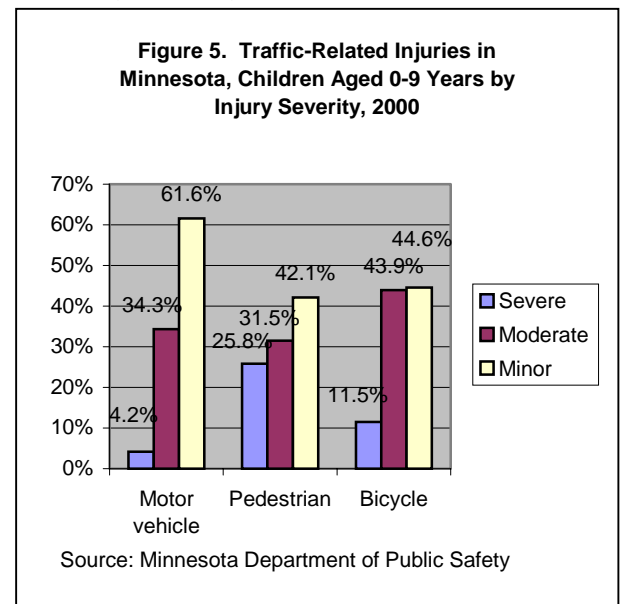
The remainder of this issue of the Population Health Assessment Quarterly will present specific data by mechanisms of injury, including transportation-related injuries, drowning, poisoning, suffocation, falls, impacts, fires, and hot objects or substances. To close, it will discuss injury prevention theory and resources.



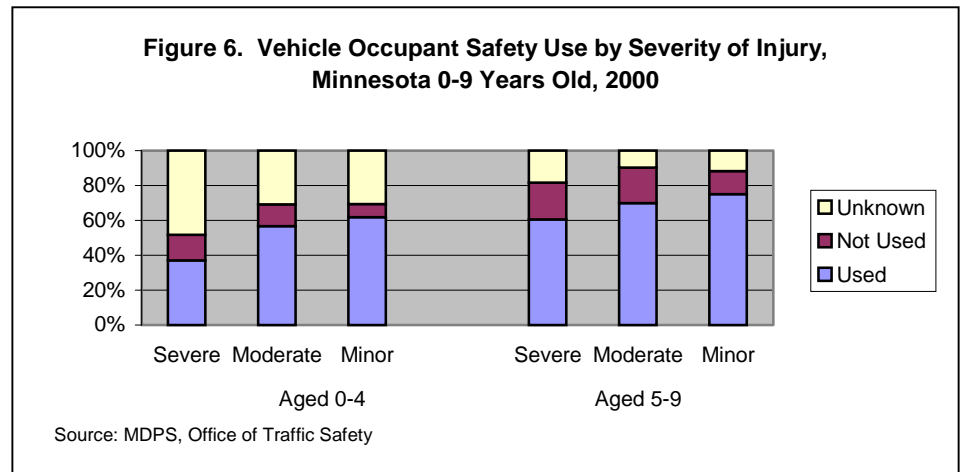
Transportation-Related Injuries

Transportation-related injuries are the leading cause of injury and death for children nine years old and younger in Minnesota (1). During the time frame 1995-1999, 93 children aged nine or younger died from injuries sustained in motor vehicle crashes. These children were most likely to be occupants of a vehicle (45 deaths), however, the second highest number of deaths were to child pedestrians involved in traffic-related incidents (30 deaths). In addition, sixteen Minnesota children died in pedestrian and bicycle-related incidents that did not involve a motor vehicle (1). In 2000, the vast majority of children with traffic-related injuries were either moderately or mildly injured (Figure 5). However, 25.8% of children pedestrians, 4.2% of children occupants in motor vehicles, and 11.5% of children on bicycles were severely injured (5).

National research into the effectiveness of child safety seats indicates they reduce fatal injury by 71% for infants and by 54% for toddlers (6). Minnesota law requires children under age four to be properly restrained in a federally approved child car seat and all children aged 4-10 years to wear safety belts, regardless of seating position. However, data indicate that of child occupants injured or killed in 2000, only 59.1% of those aged 0-4 years and 72.7% of those aged 5-9 years were known to have used safety equipment (Figure 6). Also, as shown in Figure 6, fewer children who were severely injured were known to have used safety equipment. It was not always possible to determine safety equipment use, so results should be interpreted with caution (5).



The National Highway Traffic Safety Administration (NHTSA) reported that 84% of young pedestrian fatalities in 1999 occurred at non-intersection locations (6). Data on bicycle-related crashes involving collision with a motor vehicle indicate that the leading action by the bicyclist prior to the crash was attempting to cross the road (5). The top contributing factors attributed to motor vehicle drivers prior to a bicycle-related crash in 2000 were that 32.9% failed to yield to right of way, 31.8% were inattentive or distracted and 11.2% had obscured vision (5).



Drowning/Submersion

Drowning is the second leading cause of unintentional injury death for children in Minnesota and the United States. From 1995 to 1999, 47 children 0 to 9 years died from drowning in Minnesota. 95.7% of these children were over 1 year old (1). Nationally, between 60 and 90% of drownings to 0 to 4 year olds occurred in residential swimming pools (7). In Minnesota, 87% of drownings to children 0 to 9 years in 1995 to 1999 were recreational (occurring in swimming pools or other bodies of water) while 13% occurred in bathtubs (1).

In Minnesota in 1999, there were 36 non-fatal injuries treated in emergency departments, 23 non-fatal hospitalizations and 16 deaths attributed to submersion/drowning to children ages 0 to 9 (1,2). Submersion injuries are more often severe than other unintentional injuries, as demonstrated by the ratio of deaths to hospitalizations and emergency department visits. In 1999, for every 1 drowning death there were only 2.3 emergency department visits and 1.4 hospitalizations (Figure 7).

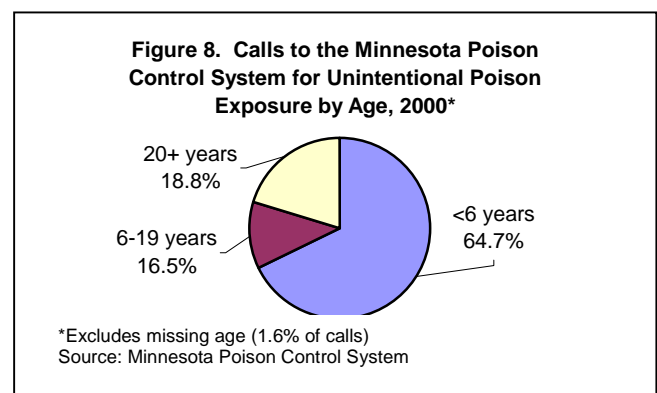
Figure 7. Ratio of Non-Fatal Emergency Department (ED) Injuries to Deaths and Non-Fatal Hospitalizations to Deaths for Children 0-9 Years Old for Selected Causes, Minnesota, 1999

Cause	Ratio	
	ED/Death	Hospitalization/Death
Drowning/submersion	2.3	1.4
Suffocation	7.0	1.6
Fire/Burn	13.1	0.6
Motor vehicle	43.4	3.3
Pedestrian	49.0	13.0
Bicycle	440.3	12.3
Falls	12385.0	353.0
Total	498.8	15.2

Sources: MDH Center for Health Statistics and Injury and Violence Prevention Unit

Poisoning

Poisoning deaths to children in Minnesota are infrequent. In Minnesota, between 1995 and 1999 there were 5 deaths to children under 10 attributed to unintentional poisoning (1). Emergency department visits and hospitalizations are also fairly infrequent compared to other unintentional non-fatal injuries. In 1999, unintentional poisonings accounted for about 2% (621) of non-fatal emergency department visits and 8% (90) of non-fatal hospitalizations of children ages 0 to 9 years (2). The Minnesota Poison Control System (MPCS) reported a total of 36,356 calls for unintentional poison exposure to victims with an identified age in 2000 (8). 64.7% were concerning children 5 years old and under (Figure 8). In 2000, the most common site of exposure was the child's own residence. About 97% of the poisonings reported to MPCS occurred at the child's or another residence. The two most common routes of exposure were ingestion and dermal. About 93% of poisonings reported to MPCS occurred because the child either ingested the poison or because the poison made contact with the skin.



Suffocation

Airway obstruction injuries occur more often among very young children. Of the 99 suffocation deaths to children under 10 that took place from 1990-98 in Minnesota, 76% were to children aged 1 or younger (1). In 1999, 112 children under 10 were treated in the ED and 25 were hospitalized for non-fatal airway obstruction injuries (2).

Most suffocation or choking injuries occur due to inhalation of foods or objects or linens and covers in beds or cribs. Suffocation related to bedding is now thought to be the cause of a number of deaths previously categorized as Sudden Infant Death Syndrome (SIDS).

Falls

In the last decade in Minnesota, 17 children under age 10 died as a result of fall injuries (1). Fourteen of these deaths were to children under age 5. The most common site of these deaths was stairs or steps. Non-fatal fall injuries occur much more often. In 1999 alone, there were 353 hospitalizations and 12,385 ED treatments for fall injuries to 0-9 year old Minnesotans, the most events in both categories (2).

Because non-fatal fall injuries are fairly common, their total financial impact exceeds that of more expensive but less common injuries. In 1999, total hospital and ED charges in Minnesota for unintentional fall injuries were \$172,298,435, the greatest total charges of any non-fatal unintentional injury (2).

Impacts

Impact injuries occur when a child is struck by or against an object, is caught in an object, is trapped between objects, or collides with another person. Such injuries might happen during sports or on the playground. Impact injuries involving motor vehicles are not included in this section.

Fatalities from non-motor vehicle-related impact injuries are fairly rare. However, non-fatal impact injuries are among the leading causes of hospitalization and ED treatment. In 1999, the combined mechanisms of “caught in/between object/s” and “struck by/against” were the third leading cause of hospitalization and the fourth leading cause of ED treatment for children aged 0-9 years. Those categories accounted for 107 hospitalizations and 9571 ED treatments (2).

Fires, Burns and Hot Objects or Substances

Between 1995 to 1999, 31 Minnesota children under the age of 10 died due to a fire or burn (1). In 1999, 92 children were treated in the ED for fire/burn-related injuries and 4 were hospitalized (2). According to the national report, Children and Fire in the United States: 1994-97, children playing with fires account for a large proportion of reported child fire injuries and deaths (9). In Minnesota, 357 fires were started by children in 1999 (Figure 9) and accounted for 2 deaths (10).

Hot object or substance injuries include burns or scalds from hot water or electric heating appliances. From 1995 to 1999 there

were no deaths to children 0 to 9 years due to hot objects or substances (1). However, 790 children under 10 were treated in the emergency department and 59 were hospitalized because of injuries from hot objects or substances in 1999 (2).

Figure 9. Fires Involving Children Playing with Fire, 1999*

Fires	357
Deaths	2
Civilians Injured	23
Firefighters Injured	4
Dollar Loss	\$2.6 Million

*Due to a new reporting system, one major metropolitan city was unable to report their 4th quarter incidents for 1999

Source: Minnesota State Fire Marshall

Playground Injury Hazards

In the United States, 177,031 children aged 0-9 years visited hospital emergency departments for treatment of injuries sustained on a playground in 1999. Falls are the most common type of playground-related injuries accounting for 79% of all ED-treated public playground injuries. Most of these falls (68%) were to the surface below the equipment, while 10% were onto other parts of the same equipment. Fall injuries to school-aged children (5-9 years old) most frequently occurred on climbers and swings (11).

Based on results from a study conducted from Spring 1998-Spring 2000, National Program for Playground Safety (NPPS) gave Minnesota playgrounds a grade of C. Researchers found that all playgrounds surveyed in Minnesota (a non-scientific sample) had appropriate types of surfacing below equipment. However, only 56% had sufficient depth of loose fill surfacing (sand, pea gravel, or wood chips) below equipment (12). An appropriate depth of surfacing can reduce harm from a fall. As a general guideline, the Consumer Product Safety Commission (CPSC) recommends at least 12 inches of loose fill surfacing that extends at least 6 feet around equipment up to 8 feet high (13).

The NPPS also docked Minnesota playgrounds for the lack of separate play areas for 2-4 and 5-12 year olds, the lack of signage indicating the age group for which the equipment is appropriate, the lack of rules posted, and the presence of less visible crawl spaces (12).

Similar problems were observed in a survey of elementary school playgrounds at one metro school district conducted by a University of Minnesota student researcher. The most common hazard in this study was inadequate depth of loose fill surfacing under the equipment, occurring in 92.9% of the situations assessed. Other common hazards were sliding poles that were too far away from the equipment platforms and S-hooks (used to attach chains or cables to support structures) that were bent open (14).



Prevention

Just as the injury burden on public health is high, the benefits of injury prevention are also great (Figure 10) (15). For reasons of cost-effectiveness and ethics, unintentional injuries should be prevented. Haddon's matrix provides a framework of strategies for injury prevention and control (16). An example of a Haddon matrix on motor vehicle/bicycle crashes is shown in Figure 11.

Prevention mechanism (expense)	Injury-related costs saved
1 car seat (\$40-200)	\$1360
1 bike helmet (\$30)	\$395
1 smoke detector (\$10-30)	\$900
Poison control center	\$6.50/\$1 of funding

Source: U.S. Department of Health and Human Services

Phase	Modifiable factors			
	Host (child on bike)	Agent (motor vehicle)	Physical environment (structures)	Social environment (policies and procedures)
Pre-event (before collision occurs)	Mount brightly colored flags on bikes for increased visibility	Improve passenger vehicle headlights	Have bike paths separate from motor vehicle traffic and parked vehicles	Eliminate right turns on red
Event (collision)	Have children wear helmets	Reduce size of motor vehicles	Make roads and shoulders softer	Prohibit "brush bars" on vehicles in metro areas
Post-event (after collision occurs)	Teach children first aid	Equip vehicles with first aid kits	Install public call boxes to EMS on bike routes	Ensure access to physical rehabilitation services

“Widespread human damage is too often taken for granted, in the erroneous belief that injuries [are] ‘accidents.’ In fact, many injuries are not ‘accidents,’ or random, uncontrollable acts of fate; rather, most injuries are predictable and preventable.”
-Healthy People 2010

While adult supervision is crucial to children's health and safety, interventions that change the situations in which injuries occur are also important in preventing unintentional childhood injuries. Changes in physical environment, consumer products, laws and social environment can affect kids regardless of their level of knowledge, behaviors or attitudes, regardless of whether or not they are "accident-prone."

Passive interventions are independent of individual behavior and do not require the active participation of the child to be effective (Fig. 12).

Injury	Active intervention	Passive intervention
Poisoning	Recognizing medicine v. candy	Fewer pills than overdose per bottle
Burn	Escaping fire via planned route	Fire resistant pajamas
Suffocation	Not putting toys in mouth	Bigger toys/toy parts
Scald	Testing bath temperature	Lower water heater temperature

Conclusions

While unintentional injury is a substantial problem for Minnesota children, reduction of injury and its effects is possible. Future progress will depend on improved surveillance of non-fatal injuries, refined measures of risk exposure, and widespread implementation of effective interventions.

More information on childhood injury is available from organizations at the web addresses listed below.

Web resources

MDH Injury and Violence Prevention Unit
 MN Safety Council – Safe Kids Coalition
 U.S. Consumer Product Safety Commission
 American Academy of Pediatrics
 SafeUSA™
 National Highway Traffic Safety Administration
 U.S. Coast Guard
 Minnesota Poison Control System
 Minnesota State Fire Marshal
 National Program for Playground Safety

<http://www.health.state.mn.us/divs/fh/chp/injury.htm>
<http://www.mnsafetycouncil.org/kids/skcoal.htm>
<http://www.cpsc.gov>
<http://www.aap.org/family>
<http://www.cdc.gov/safeusa>
<http://www.nhtsa.gov/people/injury>
<http://www.uscg.mil>
<http://www.mnpoison.org>
<http://www.dps.state.mn.us/fmarshal/fmarshal.html>
<http://www.uni.edu/playground>



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Saint Paul, Minnesota 55164-0975
www.health.state.mn.us/divs/chs/data/popassess.htm

Please email michele.seeley@health.state.mn.us, or call 651/296-8422 to receive this newsletter regularly via email or for more information.

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