Special Research Report 1998
Cree Public Health Module &
Injury Prevention Module

Injuries from falls among the Cree of Eastern James Bay, Canada

Circumstances and Prevention

RÉGIE RÉGIONALE
DE LA SANTÉ ET DES
SERVICES SOCIAUX
DE MONTRÉAL-CENTRE

Direction de la santé publique

Conseil Cri de la santé et des services sociaux de la Baie James
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Cree Board of Health and Social Services of James Bay

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Circumstances and prevention

Produced by the Injury Prevention Module of the Écologie humaine et sociale unit (Maisonneuve Rosemont Hospital) and the Public Health Module, Cree region of James Bay (Montreal General Hospital), in collaboration with the Cree Board of Health and Social Services of James Bay.

Dépôt légal – 4° trimestre 1998
Bibliothèque nationale du Québec
Bibliothèque national du Canada

ISBN 2-921740-93-5

Credits

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Revision: Dr Elizabeth Robinson and Mr Robert Imrie of the Public Health Module, Cree Region.

Funding: Cree Board of Health and Social Services of James Bay, ministère de la Santé et des Services sociaux du Québec. Funding for Mme Gros-Louis was supplied in part by the Program for Careers in Health for Indians and Inuits, Health and Welfare, Canada.

Special thanks: Dr Elizabeth Robinson, Director of the Public Health Module, Cree Region; Mr James Bobbish, Director, Mr Steven Bearskin, former Director, and Mr Richard St-Jean, Director of Research, all of the Cree Board of Health and Social Services. Thanks to Dr Joyce Pickering for preparing a summary of the report.

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INTRODUCTION

Falls rank with motor vehicle injuries as leading causes of hospitalization for injury among the Cree; however, unlike the situation in the rest of Canada falls are relatively unimportant as a cause of death. Although not assessed by this study, it was found in another study that among the Cree falls ranked in the top four leading causes of less serious injuries resulting in a temporary restriction of activity (Robitaille and Barss, 1994).

While falls occur at all ages, the risk factors for falls are different for small children, young adults, and the elderly. Small children and the elderly are the most frequent victims in or around the home, while older children and young adults are more often injured during sports or while impaired by alcohol. There are specific personal and environmental hazards that are most susceptible to modification by intervention for different high-risk groups, activities, and locations, and these are discussed below in the section on hospitalizations.

METHODS

Information on deaths of Cree residents of Cree communities of Eastern James Bay was obtained from coroners' reports, vital statistics, lists of beneficiaries of the James Bay agreement, and special mortality interviews with families of persons who died by injury (Damestoy, 1994). Data are reported by calendar years.

Preliminary information on hospitalizations for residents of these villages was obtained by analysis of the Quebec hospitalization data files. Data are by fiscal years, i.e., April 1 to March 31. Hospital records were later reviewed to confirm the diagnosis and to obtain circumstances for the 94% of hospitalizations that occurred in the 4 local hospitals and in 2 main McGill University referral hospitals in Montréal used by the Cree Health Board. For falls, a specific questionnaire was used to obtain details on environmental and equipment factors. Details for the 6% of cases that were hospitalized in a variety of other hospitals are not available. Inuit victims, mainly from Great Whale, were identified by their language specified in the chart and/or by family name, and were excluded from analysis.

183 cases of hospitalizations in the six study hospitals where medical records were reviewed are analyzed in this chapter. There were an additional 12 cases that occurred outside the 6 study hospitals and that are described only briefly by age and sex since no details are available nor were the diagnoses confirmed. Among the 183 cases, there were actually 181 patients, because two had been counted twice as a result of interhospital transfers (See Annex II for details).

After a careful review of each questionnaire by a medically qualified injury epidemiologist, cases were coded using the World Health Organization's International Classification of Diseases, 9th revision. These codes were verified against the original codings as done by hospital coding staff. The major differences in agreement are discussed in Annex II.

Intentional versus unintentional injuries Intentional injuries involve incidents where a person committed an act with the intention of harming themself or another person. Thus suicides and assaults are considered intentional injuries, while most injuries from falls, road crashes, and other so-called "accidents" are unintentional injuries.

DEATHS FROM FALLS

There was 1 death from a fall during the 10 year study period 1982-1991. This gives a death rate of approximately 1 fall per 100,000 population per year among the Cree. Falls ranked seventh as a cause of unintentional injury death (i.e. excluding suicide and homicide).

Comparison vith other populations

- Canada Falls ranked second after traffic injuries as a cause of unintentional injury death among Canadian males during 1991, and ranked first among females (data from Statistics Canada, 1991). The death rate from falls per 100,000 population per year was 7.0 for males and 8.0 for females.

- Québec The death rate from falls was about 6 deaths per 100,000 population per year during 1988-90. Since the highest risk group for death from falls is persons 75 and older, the Quebec rate is higher than the Cree rate at least in part because the Cree population is on average much younger than the population of Québec.

- Inuit of Nunavik As for the Cree, falls were an uncommon cause of death among the Québec Inuit, and were not listed among the 8 leading causes of injury death for 1989-93 (Snarch, 1995).

HOSPITALIZATIONS FOR FALLS

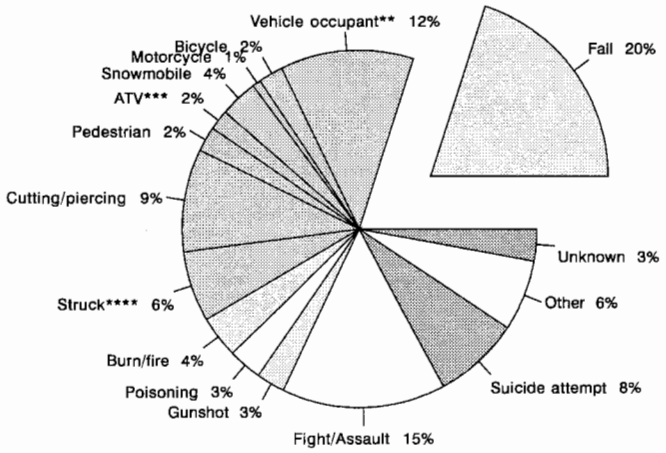
The information included in the graphics for this section is based upon 183 patients hospitalized in the six study hospitals during the 10-year period 1982 to 1992. Another 12 patients were hospitalized in various other hospitals and are included only in the graphic on numbers and rates by age and sex (Figure 4).

RELATIVE IMPORTANCE OF FALLS AS A SOURCE OF INJURY

Fall accounted for 20% of hospitalizations for all unintentional andintentional injuries among the Cree of eastern James Bay (Figure 1). Falls and various types of motor vehicle and pedestrian injuries were the two leading sources of hospitalisations for injury. Falls accounted for 26% of all unintentional injuries.

Figure 1

Hospitalizations due to an injury by type of injury, Cree of Eastern James Bay, Canada 1982-92 (n=910*)



*There were another 288 injury cases outside the 6 survey hospitals; approximately 80% were Cree and 20% were Inuits or Caucasians; **Includes on-road vehicle such as car, truck & van;*** All-terrain vehicle includes 3 and 4 wheelers; ****Struck by/against falling object, stationary object or person
Source: Cree Injury Study, 1996

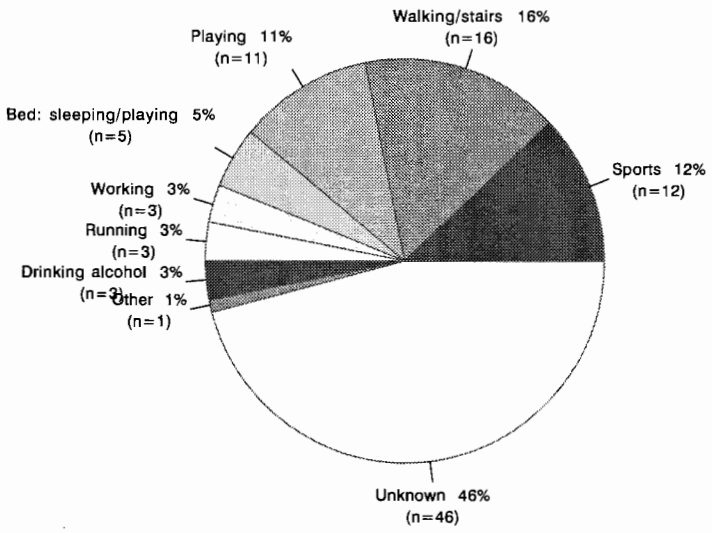
ACTIVITY AT TIME OF THE FALL

Sports accounted for at least 12% (22/183) of falls, walking, including using stairs, 16%, playing for 11%, sleeping/playing in bed 5%, working 3%, running for 3%, drinking alcohol, 3%, other 1%, and unknown activity 46% (Figure 2).

Among males, most sports injuries resulted from ice hockey, while among females, other activities were involved (Figure 3).

Figure 2

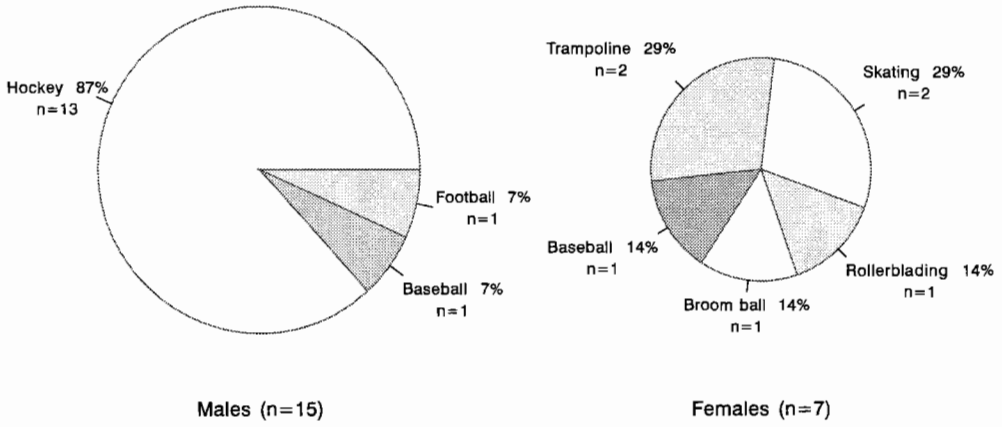
Hospitalizations for falls by activity at the time of the incident Cree of Eastern James Bay, Canada 1982-92 (n=183)



Source: Cree Injury Study, 1996

Figure 3

Hospitalizations for falls during sport by sex
Cree of Eastern James Bay, Canada 1982-92 (n=22)



Source: Cree Injury Study, 1996

PERSONAL FACTORS

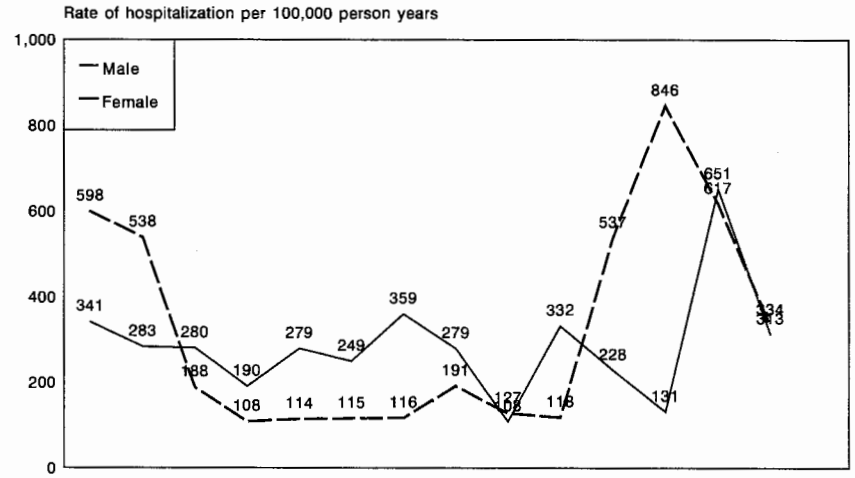
- Age & Sex Overall hospitalization rates were similar for males and females, with males accounting for 55% of the total. The highest rates of hospitalizations for all types of falls among girls were observed among infants (<1 year), toddlers (1 to 4 years), and persons 55 years of age and older (Figure 4). For boys, rates were relatively similar at all ages, with the exception of somewhat higher rates among persons 70 years of age and older. Rates for female infants and toddlers and for persons 55 years of age and older were nearly twice as high as for males. The overall rates by sex for all ages combined and for all hospitals were 261 per 100,000 population per year for males and 216 for females.

  The Cree rates of hospitalization for fall for all ages combined are not remarkably different than for Québec as a whole and somewhat lower than for some other rural areas (Choinière et al., 1993). Rural areas such as Abitibi-Témiscamingue and the Côte-Nord tend to have higher rates

of hospitalization for fall than urban areas such as Montréal. This may reflect long travel distances to rural hospitals with a greater need for admission for observation and investigations such as X-rays, and perhaps other factors such as greater availability of beds in small rural hospitals. When examined by age group, the most striking difference in rate of hospitalization between the Cree and Québec is for the elderly of 75 years and older for falls is much lower than for Québec as a whole, 300 per 100,000 population per year for the Cree versus about 2,000 for Québec. However, for 55 to 74 year olds, hospitalization rates were similar for the two groups. As discussed below under clinical details of injuries from falls, injuries of the lower extremity, especially the hip, were much less frequent among the Cree than among other Québecers. This may in part be explicable by the small number of elderly and imprecise knowledge of age, but other factors such as physical activity may also be important in protecting elderly Cree from deterioration of bone structure and associated fractures of the hip.

Figure 4

Rates and numbers of hospitalizations for falls by age & sex Cree of Eastern James Bay, Canada 1982-92 (n=195*)

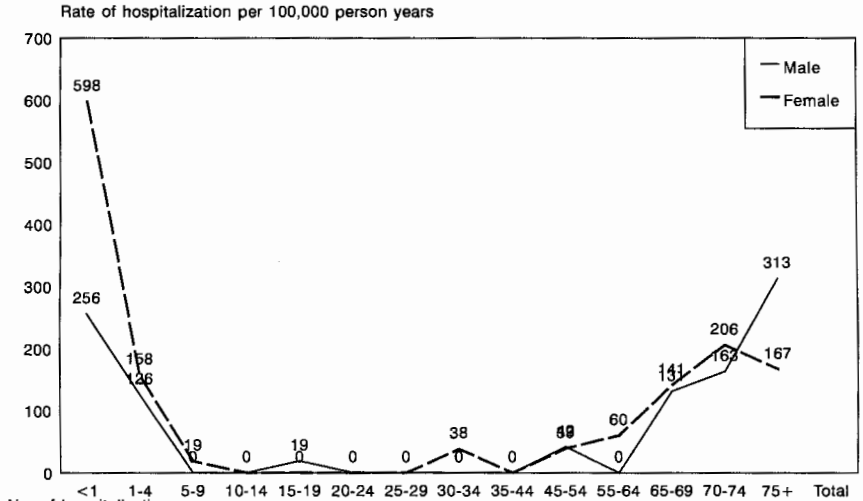


* Includes 183 falls reviewed in the 6 study hospitals and 12 that occurred in other hospitals
Source: Cree Injury Study, 1996

The high risk age groups for falls at home and during sport were examined separately, since the age groups at risk are quite distinctive and prevention involves intervention for special environments and equipment or activitities. For falls at home, the highest rates of hospitalization were seen among infants, toddlers, and persons of 65 years and older (Figure 5). The overall rate of hospitalization for home injuries was 32 per 100,000 population per year for males and 47 for females. Infants accounted for 31% of falls at home, toddlers for 28%, and the elderly for 22%, with only 19% in all other age groups. Falls during sports involved mainly older children and young adults, with 91% of victims in the age groups 10-34 (Figure 6). Rates of falls during sports were about twice as high among males as among females. The overall rate of sports-related falls for males of all ages was 37 per 100,000 population per year and 17 for females.

Figure 5

Rates and numbers of hospitalizations for falls at home by age & sex
Cree of Eastern James Bay, Canada 1982-92 (n=32)



No. of hospitalizations

	<1	1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-44	45-54	55-64	65-69	70-74	75+	Total
Male	3	4	0	0	1	0	0	0	0	1	0	1	1	2	13
Female	7	5	1	0	0	0	0	1	0	1	1	1	1	1	19

Age group in years

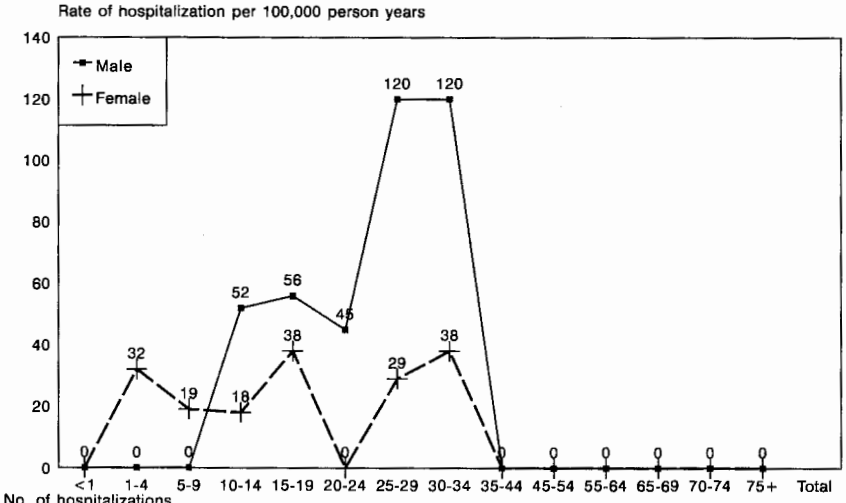
Source: Cree Injury Study, 1996

These rates and numbers are undoubtedly underestimates of the true number of falls at home and during sports injuries, since information on location and activity were not recorded in the hospital records for many falls. Because of these unknowns, it is not possible to state with certainty the age pattern of all other types of falls excluding sports and home injuries. However, this group of falls tended to involve all age groups, with somewhat higher rates among males than females, with the exception of toddlers and the elderly.

Other than the home, two other locations for fall incidents were mentioned relatively frequently, including the street (7%, n=12), and the bush (4%, n=7). Falls in the street involved most age groups from toddlers to 60 years, while falls in the bush involved all ages from toddlers to the 80-84 year age group.

Figure 6

Rates and numbers of hospitalizations for falls during sports by age & sex Cree of Eastern James Bay, Canada 1982-92 (n=22)



No. of hospitalizations

	<1	1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-44	45-54	55-64	65-69	70-74	75+	Total
Male	0	0	0	3	3	2	4	3	0	0	0	0	0	0	15
Female	0	1	1	1	2	0	1	1	0	0	0	0	0	0	7

Age group in years

Source: Cree Injury Study, 1996

- Alcohol Alcohol intoxication or suspected intoxication was reported for 17% of falls among persons of 15 years and older. This is probably an underestimate due to incomplete recording of alcohol intoxication by health professionals. However, in certain villages, the proportion of falls reported to involve alcohol was higher than in others, including Chisisibi with 38% (6/16) intoxication and Waswanipi with 22% (7/32). This may reflect availability of alcohol in these villages, or, alternatively, better recording of alcohol intoxication because of rapid arrival in hospital.

  Alcohol intoxication was not recorded as a factor in any hospitalizations for falls during sports. Intoxication or suspected intoxication was reported for at least 15% of falls at home in persons of 15 years and older. For all other falls (excluding sports or at home), at least 15% of victims of 15 and older were reported as intoxicated.

  Alcohol intoxication was most frequently reported for falls on Saturday and Sunday, and may have accounted for at least part of the excess number of falls that occurred during weekends among persons 15 and older (See below, including Figure 12).

- Vision Eight victims were said to suffer from impaired vision. None were in the 0-14 years age group, 38% in the 15-54 year group, and 62% in the 55+ age group. Otherwise stated, 0% of victims of falls in the 0-14 year age group were reported to suffer from impaired vision, 4% of victims in the 15-54 year age group did so, and 17% of victims in the 55+ group did. However, whether the impaired vision was an important factor in these falls is not known.

- Physical handicaps affecting mobility At least 9% of victims had a permanent or temporary handicap. These included: 6 with a history of congential subluxation of the hip and 11 with other disabilities, including scoliosis 2, mental and psychomotor retardation 2, and 1 each of contracture of the knee, pathological obesity, Parkinson's disease, necrosis of the great toe, weakness of the arms due to previous trauma, chronic back pain, and sprained ankle.

EQUIPMENT & SURFACE FACTORS

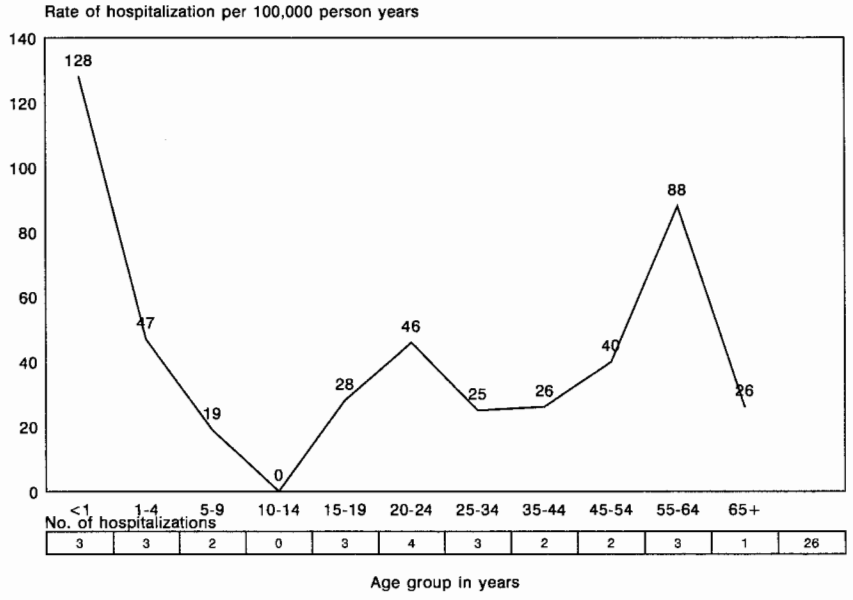
- Equipment The term equipment is used here to group factors involving various types of person-made items that are pertinent to prevention of falls, including steps and furniture. Of falls excluding sports, 16% involved stairs or steps, including 23% inside, 15% outside, and the remainder unspecified. Of falls on stairs, 12% of victims were infants and 12% toddlers, 38% were 15-34 year olds, 8% were 5-9 year olds, and 27% werr 40-64 year olds. Only 4% of

victims (n=1) were 65 years or older. The rate of falls on stairs was highest among infants and persons between 55-64 years, followed by young adults (Figure 7). Rates were particularly high among female infants and toddlers, among young male adults, and among older females. The risk factors and strategies for prevention are probably different for these three population subgroups.

For falls on steps or stairs, pertinent factors for prevention include the presence of a handrail, adequate depth of steps/treads, and appropriate lighting. These factors have been shown to be associated with protection against falls in other studies (Locklear, 1991). Unfortunately, health professionals seldom inquire about these factors and there was no information about them in the records of the 26 victims of falls on stairs, with the exception of a single case where a handrail was stated to have been present. Infant walkers accounted for falls among infants and have now been banned in Canada, although these are sometimes passed on from one family to another or purchased in the United States.

Figure 7

Rates and numbers of hospitalizations for falls on stairs by age Cree of Eastern James Bay, Canada 1982-92 (n=26)



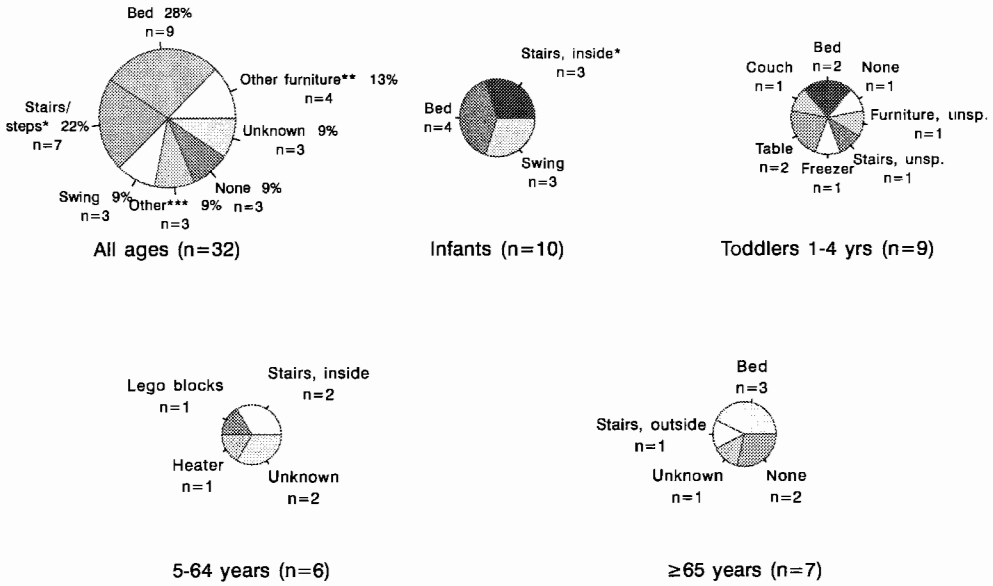
Source: Cree Injury Study, 1996

Since many falls associated with equipment factors occur at home, home falls were examined separately, including furniture, play equipment, stairs (Figure 8). Beds, stairs, and swings were the most frequent sources of falls in or around the home. For infants, beds, stairs, and swings were the most frequent source of falls, while for toddlers, furniture including beds, tables, and couches were most common. For the elderly, beds were most frequent. Thus, for small children, beds, stairs, and swings represented the most frequent source of falls at home. However, in some cases, more than one equipment factor was involved. Two of the infants who fell downstairs were using walkers, while the other infant was dropped while being carried by its mother. Occasionally, equipment was reported to be in poor repair, including the rope of a swing and the base of an infant cradle that broke.

- Other equipment factors were less frequently mentioned. For persons working, these included 2 falls from a roof and 1 person who fell while shovelling. Among persons playing, 5-9 year olds who fell included 1 from monkey bars at a playground, 1 from a 45 gallon drum, and 1 from a tree branch, 1 from a sled, while 1 infant fell from an infant hammock/swing/cradle. One person fell from a balcony and 1 from a bar stool. Another person was knocked down by the jet of a fire extinguisher and 1 fell from a platform. Another person tripped over a root.

Figure 8

Hospitalizations for falls at home by equipment factors
Cree of Eastern James Bay, Canada 1982-92



* 5 inside stairs, 1 outside, & 1 unspecified - 2 infants fell downstairs while using walkers;
** 1 couch, 1 table, 1 fall onto corner of table, & 1 unspecified furniture; *** 1 freezer, 1 lego blocks, 1 heater
Source: Cree Injury Study, 1996

ENVIRONMENTAL FACTORS

- Location The general location of falls was known for 47% of incidents, and these included the home in 18%, a sports area in 10%, a street in 7%, the bush in 4%, a public building in 2%, a playground in 1%, a shop or work area in 1%, and other areas in 4%.

- Inside/outside Information was available for 50% (92/183) of hospitalizations for falls. Of these, 48% occurred inside a building and 52% outside.

  Of falls inside a building, 64% occurred in the home, 27% in a sports facility, and 9% in other or unspecified buildings. Of falls outside, 25% occurred in the street, 15% in the bush, 9% at a sports area, 6% at a public building, 4% at a playground, 2% at a home, and 40% at other or unspecified locations.

  Of falls at home, 91% were reported to have occurred inside, 3% outside, and 6% in unknown locations. Of falls at a sports area, 63% had occurred inside, 21% outside, and 16% in unknown locations.

- Surface slipperiness Ice was the most important surface factor associated with falls, with 19% of all falls occurring on ice. For falls outside, excluding the ice sports of hockey and skating, falls on ice accounted for 33% (14/43), mud for 2%, an unspecified slippery surface for 2%, while for the remaining 63% the surface was unspecified. Falls on ice, excluding sports, affected most age groups from 5 to 74 years.

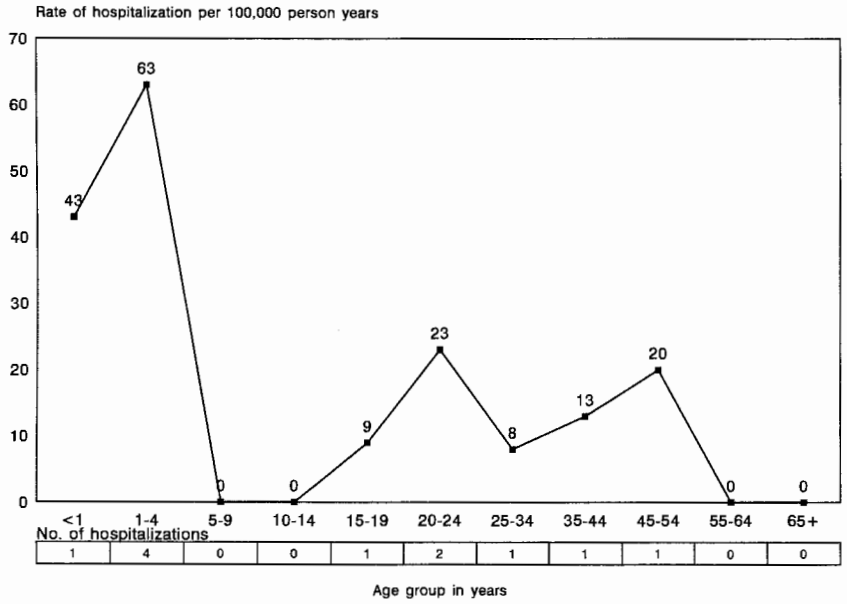
- Surface hardness Concrete was noted as a surface factor in 7% (11/161) of falls, excluding sports. Of injuries from falls on concrete, 45% involved small children, including infants and toddlers (0-4 years), mainly toddlers, and the rates were also highest for these two age groups (Figure 9). The remainder involved persons in age groups between 15-49 years. Some of these falls occurred at home and others in public places such as arenas.

- Obstacles It was reported that 3% of falls had resulted from unspecified obstacles, presumably involving tripping over something.

- Other surface factors One victim fell into an unspecified hole. Rocks were mentioned in 2 cases, including 1 each on land and in the water.

Figure 9

Rates and numbers of hospitalizations for falls on cement by age Cree of Eastern James Bay, Canada 1982-92 (n=11)



Source: Cree Injury Study, 1996

ACCOMPANYING SITUATION

Unfortunately, hospital records seldom specified whether small children who were injured in falls had been under adult supervision at the time of injury. It was noted that in at least 19% of falls involving infants and toddlers (0-4 years) (7/36) that the actions or inactions of a parent were associated with the injury. In 3%, it was reported that another child had contributed to the fall.

FALLS BY VILLAGE

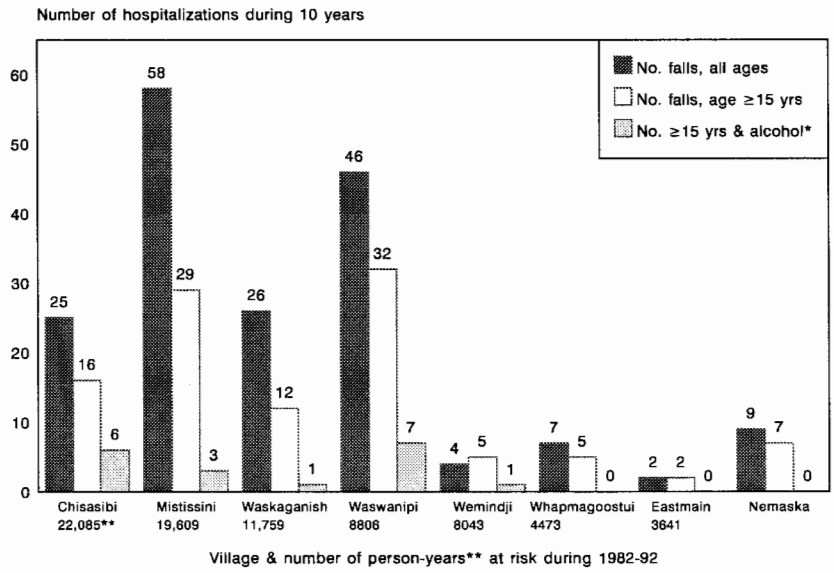
For its population, Waswanipi had a disproportionate number of falls (Figure 10). The proportion of falls among adults was greater in Waswanipi than in Mistissini, and there appeared to be a more frequent involvement of alcohol intoxication in Waswanipi. When trends by five year periods were examined, the number of

hospitalizations for falls had doubled in Waswanipi, while there had been essentially no change in Mistissini (Figure 11). The number of hospitalizations for falls also showed a substantial increase in Chisasibi. These increases and differences may be explicable in part by different access to health facilities by location and time period, but other factors such as exposure to alcohol also need to be considered.

The 12 falls that were hospitalized elsewhere than in the six study hospitals included 5 from Mistissini, 4 from Waswanipi, and 1 each from Eastmain, Nemaska, and Whapmagoostui.

Figure 10

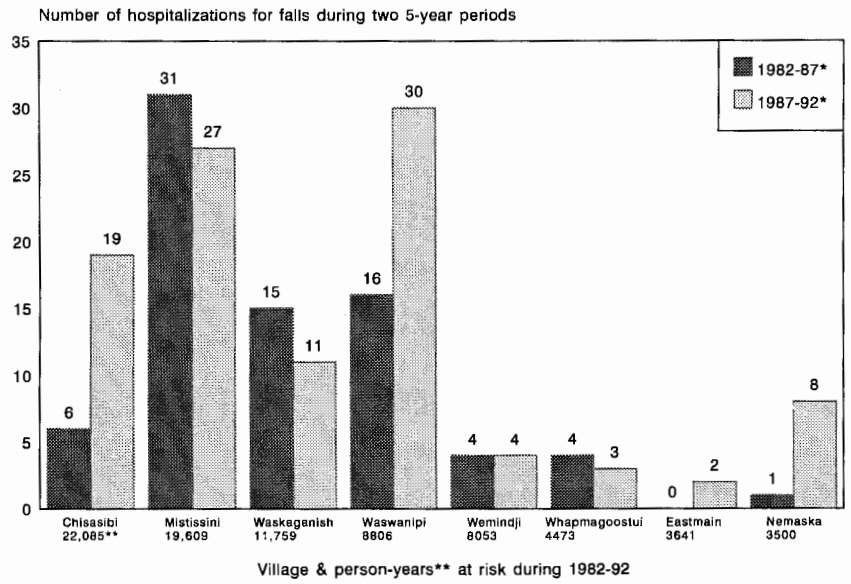
Hospitalizations for falls by village: all ages, adults, & with alcohol intoxication Cree of Eastern James Bay, Canada 1982-92 (n=183)



* Number of victims of falls ≥15 yrs of age with alcohol intoxication or suspected intoxication noted in their hospital record; ** Person-yeers at risk in village during 1982-92 (Average population in village x 10 yrs)
Source: Cree Injury Study, 1996

Figure 11

*Hospitalizations for falls by village by 5-year periods Cree of Eastern James Bay, Canada 1982-92 (n=183)**



* Five-year fiscal periods from April 1, 1982 to March 31, 1992
** Person-years at risk in village during 1982-92 (Average population in village x 10 yrs)
Source: Cree Injury Study, 1996

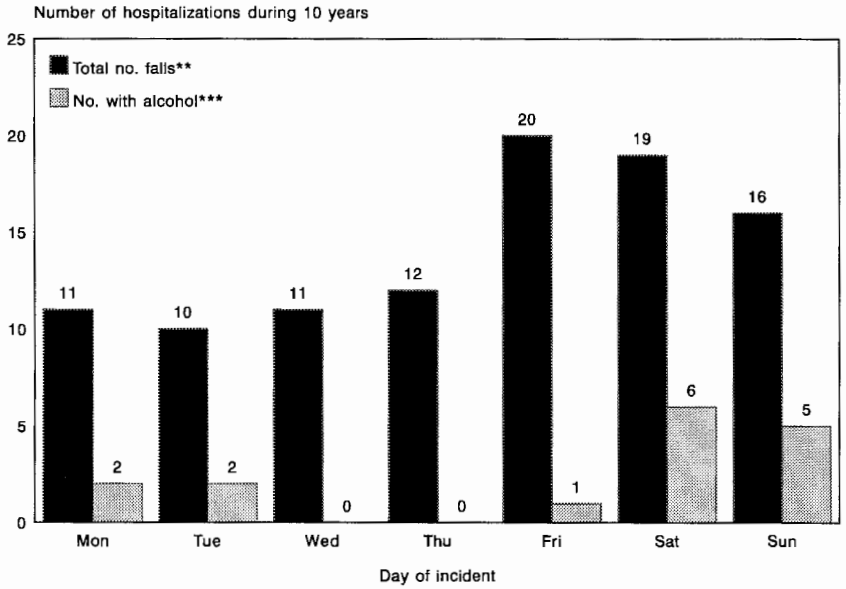
TIME FACTORS

Falls were examined by day of week and alcohol intoxication for persons of 15 years and older. It was apparent that a disproportionate number of falls of adults occurred during the weekend, and that at least part of the excess on Saturdays and Sundays was associated with alcohol intoxication (Figure 12). For victims younger than 15 years, there was no excess on falls on weekend days, with the mean number of falls per weekday and per weekend day the same at 10 falls/day.

For sports injuries, 77% occurred during the six month period between 1 October and the 31 March. This probably reflects the period for hockey and skating.

Figure 12

Number of hospitalizations for falls by day of incident & by alcohol
Cree of Eastern James Bay, Canada 1982-92, persons ≥15 years old (n=99)*



* Day of week was unknown for another 9 cases; ** Total number of falls; *** Number of falls where victim was reported in hospital record as intoxicated or where intoxication suspected
Source: Cree Injury Study 1996

LINK WITH OTHER TYPES OF INJURIES

Certain types of injuries involve more than one external cause. For example, a person may fall onto a sharp or penetrating object. It is not always clear from the history whether the injury was primarily a fall or primarily a cutting/piercing injury. Two cases of hospitalized falls, 1% of the total, had a link to cutting/piercing injuries.

There were 29 hospitalizations classified as primarily attributable to other types of injuries with a link to a fall, indicating that a fall may have occurred as part of the other injury. These included: 9 cutting/piercing injuries (11% of all cutting/piercing injuries), 6 assaults (4% of all assaults), 2 cases of being struck or striking against something or someone (3% of struck/striking injuries), 1 traffic injury (1% of traffic injuries), 1 case of overexertion, and 10 cases of injury of unknown external cause.

CLINICAL DETAILS OF FALLS IN CREE COMMUNITIES

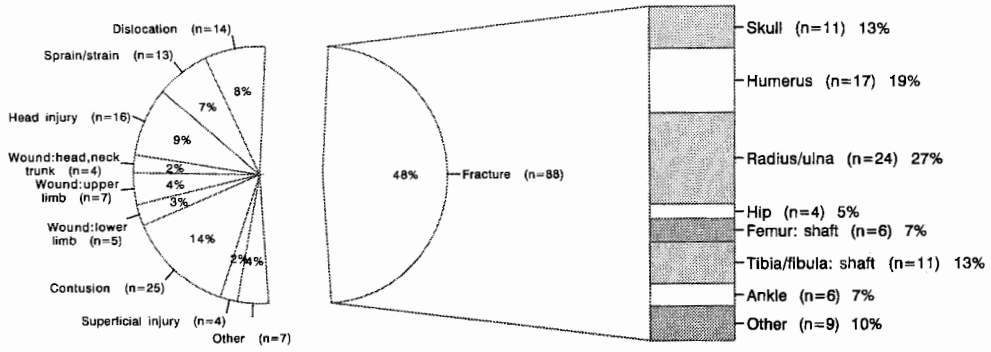
- Type of injuries Fractures were the most frequent primary (most severe) injury, accounting for 48% (88/183) of hospitalizations for falls (Figure 13). Other leading types of primary injuries included contusions, head injuries, dislocations, sprains or strains, open wounds of head, upper and lower limbs. Only 9% of fall victims had more than one type of injury specified, and 2% had more than two.

  Among fractures, the most frequent sites included the forearm and upper arm. The radius and/or ulna accounted for 30% and the humerus for 19%. The lower end of the radius/ulna and the humerus were most frequently involved. Other fractures included the skull 12%, hip 5%, shaft and lower end of femur 7%, upper ends or shaft of tibia and/or fibula 12%, ankle, including lower ends of tibia and fibula, 7%, and various other bones, 8%. Of all fractures, 5% were described as open, including 2 of the lower radius, 1 of the tibia, and 1 of the skull.

  For dislocations, the shoulder accounted for 71% of cases.

Figure 13

Hospitalizations for falls by nature of primary injury
Cree of Eastern James Bay, Canada 1982-92 (n=183)



Source: Cree Injury Study, 1996

For head injuries, concussions accounted for 75% and other intracranial injuries for 25%.

At least 40% (8/20) of open lacerations and superficial wounds/abrasions were complicated by infection.

The type of injury varied with falls in different age groups (Figure 14):

For infants of <1 year old (n=11; male 4, female 7), head injuries and contusions of the head accounted for 82% of hospitalizations from falls and injuries of the lower limb for 9%. Head injuries were somewhat more frequent among female toddlers.

For toddlers of 1-4 years of age (n=25; male 9, female 16), injuries of the head together with facial wounds and contusions accounted for 36% of hospitalizations from falls, while fractures and wounds of the upper and lower limbs accounted for 56%. The patterns were similar for boys and girls, except that all of the fractured femurs involved boys.

For older children of 5-14 years (n=39, male 23, female 16), head injuries and facial fractures and contusions accounted for only 13% of all hospitalizations for falls and fractures and other injuries of the limbs for 77%.

For young adults 15-24 years old (n=36; male 25, female 11), head injuries and wounds of the head/mouth accounted for 14% of hospitalizations from falls, while fractures and other injuries of the limbs accounted for 69%.

For adults between 25-64 years (n=55; male 31, female 24), head injuries and wounds of the head/scalp accounted for 11% of hospitalizations from falls, while fractures and other injuries of the extremities accounted for 71%, and other or unspecified locations for the remainder. Fractures of the distal radius were more frequent in women (7 versus 2) and the only hip fracture occurred in a woman. Infected wounds and abrasions were more common among males (6 versus 2).

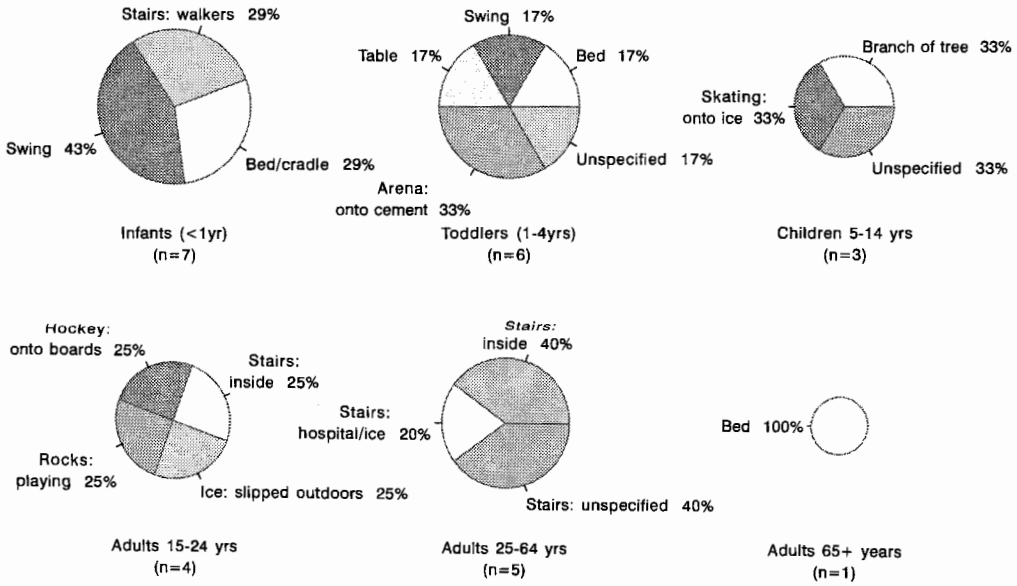
For older persons of 65 years and over (n=17; male 7, female 10), head injuries accounted for only 6% of hospitalizations for falls, while fractures, dislocations and other injuries of the extremities accounted for 82% of injuries, and of these, the lower extremity accounted for 67%. All victims of fractured femur, including hip, were women.

Since head injuries are potentially among the most serious injuries, their rates (Figure 7) and external causes (Figure 14) were examined separately by age group. Overall, for all ages combined (n=26), stairs/steps accounted for 31% of head injuries from falls, beds 15%,

playground equipment/swings 15%, hockey/skating 8%, falls from a height in arenas, 8%, tables 4%, outside on ice 4%, rocks 4%, a branch of a tree 4%, and unspecified falls 8%.For infants, stairs in infant walkers 2, onto concrete in one case and swings (rope/swing broke in two cases) and beds/cradles were most important, while for toddlers, beds swings, tables, and falls of 2 to 3 metres onto cement in an arena resulted in most head injuries. Among adults 15-24, at least 1 victim - on stairs - was intoxicated by alcohol. Among adults 25-64, stairs were the source of most injuries from falls, and at least 2 victims were intoxicated by alcohol.

Figure 14

Hospitalizations for head injuries* from fall by cause & age group Cree of Eastern James Bay, Canada 1982-1992 (n=26)



* Including concussion, other intracranial injury, and/or skull fracture

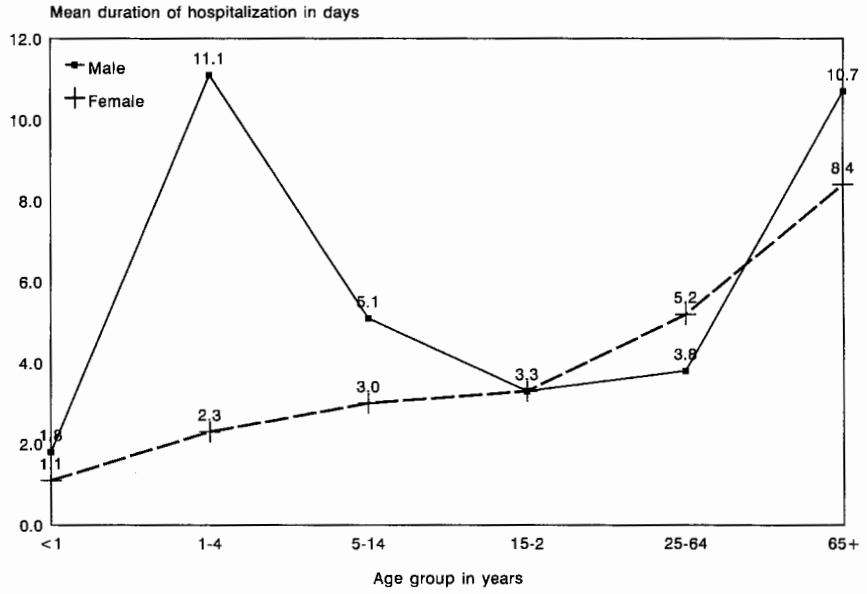
Source: Cree Injury Study 1996

- Duration of hospital stay There were 828 days of hospitalization in the 6 study hospitals for 181 falls where the sejour was known, with a mean (average) of 4.6 days, a median of 2 days, and mode (most frequent duration) of 1 day. The maximum duration of stay was 29 days. At least 50 days of hospitalization (6%) resulted from falls associated with alcohol intoxication. Males accounted for 498 days or 60% of these falls, and females for 330 days.

Long mean and median durations of stay among males were mainly in the 1-4, 5-14, and 65+ year age groups, while for females long durations of stay were most common among the 65+ group. (Figure 15). Male toddlers may sustain more severe injuries than females, since although there were 9 hospitalizations for males and 16 for females, the total number of days of hospitalization for male toddlers was 100 and for females 37.

Figure 15

Mean duration of hospitalization for falls by age & sex Cree of Eastern James Bay, Canada 1982-92 (n=181)*



* Includes 181 of 183 falls reviewed in 6 study hospitals where duration of stay was known
Source: Cree Injury Study 1996

However, the most frequent duration of stay (mode) for males was 1 day for all age groups, except 15-24 year olds, where it was 2 days. For females, the most frequent duration of stay was 1 day for all age groups, with the exception of 65 years and older, where it was 2 days.

A proportion of hospitalizations for injuries are of short duration involving a one-day overnight stay for observation of minor injuries. The proportion of hospitalizations involving a stay of two or more days rose by age group from 27% among infants, to 52% among toddlers, 69% among 5-14 year olds, 74% among 15-24 year olds, 74% among 25-65 year olds, to 81% among patients 65 and older.

The duration of stay was also examined for different categories of fall injuries. For falls involving stairs, the mean duration of stay was 2.9 days, for furniture 3.5 days, for other equipment 5.7 days, and where no equipment was involved, 4.6 days.

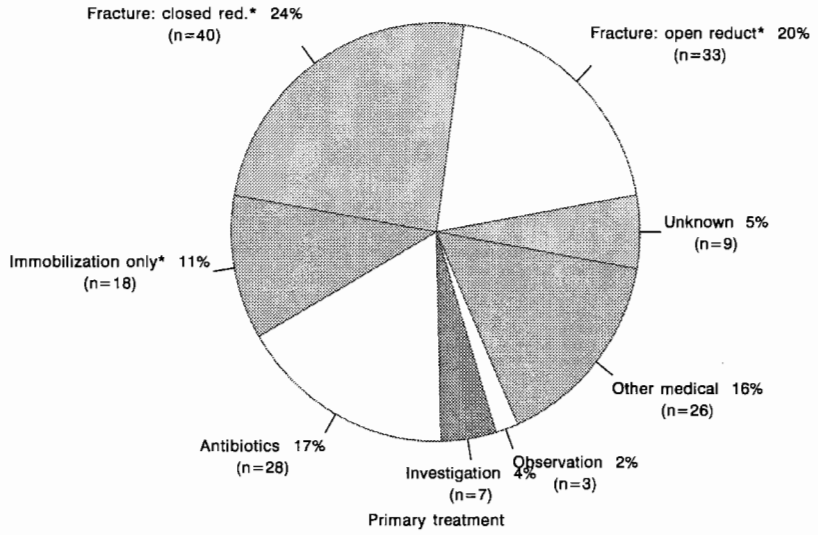
For the 12 hospitalizations outside the 6 study hospitals, there were a total of 95 days of hospitalization. The maximum duration was 37 days. Thus the total number of days for the period in all hospitals was 923.

- Transfers & Transport Of a total of 183 hospitalized fall patients, 65% (n=119) were transferred between various types of health facilities, including clinics and hospitals. Of these, 61% (n=72) of transfers were from a clinic or health centre to a hospital, 31% (n=37) from one study hospital to another, 7% (n=8) from a hospital outside the 6 study hospitals to a study hospital, and 1% (n=2) from an unspecified location. [Note: All transfers were counted only once as a case in the analyses, with the exception of two cases of interhospital transfers that were counted twice -- thus the actual number of fall incidents was 181, as discussed in the Annex].

- Type of treatment Since fractures, dislocations, and sprains are injuries that often result from more severe falls, treatment of such injuries was common. Thus, the most common primary treatment for fall injuries was a closed reduction of a fracture or dislocation with a plaster cast or skeletal traction (22%), followed by open reduction or other operative procedure for a fracture or dislocation (18%), and by immobilization only without a reduction (11%) (Figure 16). There were also a large number of infected wounds that resulted from falls, so antibiotic treatment was the primary treatment for 17% of falls. There was only a single case with more than one type of treatment specified, and none with more than two.

Figure 16

Treatment for hospitalized victims of falls
Cree of Eastern James Bay, Canada 1982-92 (n=183)



* Open reduction: operative treatment of fracture/dislocation, other surgical procedure, or external fixation with intraosseous rods; closed reduction: treatment of a fracture/injury with plaster cast or skeletal traction; immobilization: plaster cast, splint, or sling
Source: Cree Injury Study, 1996

IMPROVING DATA SOURCES FOR FUTURE SURVEILLANCE OF FALLS

One of the main limitations of hospital data for injury prevention is failure of physicians to include the external cause and intent of injuries in their admission and discharge diagnosis, and to specify alcohol intoxication as a diagnosis or contributing factors when this is present.

For details on problems with incomplete diagnoses by health professionals and with errors or incomplete coding by hospital coders, see Annex I.

DISCUSSION AND RECOMMENDATIONS

OVERVIEW OF RESEARCH FINDINGS FOR FALLS

Falls are a leading cause of hospitalizations for injury among the Cree, and rank with traffic injuries as the most frequent causes. However, as a cause of death, falls are much less frequent than among non-aboriginal populations in Québec and Canada. Part of the difference in mortality may be explicable by the younger age structure of the Cree population, since deaths from falls tend to involve the elderly with hip fractures. Nevertheless, physical activity is protective against age and activity-related deterioration of bone structure and hip fractures, and the Cree probably are or have been in the past more active than urban populations.

Most falls occur during sport (mainly hockey) or while walking, running, or playing (especially on stairs or ice). The home was the most frequent specified location for injuries from falls, followed by a sports area and the street. About half of the falls occurred inside a building and half outside. While injury rates are highest among small children and the elderly, the large number of injuries among young adults means that to be effective, injury prevention programs will also need to target this age group. Prevention of high risk groups for home injuries such as small children and the elderly will need to be focused on equipment and environmental factors such as stairs and furniture, while protection of young adults will also involve measures to deal with factors that contribute to alcoho intoxication.

Large increases during the 1980's in the numbers of hospitalizations for falls in the villages of Chisasibi and Waswanipi may be related to factors such as greater access to alcohol, social disruption, and perhaps also due to greater access to hospitals. While it is desirable to deal with the underlying problems that trigger alcohol abuse in the form of binge drinking, safer environments including better stairs should help to protect not only the intoxicated but also other vulnerable groups such as children, the elderly, and the handicapped.

The high rate of head injury from falls among infants and toddlers should be preventable by attention to equipment factors around the home, including stairs, infant walkers, swings, beds, and tables, as well as special attention to public locations such as arenas where children could fall.

Special attention may be needed for the homes of children and adults who are more vulnerable to falls because of physical disabilities and impaired vision.

For falls that occur outside the home, slipperiness due to ice is an important factor and should be subject to at least partial control.

PERTINENT DATA FROM OTHER STUDIES

- The Santé Québec Cree health survey of 1991

  In the Santé Québec health survey, interviews were conducted with a random sample of about 20% of the Cree population to determine the number of injuries that had caused a limitation of usual activities during the preceding 12 months (Robitaille and Barss, 1994). Falls ranked with motor vehicles, work, and play injuries as the most frequent sources of injuries at the community level.

  There were about 7.0 falls per 1000 population per year that resulted in a limitation of the victim's usual activity. This contrasts with a rate of hospitalization for falls of about 2.6 per 1000 population per year for males and 2.1 for females. Thus, for each hospitalization, there may be 1 to 2 other injuries from falls that are not severe enough to necessitate hospitalization, i.e. a ratio of 2 to 3 injuries from falls per hospitalization. There are probably about 200 hospitalizations from falls for each death.

- Santé Québec Inuit Health Survey of 1992

  Falls were among the leading sources of injury among the Nunavik Inuit, accounting for about 17% of all unintentional and intentional injuries in this community survey (Kapetanakis, 1994). They ranked with snowmobile and sports injuries as the top three causes of injury at a community level.

- Profile of injuries in Quebec by region

  When the pattern of injuries from falls among was compared with Québec as a whole, the most striking difference was in the proportion of hospitalizations resulting from fractures of the lower limb. Fractures of the lower extremity, in particular fractures of the femur (including hip), accounted for 5% of hospitalizations from falls among the Cree and 31% among all Québecers (Choinière et al., 1993).

- Other research

  In a study of falls in several aboriginal communities in the United States, the homes of victims of falls were compared with homes of uninjured "control" persons (case-control or case-referent study). It was found that many falls were associated with a particular design of house in one village (Locklear, 1991). The porch steps had a narrow depth that made people more likely to stumble and fall down the stairs when they placed their foot too far forward while descending the steps. Handrails, porch lighting, and level steps were present more often at homes of uninjured controls than of falls victims, and were judged to be protective against falls. Wide stairs (as opposed to steps) also appeared to be protective, since when people did fall, they tended to remain on the stairs rather than fall completely off the stairway onto the ground below.

Other studies have found that along with stairs, furniture such as beds and the sharp edges of some coffee tables are frequent sources of injuries from falls among small children such as infants and toddlers (Hu et al., 1993). Injuries occur when children jump up and down on sofas or chairs and fall off striking themselves on the sharp edges of coffee tables.

Among adults, alcohol intoxication is an important source of injuries from falls and other injuries around the home in many countries (Honkanen, 1993; Honkanen et al., 1983). Young and middle-aged males are often involved, with a particularly strong link to alcohol for falls on stairs, including more severe falls with head injuries.

Physical activity is important in maintaining bone strength and protecting from fractures when a fall occurs, especially among women (Lees et al., 1993; Zhang et al., 1992). Hip fractures are rare in populations in developing countries where the population do not use cars, remain physically active, and walk a great deal (Barss, 1985). Weight-bearing exercise is best, including walking, and is most effective when begun at a young age. Exercise offers many other health benefits. For women, increases in bone mass with exrecise occur in the spine, total body, and forearm. Such gains were found to be maximal in young women in their 20's and required only modest increases in physical activity (Recker et al., 1992). Oral contraceptives were beneficial in contributing to increases in bone mass. Cigarette smoking, on the other hand, has an adverse impact on bone strength and is also a factor in vulnerability to injuries of the low back (Hollenbach et al., 1993; Kelsey and Hochberg, 1992). Heavy alcohol consumption and/or chronic alcoholism have been reported to have an adverse impact on bone strength (Freedland et al., 1993).

Implementation of prevention of falls at a community and regional level

The Ottawa Charter provides a framework for considering prevention of injuries from falls (World Health Organization, 1986). Health promotion should include the following elements:

- Build healthy public policy
- Create supportive environments
- Strengthen community action
- Develop personal skills
- Reorient health services

Healthy public policy can ensure that appropriate municipal or village building regulations are introduced and followed to ensure that the home and village environment is as safe as possible. In the home and in public buildings, particular emphasis is needed on the width of steps, railings, lighting, and landings to shorten the distance of falls. Hazardous devices such as infant walkers need to be banned and destroyed. During winter, municipal regulation may be needed to reduce the risk of falls on ice in the streets. Appropriate regulations and maintenance of ice conditions for sports such as hockey should help to reduce the number of severe injuries from sports-related falls. Public areas such as arenas with hard concrete surfaces may require special barriers to prevent small children from falling onto the floor. Healthy public policy can also be used to control the marketing and sales programs for alcoholic beverages that target young adults and lead to falls among this age group.

Supportive environments can be created by community action to provide education on the harmful impact of binge drinking and smoking. New social norms are needed to make smoking and alcohol intoxication socially repugnant and unacceptable. Sidewalks and walking/hiking trails to make walking safe and enjoyable should encourage weight-bearing exercise among all ages.

Community action could include periodic home safety rounds by Cree safety officers to assess the safety of stairs, steps, and household furniture such as beds and coffee tables. The community would also need to monitored during the winter to ensure ice safety outside and in arenas. Such safety rounds have been used in Sweden and elsewhere (Bjärås et al., 1990; Bjärås 1993, 1992, 1991).

Personal skills could take the form of developing the capacity and interest for regular moderate exercise to maintain bone strength, which protects against injuries such as fractures when a fall does occur. It is probable that as motorization increases and people walk less, that the risk of life-threatening fractures of the hip in older age will increase as it has in other populations. The ability to cope with stress and interpersonal crisis without resolting to alcohol intoxication as an escape will be important in preventing injuries from falls among adults. Since cigarette smoking and heavy ingestion of alcohol both can reduce bone strength, both should be avoided.

People also need to be aware of common sources of injury in the home. They should understand what can be done by way of supervision of their children, as well as the importance of passive protection by a careful choice of furniture, play equipment, and housing design, especially stairs. Architects, contractors, and town planners who work in Cree communities should also design safety into homes, public buildings such as arenas, and streets.

Health services need to take a greater interest in the external causes of falls that they treat. Better recording of data on the external causes of falls and contributing factors such as alcohol intoxication would help to improve prevention in the Cree communities. Health professionals could take a greater interest in home safety, including investigating the personal, equipment, and environmental causes of falls that come to their attention as specific injuries. Thus health professionals should record for all falls, not only the nature of the injury, but also:

- Intent, whether the fall occurred unintentionally or during a fight or assault
- A full description of the external cause of the fall, including: any equipment involved, such as stairs, furniture, toys, playground equipment; surface factors such as ice or concrete; the specific location, such as home, street, etc.
- The activity when the fall occurred, including sport, walking, playing, etc.
- Contributing personal or host factors such as acute alcohol intoxication, chronic alcoholism, epilepsy, and other disabilities.

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APPENDICES FOR HEALTH PROFESSIONALS

APPENDIX 1 : RECLASSIFICATION OF HOSPITALIZATIONS FROM OTHER CATEGORIES TO FALLS

Completeness of coding of external cause of injury and contributory factors by physicians and impact on quality of coding by hospital coders

Physicians often fail to specify the external cause and intent of injury in their admission and discharge diagnoses in hospital records, and seldom include intoxication by alcohol or illegal drugs as a contributing factor. For all 183 injuries from falls, the external cause of injury was reported in admission diagnoses completely (eg. fall on stairs, from bed, etc.) in 1%, partially (eg. fall) in 4%, and not at all in 95%. In discharge diagnoses, the external cause was specified in completely in 0.5%, partially in 2%, and not at all in 97%. Fifteen percent of falls had initially been coded as other types of injuries, with most as of unspecified external cause.

While acute alcohol intoxication was described in hospital records for 8% of falls (17% for persons of 15 years and older), it was reported in only 1% of admission diagnoses and 2% of discharges. Acute alcohol intoxication had been coded as a contributory diagnosis by a hospital coder in only 1% of falls, exactly the same proportion as had been included in the physician's diagnosis. While alcoholism was described in hospital records for 3% of all fall admissions, alcoholism alone was reported in 2% of admission diagnoses and 1% of discharges. Alcoholism had been coded as a contributory diagnosis by a hospital coder in 2% of cases of falls. Both acute intoxication and chronic alcoholism were noted in another 2% of discharges.

Acute intoxication from use of an illegal drug (cocaine) was noted in 0.5% of admission diagnoses and in 0.5% of discharges; intoxication by cocaine had not been coded as a contributory diagnosis by the hospital coder. Use of a legal drug was noted in 2% of admission diagnoses and 2% of discharges.

This annex presents certain problems with coding of Cree injuries from falls that arose at the level of hospital coders, and that are of practical importance for public health professionals who work with injury data and for coders who work with injury data involving Cree (and other) populations. However, in considering the following information two points should be kept in mind. First, the work of coders is often very difficult, since as discussed above, health professonals seldom specify the external cause of injury in their admission and discharge diagnoses, and at times even the nature of injury is not clearly specified according to international terminology and standards. Second, the codes that were assigned during the study on the basis of a review of the hospital records will also contain errors. Nevertheless, certain errors recurred frequently in more than one hospital, suggesting systematic errors in interpretation by hospital coders that could benefit from additional training in coding of injuries.

Completeness and validity of external cause coding, including location, in hospital database

Coders versus recoded diagnoses:

E880.9 (n=26): fall on stairs -- 69% correct (as fifth digit code for location: home versus unknown, 4% difference in location between original and recoded diagnoses).

E882 (n=5): fall from or out of building (roof, balcony) -- 60% correct.

E883 (n=1): fall into other hole or opening in surface -- 0% correct.

E884.0 (n=7): fall from playground equipment (swing, etc. at home or elsewhere) -- 43% correct.

E884.2 (n=15): fall from chair or bed -- 80% correctly coded (location - home, etc. completely and correctly coded as fifth digit code in 67%)

E884.9 (n=11): other fall one level to another -- 9% correctly coded; most coded as unspecified falls (E888.9).

E885.9 (n=30): fall on same level from tripping or slipping -- 30% correctly coded as such; most coded as unspecified falls or as tackles in sports (E886.0). There was 83% agreement between the coded location and that defined after chart review; unfortunately, location was unspecified in 53% of such falls.

Of all falls, 62% (113/183) were originally coded as unspecified falls. After chart review, a total of 15% (27/183) of all falls were reclassified from being coding as unspecified falls (E888) to a more definitive and informative category, and the proportion of falls with a specified external cause was thereby increased from 38% to 53%. This is still unacceptably low, indicating an urgent need for better history taking and diagnosis of external cause of injury by health providers, including both physicians and nurses.

Concerning location (home, workplace, public facility, etc.), 62 were unknown (in agreement with chart review and coded location; 59 more unknown after chart review; 69 more unknown according to coders. Thus of the 183 falls, the location was unspecified by coders in 72% and after chart review in 66%. Where a location was specified by either a coder or after chart review, there was 82% (40/49) agreement between the two sources.

Nature of injury codes

Nature of injury codes (N-codes) as assigned after a careful review of each medical file were compared with codes assigned by the hospital coders and used in the Med-Écho file. Of 183 cases classified by external cause

as falls, 179 were assigned an N-code by the study (codes 800-999). The N-codes were in agreement to the 4the digit level in 48% (86/179) of cases. The cases in agreement will not be discussed further.

INJURIES THAT WERE NOT PRIMARY CODES AS INJURIES WITH N-CODES

Of the 179 falls that were assigned an N-code by the study, 83% (149/179) had been assigned an N-code by hospital coders. The 30 cases that had not been assigned an N-code accounted for 32% (30/95) of the disagreements between study and original hospital codes. The major coding differences that led to failure of coders to assign an injury code were as follows:

- Open wounds or abrasions complicated by infection coded primarily as infection or as other medical conditions: 50% (n=15)
  - ·Infected wound or abrasion (with cellulitis) coded with cellulitis as the primary code (codes 681-682.9), rather than with an infected wound as the primary code (N880.1-N884.1; N890.1-N894.1; N910.1-N919.1), and with cellulitis as a secondary code 40% (12/30)
  - ·Contusion of periorbital structures & eyelids (N921.1) coded as orbital cellulitis (code 376.0) 7% (2/30)
  - ·Infected superficial injury of elbow (N913.9) coded as various acute or chronic disorders of the musculoskeletal system, epicondylitis or tennis elbow (code 726.3) 33% (1/30)
- Sprains/tears or contusions of joint structures or the spine classified as disorders of the musculoskeletal system: 37% (n=11)
  - Tears of cruciate ligament (N844.2), other sprains/strains of knee, osteoarthosis, or late effect of injury (N844.9; N905.6; N924.1) coded as various acute or chronic disorders of the musculoskeletal system (codes 715-719): 20% (6/30)
  - Cervical or lumbar back injury/sprains (N847.2) coded as various acute chronic disorders or musculoskeletal system, such as intervertebral disc disorders (codes 722-724): 10% (3/30)
  - Contusions with inflammation in the epicondylar area (N923.1) coded as various acute or chronic disorders of the musculoskeletal system, epicondylitis or tennis elbow (code 726.3) 7% (2/30)
- Other injuries coded as medical disorders: 13% (n=4)
  - Blunt trauma of kidney coded as non-traumatic bladder neck obstruction 3% (1/30)
  - Unspecified injury of trunk coded as fever of unknown origin 3% (1/30)
  - Open wound of vagina coded as noninflammatory disorder of vagina 3% (1/30)
  - Lumbar spine fracture (pathological) coded as multiple myeloma 3% (1/30)

MISCODING OF NATURE OF INJURY

The majority of coding errors were relatively minor, in the sense that the correct bone or area of body was usually identified, but there were a few significant errors that reoccur frequently in a systematic manner. An example was miscoding of fractures of the distal radius, which are very common in children and in elderly women (where they are often known as Colle's fractures and often reflect underlying osteporotic weakness of bone structure); skull fractures and associated head injuries were often miscoded at the level of detailed subcodes; another systematic error was the coding of closed fractures that underwent open reduction as open fractures (problem areas for coding noted with an asterisk):

I. Injuries of the skull and brain (n=26)

a)* Fractures of skull (N800, N801, N803) (n=10)
Correctly coded as skull fractures in general, 90%; coded to specific site and complicating factors with all digit codes correct, 40%.
Frontal-parietal skull fracture, closed (N800.0) (n=3) coded as:
Unspecified skull fracture (N803.0) (n=2) 67%
Correctly coded (n=1) 33%
Fracture base of skull,
Closed (N801.0) (n=1) coded as:
Unspecified skull fracture, intracranial injury (N803.1) (n=1) 100%
With intracranial injury (N801.1) (n=3) coded as:
Unspecified skull fracture with intracranial injury (N803.1) (n=1) 33%
Facial nerve injury (N951.4) (n=1) 33%
Correctly coded (n=1) 33%
Open with intracranial injury (N801.3) (n=1) coded as:
Fracture base of skull, closed, intracranial injury (N801.1) (n=1) 100%
Unspecified skull fracture, closed (N803.0) (n=2):
Correctly coded (n=2) 100%

b) Intracranial injury, excluding those with skull fracture (N850-854) (n=16):
* *Concussion* (N850.0), without mention of intracranial wound (n=12), coded as:
Concussion unspecified (N850.9) (n=10) 83%
Fracture clavicle (N810.0) (n=1) 8%
Contusion of face, scalp, and neck (N920.9) (n=1) 8%
Intracranial injury, of other and unspecified nature (N854.0) (n=4) coded as:
Contusion of face, scalp, and neck (N920.9) (n=1) 25%
Coded correctly (n=3) 75%

APPENDIX II : INFORMATION ON CREE VICTIMS OF FALLS HOSPITALIZED OTHER THAN IN STUDY HOSPITALS

Appendix for methods section & persons interested in validity of hospital coding of falls & related injuries

Among the cases reviewed in the 6 study hospitals, there were 152 hospitalizations originally classified as falls by hospital coders that were also coded as falls for the purpose of this study after a detailed review of the hospital files. 27 cases originally classified by hospital coders as due to other external causes were reclassified as falls; the original classification by coders included 13 as non-specified injuries, 4 as struck by object or person, 3 as excess effort, 3 as sequels of trauma, 2 as cutting/piercing, and 2 as off-road vehicle injuries. 4 new cases were also included that were not in the MED-ECHO files. There were no cases without external cause codes during the last 5 years of the study.

Thirty-seven cases that were classified as falls by MED-ECHO were excluded, including 21 that were reclassified as primarily due to other external causes, and 16 that were excluded for other reasons. The cases that were reclassified included 5 assaults, 4 incidents involving being struck by an object or person, 3 snowmobile injuries, 3 unspecified injuries, 2 motor vehicle injuries, 2 injuries from cutting instruments, 1 fall from a boat (water-transport injury), and 1 hospitalization for an unknown cause. The 16 excluded cases included 7 Inuit, 1 caucasian, 7 follow-ups (double counts), and 1 inexisting file due to an erroneous file number.

The provincial hospitalization database counts admissions, not incidence of new injuries. Hence transfers between hospitals tend to be double counted as cases. While due attention was given during the analysis to eliminating double counts, when the report was completed, it was found that there remained 2 double counts. Thus the number of falls included in the tables and graphics is 183, but the actual number of incidents was 181. The cases that were counted twice in the graphics include a 44 year old male who fell down a stairs sustaining a skull fracture and a 2 year old male who fell from a couch and sustained a fractured humerus. This double count of 1% was detected after all of the analyses and graphics were complete, and it was decided that it was not large enough to warrant the additional cost of completely redoing the analyses, text, and graphics.