ABSTRACT

The 1996 Alberta Sport and Recreation Injury Survey is a retrospective study describing the annual incidence of injuries in the province of Alberta resulting from sport and recreational involvement. Data was collected by means of a telephone survey using random digit dialling techniques to obtain a representative sample of Albertans in the winter of 1995-96. The sample produced a total of 3,790 respondents from 1,478 households evenly split between genders, with an age range of 6 to 93 years. The survey asked information regarding medically attended, non-fatal injuries resulting from sport and recreational activities. Findings reveal an annual incidence of sport or recreational injuries of 11%. Among those reporting a sport or recreational injury, the most common types of injuries were a sprained/torn ligament (31%), strained/pulled muscle (19%), and fracture (13%). The most common bodily locations of injuries were the knees (21%) and the ankle (14%).

ABRÉGÉ

Le Alberta Sport and Recreation Injury Survey de 1996 est une étude rétrospective qui décrit l'incidence annuelle de blessures dans la province de l'Alberta intervenues dans le cadre d'activités de sport et de loisirs. Les données ont été recueillies au moyen d'un sondage téléphonique réalisé au moyen des techniques de composition aléatoire des numéros, afin d'avoir un échantillon représentatif d'Albertains pour l'hiver 1995-1996. L'échantillon a produit un total de 3 790 répondants représentant 1 478 foyers, répartis également entre les genres, avec une fourchette d'âge allant de 6 à 93 ans. Des questions ont été posées au sujet des blessures non mortelles ayant fait l'objet de soins médicaux qui avaient été causées par des activités de sport et de loisirs. Les résultats révèlent que l'incidence annuelle de blessures de ce type est de l'ordre de 11 %. Pour ce qui concerne les répondants ayant déclaré avoir été blessés dans le cadre d'une activité sportive ou de loisir, les blessures les plus courantes ont été les entorses/déchirures de ligament (31 %), les elongations musculaires (19 %), et les fractures (13 %). Les endroits du corps le plus souvent touchés par ces blessures ont été les genoux (21 %) et les chevilles (14 %).

A Descriptive Epidemiology of Sport and Recreation Injuries in a Population-Based Sample: Results from the Alberta Sport and Recreation Injury Survey (ASRIS)

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Participation in physical activity by means of sport and recreation involvement holds promise for tremendous public health benefits.^{1,2} Injury is an unwanted side effect of participation, one that has the potential to reduce the benefits of involvement in sport and recreational activities, and act as a barrier to future involvement.^{3,4} One of the first steps in the sequence of reducing sport and recreational injuries is to establish the nature and extent of the problem.⁵⁻⁷ Until recently, there has been limited sport or recreation-specific injury information accessible in Canada. Recent studies in Quebec⁸ and Ontario⁹ have provided some insight regarding the incidence of sport and recreational injuries in population-based samples. In Alberta, one of the few sources of sport and recreational injuries has been fatality statistics available through the provincial Medical Examiners office. At the level of hospitalizations and emergency room visits, injuries are coded using the international ICD-9 coding system.

Unfortunately this coding system lacks specific codes for the majority of sport and recreational activities. Although there has been recent implementation of a sport and recreation activity ICD-9 subdirectory for severe trauma in several regional hospitals in the province, the vast majority of sport and recreational injury data remain unrecorded and inaccessible. The purpose of this study was to obtain retrospective information, currently nonexistent in Alberta, about the incidence, type and extent of injuries occurring as a result of sport or recreational involvement.

METHODS

Data collection procedures

A telephone survey, using computer-assisted technology (CATI), of a representative sample of Alberta households was conducted to collect information regarding sport and recreational involvement and injuries. The sampling frame included any dwelling unit in Alberta that could be reached by direct dialing at the time of the survey. The total number of households that have telephones in Alberta is estimated at 1,027,000 which is 99% of all households.¹⁰ Data were gathered by means of a telephone interview with a knowledgeable household member aged 18 years or older. The respondent provided demographic, sport and recreation participation, and injury information for each household member aged 6 years or older. Only information regarding injuries resulting from sport or recreational activities that required medical attention was gathered.

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Response rates

For the purpose of this study, response rates were calculated as the percentage of eligible households that agreed to provide information to the interviewer at time of call. Non-eligible households included non-residential numbers; numbers not in service/disconnected; households where a person aged 18 years or older was not present; and households where the respondent was unable to speak English, or was not healthy enough to complete the interview. Of eligible households, a total of 1,478 households (0.1% of all households with telephones) provided information (50.2%) and 1,462 households refused to participate in the study (49.8%). No follow-up of non-respondents was conducted.

Questionnaire

Participants were informed that the questionnaire pertained to a study of sport and recreational injuries. The questions related to activities participated in at least once in the 12-month period prior to the survey. It did not include activities such as housework, gardening, mowing the lawn, picnics, or walking to do errands. Respondents were guided by the use of the following qualifiers: bike riding, swimming, home exercises, team sports, etc. Of principal interest were injuries resulting from sport or recreational activities that led to a visit to a health care professional. Where required, participants were prompted that these professionals included: doctors, physiotherapists, chiropractors or sport clinic personnel.

The questionnaire collected information with respect to frequency and type of sport and recreational activity involvement; number, type and location of injuries requiring medical attention starting with the most serious (respondent ordered), the location and type of medical attention received; and an estimate of the amount of time lost from work, school or regular activities as a result of the injury in question. Each injury was linked to a specific sport. The questionnaire was patterned after previous work conducted in Quebec⁸ and Ontario.⁹

Data analysis

Rates were calculated as the total number of injuries sustained divided by the

TABLE I
Injury Rates (At Least Once in the Past 12 Months) in Sport and Recreational Activities by Age, Household Income and Gender

	n	Overall %±95% CI	Males n	%±95% CI	Females n	%±95% CI
Age Group (years)*						
6-14	662	13.6±2.6	346	16.8±3.9	316	10.1±3.3
15-19	339	26.0±4.7	176	29.0±6.7	163	22.7±6.4
20-24	276	16.3±2.5	142	23.2±6.9	134	9.0±4.8
25-34	690	12.5±1.9	348	17.2±4.0	342	7.6±2.8
35-44	795	8.3±2.0	393	10.2±3.0	402	6.5±2.4
45-54	495	5.7±2.0	263	6.5±3.0	232	4.7±2.7
55-64	273	2.2±1.7	142	includes 0	131	includes 0
65+	228	includes 0	98	includes 0	130	includes 0
Household Income†						
Under \$20,000	375	8.8±2.9	178	14.6±5.2	197	3.6±2.6
\$20,000 - \$29,999	407	10.1±2.9	205	13.7±4.7	202	6.4±3.4
\$30,000 - \$39,999	521	12.1±2.8	274	13.1±4.0	247	10.9±3.9
\$40,000 - \$59,999	726	13.5±2.5	373	19.0±4.0	353	7.7±2.8
\$60,000 - \$79,999	476	12.6±3.0	257	15.2±4.4	219	9.6±3.9
\$80,000 or more	422	13.3±3.2	213	14.6±4.7	209	12.0±4.4
Total Sample	3790	10.8±1.0	1921	13.5 ±1.5	1869	8.0±1.2

* 32 subjects declined to give their age.

† 863 subjects declined to provide information on household income.

TABLE II
Estimated Participation and Injury Rates for the 10 Top Injury-producing Sport/Recreational Activities

Activity	Participation Rate (%)	Estimated Participants	Injury Rate (%)	Estimated Injuries
Ice Hockey	12	287,673	13	37,397
Baseball	14	360,216	9	32,419
Basketball	7	175,105	15	26,266
Soccer	8	192,616	12	23,499
Jogging/Running	7	172,603	11	18,986
Cycling (Rec.)	33	827,997	2	16,560
Volleyball	8	207,625	7	14,326
Tackle Football	2	42,526	25	10,631
Alpine Skiing	11	262,658	3	8,668
Softball	5	120,072	7	7,925

total number of individuals in a specific group and are expressed as the number of injuries per 100 population. Injury rates were extrapolated to the 1995 population projection (2,501,500 aged 6 and older)¹¹ to estimate the overall burden of injury in the Alberta population. Injury rates were also related to participation numbers for selected sports to estimate the number of injuries occurring provincially in these sports.

RESULTS

Subject characteristics

Information was obtained regarding 3,790 individuals (0.2% of the eligible population) aged 6 years and older. The sample was evenly split by gender (males 51%; females 49%). The largest proportion of the sample was between 25 and 44

years of age (40%), 34% were less than 25 years of age, 20% were between 45 and 64 years of age, and 6% were 65 years of age or older. This distribution is close to Statistics Canada's 1995 population projection for Alberta.¹¹ Level of education (for those more than 18 years of age) varied, with 13% of the sample reporting less than a high school education and approximately 30% having attended or completed university.

Sport and recreation injuries

Of the 3,790 individuals surveyed, 322 participants reported injuries that required medical attention. Of this number, 89 reported experiencing more than one injury raising the total number of injuries to 411. This equals an injury rate of 11%, which can be expressed as 11 injuries per 100 people. Based on 1995 provincial pop-

among these activities. More than half of the total estimated injuries were attributed to seven activities: ice hockey, baseball, basketball, soccer, jogging, cycling, and volleyball (Table II). Ice hockey (37,397) and baseball (32,419) produced approximately one fifth of all sport or recreation injuries.

For activities for which at least three injuries were reported, the highest injury rates among survey participants were for boxing (100%), rodeo (63%), rugby (47%), competitive cycling (27%), and tackle football (25%). The small numbers reporting injuries for the first four of these activities limit the accuracy by which they can be estimated in the overall population.

The activities that produced the highest number of estimated injuries in Alberta (i.e., ice hockey, baseball, basketball) displayed a combination of low injury rates and high participation rates. For example, recreational cycling had a very low injury rate (2%), yet resulted in more than 16,000 estimated injuries due to the number of people who participated in this activity (33% participation rate). Of the 10 activities producing the highest number of estimated injuries, only tackle football (25%) had an injury rate exceeding 15% for the participating population.

Bodily location and nature of injury

Participants were asked to identify the bodily location of their most serious injury and of up to three other injuries that they may have experienced in the preceding 12 months (see Figure 1). Half of all injuries were to the lower limbs with the knee (20%) and ankle (14%) accounting for most of these injuries. Almost 25% of injuries were to the upper limbs while the head and face received 10% of the injuries. As for the most serious injury, a similar pattern was observed with the knee experiencing most of the injuries (23%).

The most common types of injuries reported were related to ligament damage (31%) and pulled muscles (19%), while fractures and dislocations accounted for another 20% of the injuries (see Table III). It should be noted that cuts and scratches did not account for a high percentage of the injuries. Although cuts and scratches may be common maladies, to be included in the present results

TABLE III
Types of Injuries Sustained in Sport and Recreational Activities

Type of Injury	Number	Percent*
Sprain/Torn ligament	128	31
Strain/Pulled muscle	77	19
Fracture	55	13
Dislocation	28	7
Bruise/Contusion	22	5
Cut/Laceration	21	5
Tendinitis	19	5
Concussion	11	3
Scratch/Abrasion	5	1
Dehydration	1	0.2
Other	42	10

Note: While 322 individuals reported experiencing at least one injury, 89 of these individuals reported experiencing more than one injury. Therefore, the total number of injuries is 411 with the nature of 2 injuries unidentified.

* Percentages do not total 100 due to rounding.

ulation estimates, it is estimated that 270,108 injuries occurred in the province in the year leading up to the survey. The injury rate varied across age and gender groupings with males experiencing almost twice as many injuries from sport and recreational activities as females (Table I). This is likely due to more males than females participating in high risk activities such as ice hockey or tackle football. For both males and females, the highest rates of injuries occurred in the 15- to 19-year-

old age group, with the rate of injury after 19 years declining across increasing age categories. Rates for sport and recreation injuries tended to increase slightly with household income.

Participation rates, injury rates and estimated number of injuries for the top 10 injury-producing activities are presented in Table II. While injuries were recorded in 60 activities (73% of respondents indicated that they participated in more than one activity), they were not evenly distributed

they would have to have resulted in treatment by a health care professional.

Provincial comparisons

The study allows for comparisons with the results from recent sport and recreation injury studies from Quebec⁸ and Ontario.⁹ Results suggest a higher injury rate in Alberta (11 injuries per 100 persons) than in Ontario (7 injuries per 100 persons) and Quebec (5 injuries per 100 persons).

DISCUSSION

The precision of the information presented here may be subject to some error due to the nature of the survey techniques used. There is likely an underestimation of the injury rates due to memory decay over the one-year recall period.¹² This bias may also lead to an over-representation of more serious injuries that are more likely to be remembered over events of a less serious nature. Further, using a single informant for all family members may be a source of additional error, as they may have a differential recall of the events surrounding the injuries suffered by each family member.¹³ Finally, it is not known if the composition and activity patterns of members of the non-responding households differ systematically from those who responded.

Based upon the data collected from a sample of Albertans, it is estimated that more than 270,000 injuries occur each year in the province from participation in sport and recreational activities. The annual incidence of sport and recreational injuries in Alberta is 11%, a rate that is substantially higher than in either Quebec or Ontario. Although the studies do not provide information regarding the mechanism of injuries, the difference in injury rates may be explained by differential participation in injury-provoking activities. Quebecers are not as active in some more injurious sports such as basketball, baseball

and soccer, and thus may not be experiencing as many injuries as participants in Alberta and Ontario. Additionally, Quebec has been aggressively dealing with sport and recreation injuries for the past 18 years through the activities of the Quebec Sports Safety Board;¹⁴ the lower injury rate in Quebec may be partly due to the success of these efforts at injury control. Albertans may be experiencing proportionally more injuries than Ontarians because they are more active in two injury-provoking activities, ice hockey (males: 21% vs. 14%) and alpine skiing (11% vs. 5%). Given the substantial differences in injury rates between Alberta, Quebec and Ontario, and the high confidence in the estimates, there remains a need to determine what interventions yield the least injury experience in specific activities.

It is estimated that ice hockey and baseball participants sustain the greatest number of injuries each year. More than half of all injuries occur in seven activities (ice hockey, baseball, basketball, soccer, jogging, cycling and volleyball). In general, most of the injuries occur in activities that have large numbers of participants and low injury rates. The survey also identified that boxing, rodeo, rugby, competitive cycling, and football were the activities with the highest injury rates, with the limitation that low numbers participating in the first four of these activities may lead to some error. However, the high rate of injury among survey participants in these activities indicates there may be a need for more detailed research regarding the incidence and nature of injuries suffered.

A population-based description of the nature and incidence of sport and recreational injuries represents a starting point for the reduction of the unwanted side-effects of participation. In combination with participation rates, it allows for estimation of the number of injuries occurring in various activities and highlights the need to

place preventive emphasis on the relatively few activities that contribute to the vast majority of sport and recreation injuries occurring within the province each year.

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