

ORIGINAL ARTICLE

# HOSPITALIZATIONS RESULTING FROM DOG BITE INJURIES – ALASKA, 1991–2002

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## ABSTRACT

**Objectives.** Determining the public health burden from all dog bite injuries is hampered by the lack of comprehensive data sources. Available data in Alaska include the number of hospitalizations following dog bite injuries. While these data are skewed in severity, describing the epidemiology of dog bite injuries that resulted in hospitalization can suggest the overall community burden of these injuries.

**Study design.** Records of dog bite injuries reported to the Alaska Trauma Registry (ATR) were analysed.

**Methods.** Cases were defined as patients with E-code 906.0 in the ATR from 1991–2002 who had been hospitalized for at least 1 day.

**Results.** From 1991–2002, 288 case-patients were hospitalized yielding an average annual rate of 3.9 per 100,000. The rate for Alaska Native people was 9.3 compared with a rate of 2.8 for non-Alaska Native people. The average days hospitalized was 4.6 for Alaska Native people compared with 2.5 for non-Alaska Native people. The highest rates occurred in more rural areas of northern and south-western Alaska.

**Conclusions.** Alaska hospitalization rates from dog bite injuries were higher overall compared with the entire U.S. and suggest that a heavy burden exists from all dog bite injuries in the state. Alaska Native people were disproportionately affected. Further study into the circumstances surrounding the injuries is needed to fully understand the injury disparities and to adapt and implement prevention programs. (*Int J Circumpolar Health* 2007;66(4):320-327)

**Keywords:** Alaska, Alaska Native, dog bite injury, trauma registry, hospitalizations, injury disparities

## INTRODUCTION

Previous surveys in the United States estimated that each year approximately 2% of the population is bitten by a dog and 0.3% seeks medical attention for the resulting injury (1). Quantifying the full public health burden on a community from all dog bite injuries is difficult because of the lack of comprehensive data sources and standardized reporting, although some studies have extrapolated figures from more infrequent events, such as fatalities or hospitalizations (2).

Alaskans keep dogs for pets, for hunting and for mushing – both for work and for sport. Only some Alaska jurisdictions require that dog bites to humans be reported to local animal control agencies; therefore, state-wide statistics of all dog bite injuries are not available. Data that are available include the number of hospitalizations resulting from a dog bite injury. Hospital stays resulting from dog bite injuries that were captured by the Alaska Trauma Registry were analysed for the 12-year period, 1991 through 2002. The aim of the analysis was to describe the epidemiology of these severe injuries, which can suggest the community burden from all dog bite injuries.

## MATERIAL AND METHODS

Since 1991, the Alaska Trauma Registry (ATR) has collected data from all 24 of Alaska's acute care hospitals (3). Inclusion criteria are persons admitted to an Alaska hospital, those held for observation, transferred to another acute care hospital or declared dead in the emergency department (ED), and for whom hospital contact occurred within 30 days of the injury.

Beyond basic demographic information, data fields include date of injury, hospital costs, days hospitalized and an open-ended narrative section. In this review, case-patients were defined as persons captured by the ATR by E-code 906.0 who had been hospitalized for at least 1 day. E-codes are part of the International Classification of Diseases system and are used to describe the external causes of injuries or poisonings and their adverse effects.

### Statistical analyses

Data analysis was performed using Stata version 8.0 software (StataCorp, College Station, Texas). Two-sided t-tests were used to evaluate differences in mean values and chi-square tests to evaluate differences in proportions. A p-value <0.05 was considered significant.

## RESULTS

For the 12-year period, 1991–2002, 288 case-patients recorded by the ATR were hospitalized for at least 1 day for a dog bite injury.

### Persons injured

The average annual rate of hospitalization following a dog bite injury in Alaska was 3.9 people per 100,000. Almost 60% of case-patients were male (163 of 288), not significantly different from the overall Alaska population. However, by race, sex distribution approached statistical significance: males comprised 63.2% of all injuries resulting in hospitalization for Alaska Natives compared with 51.8% for non-Natives ( $\chi^2=3.56$ ,  $p<0.059$ ). For those whose race was specified, 59.6% (168 of 282) were non-Native and 40.4% (114 of 282) were Alaska Native, significantly disproportionate to the

overall Alaska population of approximately 20% Alaska Natives ( $\chi^2=114, p<0.0001$ ).

Average annual hospitalization rates calculated by age group ranged from 1.3 to 15.2 people per 100,000 (Table I). Rates for Alaska Natives were more than three times higher than those for non-Natives at 9.3 and 2.8 per 100,000, respectively. Over 50% of all injuries that resulted in hospitalization occurred to case-patients less than 9 years old. The mean age was 19.9 years, median was 9 and range was <1 to 96. Alaska Natives were significantly younger than non-Natives with mean ages of 12.2 years (95% CI 9.3, 15.2) and 25.2 years (95% CI 21.6, 28.9), respectively ( $p<0.001$ ).

**Injury details**

About 40% of injuries requiring hospitalization occurred to each the head and the neck (123 of 288) and to the upper extremity (115 of 288). The mean number of days hospitalized was 3.4, median was 2 and range was 1 to 28. Mean days hospitalized varied significantly

by race with Alaska Native people averaging 4.6 days (95% CI 3.7, 5.5) and non-Native people averaging 2.5 days (95% CI 2.2, 2.9) ( $p<0.0001$ ). There was no significant difference in days hospitalized when Anchorage case-patients were compared with the rest of the state. Hospital charges were recorded for only 125 (43%) of case-patients, with a mean cost of \$2,591, median \$6,801 and range of \$43 to \$47,356. Cost data were not recorded for facilities serving primarily federal beneficiaries.

**Injury scenario**

The highest number of injuries requiring hospitalization occurred in the urban Anchorage/Matanuska-Sustina Valley region. The highest rates were in northern and south-western Alaska (Table II). The rates for Anchorage residents were lower compared with the rest of the state at 2.5 and 4.8 per 100,000, respectively; this was also true when stratified by race (Table III).

**Table I.** Average annual rates of dog bite injuries requiring hospitalization by age and by race – Alaska, 1991–2002.

Age group in years	Number of hospitalizations (% of total)	Average annual rate per 100,000 <sup>a</sup>	Average annual rate (#) per 100,000 <sup>a</sup> – Alaska Native people	Average annual rate (#) per 100,000 <sup>a</sup> – Non-Native people
0–4	95 (33.0)	15.2	34.7 (49)	9.3 (45)
5–9	60 (20.8)	8.7	20.1 (32)	5.3 (28)
10–14	23 (8.0)	3.5	4.3 (6)	2.7 (14)
15–19	8 (2.8)	1.5	3.6 (4)	0.7 (3)
20–29	17 (5.9)	1.9	1.8 (3)	1.9 (14)
30–39	29 (10.0)	2.2	7.0 (13)	1.3 (15)
40–49	17 (5.9)	1.3	2.1 (3)	1.2 (14)
50–59	18 (6.3)	2.6	2.5 (2)	2.6 (16)
60+	21 (7.3)	3.7	2.2 (2)	4.1 (19)
Total	288	3.9	9.3 (114 <sup>b</sup> )	2.8 (168 <sup>b</sup> )

<sup>a</sup>Based on July 1, 1997 population distribution (11).

<sup>b</sup>Race missing for some records; therefore, total does not sum to 288.

**Table II.** Region of occurrence for dog bite injuries requiring hospitalization – Alaska, 1991–2002.

Region of injury occurrence <sup>a</sup>	Number of injuries (% of total)	Alaska population in region <sup>b</sup> (% of total)	Average annual rate per 100,000 <sup>b</sup>
Anchorage / Mat-Su	115 (39.9)	306,877 (50.3)	3.1
Gulf Coast	25 (8.7)	71,700 (11.8)	2.9
Interior	53 (18.4)	95,567 (15.7)	4.6
Northern	26 (9.0)	23,082 (3.8)	9.4
South-east	17 (5.9)	73,830 (12.1)	1.9
South-west	47 (16.3)	37,599 (6.2)	10.4
Non-specific location given	2 (0.7)	–	–
Unknown	2 (0.7)	–	–
Out of state	1 (0.3)	–	–
Total	288	609,655	3.9

<sup>a</sup>Data presented by the 6 labour market categories (11).

<sup>b</sup>Based on July 1, 1997 population distribution (11).

**Table III.** Rate of dog bite injuries requiring hospitalization by location and race – Alaska 1991–2002.

	Number of injuries <sup>a</sup>	Rate per 100,000 <sup>b</sup>
Alaska Native people	114	9.3
Non-Native people	168	2.8
Anchorage	77	2.5
Outside Anchorage	206	4.8
Anchorage		
• Alaska Native people	19	7.5
• Non-Native people	57	2.0
Outside Anchorage		
• Alaska Native people	93	9.3
• Non-Native people	108	3.2

<sup>a</sup>Race and location missing for some records; therefore totals may not always sum to 288.

<sup>b</sup>Based on July 1, 1997 population distribution (11).

For place of injury, “home” was listed for almost 60% (130 of 221) of records with these data. Month of injury did not vary significantly. Time of injury was recorded for 188 (65.3%) records. The interval from time of injury to ED visit could be calculated for 155 (53.8%) records. The mean time was 17.6 hours, median of 1.9 and range of 5 minutes to 27 days plus 1 hour. The mean time did not

vary significantly when considered by race or by location (Anchorage versus the rest of the state). Eighteen different dog breeds or types were specified in the narrative section of a total of 73 reports. Other anecdotal information described persons being bitten who approached dogs that had recently had puppies, were inside a vehicle, were eating or were chained in/confined to a small space.

## DISCUSSION

This study demonstrated that the rates of Alaskans hospitalized for dog bite injuries were greater than those calculated for other populations. Although ATR data were limited in scope, high hospitalization rates suggest that dog bites in general are placing a heavy public health burden on Alaskan communities. The highest rate in Alaska was for the 0 to 4 year-olds at 15.2 per 100,000 compared with a national estimate of 5.0 per 100,000 (4). Alaska rates were also higher than those reported for this age-group by individual states – Missouri at 9.4 (5) and California at 5.5 (6). Although not as large, rate differences were also present when other age groups were compared. The reasons for these differences were not entirely clear; there may be differences in the training, use and maintenance of dogs or differences in the level of people's (i.e., children's) access to or ownership of dogs in Alaska.

Aside from rates, several features of the injuries requiring hospitalization in Alaska were similar to those previously reported in both the United States and Europe where injuries occurred predominately to younger children and to the head and neck (7,8). This is not surprising given the smaller stature of children and the observations by animal behaviour experts that young children, when excited, may suddenly shift posture or vocal range – actions that could cause animals to become agitated (9).

Another similar feature was that most bites in Alaska reportedly occurred in a "home" setting. "Home" might have been indoors or outdoors, which could have

important implications for prevention messages. Although there was no significant variation in month of injury, that information may be more relevant when considered in addition to factors such as where the dog was kept. Regardless, the conclusion is the same as previous studies: most case-patients were bitten by known dogs and not "strays" (10).

Also consistent with past studies was, that the ATR data did not reveal a tendency for injuries to be related to a specific dog breed (10), although only limited anecdotal information on the breed was available in the narrative section. For prevention purposes, breed data are not as useful as details about the incidents or behaviour at the time of the bite. For example, dogs that have recently given birth and are surrounded by their puppies generally should not be approached. Those recommendations and others concerning human behaviour and responsible dog ownership should be the focus of dog bite prevention programs because they apply to any breed of dog and any human–dog encounter.

Rates of hospitalization were three times greater for Alaska Natives compared with non-Natives; both rates were still higher than national rates. Alaska Natives make up approximately 20% of the total Alaska population and yet accounted for just over 40% of injuries. The mean age of the injured person also varied by race. Alaska Natives were significantly younger than non-Natives; however, some of that difference may be because the median age for the Alaska Native population is generally several years lower than that of the non-Alaska Native population (11).

Within the State of Alaska, injury rates differed by region. The highest rates of injuries occurred in the more rural northern and the south-western regions of the state. It is unknown whether regional rate differences were related to differences in dog ownership, use or handling practices, or other factors that differ between regions, including race distribution, or presence of a borough-wide animal control infrastructure. As a rough measure of rural status, some data were analysed as occurring in Anchorage (Alaska's largest urban centre with approximately 40% of the total population) versus occurring in the rest of the state. Rates were higher outside of Anchorage overall; however, that difference when stratified by race was somewhat blunted. These data suggest that risk for dog bite injuries resulting in hospitalization are influenced by both race and geography.

The length of hospitalization could be considered a proxy for injury severity based on the assumption that those with more severe injuries were hospitalized for greater time periods. The mean days hospitalized did not vary significantly based on residence in Anchorage, suggesting that severe injuries occur statewide. Alaska Native people did have significantly longer average hospital stays compared with non-Native people; however, it is unclear whether this may be a result of having more injuries in the younger age-groups or other factors not explored, such as distribution of anatomic location of injury by race. Dog bite injuries can be very heterogeneous and without a more objective method for assessing severity, data should be interpreted cautiously.

There were multiple limitations to this analysis. Some data fields of the ATR were incomplete, such as time of injury and cost data. For example, no significant difference was noted in mean time elapsed from injury occurrence to ED visit either by race or by residence in Anchorage. Whether this represents an accurate assessment of access to care or is simply a function of missing data is unknown. The focus of the ATR is to capture severe trauma; therefore, the features of these injuries probably do not accurately reflect features of dog bite fatalities or minor injuries for which hospitalization was not necessary. Because the numbers of persons hospitalized each year averaged about 25, the ability to stratify data on several features or assess trends over time was limited. Data were not analysed for procedures or other details (e.g., assessment of exposure to rabies) that may have occurred during hospitalization.

ATR data are useful for showing that severe injuries exact a large public health burden on a community and can describe some of the demographic features of those injuries. However, except for anecdotal information in the narrative, the real value in summarizing dog bite data in general is to point to issues that could inform prevention programs. ATR provides the who, where, and when, but the why of these injuries is largely uncharacterized. The narrative portion of the record provides some anecdotal information that suggests more qualitative research would be helpful in adapting prevention programs. For example, it would be instructive to know whether a case-patient had experienced a prior bite or ever received education about how to behave around an animal. Depending on the answers to these

questions, a dog bite prevention program might need to be tailored to effectively reach different audiences.

In the late 1990s, a local dog bite prevention program was developed in south-western Alaska that consisted of educating school children and dog owners who had teams of dogs on their property (12). In the following 6 years, the number of all reports of bites declined; however, whether that was the direct result of the intervention is unknown. A prevention program in Australia that similarly targeted school children also demonstrated behavioural change after specialized training (13). These strategies and others are part of a more comprehensive guide to dog bite prevention programs published by the American Veterinary Medical Association (14).

Although most hospitalizations occurred in more urban regions of Alaska, the rural areas experienced the highest rates. This is likely comparable to other rural Arctic regions where dog bite injuries are a well-known although incompletely characterized public health burden. For example, dog bite injuries are monitored by wildlife and health agencies in the Northwest Territories as part of rabies surveillance; however, statistics on the health outcomes of such exposures are not available (15). Strategies developed in any of these rural Arctic areas may be helpful to other nations with similar environmental conditions.

Regardless of strategies implemented, both the continued examination of the local

epidemiology of all dog bite injuries and the continued engagement of community stakeholders are necessary to determine the best prevention programs for the area to reduce the burden of dog bite injuries.

### Conclusions

While the Alaska data reflect unique conditions present in one state, elements of the analysis are instructive for the larger injury prevention community. Beyond the similarities to other studies, the Alaska data demonstrate that dog bite injuries are placing a burden on many Alaskan communities and that substantial disparities exist by race and geography (i.e., rural versus urban) such that dog bite injury prevention programs may need to be adjusted accordingly.

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