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# Nonfatal Dog Bite–Related Injuries Treated in Hospital Emergency Departments — United States, 2001

In 1994, the most recent year for which published data are available, an estimated 4.7 million dog bites occurred in the United States, and approximately 799,700 persons required medical care (*1*). Of an estimated 333,700 patients treated for dog bites in emergency departments (EDs) in 1994 (*2*), approximately 6,000 (1.8%) were hospitalized (*3*). To estimate the number of nonfatal dog bite–related injuries treated in U.S. hospital EDs, CDC analyzed data from the National Electronic Injury Surveillance System-All Injury Program (NEISS-AIP). This report summarizes the results of the analysis, which indicate that in 2001, an estimated 368,245 persons were treated in U.S. hospital EDs for nonfatal dog bite–related injuries. Injury rates were highest among children aged 5–9 years. To reduce the number of dog bite–related injuries, adults and children should be educated about bite prevention, and persons with canine pets should practice responsible pet ownership (Box).

NEISS-AIP is operated by the U.S. Consumer Product Safety Commission and collects data about initial visits for all types and causes of injuries treated in U.S. EDs (*4*). NEISS-AIP data are drawn from a nationally representative subsample of 66 out of 100 NEISS hospitals, which were selected as a stratified probability sample of hospitals with a minimum of six beds and a 24-hour ED in the United States and its territories. NEISS-AIP provides data on approximately 500,000 injury- and consumer product–related ED cases each year.

The analysis included every nonfatal injury treated in a NEISS-AIP hospital ED in 2001 for which "dog bite" was listed as the external cause of injury. Because deaths are not captured completely by NEISS-AIP, patients who were dead on arrival or died in EDs were excluded. Each case was assigned a sample weight based on the inverse probability of selection; these weights were added to provide national estimates of dog bite–related injuries. Estimates were based on weighted data for 6,106 patients with dog bite–related injuries treated at NEISS-AIP hospital EDs during 2001. Confidence intervals (CIs) were calculated by using a direct variance estimation procedure that accounted for the sample weights and complex sample design. Rates were calculated by using U.S. Census Bureau population estimates for 2001 (*5*).

In 2001, an estimated 368,245 persons were treated for dog bite–related injuries (rate: 129.3 per 100,000 population) (Table). The injury rate was highest for children aged 5–9 years and decreased with increasing age. Approximately 154,625 (42.0%) dog bites occurred among children aged ≤14 years; the rate was significantly higher for boys (293.2 per 100,000 population) than for girls (216.7) ($p = 0.037$) (Figure 1). For persons aged ≥15 years, the difference between the rate for males (102.9) and females (88.0) was not statistically significant. The number of cases increased slightly during April–September, with a peak in July (11.1%). For injured persons of all ages, approximately 16,526 (4.5%) dog bite injuries were work-related (e.g., occurred to persons who were delivering mail, packages, or food; working at an animal clinic or shelter; or doing home repair work or installations). For

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**BOX. Measures for preventing dog bites**

- Consult with a professional (e.g., veterinarian, animal behaviorist, or responsible breeder) before choosing a dog to determine suitable breeds on the basis of the owner's lifestyle and physical environment.
- Exclude dogs with histories of aggression from households with children.
- Be sensitive to cues that a child is fearful or apprehensive about a dog and, if so, delay acquiring a dog.
- Spend time with a dog before buying or adopting it.
- Use caution when bringing a dog or puppy into the home of an infant or toddler.
- Spay/neuter virtually all dogs (this frequently reduces aggressive tendencies).
- Never leave infants or young children alone with any dog.
- Properly socialize and train any dog entering the household. Teach the dog submissive behaviors (e.g., rolling over to expose abdomen and relinquishing food without growling).
- Seek professional advice (e.g., from veterinarians, animal behaviorists, or responsible breeders) immediately if the dog develops aggressive or undesirable behaviors.
- Do not play aggressive games (e.g., wrestling) with a dog.
- Teach children basic safety around dogs and review regularly:
  - — Never approach an unfamiliar dog.
  - — Never run from a dog or scream.
  - — Remain motionless when approached by an unfamiliar dog (e.g., "be still like a tree").
  - — If knocked over by a dog, roll into a ball and lie still (e.g., "be still like a log").
  - — Never play with a dog unless supervised by an adult.
  - — Report stray dogs or dogs displaying unusual behavior to an adult immediately .
  - — Avoid direct eye contact with a dog.
  - — Do not disturb a dog who is sleeping, eating, or caring for puppies.
  - — Do not pet a dog without allowing it to see and sniff you first.
  - — If bitten, report the bite to an adult immediately.

persons aged ≥16 years, approximately 16,476 (7.9%) dog bite injuries were work-related.

Injuries occurred most commonly to the arm/hand (45.3%), leg/foot (25.8%), and head/neck (22.8%). The majority (64.9%) of injuries among children aged ≤4 years were to the head/neck region; this percentage decreased significantly with age ($p<0.01$) (Figure 2). Injuries to the extremities increased with age ($p<0.01$) and accounted for 86.2% of injuries treated

**TABLE. Number, percentage, and rate* of nonfatal dog bite–related injuries treated in U.S. hospital emergency departments, by selected characteristics — National Electronic Injury Surveillance System-All Injury Program, United States, 2001**

| Characteristic | No.† | (%) | Rate | (95% CI§) |
|---|---|---|---|---|
| **Age group (yrs)** | | | | |
| 0–4 | 49,153 | (13.3) | 253.8 | (218.9–288.7) |
| 5–9 | 56,146 | (15.2) | 278.2 | (234.8–321.6) |
| 10–14 | 49,326 | (13.4) | 236.2 | (203.1–269.4) |
| 15–19 | 27,820 | (7.6) | 137.3 | (108.6–166.0) |
| 20–24 | 26,181 | (7.1) | 133.0 | (105.9–160.2) |
| 25–34 | 45,133 | (12.3) | 114.0 | (99.2–128.7) |
| 35–44 | 46,658 | (12.7) | 103.6 | (89.1–118.2) |
| 45–54 | 32,613 | (8.9) | 83.2 | (72.4–94.0) |
| 55–64 | 16,185 | (4.4) | 64.0 | (49.5–78.4) |
| ≥65 | 19,005 | (5.2) | 53.9 | (45.5–62.2) |
| Unknown | 25¶ | | — | — |
| **Sex** | | | | |
| Male | 202,735 | (55.1) | 145.0 | (126.5–163.5) |
| Female | 165,510 | (44.9) | 114.2 | (103.8–124.5) |
| **Treatment month** | | | | |
| January | 21,994 | (6.0) | 7.7 | (5.7–9.7) |
| February | 24,945 | (6.8) | 8.8 | (6.4–11.1) |
| March | 27,511 | (7.5) | 9.7 | (7.3–12.1) |
| April | 36,108 | (9.8) | 12.7 | (10.1–15.3) |
| May | 34,284 | (9.3) | 12.0 | (9.8–14.2) |
| June | 34,742 | (9.4) | 12.2 | (11.3–13.1) |
| July | 40,828 | (11.1) | 14.3 | (11.3–17.4) |
| August | 34,716 | (9.4) | 12.2 | (10.9–13.5) |
| September | 32,983 | (9.0) | 11.6 | (9.6–13.6) |
| October | 27,372 | (7.4) | 9.6 | (7.3–11.9) |
| November | 25,011 | (6.8) | 8.8 | (7.2–10.4) |
| December | 27,749 | (7.5) | 9.7 | (7.9–11.6) |
| **Work-related** | | | | |
| Yes | 16,526 | (4.5) | 5.8 | (4.1–7.5) |
| No | 350,554 | (95.2) | 123.1 | (109.9–136.3) |
| Unknown | 1,165¶ | (0.3) | — | — |
| **Body part injured** | | | | |
| Head/Neck | 83,946 | (22.8) | 29.5 | (26.0–32.9) |
| *Face* | *55,867* | *(15.2)* | *19.6* | *(17.0–22.2)* |
| *Mouth* | *17,029* | *(4.6)* | *6.0* | *(5.2–6.8)* |
| *Ear* | *5,475* | *(1.5)* | *1.9* | *(1.4–2.5)* |
| *Head* | *3,669* | *(1.0)* | *1.3* | *(0.8–1.8)* |
| *Other (neck/eyeball)* | *1,906* | *(0.5)* | *0.7* | *(0.3–1.0)* |
| Upper trunk (includes shoulder) | 5036 | (1.4) | 1.8 | (1.2–2.3) |
| Lower trunk | 14,432 | (3.9) | 5.1 | (3.8–6.4) |
| Arm/Hand | 166,756 | (45.3) | 58.6 | (54.2–62.9) |
| *Hand* | *66,969* | *(18.2)* | *23.5* | *(20.6–26.4)* |
| *Lower arm* | *45,482* | *(12.4)* | *16.0* | *(14.7–17.3)* |
| *Finger* | *34,787* | *(9.4)* | *12.2* | *(10.3–14.1)* |
| *Upper arm* | *8,645* | *(2.3)* | *3.0* | *(2.3–3.7)* |
| *Wrist* | *8,029* | *(2.2)* | *2.8* | *(2.2–3.4)* |
| *Elbow* | *2,843* | *(0.8)* | *1.0* | *(0.7–1.3)* |
| Leg/Foot | 94,848 | (25.8) | 33.3 | (26.2–40.4) |
| *Lower leg* | *54,388* | *(14.8)* | *19.1* | *(14.3–23.9)* |
| *Upper leg* | *25,379* | *(6.9)* | *8.9* | *(7.3–10.5)* |
| *Knee* | *5,317* | *(1.4)* | *1.9* | *(1.3–2.5)* |
| *Foot/Toe* | *5,063* | *(1.4)* | *1.8* | *(0.9–2.6)* |
| *Ankle* | *4,700* | *(1.3)* | *1.7* | *(1.1–2.2)* |
| Other | 2,328¶ | (0.6) | — | — |
| Unknown | 899¶ | (0.2) | — | — |
| **Diagnosis** | | | | |
| Contusion/Abrasion/Hematoma | 22016 | (6.0) | 7.7 | (5.7–9.7) |
| Laceration | 90,926 | (24.7) | 31.9 | (27.3–36.5) |
| Puncture | 148,180 | (40.2) | 52.0 | (34.1–70.0) |
| Fracture/Dislocation | 1,386 | (0.4) | 0.5 | (0.2–0.8) |
| Amputation/Avulsion/Crush | 2,854 | (0.8) | 1.0 | (0.7–1.4) |
| Cellulitis/Infection | 5,559 | (1.5) | 2.0 | (1.0–2.9) |
| Unspecified dog bite/Other | 97,324 | (26.4) | 34.2 | (20.4–48.0) |
| **Disposition** | | | | |
| Treated and released | 361,692 | (98.2) | 127.0 | (113.3–140.7) |
| Hospitalized/Observed/Transferred | 5,921 | (1.6) | 2.1 | (1.6–2.6) |
| Unknown | 631¶ | (0.2) | — | — |
| **Total** | **368,245** | **(100.0)** | **129.3** | **(115.9–142.7)** |

* Per 100,000 population.
† Numbers might not sum to total because of rounding.
§ Confidence interval.
¶ Estimate might be unstable because the coefficient of variation is >30%.

in EDs for persons aged ≥15 years. Injury diagnoses were described frequently as "dog bite" (26.4%); other diagnoses included puncture (40.2%), laceration (24.7%), contusion/abrasion/hematoma (6.0%), cellulitis/infection (1.5%), amputation/avulsion/crush (0.8%), and fracture/dislocation (0.4%). Overall, 98.2% of patients were treated and released from the ED.

Narrative comments in the medical records note common circumstances in which children and adults incurred dog bite–related injuries. Examples among children included a girl aged 18 months who was attacked by the family dog in the backyard and sustained an open depressed skull fracture, mandible fractures, and avulsion of an ear and part of a cheek; a boy aged 4 years who was bitten on the lip by a dog that was guarding her pups; and a girl aged 3 years who was bitten on the face when trying to take food away from the family dog. Examples among adults included a man aged 34 years who sustained an avulsion laceration to his left thumb while trying to break up a fight between his dogs; a woman aged 27 years who sustained multiple puncture wounds to her forearm, thumb, and chest while trying to help her dog, which had been hit by a car; and a woman aged 75 years who was bitten while she was trying to prevent her dog from attacking an Emergency Medical Technician who was attempting to transport her from home by ambulance.

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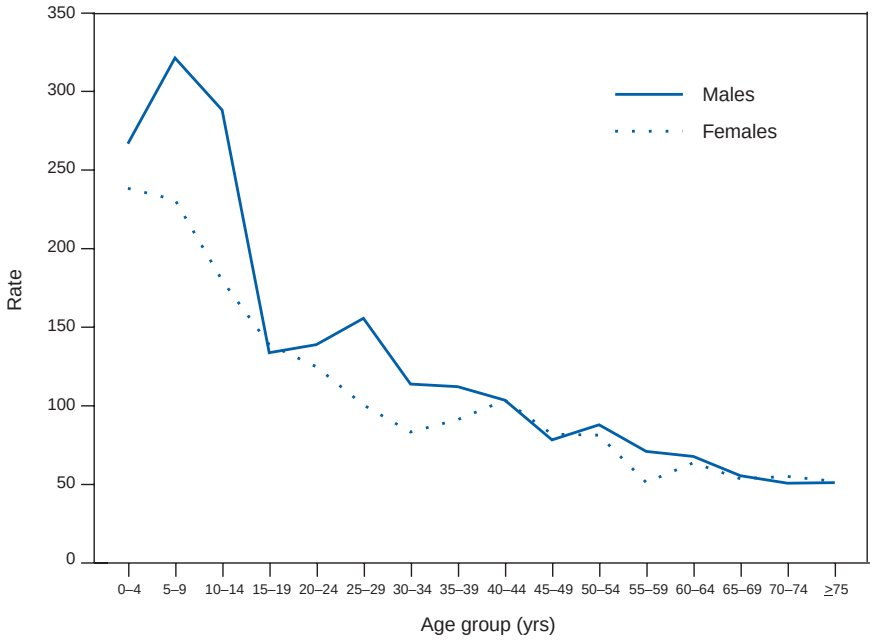
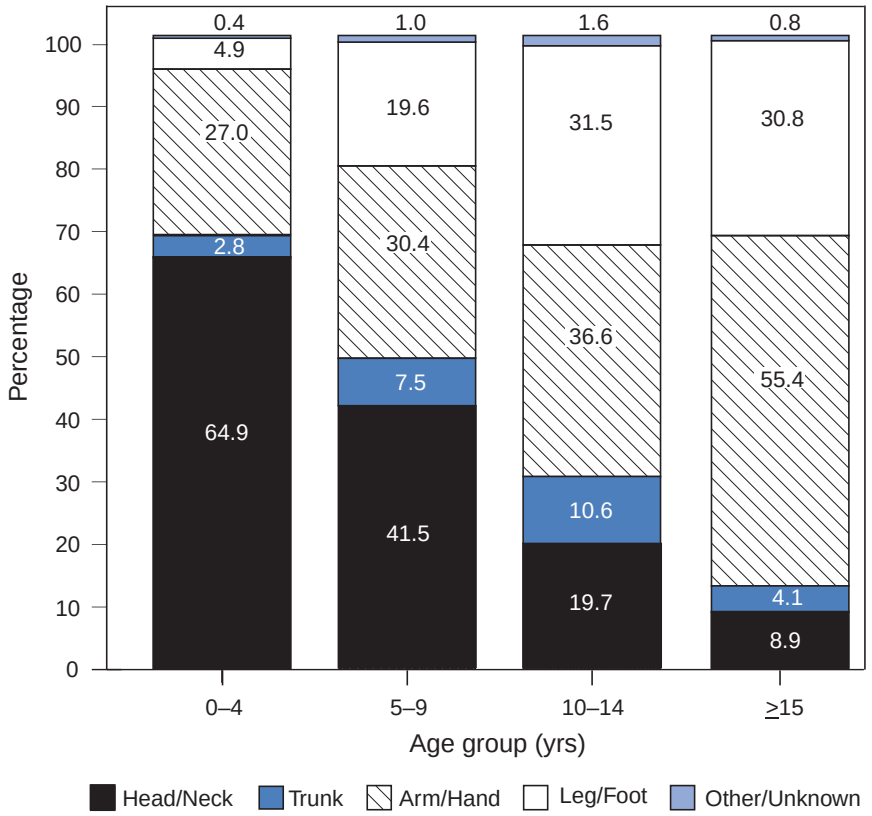
**Editorial Note:** In 2001, an estimated 68 million canines were kept as pets in the United States (*6*). This report is the first that uses data from an ongoing surveillance system to provide national estimates of the number of dog bite–related injuries treated in EDs. In 2001, an estimated 368,245 persons were treated for dog bites in EDs; this finding is consistent with a previous estimate of 334,000 persons treated annually for dog bites in EDs during 1992–1994 (*2*). Of the estimated 368,245 persons treated for dog bites in EDs, an estimated 154,625 (42%) were aged ≤14 years. Higher rates of dog

**FIGURE 1. Rate* of nonfatal dog bite–related injuries treated in U.S. hospital emergency departments, by sex and age group — National Electronic Injury Surveillance System-All Injury Program, United States, 2001**




* Per 100,000 population.

**FIGURE 2. Percentage of nonfatal dog bite–related injuries treated in U.S. hospital emergency departments, by primary body part affected and age group — National Electronic Injury Surveillance System-All Injury Program, United States, 2001**




bites for children aged ≤14 years also are consistent with previous reports (*1,7*). Narrative comments from medical records describing dog bite events underscore the importance of prevention messages.

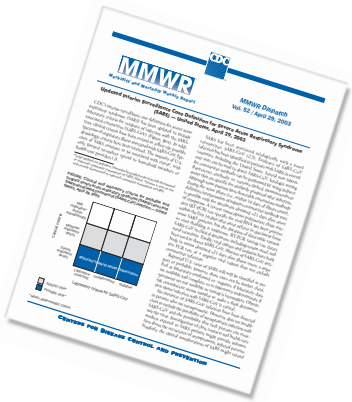
Because children have higher rates of dog bites, prevention programs often are targeted to this group. Although boys aged ≤14 years have higher rates than girls the same age, all children need to be taught how to respond to dogs. A randomized controlled trial of a school-based intervention in Australia that taught children how to behave around and interact with dogs documented a substantial decrease in children's approach to and interaction with a strange dog (*8*). CDC is funding an evaluation of a similar school-based education program in Georgia aimed at increasing children's understanding of how to behave around and interact with dogs.

In addition to educating children properly, prevention efforts should encourage responsible dog ownership, including training, socializing, and neutering family pets. Previous research has indicated that the majority (80%) of dog bites incurred by persons aged ≤18 years are inflicted by a family dog (30%) or a neighbor's dog (50%) (*9*). During 1997–1998, a total of 75% of fatal dog bites were inflicted on family members or guests on the family's property (*10*). In 2001, an estimated 16,476 (8%) dog bites to persons aged ≥16 years were work-related, including some that occurred while persons were visiting homes as part of their work activities.

Additional strategies to encourage responsible pet ownership and reduce dog bites include regulatory measures (e.g., licensing, neutering, and registration programs and programs to control unrestrained animals) and legislation (*7*). "Dangerous" dog laws focus on dogs of any breed that have exhibited harmful behavior (e.g., unprovoked attacks on persons or animals) and place primary responsibility for a dog's behavior on the owner. Because a dog's tendency to bite depends on other factors in addition to genetics (e.g., medical and behavioral health, early experience, socialization and training, and victim behavior), such laws might be more effective than breed-specific legislation (*7*). These prevention strategies require further evaluation.

up-to-the-minute: *adj*

1 : extending up to the immediate present, including the very latest information; see also *MMWR*.

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The findings in this report are subject to at least five limitations. First, only nonfatal injuries treated in hospital EDs were included, and injuries treated in health-care facilities outside of an ED (e.g., a physician's office or an urgent care center) or those for which no care was received were not included. Previous estimates indicate that 17% of dog bite–related injuries are treated in medical facilities, of which 38% are seen in hospital EDs (*1*). Second, injury diagnoses were not specified for 26% of cases. Third, limited data are available on the circumstances of the event or the dog involved. Fourth, NEISS-AIP is designed to provide national estimates and does not provide state or local estimates. Finally, although the extent of human exposure to dogs might vary by age, sex, season, or other factors, these data are not available; as a result, the analysis did not account for exposure.

Prevention programs should educate both children and adults about bite prevention and responsible pet ownership. Additional information about preventing dog bites is available at http://www.cdc.gov/ncipc/duip/dogbites.htm.

### Acknowledgments

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### References

1. Sacks JJ, Kresnow M, Houston B. Dog bites: how big a problem? Inj Prev 1996;2:52–4.
2. Weiss HB, Friedman DI, Coben JH. Incidence of dog bite injuries treated in emergency departments. JAMA 1998;279:51–3.
3. Quinlan KP, Sacks JJ. Hospitalizations for dog bite injuries [Letter]. JAMA 1999;281:232–3.
4. CDC. National estimates of nonfatal injuries treated in hospital emergency departments—United States, 2000. MMWR 2001;50:340–6.
5. National Center for Health Statistics. U.S. Census population with bridged race categories. Available at http://www.cdc.gov/nchs/about/major/dvs/popbridge/popbridge.htm.
6. American Pet Products Manufacturers Association. 2001/2002 APPMA National Pet Owners Survey. Greenwich, Connecticut: American Pet Products Manufacturers Association, 2001.
7. American Veterinary Medical Association Task Force on Canine Aggression and Human-Canine Interactions. A community approach to dog bite prevention. J Am Vet Med Assoc 2001;218:1732–49.
8. Chapman S, Cornwall J, Righetti J, Sung L. Preventing dog bites in children: randomised controlled trial of an educational intervention. BMJ 2000;320:1512–3.
9. Beck AM, Jones BA. Unreported dog bites in children. Public Health Rep 1985;100:315–21.
10. Sacks JJ, Sinclair L, Gilchrist J, Golab GC, Lockwood R. Breeds of dogs involved in fatal human attacks in the United States between 1979 and 1998. J Am Vet Med Assoc 2000;217:836–40.

# Heat-Related Deaths — Chicago, Illinois, 1996–2001, and United States, 1979–1999

Heat waves (i.e., ≥3 consecutive days of air temperatures ≥90° F [≥32.2° C]) are meteorologic events that contribute significantly to heat-related deaths. Exposure to excessive heat can cause illness, injury, and death. This report describes four cases of heat-related deaths*, as reported by the Office of the Medical Examiner, Cook County, Chicago, that occurred during 1996–2001; summarizes total heat-related deaths in Chicago during 1996–2001; and compares the number of heat-related deaths during the 1995 and 1999 Chicago heat waves. This report also summarizes trends in the United States during 1979–1999, describes risk factors associated with heat-related deaths and symptoms, and outlines preventive measures for heat-related illness, injury, and death. Persons at risk for heat-related death should reduce strenuous outdoor activities, drink water or nonalcoholic beverages frequently, and seek air conditioning.

## Case Reports

**Case 1.** In June 1997, a woman aged 86 years with no known medical history was found unresponsive in her bedroom. Her grandson reported that the woman had kept the bedroom windows closed for a week and that the room was very hot. The room had no fan. Paramedics transported the woman to the hospital, where a rectal temperature of 108° F (42.2° C) was recorded. She was pronounced dead in the emergency department. An autopsy revealed moderate coronary atherosclerosis. Heat stroke was listed as the cause of death, with arteriosclerotic cardiovascular disease as a significant contributing condition.

**Case 2.** In July 1999, a woman aged 73 years whose medical history was unknown was found unresponsive behind a building. She had been seen earlier in the day drinking alcohol. Paramedics transported her to the hospital, where she was pronounced dead on arrival.

Her rectal temperature was registered as 108° F (42.2° C). An autopsy revealed a blood alcohol level of 117 mg/dL (legal blood alcohol limit in Illinois is 80 mg/dL) and a vitreous alcohol level of 157 mg/dL. The cause of death was listed as heat stroke.

* Defined as one in which exposure to high ambient temperatures either caused the death or contributed to it substantially, body temperature at the time of collapse was ≥105° F (≥40.6° C), the decedent had a history of exposure to high ambient temperature, and other causes of hyperthermia could reasonably be excluded (*1*). Because rates of death from other causes (e.g., cardiovascular and respiratory disease) increase during heat waves (*2,3*), deaths classified as caused by hyperthermia represent only a portion of heat-related mortality.