

Below, please find a copy of the article “Breeds of dogs involved in fatal human attacks in the United States between 1979 and 1998”, published in the September 15, 2000 issue of the *Journal of the American Veterinary Medical Association*.

In your review, please be cognizant of the following:

- This study was NOT conducted by the American Veterinary Medical Association, but by individual investigators from the Centers for Disease Control and Prevention, the Humane Society of the United States, and the American Veterinary Medical Association. The report underwent the standard review process required for publication of scientific reports published in the *Journal of the AVMA*.
- In contrast to what has been reported in the news media, the data from this study **CANNOT be used to infer any breed-specific risk** for dog bite fatalities (e.g., neither pit bull-type dogs nor Rottweilers can be said to be more “dangerous” than any other breed based on this study). To obtain such risk information it would be necessary to know the numbers of each breed currently residing in the United States. Such information is not available.
- Data from this study indicate that the number of dogs of a given breed associated with fatal human attacks varies over time, further suggesting that such data should not be used to support the inherent “dangerousness” of any particular breed.

More than 25 breeds have been involved in fatal human attacks over the 20-year period summarized in this study.

- Fatal attacks represent a small proportion of dog bite injuries to humans and, therefore, should not be the primary factor driving public policy concerning dangerous dogs.
- Strategies that can be used in an effort to prevent dog bites include enforcement of generic, non-breed-specific dangerous dog laws, with an emphasis on chronically irresponsible owners; enforcement of animal control ordinances such as leash laws; prohibition of dog fighting; encouraging neutering; and school-based and adult education programs that teach pet selection strategies, pet care and responsibility, and bite prevention.

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## Special Report

# Breeds of dogs involved in fatal human attacks in the United States between 1979 and 1998

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**Objective**—To summarize breeds of dogs involved in fatal human attacks during a 20-year period and to assess policy implications.

**Animals**—Dogs for which breed was reported involved in attacks on humans between 1979 and 1998 that resulted in human dog bite-related fatalities (DBRF).

**Procedure**—Data for human DBRF identified previously for the period of 1979 through 1996 were combined with human DBRF newly identified for 1997 and 1998. Human DBRF were identified by searching news accounts and by use of The Humane Society of the United States' registry databank.

**Results**—During 1997 and 1998, at least 27 people died of dog bite attacks (18 in 1997 and 9 in 1998). At least 25 breeds of dogs have been involved in 238 human DBRF during the past 20 years. Pit bull-type dogs and Rottweilers were involved in more than half of these deaths. Of 227 reports with relevant data, 55 (24%) human deaths involved unrestrained dogs off their owners' property, 133 (58%) involved unrestrained dogs on their owners' property, 38 (17%) involved restrained dogs on their owners' property, and 1 (< 1%) involved a restrained dog off its owner's property.

**Conclusions**—Although fatal attacks on humans appear to be a breed-specific problem (pit bull-type dogs and Rottweilers), other breeds may bite and cause fatalities at higher rates. Because of difficulties inherent in determining a dog's breed with certainty, enforcement of breed-specific ordinances raises constitutional and practical issues. Fatal attacks represent a small proportion of dog bite injuries to humans and, therefore, should not be the primary factor driving public policy concerning dangerous dogs. Many practical alternatives to breed-specific ordinances exist and hold promise for prevention of dog bites. (*J Am Vet Med Assoc* 2000;217:836–840)

(DBRF) in the United States.<sup>1-3</sup> Most victims were children. Studies indicate that pit bull-type dogs were involved in approximately a third of human DBRF reported during the 12-year period from 1981 through 1992, and Rottweilers were responsible for about half of human DBRF reported during the 4 years from 1993 through 1996. These data have caused some individuals to infer that certain breeds of dogs are more likely to bite than others and should, therefore, be banned or regulated more stringently.<sup>4,5</sup> The purposes of the study reported here were to summarize breeds associated with reported human DBRF during a 20-year period and assess policy implications.

### Procedure

We collected data from The Humane Society of the United States (HSUS) and media accounts related to dog bite attacks and fatalities, using methods from previous studies.<sup>1-3</sup> The HSUS maintains a registry of human DBRF, including date of death, age and sex of decedent, city and state of attack, number and breeds of dogs involved, and circumstances relating to the attack. To supplement HSUS reports, as in the past, a database<sup>6</sup> was searched for accounts of human DBRF that occurred in 1997 and 1998. Our search strategy involved scanning the text of newspapers and periodicals for certain words and word combinations likely to represent human DBRF followed by a review of articles containing those terms. Data obtained from HSUS and news accounts were merged to maximize detection of human DBRF and avoid duplicate reports. One new human DBRF from 1996 was identified in the 1997 and 1998 reports and was added to the existing data for 1996.

A human DBRF was defined as a human death caused by trauma from a dog bite. In addition to excluding 9 human deaths, as described in previous reports (eg, dying of rabies from a dog bite, strangling on a leash or scarf pulled by a dog, dying from fire ant

**F**rom 1979 through 1996, dog attacks resulted in more than 300 human dog bite-related fatalities

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bites after being pushed on a mound by a dog, or dying from a motor vehicle or bicycle crash while being chased by a dog), for 1997 and 1998, we excluded 3 additional deaths: death resulting from infection secondary to a dog bite, death attributable to trauma from being knocked over but not bitten, and death resulting from myocardial infarction, which was caused by an individual being chased but not bitten. For the 20-year study, we excluded 4 human deaths from attacks by guard or police dogs "at work" and approximately 90 deaths when breed information for the attacking dog was unavailable; thus, this study included approximately 72% of cases of human DBRF and is not exhaustive.

We tallied data in 2 ways to provide alternatives for breed data interpretation. First, we used a human death-based approach in which we counted whether a particular breed was involved in a death. When multiple dogs of the same breed were involved in the same fatal episode, that breed was counted only once (eg, if 10 Akitas attacked and killed a person, that breed was counted once rather than 10 times). When crossbred dogs were involved in a fatality, each suspected breed in the dog's lineage was counted once for that episode. Second, we tallied data by dog. When multiple dogs of the same breed were involved in a single incident, each dog was counted individually. We allocated crossbred dogs into separate breeds and counted them similarly (eg, if 3 Great Dane-Rottweiler crossbreeds attacked a person, Great Dane was counted 3 times under crossbred, and Rottweiler was counted 3 times under crossbred). Data are presented separately for dogs identified as pure- and crossbred. Lastly, dogs were classified as to whether they were on or off the owners' property and restrained (eg, chained or leashed) or unrestrained at the time of the attack.

## Results

**Fatalities during 1997 and 1998**—During 1997 and 1998, at least 27 people died as the result of dog bite attacks (18 people in 1997 and 9 in 1998). Of 27 human DBRF, 19 (70%) were children (1 was  $\leq$  30 days old, 3 were between 7 and 11 months old, 9 were between 1 and 4 years old, and 6 were between 5 and 11 years old), and 8 were adults (ages 17, 44, 64, 70, 73, 75, 75, and 87). Approximately half (n = 15 [56%]) of the human DBRF were male.

Five (19%) deaths involved unrestrained dogs off the owners' property, 18 (67%) involved unrestrained dogs on the owners' property, 3 (11%) involved restrained dogs on the owners' property, and 1 (4%) involved a restrained dog off the owner's property. Eighteen (67%) deaths involved 1 dog, 5 (19%) involved 2 dogs, and 4 (15%) involved 3 dogs. Sixty percent of attacks by unrestrained dogs off the owners' property involved more than 1 dog.

Fatal attacks were reported from 17 states (California [4 deaths]; Georgia and North Carolina [3 each]; Kansas, Texas, and Wisconsin [2 each]; and Alaska, Arkansas, Colorado, Florida, Kentucky, Massachusetts, Michigan, Missouri, New York, South Dakota, and Tennessee [1 each]).

Some breed information was reported for all 27 attacks. As in recent years, Rottweilers were the most commonly reported breed involved in fatal attacks, followed by pit bull-type dogs (Table 1). Together, these 2 breeds were involved in approximately 60% of human deaths.

**Twenty-year data**—Some breed information was available for 238 human DBRF. More than 25 breeds of dogs were involved in DBRF during the past 20 years (Table 2). Of 227 human DBRF for which data were

Table 1—Breeds of dogs involved in human dog bite-related fatalities (DBRF) in the United States, by 2-year period, between 1979 and 1998. Death-based approach of counting most frequent purebreds and crossbreds involved in 7 or more human DBRF

Breed	1979– 1980	1981– 1982	1983– 1984	1985– 1986	1987– 1988	1989– 1990	1991– 1992	1993– 1994	1995– 1996	1997– 1998	Total
<b>Purebred</b>											
Pit bull-type	2	5	10	9	11*	8	6	5	4*	6	66
Rottweiler	0	0	1	1	3	1	3	10	10	10	39
German Shepherd Dog	2	1	4*	1	1	4*	2	0	2	0	17
Husky-type	2	1	2	2	0	2	2	1	2	1	15
Malamute	2	0	3	1	0	2	3	1	0	0	12
Doberman Pinscher	0	1	0	2	2	2	1	0	0	1	9
Chow Chow	0	1	0	0	0	2	3	0	2	0	8
Great Dane	3	1	0	0	0	0	0	1	1	1	7
Saint Bernard	1	2	1	0	0	0	0	0	0	3	7
<b>Crossbred</b>											
Wolf-dog hybrid	0	1	1	2	1	4	1	2	2	0	14
Mixed-breed	0	3	1	2	1	2	0	1	1	1	12
German Shepherd Dog	0	2	0	2	2	2†	0	1	2	0	10†
Pit bull-type	0	1	0	3	2†	3	1	1	0	0	10†
Husky-type	0	1	1	2	1	1	0	0	0	0	6
Rottweiler	0	0	0	0	1†	1	0	1	1	2	5†
Alaskan Malamute	0	0	0	0	0	2	1	0	0	0	3
Chow Chow	0	0	0	0	0	1	0	1	1	0	3
Doberman Pinscher	0	0	0	0	1	0	0	0	0	1	0
Saint Bernard	0	0	0	0	0	0	1	0	0	0	1
Great Dane	0	0	0	0	0	0	0	0	0	1†	0†
No. deaths for which breed was known	10	20	26*	24	22	34*	24	25	26*	27	238

\*Numbers differ from previous reports because police/guard dogs "at work" were excluded, and 1 new DBRF was identified as occurring in 1996. †A purebred dog and a crossbred dog of this breed were involved in a single fatality; therefore, that breed is counted only once in the total column.

Table 2—Breeds of dogs involved in human dog bite-related fatalities between 1979 and 1998, using death-based and dog-based approaches

Breed	Death-based approach			Dog-based approach		
	Purebred	Crossbred	Total	Purebred	Crossbred	Total
Pit bull-type	66	11*	76*	98	20	118
Rottweiler	39	6*	44*	60	7	67
German Shepherd Dog	17	11*	27*	24	17	41
Husky-type (includes at least 2 Siberian)	15	6	21	15	6	21
Malamute	12	3	15	13	3	16
Wolf-dog hybrid	0	14	14	0	15	15
Mixed-breed (NOS)	0	12	12	0	47	47
Chow Chow	8	3	11	8	13	21
Doberman	9	1	10	12	1	13
Saint Bernard	7	1	8	7	1	8
Great Dane	7	1*	7*	11	2	13
Labrador Retriever	1	4	5	1	7	8
Akita	4	0	4	4	0	4
Sled-type (NOS)	3	0	3	12	0	12
Bulldog	2	1	3	2	1	3
Mastiff	2	1	3	4	1	5
Boxer	2	1	3	4	1	5
Collie	0	3	3	0	6	6
Bullmastiff	1	1	2	1	1	2
Hound-type (NOS)	1	1	2	1	1	2
Retriever-type (NOS)	1	0	1	1	0	1
Chesapeake Bay Retriever	1	0	1	1	0	1
West Highland Terrier (NOS)	1	0	1	1	0	1
Terrier-type (NOS)	1	0	1	1	0	1
Japanese Hunting Dog (NOS)	1	0	1	1	0	1
Newfoundland	1	0	1	1	0	1
Coonhound	1	0	1	1	0	1
Sheepdog (NOS)	1	0	1	1	0	1
Australian Shepherd	0	1	1	0	3	3
Rhodesian Ridgeback	1	0	1	1	0	1
Cocker Spaniel	1	0	1	1	0	1

\*A purebred dog and a crossbred dog of this breed were involved in a single fatality; therefore, that breed is counted only once in the total column.  
NOS = Not otherwise specified.

available, 55 (24%) deaths involved unrestrained dogs off the owners' property, 133 (58%) involved unrestrained dogs on the owners' property, 38 (17%) involved restrained dogs on the owners' property, and 1 (< 1%) involved a restrained dog off the owner's property.

Four hundred three dogs were responsible for these attacks. There were almost twice as many dogs involved in off-owner-property attacks, compared with attacks occurring on the owners' properties. In 160 human deaths, only 1 dog was involved; in 49 deaths, 2 dogs were involved; and in 15 deaths, 3 dogs were involved. Four and 7 dogs were involved in 3 deaths each; 5, 6, and 10 dogs were involved in 2 deaths each; and 11 and 14 dogs were responsible for 1 death each.

## Discussion

Ideally, breed-specific bite rates would be calculated to compare breeds and quantify the relative dangerousness of each breed. For example, 10 fatal attacks by Breed X relative to a population of 10,000 X's (1/1,000) implies a greater risk than 100 attacks by Breed Y relative to a population of 1,000,000 Y's (0.1/1,000). Without consideration of the population sizes, Breed Y would be perceived to be the more dangerous breed on the basis of the number of fatalities.

Considering only bites that resulted in fatalities, because they are more easily ascertained than nonfatal bites, the numerator of a dog breed-specific human DBRF rate requires a complete accounting of human

DBRF as well as an accurate determination of the breeds involved. Numerator data may be biased for 4 reasons. First, the human DBRF reported here are likely underestimated; prior work suggests the approach we used identifies only 74% of actual cases.<sup>1,2</sup> Second, to the extent that attacks by 1 breed are more newsworthy than those by other breeds, our methods may have resulted in differential ascertainment of fatalities by breed. Third, because identification of a dog's breed may be subjective (even experts may disagree on the breed of a particular dog), DBRF may be differentially ascribed to breeds with a reputation for aggression. Fourth, it is not clear how to count attacks by crossbred dogs. Ignoring these data underestimates breed involvement (29% of attacking dogs were crossbred dogs), whereas including them permits a single dog to be counted more than once. Therefore, we have elected to present data separately for purebred and crossbred dogs to demonstrate at least 2 alternative counting methods. Relative rankings do not differ greatly whether one focuses only on purebred dogs or includes crossbred dogs. The crossbreed issue is also problematic when estimating denominators (ie, breed-specific population sizes).

The denominator of a dog breed-specific human DBRF rate requires reliable breed-specific population data. Unfortunately, such data are not currently available. Considering American Kennel Club registration data<sup>7</sup> for Rottweilers in parallel with fatality data for that breed indicates that as the breed has soared in pop-

ularity, so have Rottweiler-related deaths (24,195 registrations from 1979 through 1982 and 0 deaths; 272,273 registrations from 1983 through 1990 and 6 deaths; and 692,799 registrations from 1991 through 1998 and 33 deaths). However, official registration or licensing data are likely to be biased, as owners of certain dog breeds may be less likely than those owning other breeds to register or license their dogs<sup>4</sup> and, thus, should not be used to calculate these rates. Finally, it is imperative to keep in mind that even if breed-specific bite rates could be accurately calculated, they do not factor in owner-related issues. For example, less responsible owners or owners who want to foster aggression in their dogs may be drawn differentially to certain breeds.

Despite these limitations and concerns, the data indicate that Rottweilers and pit bull-type dogs accounted for 67% of human DBRF in the United States between 1997 and 1998. It is extremely unlikely that they accounted for anywhere near 60% of dogs in the United States during that same period and, thus, there appears to be a breed-specific problem with fatalities.

Although the fatality data are concerning, one must broaden the context to consider both fatal and nonfatal bites when deciding on a course of action. Nonfatal dog bites continue to be a public health problem in the United States. Although this and prior reports<sup>1-3</sup> document more than 330 DBRF during a 20-year period, these tragedies represent only the most severe manifestation of the problem. In 1986, nonfatal dog bites resulted in an estimated 585,000 injuries that required medical attention or restricted activity.<sup>8</sup> By 1994, an estimated 4.7 million people (1.8% of the US population) sustained a dog bite; of these, approximately 800,000 (0.3% of the US population) sought medical care for the bite (332,000 in emergency departments), and 6,000 were hospitalized.<sup>9-11</sup> This 36% increase in medically attended bites from 1986 to 1994 draws attention to the need for an effective response, including dog bite prevention programs. Because (1) fatal bites constitute less than 0.00001% of all dog bites annually, (2) fatal bites have remained relatively constant over time, whereas nonfatal bites have been increasing, and (3) fatal bites are rare at the usual political level where bite regulations are promulgated and enforced, we believe that fatal bites should not be the primary factor driving public policy regarding dog bite prevention.

Several interacting factors affect a dog's propensity to bite, including heredity, sex, early experience, socialization and training, health (medical and behavioral), reproductive status, quality of ownership and supervision, and victim behavior. For example, a study in Denver of medically-attended dog bites in 1991 suggested that male dogs are 6.2 times more likely to bite than female dogs, sexually intact dogs are 2.6 times more likely to bite than neutered dogs, and chained dogs are 2.8 times more likely to bite than unchained dogs.<sup>12</sup> Communities have tried to address the dog bite problem by focusing on different factors related to biting behavior.

To decrease the risk of dog bites, several communities have enacted breed-specific restrictions or bans. In general, these have focused on pit bull-type dogs and Rottweilers. However, breeds responsible for human

DBRF have varied over time. Pinckney and Kennedy<sup>13</sup> studied human DBRF from May 1975 through April 1980 and listed the following breeds as responsible for the indicated number of deaths: German Shepherd Dog (n = 16); Husky-type dog (9); Saint Bernard (8); Bull Terrier (6); Great Dane (6); Malamute (5); Golden Retriever (3); Boxer (2); Dachshund (2); Doberman Pinscher (2); Collie (2); Rottweiler (1); Basenji (1); Chow Chow (1); Labrador Retriever (1); Yorkshire Terrier (1); and mixed and unknown breed (15). As ascertained from our data, between 1979 and 1980, Great Danes caused the most reported human DBRF; between 1997 and 1998, Rottweilers and pit bull-type dogs were responsible for about 60% of human DBRF. Indeed, since 1975, dogs belonging to more than 30 breeds have been responsible for fatal attacks on people, including Dachshunds, a Yorkshire Terrier, and a Labrador Retriever.

In addition to issues surrounding which breeds to regulate, breed-specific ordinances raise several practical issues. For optimal enforcement, there would need to be an objective method of determining the breed of a particular dog. Pedigree analysis (a potentially time-consuming and complicated effort) combined with DNA testing (also time-consuming and expensive) is the closest to an objective standard for conclusively identifying a dog's breed. Owners of mixed-breed or unregistered (ie, by a kennel club) dogs have no way of knowing whether their dog is one of the types identified and whether they are required to comply with breed-specific ordinances. Thus, law enforcement personnel have few means for positively determining a dog's breed and deciding whether owners are in compliance or violation of laws.

Some municipalities have attempted to address this classification issue of unregistered and mixed-breed dogs by including within their ordinances a description of the breed at which the ordinance is directed. Unfortunately, such descriptions are usually vague, rely on subjective visual observation, and result in many more dogs than those of the specified breed being subject to the restrictions of the ordinance.

When a specific breed of dog has been selected for stringent control, 2 constitutional questions concerning dog owners' fourteenth amendment rights have been raised: first, because all types of dogs may inflict injury to people and property, ordinances addressing only 1 breed of dog are argued to be underinclusive and, therefore, violate owners' equal protection rights; and second, because identification of a dog's breed with the certainty necessary to impose sanctions on the dog's owner is prohibitively difficult, such ordinances have been argued as unconstitutionally vague, and, therefore, violate due process. Despite such concerns, a number of breed-specific ordinances have been upheld by the courts.<sup>14-16</sup>

Another concern is that a ban on a specific breed might cause people who want a dangerous dog to simply turn to another breed for the same qualities they sought in the original dog (eg, large size, aggression easily fostered). Breed-specific legislation does not address the fact that a dog of any breed can become dangerous when bred or trained to be aggressive. From a scientific point of view, we are unaware of any formal

evaluation of the effectiveness of breed-specific legislation in preventing fatal or nonfatal dog bites.

An alternative to breed-specific legislation is to regulate individual dogs and owners on the basis of their behavior. Although, it is not systematically reported, our reading of the fatal bite reports indicates that problem behaviors (of dogs and owners) have preceded attacks in a great many cases and should be sufficient evidence for preemptive action. Approaches to decreasing dangerous dog and owner behaviors are numerous. The potential importance of strong animal control programs is illustrated by our data; from 1979 through 1998, 24% of human DBRF were caused by owned dogs (typically more than 1) that were roaming off the owners' property. Some deaths might have been averted through more stringent animal control laws and enforcement (eg, leash laws, fencing requirements). Although the bite prevention effectiveness of such animal control ordinances and programs has not been systematically evaluated, free-roaming dogs and dogs with menacing behavior are problems that need to be addressed even if they do not bite (eg, causing bicycle or car crashes).

Generic non-breed-specific, dangerous dog laws can be enacted that place primary responsibility for a dog's behavior on the owner, regardless of the dog's breed.<sup>17</sup> In particular, targeting chronically irresponsible dog owners may be effective.<sup>18</sup> If dog owners are required to assume legal liability for the behavior and actions of their pets, they may be encouraged to seek professional help in training and socializing their pets. Other options include enforcing leash laws and laws against dog fighting. We noticed in the fatal cases, that less than one half of 1% of DBRF were caused by leashed animals off the owners' property. Subdivisions and municipalities that outlaw fences or limit fences to heights insufficient for controlling large dogs may be increasing the probability of children interacting with unsupervised dogs. Scientific evaluations of the effects of such regulations are important.

Education of dog owners can address several issues: (1) understanding breed profiles<sup>19,20</sup> may assist owners in selecting the appropriate dog for their lifestyle and training abilities, (2) convincing owners to seriously consider the sex and reproductive status of their dogs is important because male and sexually intact dogs are more likely to bite than are female and neutered dogs,<sup>12</sup> and (3) teaching owners about the importance of socialization and training may decrease their likelihood of owning a dog that will eventually bite.

Veterinarians play a key role in educating pet owners, but because many dogs that bite may not be seen by a veterinarian prior to the bite incident, programs that encourage responsible ownership must also be presented through other venues. Public education strategies should include school-based and adult educational programs addressing bite prevention and basic canine behavior, care, and management. Programs should strive to ensure that dogs receive proper socialization, exercise, and attention; that they are given adequate food, water, shelter, and veterinary care; that they are neutered if they are not maintained for legitimate and responsible breeding purposes; and that they are trained humanely and confined safely. However,

like breed-specific legislation, all these approaches appear formally unevaluated for effectiveness.

Targeting and evaluation of prevention efforts requires improved surveillance for fatal and nonfatal dog bites. Dog bites should be reported as required by local or state ordinances, and reports of such incidents should include information about the circumstances of the bite, ownership, breed, sex, reproductive status of the dog, history of prior aggression, and the nature of restraint prior to the bite incident. Collection of data on the entire dog population (eg, breed, age, sex) would help resolve comparative risk issues and may be accomplished by combining paperwork on mandatory rabies immunizations with registration of breed and sex. Only with numerator and denominator data and with formal evaluations of the impacts of strategies tried by various communities will we be able to make science-based recommendations for decreasing the number of dog bites. In the interim, adequate funding for animal control agencies, enforcement of existing animal control laws, and educational and policy strategies to reduce inappropriate dog and owner behaviors will likely result in benefits to communities and may well decrease the number of dog bites that occur.

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