

# Dog Bite–Related Fatalities From 1979 Through 1988

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By combining data from the National Center for Health Statistics and computerized searching of news stories, we identified 157 dog bite–related fatalities that occurred in the United States from 1979 through 1988. Of the 157 deaths, 70% occurred among children who were less than 10 years of age. The death rate for neonates was almost 370 times that of adults who were 30 to 49 years of age. Pit bull breeds were involved in 42 (41.6%) of 101 deaths where dog breed was reported, almost three times more than German shepherds, the next most commonly reported breed. The proportion of deaths attributable to pit bulls increased from 20% in 1979 and 1980 to 62% in 1987 and 1988. Pit bull attacks were almost twice as likely to be caused by strays as attacks by other breeds. Extrapolated estimates suggest 183 to 204 dog bite–related fatalities from 1979 through 1988. To prevent such deaths, we recommend stronger animal control laws, public education regarding dog bites, and more responsible dog ownership. Parents and physicians should be aware that infants left alone with a dog may be at risk of death.

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RECENT publicity regarding attacks on humans by pit bulls and what should be done about them has been considerable (*Time*. July 27, 1987:60).<sup>1</sup> In the scientific literature, Winkler<sup>2</sup> reported 11 dog bite–related fatalities (DBRFs) in the United States between 1974 and 1975, none of which involved pit bulls, while Pinckney and Kennedy<sup>3</sup> noted that 6 of 74 DBRFs that occurred in the United States from March 1966 through June 1980 were caused by pit bulls. Both studies used a primarily anecdotal rather than systematic approach toward identifying the deaths and breeds involved.

For the past few years, the usually cited source of information regarding DBRFs and the breeds responsible has been the Humane Society (HS) of the United States. Although the HS considers their own information before 1986 incomplete, HS data for 1987 through 1988 suggest that pit bulls were involved in 58% of human fatalities from dog bites (A. Joly, written com-

munication, January 13, 1989).

Our study had two goals—to estimate mortality from dog bites for the 10-year period from 1979 through 1988 and to identify the breeds of dogs responsible. To accomplish this, we reviewed four separate sources of information regarding DBRFs in the United States.

## METHODS

The two sources of data used to identify DBRFs were the NEXIS search service of Mead Data Central and the single-cause mortality tapes (SCMTs) from the National Center for Health Statistics (NCHS). Two additional sources of data (HS records and multiple-cause mortality tapes from the NCHS) were used for supplementary information, but not for case ascertainment.

We searched for news stories regarding DBRFs from 1979 through 1988 using the NEXIS search service. The NEXIS service is a full-text, on-line service that contains more than 160 files of information from newspapers, magazines, wire services, and broadcast transcripts. The NEXIS files can be searched for specific words or word combinations to retrieve stories regarding a requested topic. Because the NEXIS service has not been designed to perform the comprehensive search required in this study, we conducted four searches with different key words and combinations to ensure that we had

identified as many deaths as possible. Other limitations of NEXIS in doing such a search are inconsistent indexing of stories, inadequate and vague documentation, and failure to inform the user when files are inaccessible during a search. Details of our search strategies are available on request.

Our second source of cases was NCHS mortality data. The SCMTs from 1979 through 1986 were used to identify deaths from dog bites among US residents in the 50 states and the District of Columbia. *Dog bite–related fatalities* were defined as those fatalities with the underlying cause of death coded as dog bite (*International Classification of Diseases, Ninth Revision* [E906.0]). Information extracted for each case included decedent's age, sex, residence, and date and location of death. Mortality data through 1986 were used since they were the most recent data available at the time of analysis.

The HS supplied their listing of DBRFs from 1983 through 1988. The listing contained the victim's name and date of death, the city and state of the attack, the dog owner's name, the number and breeds of dogs involved, and information regarding circumstances. These data were used only to identify dog breeds if stories from NEXIS did not note the breed(s) or if the case was identified from the SCMTs only.

Information from the three sources of death data were merged, and duplicate entries were noted. For those deaths reported in NEXIS or the HS data and not found in the SCMTs, we searched both the NCHS single- and multiple-cause mortality tapes for a person of similar age, sex, state of residence, and date of death.

The NCHS multiple-cause mortality tapes for 1979 through 1986 were searched for entries of E906.0 in fields other than underlying cause of death for all cases that appeared in NEXIS, but not in the SCMTs. Deaths found in the SCMTs but not found in NEXIS were again sought in NEXIS by searching for all stories that contained the word *dog* in a 1-week window around the time of death in the states of residence and occurrence. Deaths reported only by the

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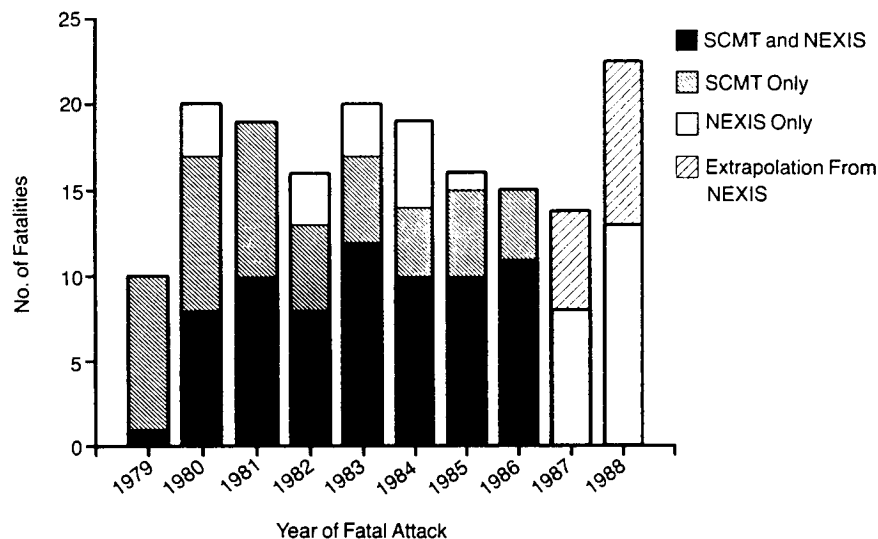


Fig 1.—Number of dog bite-related fatalities, by source of information, in the United States from 1979 through 1988. SCMT indicates single-cause mortality tape; and NEXIS, NEXIS search service of Mead Data Central.

HS were sought in NEXIS by searching for both the deceased person's name and breed of dog in the state of occurrence in the month of the death.

When multiple dogs of the same breed were involved in a fatality, we counted that breed only once. When crossbred animals were involved in a fatality, each breed in the dog's parentage was counted once. Thus, if three pit bulls killed a man, pit bull was counted once. If three pit bull-Labrador crossbreeds killed a man, the pit bull crossbreed was counted only once, as was the Labrador crossbreed.

Dogs were classified as pets, strays, or police or guard dogs. A *pet* was defined as a dog that at the time of the attack was in the owner's house, was confined to the owner's property by a fence, leash, or chain, or was on a restraint off of the owner's property. Free-roaming animals were defined as *strays*.

We excluded the following NEXIS-reported causes of death in this analysis: dying of rabies following a dog bite ( $n=1$ ), being struck by a motor vehicle while being chased by a dog ( $n=2$ ), strangling on a leash or scarf pulled by a dog ( $n=2$ ), dying of a heart attack while a dog prevented resuscitation efforts ( $n=1$ ), dying of a head injury after falling off of a bicycle while being chased by a dog ( $n=1$ ), dying of anaphylaxis after being pushed into a fire ant mound by a dog ( $n=1$ ), and dying of a heart attack while being chased by a dog ( $n=1$ ).

The dog bite-related death rates per 100 million population were calculated for 1979 through 1988 using population

estimates from the Bureau of the Census.<sup>47</sup> Because 1988 figures were not yet available, we projected these figures. Newborns less than 1 month of age were assumed to represent one twelfth of the population less than 1 year of age.

We assumed that the probability of a fatal dog bite appearing in the SCMTs was independent of its probability of appearing in NEXIS. Accordingly, the "capture-recapture" statistical methods of Sekar and Deming<sup>3</sup> were used to estimate the true number of DBRFs that occurred from 1979 through 1986.

Since NCHS data from 1987 and 1988 were unavailable, we projected fatality figures for 1987 and 1988 based on the cases reported in NEXIS those 2 years and the estimated sensitivity of the NEXIS system, ie, the number of cases found in NEXIS from 1979 through 1986 divided by the estimated number of deaths from 1979 through 1986.

## RESULTS

### Epidemiologic Characteristics of DBRFs

By combining the NEXIS data from 1979 through 1988 and the SCMTs from 1979 through 1986, we identified 157 deaths that occurred from 1979 through 1988 (Fig 1), a rate of 6.7 deaths per 100 million population per year. Of 106 deaths that could be classified, 3 (2.8%) involved a police or guard dog, 29 (27.3%) involved a stray dog, and 74 (69.8%) involved a pet. Of 108 deaths where the number of dogs involved was known, 76 deaths (70.4%) involved 1 dog, 20 deaths involved 2 dogs, and 12 deaths involved 3 to 22 dogs.

We found no obvious trend in number of fatalities over the years and little variation in the season of the attack (winter, 43; spring, 40; summer, 36; and fall, 38). Deaths that involved stray dogs, however, were most common in fall and least common in summer; deaths that involved pets were most common during the winter. The three states with the largest number of fatal attacks were Texas, California, and Ohio. Only 13 states had no fatal attacks during the 10 years (Fig 2). By NCHS region, the South had the most fatalities, but the West had the highest death rate.

Of those killed by dog bites, 70% were children less than 10 years of age (Table 1). The death rate was particularly high for neonates less than 1 month of age. For infants less than 1 year of age, the rate was 68.3 deaths per 100 million population per year. Males accounted for 95 (60.5%) of the 157 deaths, and their death rate (8.3 deaths per 100 million population per year) was 1.6 times that of females (5.1 deaths per 100 million population per year). Between the ages of 1 and 29 years, there were more male than female victims; after age 29 years, there were roughly equal numbers of male and female victims.

Circumstances of the attack were reported for 19 of the 25 deaths among infants less than 1 year of age. All involved pet dogs, and all but one attack occurred in the home and involved a single animal. Ten attacks occurred while the infant was sleeping or in a crib. By breed, pit bull and pit bull crossbreeds, German shepherds and shepherd crossbreeds, and husky and husky crossbreeds were each involved in four attacks.

For pet-related deaths among victims 1 year of age and older, 50 of 53 cases had a description of the circumstances. Thirty-six percent involved a child who gained unauthorized access to a fenced yard where a dog was kept, and 28.0% resulted from a child who wandered too close to a chained dog. Only 9 (17.0%) of these 53 deaths involved more than one dog.

The following circumstances of the attack were described for 28 of the 29 deaths that involved stray dogs: 42.9% occurred on the victim's property; 35.7% involved a dog that had escaped a fence, pen, or restraint; and 10.7% involved children who were riding bicycles and were attacked by a pack of 4 to 14 stray dogs. Overall, 65.5% of the 29 deaths from strays involved 2 or more dogs.

Pit bulls and pit bull crossbreeds were involved in 42 (41.6%) of 101 deaths where the breed of dog was reported (Table 2). Although the yearly number

of DBRFs changed little from 1979 through 1988, the proportion of fatal attacks with reported pit bull involvement increased from 20% in 1979 and 1980 to 62% in 1987 and 1988. Pit bull attacks involved older victims—31% of pit bull-related deaths were among persons older than 9 years compared with 19% for other breeds. Of 41 classifiable attacks that involved pit bulls, 15 (36.6%) involved a stray, compared with 11 (18.6%) of 59 for other breeds.

### NEXIS and NCHS Case Ascertainment and Overlap

From 1979 through 1986, the years for which both NEXIS and the SCMT data were available, we identified 136 DBRFs in the United States (Fig 1). Seventy deaths appeared in both systems, 51 deaths in the SCMTs alone, and 15 deaths in NEXIS alone. Overall, the SCMTs identified 121 (89.0%) of the 136 deaths and NEXIS detected 85 deaths (62.5%).

Of the 15 deaths found in NEXIS and not in the SCMTs, 2 deaths (both in women who were older than 90 years) were coded as caused by heart or vascular disease, 4 (all males, 3 less than 1 year of age) were coded as E906.8 (other specified injury caused by an animal), 7 (all less than 15 years of age, 5 were boys) were coded as E906.9 (unspecified injury caused by animal), and 2 could not be located in the death tapes at all. From 1979 through 1986, there were 537 deaths ascribed to E906.8 and 64 deaths ascribed to E906.9.

Reviewing multiple-cause mortality tapes identified an additional 17 persons not found in the SCMTs or in the NEXIS search who had E906.0 noted somewhere on the death certificate, although not as the underlying cause of death. The underlying cause of death listed in 11 cases was some form of cardiovascular disease. Of the remaining 6 deaths, one was listed as assault from a person's bite (E968.8), 1 from bicycling (E826.1), 3 from medical conditions (N310.9, N571.5, and N583.2), and 1 from leptospirosis (N100.9).

### Extrapolations Based on the Data

Since neither the NEXIS nor the SCMT surveillance system was complete, we attempted to estimate the true occurrence of DBRFs. According to the SCMTs and NEXIS, the total number of dog bite-related deaths that occurred from 1979 through 1986 was 136. Based on the overlap of cases found in the systems,<sup>8</sup> we estimate that there were 146.9 DBRFs during this period. For the years when only NEXIS data are available, 21 fatalities were identi-

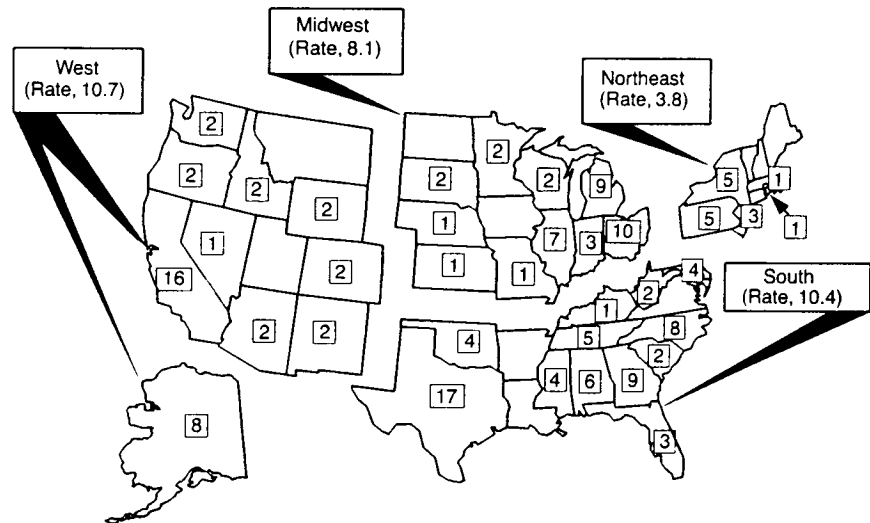


Fig 2.—Number of dog bite-related fatalities and death rate per 100 million population, by state and region of occurrence, in the United States from 1979 through 1988.

Table 1.—Dog Bite-Related Fatalities and Death Rates, by Age and Sex in the United States, 1979 Through 1988

Age Group	No. of Dog Bite-Related Fatalities			Cumulative %	Death Rate*
	Males	Females	Total		
<1 mo	4	5	9	5.7	294.9
1-11 mo†	6	10	16	15.9	47.7
1-4 y	36	20	56	51.6	40.5
5-9 y	23	6	29	70.1	17.3
10-29 y	8	1	9	75.8	1.1
30-49 y	3	2	5	79.0	0.8
50-69 y	9	8	17	89.8	4.0
>69 y	6	10	16	100.0	8.7
All Age Groups	95	62	157	...	6.7

\*Per 100 million population per year.

†There were five deaths in 1-month-old infants, five deaths in 2-month-old infants, two deaths in 7-month-old infants, and one death each in 4-, 5-, 6-, and 11-month-old infants.

Table 2.—Breeds of Dogs Involved in Dog Bite-Related Fatalities by 2-Year Period in the United States, 1979 Through 1988

Breed of Dog*	No. of Deaths Where Breed Was Known					
	1979-1980 (n=10)	1981-1982 (n=20)	1983-1984 (n=27)	1985-1986 (n=23)	1987-1988 (n=21)	Total (N=101)
Purebred						
Pit bull	2	5	10	8	12	37
German shepherd	2	1	5	1	0	9
Husky	2	1	2	2	0	7
Malamute	2	0	3	1	0	6
Doberman pinscher	0	1	0	2	2	5
Rottweiler	0	0	1	1	3	5
Great Dane	3	1	0	0	0	4
Saint Bernard	1	2	1	0	0	4
Crossbred dogs by bloodline†						
Pit bull	0	1	0	3	2‡	6‡
German shepherd	0	2	0	2	2	6
Husky	0	1	1	2	1	5
Wolf-hybrid	0	1	1	2	1	5

\*Data shown only for the breed or crossbreeds involved in 4 or more fatalities; 11 additional purebreds accounted for 13 additional deaths (boxer, 1; chow chow, 1; cocker spaniel, 1; dingo, 1; English sheepdog, 1; Japanese hunting dog, 1; Labrador retriever, 1; unspecified retriever, 1; Rhodesian Ridgeback, 1; English bulldog, 2; and hound, 2).

†Each breed that contributed to the crossbreed is counted once.

‡One of these fatalities also involved a purebred pit bull, so the total number of incidents with a pit bull involved is 42.

fied from 1987 through 1988. Assuming a 57.9% sensitivity of NEXIS, ie, 85 of 146.9 deaths that occurred from 1979 through 1986 were detected, the estimated number of fatalities that would have been found from 1987 through 1988 using NCHS (if it were available) and NEXIS was 36.3. The 10-year total would be 183.2.

### Humane Society Case Finding

From 1979 through 1986, the HS listed 21 (15.4%) of the 136 deaths found by NEXIS and NCHS. The HS data showed a marked improvement in detection of deaths over time (1979 through 1982, 0.0%; 1983, 10.0%; 1984, 21.1%; 1985, 25.0%; and 1986, 76.5%). Two additional deaths were listed by the HS that were not found in NEXIS or the SCMTs. The first was a 4-year-old boy who died in Kansas in January 1986 after being bitten by two or three Australian shepherd crossbreeds—no NCHS record of death from any cause could be found for such an individual. The second case involved a 79-year-old man in Florida who died in April 1986 from bites by three dogs: a pit bull, a boxer, and a mixed-breed dog—the multiple-cause mortality tapes listed his underlying cause of death as arteriosclerotic heart disease, with dog bite as contributory.

The HS listed 24 deaths during 1987 and 1988 (10 in 1987 and 14 in 1988). Two of the deaths (1 in 1987 and 1 in 1988) could not be located in NEXIS, even after searching for the victims' names. One of these deaths was a 9-year-old Maryland boy who was killed by a stray Newfoundland; the other was a 3-year-old Arkansas boy who was killed by a pet German shepherd. Two HS-reported deaths did not meet our definition of a dog bite-related death—one 1987 case was reported in NEXIS as a 63-year-old Massachusetts man who had a heart attack while being chased by a pit bull and a mixed-breed dog and one 1988 case was reported as a 41-year-old Texas man who suffered a head injury after falling off a bicycle while being chased by a Doberman pinscher and a chow chow crossbreed.

For the 20 DBRFs that appeared in both NEXIS and the HS during 1987 and 1988, the breed(s) of dog listed was identical in 19 cases (95%). In the 20th case, the HS listed one dog from a multiple dog attack as a collie-German shepherd crossbreed and NEXIS listed the dog as a "collie-type."

### COMMENT

The occurrence of DBRFs has been underestimated. The HS, the usually cited source of such statistics, identified

45 fatalities from 1979 through 1988. Our results suggest there were approximately 183 DBRFs from 1979 through 1988. If we include the 4 deaths uniquely found by the HS and the 17 deaths in the NCHS multiple-cause mortality tapes where dog bite was listed as a contributory but not underlying cause of death, the total is 204 dog bite-related deaths.

Each surveillance system has limitations. The NEXIS search service proved difficult and expensive to use and results were inconsistent. NEXIS was not intended for scientific purposes; given the problems in using it, its use for routine surveillance is questionable. The SCMTs from the NCHS also had disadvantages. There is a 1- to 2-year lag in their availability. Also, of the 601 deaths ascribed to E906.8 or E906.9, at least 11 persons should have been coded as E906.0 (dog bite-related death). How many more of these deaths are actually dog bite-related is unknown. The HS data included cases that did not meet our definition, and before 1986 the system missed many deaths.

The main victims of fatal dog bites were the very young and very old, those least able to protect themselves. Indeed, the death rate for neonates was almost 370 times that of adults 30 to 49 years of age; the death rate for infants was 85 times that of adults 30 to 49 years of age. In 10 cases, an infant was killed while it was asleep or in a crib—in 4 cases by a pit bull or related breed.

Forty-two percent of dog bite-related deaths in the past 10 years were attributable to pit bulls, and 37% of pit bull-related deaths involved strays. Furthermore, the reported proportion of fatal attacks by pit bulls increased from 20% in 1979 through 1980 to 62% in 1987 and 1988. Because breeds may be misclassified by news stories, our numbers may not be exact. For example, the term *pit bull* has been used to describe a variety of pit bull terrier and bull terrier breeds.<sup>1</sup> It has also been suggested that any short-haired, stocky dog is likely to be called a pit bull.<sup>1</sup> Moreover, the recent attention directed toward these dogs may lead to media overreporting of pit bull-related incidents relative to other species. However, even before 1985, when news coverage seemed to increase, pit bulls still accounted for 31% of deaths.

We would have preferred to calculate dog breed-specific fatality rates. The numerator requires accurate definition of breed as well as a full ascertainment of fatalities. The denominator requires reliable breed-specific population figures, which are not currently available. Using registration or licensing figures for a denominator is problematic be-

cause pit bull owners may be much less likely than other breed owners to register or license their animals.<sup>1</sup> Better dog population data and improved surveillance for fatal and nonfatal dog bites are needed.

Despite the potential biases and lack of dog population figures, pit bulls seemed to be involved in 42% of the fatalities. We do not believe that pit bulls represent anywhere near 42% of dogs in the United States. Therefore, we believe that the pit bull excess in deaths is real and increasing.

Whether they are caused by pit bulls or not, dog bites are a tremendous injury problem. More than 2 million persons are bitten yearly—half are left scarred, one tenth require sutures, and one third suffer lost school or work time.<sup>3</sup> Many of these bites and deaths are potentially preventable. For example, 27% of DBRFs were from stray dogs; more stringent animal control laws and enforcement might prevent some of these deaths. Dog owners could prevent some deaths by realizing that a chain may not be a sufficient restraint to ensure that a dog cannot escape and that a securely enclosed and locked pen or structure able to prevent the entry of young children may also be necessary. In particular, parents should be aware that very small infants left alone with a dog may be at risk of death. We support the recommendations offered by the HS as a first step toward the prevention of DBRFs.<sup>3,9</sup> These measures call for strong animal control laws, public education regarding dog bites, and more responsible dog ownership.

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