# Animal Bites, a Public Health Problem in Jefferson County, Alabama

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ANIMAL BITES were a major public health concern before 1962 in Jefferson County, Alabama, primarily because of enzootic rabies. Located in the north-central part of the State, the county comprises 34 incorporated municipalities, including Birmingham—the State's largest city (population 300,910). Records of the Birmingham branch of the State public health laboratory indicate that 17 percent of the nearly 4,000 animal heads tested for rabies between 1956 and 1963 were positive, and 26 percent of these positive findings occurred during 1956–58. Since public health officials implemented a countywide canine vaccination and control program in 1962, no cases of rabies in domestic animals and only an occasional case in wildlife have been reported in the county.

Although rabies is no longer a major health threat, injuries to people from animal bites, due in part to the size of the pet animal population, have become of increasing concern (*1–5*). Dogs are the primary animals implicated in bite injuries; however, ownership of cats and exotic pets has become much more common, and these animals contribute to the bite problem to a greater extent than is generally documented.

Because rabies is now uncommon in the United States, medical care providers and the community at large are uncertain as to the extent of consideration to be given to animal bites. Unquestionably, the level of knowledge and concern regarding rabies diminishes in a community that has not experienced the disease for a long time, which has been the case in much of the nation during the past 20 years. The other implications of animal bite injuries have been recognized only relatively recently. These implications relate to the magnitude of the animal population problem, and they include therapeutic considerations and the economic burden on the bite victim and the community (*6–8*).

Since Jefferson County was a major rabies area and animal bites are reportable in Alabama, the study reported here was conducted to characterize the significance of bite injuries in the county and to evaluate the medical and public health responses to them.

## Methods

Information pertaining to bite incidents was obtained from reports received by the Jefferson County Department of Health for 1973 through 1976. The reports

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are routinely numbered and filed by order of occurrence of the bites. Specific data collected include month of occurrence, age and sex of the victim, anatomical site of the bite, species and breed (if any) of the biting animal, and the animal's ownership status. Since reporting was legally required before 1976 only for dog bites, the number of reported incidents implicating other species was assumed to be a much less accurate indicator of their true incidence.

To obtain information about followup of bite incidents, a sample consisting of every seventh person for whom a dog bite was reported in 1976 was selected for telephone interview. If a victim whose record was chosen could not be contacted after several attempts, consecutive records were pulled until a contact was made. The interviews included questions about the kind of treatment received (for example, cleansing, wound dressing, suturing), where treatment was received (for example, emergency room, physician's office), disposition of the animal after the bite (if known), and post-exposure rabies prophylaxis.

An attempt was also made to contact all victims bitten by exotic (nondomestic) animals in 1976, since only 109 such incidents were reported. These cases were included primarily for an evaluation of physicians' responses relative to the risk of rabies and disposition of the animals.

Because of the number of dog bite injuries and the variation in their severity, typical treatment costs for such injuries were derived from a survey of 1976 medical records of the Children's Hospital and the University of Alabama Hospital, both in Birmingham. The total costs of treatment were obtained from emergency room logs and from inpatients' charts. Average costs for inpatient and outpatient therapy were then applied to the proportionate numbers of victims in each treatment site category, and a crude approximation was made of treatment costs for all dog bite victims reported from 1973 through 1976. This computation included both costs paid by the patients and those assumed by third parties.

## Results

**Dog bites.** Of 8,072 animal bites reported during the 4 years, 7,075 (88 percent) were attributed to dogs. The highest numbers of dog bites consistently occurred in the spring and early summer (fig. 1). Figure 2 shows the numbers of dog bite victims per 100,000 population by age and sex; 62 percent were males. Both males and females in the age group 0–9 had a significantly higher

Figure 1. Reported dog bites of human beings by month, Jefferson County, Ala., 1973–76

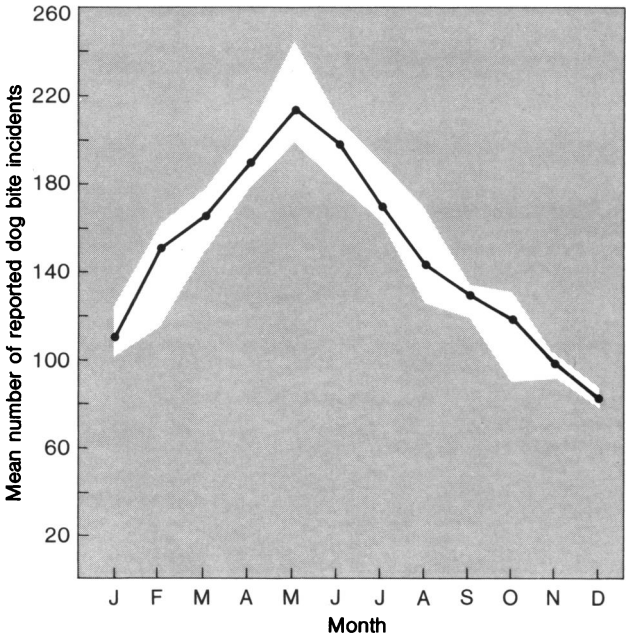
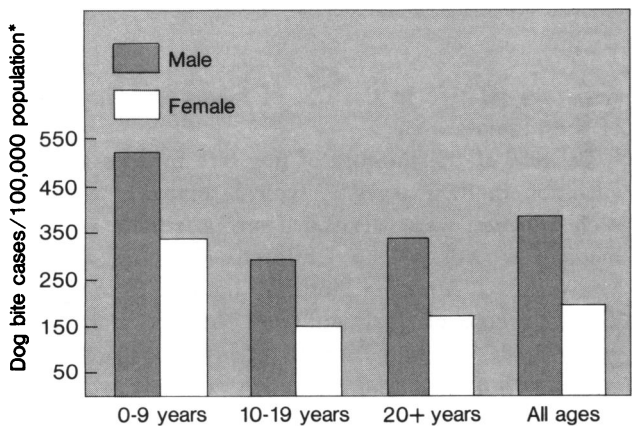
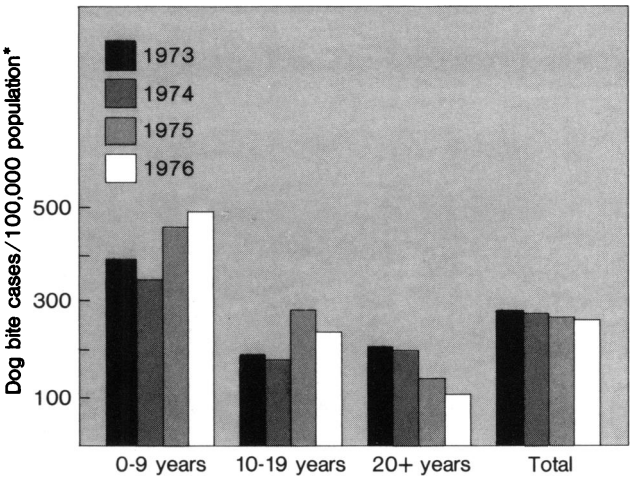



Figure 2. Mean annual rate of dog bites by age and sex, Jefferson County, Ala., 1973—76




*Population data by age and sex, U.S. Census, 1970.

Figure 3. Rate of dog bites by age, Jefferson County, Ala., 1973–76




*Population data by age, U.S. Census, 1970.

rate of bite injuries than either of the other two age groups ($P<.01$, from the standard error of the difference between standardized morbidity ratios). The rate of dog bites for both sexes combined is shown by year in figure 3.

The extremities were involved in more than 75 percent of the dog bite incidents (table 1). As would be expected, head and neck bites occurred most often to victims 0–9 years old.

The ownership status of biting dogs was determined for 99 percent of the incidents. Individuals other than the victims owned 79 percent of these animals, and the remaining dogs were equally represented in the victim-owned and stray categories (table 2).

Approximately 37 percent of the dog bites reported each year were attributed to specified breeds; almost half were attributed to German shepherds (table 3). Although the American Kennel Club indicates that this breed has been the second most popular during the past decade, the German shepherd has accounted for only 7–10 percent of the total number of dogs registered since 1973 (*9*). It is worth noting that more than

Table 1. Numbers of reported dog bites, by anatomical site of bite, Jefferson County, Ala., 1973–76

| Year | Head, neck | Torso | Upper extremity | Lower extremity | Total |
|---|---|---|---|---|---|
| 1973 | 266 | 175 | 500 | 821 | 1,762 |
| 1974 | 252 | 167 | 510 | 790 | 1,719 |
| 1975 | 294 | 89 | 552 | 787 | 1,722 |
| 1976 | 272 | 127 | 564 | 785 | 1,748 |
| Total | 1,084 | 558 | 2,126 | 3,183 | 6,951 |
| Percent of total | 15.6 | 8.0 | 30.6 | 45.8 | .... |

NOTE: Totals represent every incident in which an anatomical site was involved, not numbers of victims.

70 percent of the biting dogs named by breed during the 4 years were those generally weighing more than 23 kilograms. If the size of a mixed-breed biting dog were documented when a bite incident is investigated, the significance of this factor could be more accurately assessed.

**Bites due to other animals.** The number of reported animal bites due to species other than dogs represented only 12 percent of the total reported during the 4 years; cat bites accounted for 55 percent of this total (table 4). An additional 39 percent in this category were attributed to wild or pet rodents, whereas only 4 percent

Table 2. Ownership status of dogs implicated in biting incidents, Jefferson County, Ala., 1973–76

| Year | Stray | Owned by victim | Not owned by victim | Total |
|---|---|---|---|---|
| 1973 | 204 | 164 | 1,447 | 1,815 |
| 1974 | 205 | 185 | 1,379 | 1,769 |
| 1975 | 172 | 193 | 1,398 | 1,763 |
| 1976 | 167 | 202 | 1,316 | 1,685 |
| Total | 748 | 744 | 5,540 | 7,032 |
| Percent of total | 10.6 | 10.6 | 78.8 | .... |

Table 3. Named breeds of dogs implicated in biting incidents, Jefferson County, Ala., 1973–76

| Breed | 1973 | 1974 | 1975 | 1976 | Total |
|---|---|---|---|---|---|
| German shepherd | 322 | 301 | 313 | 282 | 1,218 |
| Collie | 54 | 40 | 36 | 30 | 160 |
| Poodle | 56 | 47 | 60 | 57 | 220 |
| Beagle | 16 | 12 | 9 | 19 | 56 |
| Dachshund | 25 | 38 | 39 | 32 | 134 |
| Chihuahua | 19 | 18 | 14 | 15 | 66 |
| Dalmatian | 14 | 9 | 4 | 1 | 28 |
| St. Bernard | 14 | 9 | 23 | 13 | 59 |
| Spitz | 13 | 13 | 10 | 7 | 43 |
| Great Dane | 9 | 7 | 20 | 9 | 45 |
| Boxer | 6 | 7 | 6 | 4 | 23 |
| Doberman | 5 | 10 | 16 | 26 | 57 |
| Cocker | 27 | 16 | 21 | 18 | 82 |
| Chow | 6 | 6 | 5 | 4 | 21 |
| Retrievers | 7 | 7 | 9 | 9 | 32 |
| Weimaraner, pointer | 3 | 2 | 7 | 7 | 19 |
| Irish setter | 4 | 12 | 7 | 6 | 29 |
| English setter, springer spaniel | 5 | — | 8 | 5 | 18 |
| Miscellaneous hounds | 22 | 15 | 21 | 19 | 77 |
| Miscellaneous terriers | 23 | 30 | 18 | 17 | 88 |
| Miscellaneous small | 8 | 9 | 14 | 13 | 44 |
| Miscellaneous large | 5 | 9 | 20 | 11 | 45 |
| Total | 663 | 617 | 680 | 604 | 2,564 |

Table 4. Reported bites of animals other than dogs, Jefferson County, Ala., 1973–76

| Species | 1973 | 1974 | 1975 | 1976 | Total |
|---|---|---|---|---|---|
| Cat | 148 | 105 | 168 | 127 | 548 |
| Rat, mouse | 39 | 26 | 44 | 41 | 150 |
| Squirrel, chipmunk | 32 | 41 | 35 | 38 | 146 |
| Pet rodents[1] | 17 | 24 | 33 | 21 | 95 |
| Miscellaneous nondomestic[2] | 12 | 9 | 13 | 9 | 43 |
| Miscellaneous domestic[3] | 3 | 6 | 4 | 2 | 15 |
| Total | 251 | 211 | 297 | 238 | 997 |

[1] Hamster, guinea pig, gerbil, rabbit.
[2] Fox, bat, opossum, mole, owl, skunk, raccoon, monkey, mink, shrew, muskrat.
[3] Cow, pig.

of the bites resulted from exposures to a variety of wild species that included those currently important in rabies transmission—the fox, skunk, raccoon, and bat.

One indicator of physicians', and often veterinarians', perceptions of rabies was obtained from a review of laboratory records of animal heads submitted to the State public health laboratory for rabies testing. As shown in table 5, dogs and cats represented about half the animals tested. An additional 38 percent of the tests were performed on rodents, animals that are rarely rabies carriers.

**Interview results.** Interviews were conducted with 274 dog bite and 80 exotic animal bite victims. Of these persons, 82 percent had sought medical assistance—two-thirds at the hospital emergency room and one-third at a physician's office. Only 3 persons had been hospitalized, and 88 percent required only medical treatment.

Post-exposure rabies vaccination was recommended for 8 of 304 victims who responded to this question; 4 of the 8 had been bitten by dogs and 4 by wild rodents—2 squirrels and 2 rats. Only one of the eight animals, a dog, was unavailable for observation or rabies testing. Conversely, in eight additional cases, biting dogs were unavailable for testing or observation —instances in which post-exposure vaccination of the victim is a justifiable consideration.

Based on current rabies recommendations, the following biting animals had been inappropriately handled:

- Nine dogs were available, but they were neither confined nor tested.
- Two skunks, one raccoon, and one ferret were confined for observation, rather than killed and tested.
- A total of eight hamsters, gerbils, and guinea pigs were confined for observation.
- Five rats and mice were confined, and nine others were tested.
- Two monkeys and two rabbits were confined.

**Site and cost of treatment.** In 1976, 20 dog bite victims were seen as outpatients at University Hospital, and treatment costs were obtained for 19. Individual bills ranged from $12 for an emergency room visit to $115.50 for a visit that included wound dressing, radiology, and multiple laboratory tests. The mean cost of outpatient treatment was $27. One patient required 2 days of hospitalization, and the bill for room, diagnostic tests, medication, and emergency treatment totaled $394.

During the same period, 204 dog bite victims were treated in the emergency room at Children's Hospital. The treatment records of a sample of 18 victims showed bills ranging from $27.50 to $78.60; the mean cost per incident was $33.15. Only one patient in this group required sutures; all the others received treatment similar to that given to the group seen at the University Hospital—cleansing, dressing, and tetanus toxoid. An additional five victims were hospitalized for surgical closure of multiple lacerations inflicted by dogs. All experienced head and face wounds, but they were treated successfully and discharged within 2 to 3 days. Their average bill was $376.

Several pediatricians were queried about their fees for treating dog bite injuries at their offices. The average charge was $17 for the usual therapeutic regimen of wound dressing and tetanus toxoid. Based on the crude assumption that all dog bite victims during the 4 years studied had sought medical attention in a manner comparable to that of the persons interviewed, treatment alone may have cost approximately $50,000 each year.

Table 5. Animal heads submitted by Jefferson County residents to Birmingham branch of State laboratory for rabies testing, 1973–76

| Species | 1973 | 1974 | 1975 | 1976 | Total |
|---|---|---|---|---|---|
| Dog | 108 | 89 | 85 | 87 | 369 |
| Cat | 85 | 70 | 82 | 65 | 302 |
| Squirrel, chipmunk | 64 | 65 | 60 | 47 | 236 |
| Rat, mouse | 22 | 19 | 25 | 36 | 102 |
| Pet rodents[1] | 46 | 42 | 23 | 24 | 135 |
| Miscellaneous nondomestic[2] | 26 | 19 | 20 | 18 | 83 |
| Miscellaneous domestic[3] | 1 | ... | 1 | ... | 2 |
| Total | 352 | 304 | 296 | 277 | 1,229 |

[1] Hamster.
[2] Fox, bat, opossum, mole, owl, skunk, raccoon, monkey, mink, shrew, muskrat.
[3] Cow, pig.

## Discussion

A current pet population explosion in the United States has been described by many authors (*10,11*), and animal handling data from shelters and animal control agencies tend to support this appraisal (*12*). The Jefferson County Health Department and the Birmingham Humane Society together handled 27,473 dogs in 1977, 22,480 of which were unclaimed and subsequently destroyed. From 1974 to 1977, the number of animals handled by the two agencies had increased by 20 percent. Since the dog population of Jefferson County may be estimated as approximately 100,000 (*13,14*), dogs theoretically are replacing through reproduction the 20 percent of their estimated population that is being eliminated each year by euthanasia, accidents, and disease. This turnover results in a younger population that may be more "bite prone" (*15*). If a question concerning pet ownership were included in the 1980 census, valuable data would be available to quantify the size of the pet population more reliably.

The high proportion of German shepherds implicated by dog bite victims may be indicative not only of their popularity, but also of indiscriminate breeding of animals with undesirable personality traits. A large number of mixed breeds also may be misclassified as German shepherds because of physical similarities. It is notable, however, that the American Kennel Club registrations of this breed have declined every year since 1973, a 26 percent reduction (*9*), although this decline may not be occurring in urban areas where large breeds are commonly used for protection. The potential for serious injuries, particularly among children, from larger dogs is increasingly becoming appreciated by medical professionals (*16,17*), and it has been stated that the number of severe attacks and even fatalities due to such dogs are underreported (*18*).

The number of rodents submitted to the public health laboratory in Birmingham for rabies testing suggests an unnecessary expenditure of resources statewide. This situation is not unique to Alabama. A 1970 survey of 25 State laboratories revealed that 30 percent of all animal species examined were rodents—about 75,000 per year—although only 20 rodents per year were found to be rabies positive (*19*). Data collected subsequently by the Center for Disease Control (CDC) indicate no appreciable change in the annual number of rodents currently being examined. The numbers of rodents with positive test results have ranged from none to seven a year; only a few of these were confirmed by CDC. The positive animals have tended to result from laboratory accidents or erroneous rabies vaccine inoculation of pets with low egg passage, attenuated live vaccine. Because of these findings and because rodent-associated rabies has never been confirmed in man, several State laboratories now refuse to test many rodent species unless circumstances particularly warrant such action (*20*).

In recent years, 30,000–35,000 persons have received post-exposure rabies vaccine annually in the United States (*19*). Since only one to three human cases of rabies occur per year, unnecessary treatment is undoubtedly frequent. One way to reduce such treatment is for State health departments to dispense rabies vaccine only after evaluating the circumstances of the bite incident and thus the indication for administration of the vaccine. Georgia and Illinois have established such a policy, although the lack of a stringent evaluation mechanism in Illinois resulted initially in unnecessary administration of the vaccine (*21*).

Careful evaluation of the bite incident circumstances is essential before treatment is started because (*a*) the cost of the post-exposure-vaccination series may be high, (*b*) one-third of the recipients of duck embryo vaccine experience systemic reactions, and (*c*) almost all recipients experience local reactions (*22*).

Post-incident confinement periods have been established only for dogs and cats (10 days). Other biting animals, particularly those considered to be of higher risk for rabies—the skunk, fox, raccoon, and bat—should be sacrificed immediately and tested. Incidents in which the animals are unavailable for either testing or observation must be evaluated individually as to the need for vaccine, particularly regarding the circumstances of the bite, the species involved, and the existtence of rabies in the area. The increasing popularity of exotic pets represents a phenomenon worthy of particular concern because of the likelihood of bites and the potential for rabies transmission.

The cost of treating the estimated 1 to 1½ million dog bite injuries that occur in this country annually has been estimated at more than $12 million. Related costs borne by the victims from factors such as work loss could easily double this figure. Since the annual number of dog bite injuries in Jefferson County (272 per 100,000) falls within the range stated by Hummer for other areas, the economic impact of bite injuries in Jefferson County is probably representative of the nation as a whole (*11*).

Solutions to the problems described in this and other reports are based primarily upon effective education programs for health professionals and the general public. Physicians and veterinarians should be apprised regularly by public health officials of pertinent legislative changes and current recommendations regarding

the handling of animal bite incidents. Education programs aimed at influencing the behavior of pet owners, particularly with respect to the responsibilities of ownership, would do much to reduce the magnitude of the problems. Unfortunately, such programs tend to face the same difficulties as others that attempt to modify a person's lifestyle. Since children are at special risk of bite injuries, concerted educational efforts that emphasize how to approach and handle dogs and other animals should be aimed at them. The consistent increase in the number of bites occurring in the spring and early summer indicates when these efforts should be intensified.

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# SYNOPSIS


MAETZ, H. MICHAEL (University of Alabama in Birmingham): *Animal bites, a public health problem in Jefferson County, Alabama. Public Health Reports, Vol. 94, November–December 1979, pp. 528–534.*

From 1973 through 1976, 8,072 animal bite incidents were reported in Jefferson County; 88 percent of these were attributed to dogs. During the 4 years, the frequency of bite incidents increased consistently in the spring and summer months. Males and children of both sexes under 9 years old comprised the greatest number of victims.

Of the biting dogs, 79 percent were owned, and two-thirds weighed more 23 kilograms. A significant proportion of all dogs implicated were identified as German shepherds. The number of animal bites due to species other than dogs represented only 12 percent of the total number reported for the 4 years; cat bites accounted for 55 percent and rodent bites for 39 percent of this total.

Interviews with victims revealed certain circumstances in which post-exposure rabies vaccination should and should not have been recommended, but in which the opposite action was taken. The mean cost for outpatient treatment at two Birmingham hospitals was $30 per visit. Most victims received outpatient care, but several children were hospitalized for treatment of multiple wounds.

Because of the apparent increase in the dog population as well as in the number of bite injuries, accurate data are needed to assess the magnitude of the bite problem. A question regarding pet ownership in subsequent census interviews would partially meet this need. The cost and trauma associated with post-exposure rabies treatment are significant, and they require a continued awareness of the epidemiology of rabies and appropriate therapeutic recommendations.