DOG BITE RATES AND BITING DOG BREEDS IN TEXAS, 1995-1997

By

DAVID E. BLOCKER, BS, MD

APPROVED:

WALTER R. ROGERS, PhD

FRANK I. MOORE, PhD

20000831 091

DTIC QUALITY INSPECTED 4

DEDICATION

To Tracey, my wife,

Brandon, my little light on a hill,

and

Baby-on-the-way.

All my love is yours, in Christ!

DOG BITE RATES AND BITING DOG BREEDS IN TEXAS, 1995-1997

By

DAVID E. BLOCKER, BS, MD

THESIS

Presented to the Faculty of The University of Texas-

Houston Health Science Center

School of Public Health

in Partial Fulfillment

of the Requirements

for the Degree of

MASTER OF PUBLIC HEALTH

THE UNIVERSITY OF TEXAS-HOUSTON HEALTH SCIENCE CENTER
SCHOOL OF PUBLIC HEALTH
Houston, Texas
August, 2000

ACKNOWLEDGEMENTS

I offer thanks to my three advisors for their months of patience, advice, and gentle prodding. You helped me shape a thesis idea into a document that will hopefully be useful to the public health arena beyond our schoolhouse walls. Dr. Rogers, as my primary advisor you did a wonderful job of going over every detail of each draft and discussing them with me, always challenging me to make this project better. Dr. Moore, your experience, wisdom, and support were always evident in your thoughtful suggestions. Dr. Herbold, your wealth of veterinary and public health experience definitely helped to get me on the "right track" with this project. I hope that each of you shares my satisfaction in a project well-done.

My appreciation goes to the many Texas Department of Health employees who provided data and insight into the importance of a better understanding of dog bites in Texas. A special thanks is given to Dr. Jane Mahlow, Director of the Zoonosis Control Division in Austin, for providing complete access to the TDH severe animal bite report database used in this study. Also, thanks are given to Dr. Chip Riggins, Dr. Christine Bradshaw, Dr. Catherine Tull, Dr. Alfonso Holguin, and Cassie Kurfmann, who got me started in the direction of this thesis while I was asking questions about dog bites in Bandera County.

Finally, I want to thank the San Antonio Metropolitan Health District Animal Control Division. I offer thanks to Dr. Ned Lammers, the director, for his time and invaluable input to this project, which included his full approval to use the SAMHD bite report database. I also want to thank Tracy Reese, his secretary, for her cheerful willingness to answer questions about the database and the Animal Control Division at any time. I hope this document will provide the TDH and SAMHD with a new perspective on dog bites in our community as they relate to the Texas population-at-large.

Thesis submitted to the MPH Committee on June 30, 2000.

DOG BITE RATES AND BITING DOG BREEDS IN TEXAS, 1995-1997

David E. Blocker, BS, MD, MPH
The University of Texas-
Houston Health Science Center
School of Public Health, 2000

Supervising Professor: Walter R. Rogers

Almost 5 million people a year are bitten by dogs in the United States. The majority of dog bites occur in children under 15, and approximately 18 deaths each year are dog-bite related. Numerous studies have provided statistics on the incidence rates of dog bites for the United States, but incidence rates have not been published for any areas of Texas in over 20 years. In addition, no published studies have looked at the relationship between biting dogs and their breed prevalence in Texas.

The first aim of this study was to summarize descriptive characteristics of biting dogs and dog bite victims in Texas from 1995 through 1997 using the Texas Department of Health severe animal bite database and the San Antonio Metropolitan Health District animal bite database. The second aim was to determine dog bite rates in Texas populations using data from both databases. The third aim was to determine annual bite rates for commonly biting dog breeds in the San Antonio area. The fourth aim was to discuss dog bite report collection methods for both databases and recommend improvements.

The estimated sex-adjusted annual rate of 109 bites per 100,000 Texas population was only 6% of the expected rate based upon national statistics. The reported annual severe bite rate in Texas was even lower, at 3.1 per 100,000 (0.2% of the expected rate). Biting dog and victim characteristics from both databases were very similar to published national statistics, but the relatively small numbers of bites reported to either database make it difficult to guide Texas public health practice based purely upon local bite data.

When bite rates were determined by breed, Pit Bulls were 5 times more likely to bite than all other breeds combined ($P < .01$). Chow Chows and Rottweilers were 3 times and 2

times more likely to bite. German Shepherds and Labradors were less likely to bite than all other breeds combined.

The San Antonio Metropolitan Health District primarily used narrative forms, whereas the Texas Department of Health used more quantitative methods like check-boxes for data entry. Standardizing methods of data entry and adopting a cooperative internet-based database for use by all public health agencies would greatly improve the accessibility, consistency, and completeness of dog bite data reporting across the state of Texas.

TABLE OF CONTENTS

List of Tables ix

List of Figures xi

List of Appendices xii

Introduction 1

A. Overview 1

B. Specific Aims 2

Literature Review 3

A. Scope of the Problem 3

B. Characteristics of Dog Bite Victims 3

C. Characteristics of Biting Dogs 5

D. Prevalence of Biting Dogs and Their Breeds 6

E. Rabies and Other Infections Spread by Dog Bites 7

F. Environmental Factors in Dog Bites 8

G. Current Bite Report Databases in Texas 9

H. Animal Control Departments in Texas 11

Methods 12

A. Databases Used 12

B. Collecting Descriptive Characteristics of Databases 13

C. Estimating Dog Bite Rates in Humans 13

D. Estimating Bite Rates for Commonly Biting Dog Breeds in Bexar County 14

E. Statistical Analysis 15

Results 19

A. Database Characteristics 19

B. Dog Bite Rates in Humans 22

C. Bite Rates for Commonly Biting Dog Breeds in Bexar County 23

Discussion 24

A. Database Characteristics 24
B. Dog Bite Rates in Humans 26
C. Bite Rates for Commonly Biting Dog Breeds in Bexar County 27
D. Recommended Changes to Dog Bite Report Databases in Texas 28
E. Recommendation for Future Study 30
Conclusions 30
Appendices 69
References 74
Vita 79

LIST OF TABLES

Table 1	Incidence Rates of Dog Bites in the United States, 1994	32
Table 2	Dog Bites Versus Breed Prevalence in San Antonio, 1992-1994	33
Table 3	Some Microorganisms Isolated from Animal Bite Wounds	34
Table 4	Percentages of Rabies Cases in Texas Dogs	35
Table 5	Dog-to-Human Bite Reports in the San Antonio Metropolitan Health District Animal Bite Database	36
Table 6	Comparison of Dog and Victim Data Fields Contained Within the Texas Department of Health and San Antonio Metropolitan Health District Animal Bite Databases	37
Table 7	Example of Table Used for Odds Ratio Calculations	38
Table 8	Texas Department of Health Severe Dog Bite Reports by Breed	39
Table 9	Texas Department of Health Severe Dog Bite Reports by Dog Sex	40
Table 10	Texas Department of Health Severe Dog Bite Reports by Neuter Status	41
Table 11	Texas Department of Health Severe Dog Bite Reports by Dog Sex and Neuter Status	42
Table 12	Texas Department of Health Severe Dog Bite Reports by Rabies Vaccination Status	43
Table 13	Texas Department of Health Severe Dog Bite Reports by Dog Sex and Rabies Vaccination Status	44
Table 14	Victim Ages by Sex for Severe Bites Reported in Texas, 1995-1997	45

Table 15	Male to Female Odds Ratios for Texas Severe Dog Bite Victims, 1995-1997	46
Table 16	Body Locations for Severe Bites in Texas, 1995-1997	47
Table 17	San Antonio Metropolitan Health District Dog Bite Reports by Breed	48
Table 18	San Antonio Metropolitan Health District Bite Reports by Dog Sex	49
Table 19	San Antonio Metropolitan Health District Dog Bite Reports by Neuter Status	50
Table 20	San Antonio Metropolitan Health District Dog Bite Reports by Dog Sex and Neuter Status	51
Table 21	San Antonio Metropolitan Health District Dog Bite Reports by Rabies Vaccination Status	52
Table 22	San Antonio Metropolitan Health District Dog Bite Reports by Dog Sex and Rabies Vaccination Status	53
Table 23	San Antonio Metropolitan Health District Dog Bite Reports by Victim Sex	54
Table 24	Reported Severe Dog Bite Rates in Texas, 1995-1997	55
Table 25	Reported Dog Bite Rates per 100,000 Bexar County Population	56
Table 26	Sex-adjusted Dog Bite Rate Estimates for Texas	57
Table 27	Estimated Number of Dogs in Bexar County	58
Table 28	Estimated Rates of Biting Dogs in Bexar County	59
Table 29	Estimated Bite Rates for Commonly Biting Dog Breeds in Bexar County, 1995-1997	60
Table 30	Odds of Biting for Commonly Biting Dog Breeds in Bexar County, 1995-1997	61

LIST OF FIGURES

Figure 1	Dog breeds most frequently involved in United States dog-bite related fatalities from 1979 through 1996.	62
Figure 2	Nine dog breeds most frequently involved in severe bites reported in Texas, 1995 through 1997.	63
Figure 3	Age distribution of severe bite victims reported in Texas, 1995 through 1997.	64
Figure 4	Body locations of severe dog bites reported in Texas by age groups, 1995 through 1997.	65
Figure 5	Body locations of severe dog bites reported in Texas children, 1995 through 1997.	66
Figure 6	Dog breeds most frequently involved in reported dog bites in Bexar County, 1995 through 1997.	67
Figure 7	Estimated bite rates for commonly biting dog breeds reported in Bexar County, 1995 through 1997.	68

LIST OF APPENDICES

Appendix A	Texas Department of Health Report of Severe Animal Bite or Attack	70
Appendix B	San Antonio Metropolitan Health District Animal Bite Report	71
Appendix C	Texas Department of Health Proposed Animal Bite Report	72

INTRODUCTION

A. Overview

Over twenty studies have been published on the magnitude and public health impact of dog bites in the United States over the past two decades, but none of that data has been specific to Texas. Sacks et al (1996a) estimated the incidence rate of dog bites in the United States population to be 1,800 bites per 100,000 in 1994. No comparable incidence rates are available for Texas or major Texas metropolitan areas like San Antonio in the published literature. Twenty-six of the 304 dog-bite-related fatalities in the United States from 1979 through 1996 occurred in Texas (CDC, 1997). Specific instances of vicious attacks on small children or the elderly by certain "high-risk" breeds, like Pit Bulls or Rottweilers, are frequently reported in the media, but no published studies in Texas have attempted to place these attacks in perspective with age-specific incidence rates or the breed-specific dog population. Public health benefit could be gained from a better understanding of dog bite statistics specific to Texas, the third most populous state, and to San Antonio, the ninth largest city in the United States (Johnson, 1997).

The Texas Department of Health (TDH) severe animal bite or attack report database, collected by the TDH Zoonosis Control Division in Austin since 1991, is the only state-wide database in Texas containing dog bite information. This database is used as the primary source of data to direct dog bite prevention efforts throughout the state of Texas. Only bites or attacks that are considered "severe" by local animal control, police, or public health agencies throughout the state are submitted to the database, and there is no requirement for those agencies to participate. Since 1995, around 600 severe bite reports have been submitted each year. The reports have been unevenly distributed by location; less than half of the counties in Texas have reported any severe bites to the TDH. The TDH publishes yearly summary reports from the database, containing biting dog and bite victim characteristics, but the usefulness and relevance of the summary data are questionable because of the limited number of bite reports collected. In addition, no dog bite rate estimates have been published in Texas since 1977, before the inception of the TDH database

(Newman, 1977). Therefore, it has been impossible to compare dog bite rates and characteristics in Texas with other states or the United States as a whole.

The San Antonio Metropolitan Health District (SAMHD) has a large animal control division that maintains a local animal bite report database. The SAMHD database includes all bites reported in the city of San Antonio and the surrounding Bexar County area; over 3,000 new bite reports have been added each year since 1995. The metropolitan area covered by the SAMHD is the third largest in Texas and the thirtieth largest in the United States, with over 1.3 million residents (Johnson, 1997). Unlike many other large metropolitan areas, San Antonio and other major Texas cities have not had their dog bite statistics published in the medical or public health literature to date (Berzon et al, 1972; 1978; Griego et al, 1995; Chang et al, 1997).

B. Specific Aims

Four specific aims guided this study to evaluate the extent of the dog bite problem in Texas.

1. Summarize descriptive characteristics of biting dogs and dog bite victims contained in the TDH and the SAMHD databases for the study period of 1995 through 1997.
2. Estimate annual crude and sex-specific dog bite rates in humans for the Texas and Bexar County populations.
3. Estimate annual bite rates for commonly biting dog breeds in Bexar County.
4. Discuss the administrative procedures for dog bite data collection currently employed by both the TDH and the SAMHD and make recommendations for future changes to improve the accessibility, consistency, and completeness of data reported to both databases.

LITERATURE REVIEW

A. Scope of the Problem

In 1994, the incidence of dog bites in the United States was estimated to be 4,490,000 bites, which is 1,800 bites per 100,000 (Sacks et al, 1996a). From 1979 through 1996, there were a total of 304 dog-bite-related fatalities in the United States (CDC, 1997). Over 70% of dog bite fatalities occurred in children less than 10 years of age, and 8.6% of the fatalities occurred in Texas. In addition to fatalities, severe dog bites often produce disfiguring and disabling injuries, and there is a high risk of infection with diseases ranging from *Pasteurella* to rabies (Gandhi et al, 1999). Annual costs of healthcare for bite injuries in United States children under 20 years of age were estimated to exceed $83 million in 1998 (Weiss et al, 1998; Quinlan and Sacks, 1999). Over $1 billion is paid out in the United States each year for damages and losses from dog bites (Phillips, 1999).

Literature on dog bites in the United States is extensive, but literature on dog bites in Texas is not. The published literature contains no dog bite rates extrapolated to the entire state of Texas since 1977. Newman (1977) reported that a random survey of households in three West Texas cities found that an estimated 246,000 Texas residents were bitten each year, equivalent to an annual dog bite rate of 2,059 bites per 100,000. That bite rate was over six times greater than the one reported to the Texas Animal Bite Surveillance Program in 1976 (336 per 100,000) and four times greater than accepted national rates at the time (500 per 100,000). Although metropolitan health districts in San Antonio, Dallas, and Houston routinely collect detailed bite report information for their own uses, this information has never been consolidated by the TDH into a "big picture" of dog bites in the state.

B. Characteristics of Dog Bite Victims

1. United States

Dog bites appear to be distributed similarly in populations throughout the United States; therefore, the unreported Texas statistics should bear some similarity to national reports (Sacks et al, 1996a; Voelker, 1997). A telephone survey done by the Centers for

Disease Control and Prevention (CDC) in 1994 estimated the national incidence rate of dog bites to be 1,800 bites per 100,000 per year (Sacks et al, 1996a). Incidence of bites was 1,610 bites per 100,000 adults and 2,450 bites per 100,000 children (Table 1). Male children were bitten almost 50% more often than female children, and male adults were bitten 95% more often than female adults. The highest dog bite incidence rate during this survey was 2,920 bites per 100,000 in 18- to 24-year old males. Small children 5 to 9 years old and younger than 5 years old were close behind, with 2,840 bites per 100,000 and 2,490 bites per 100,000, respectively. Compared to the severity and frequency of all other causes of childhood injury and illness, dog bites have been called the number one public health problem facing United States children (Boenning, 1983).

Other national estimates provide numbers for dog bite fatalities ranging from 12 to 20 per year since 1979 (Sacks et al, 1989; Weiss et al, 1998). Every year, at least 57% of those fatalities have been children. Emergency department visits because of dog bite injuries were estimated to be about 333,700 visits annually at a rate of 129 per 100,000 people each year from 1992 through 1994 (Quinlan and Sacks, 1999). In some areas, 1% of all emergency department visits were for dog bites. Boys from 5 to 9 years old were the victims most commonly seen in the emergency department, with an incidence rate of 607 visits per 100,000, which is 3.6% of all emergency department injury visits for this age group. The head, face, or neck was bitten in 73% of children. Children under the age of four were most commonly bitten in the face, and children 5 to 18 years of age, as well as adults, were most frequently bitten on the extremities (Boenning, 1983; Tuggle, 1993). The median age for victims receiving care for dog bites in emergency departments was 15 years old, but victims were seen from less than one year to 91 years old. There were around 6,000 United States hospitalizations for dog bites in 1994 (Quinlan and Sacks, 1999).

2. Texas

Six hundred and twenty-five severe dog bite attacks were reported in Texas during 1998, but no crude or age-specific incidence rates were estimated (TDH, 1999b). Males experienced 54% of the attacks. Children under six experienced 20% of the attacks, and 23%

occurred to 6- to 10-year olds. Seventy-five percent of the victims required sutures, 28% were hospitalized, and 15% required surgery. Similar to national statistics, Texas children under 10 years old experienced 75% of the head trauma cases. When occupations were reported, animal control officers consistently had the highest number of bites, followed by utility workers, home health aids, veterinary assistants, and law enforcement officers (TDH, 1996b; 1997; 1998a; 1999b).

3. San Antonio

Other than yearly summary numbers, statistics for dog bite victims specifically within the San Antonio area have not been published. According to the SAMHD health profile for 1998, an average of 3,753 animal bites were reported and substantiated for each year from 1995 through 1998 (SAMHD, 1999). These numbers include animal-to-animal as well as animal-to-human bites. Information has been collected on all reported animal bites in the SAMHD area since 1995 and the general trends appear to support the national data. Children are more frequently bitten and are more likely to sustain severe injuries than adults. Males also appear to be bitten more commonly than females.

C. Characteristics of Biting Dogs

The most common breeds involved in dog bites appear to be larger, more aggressive species, although smaller breeds are involved as well (CDC, 1997). Since 1979, the pure breeds most frequently implicated in dog bite fatalities in the United States include Pit Bulls, Rottweilers, German Shepherds, and Huskies (Figure 1). Mixed breeds included wolf hybrids as well as mixes of the other breeds listed above. Male, non-neutered dogs over 50 pounds were most often involved. Of the bites prior to 1994, at least 19% of the dogs had a prior history of aggression, and 21% were "roaming" off the owner's property without any restraints (Sacks et al, 1996b). About 80% of the time, the victim was familiar with the biting dog (Boenning, 1983).

Chow Chows, Rottweilers, Pit Bulls, German Shepherds, and Labrador Retrievers most commonly cause severe bites in Texas (TDH, 1999b). In 1998, non-neutered male dogs

were 2.6 times more likely to attack than neutered males or females. The risk of a female dog biting was unaffected by spaying. One particularly concerning characteristic was that over 48% of the biting dogs reported in Texas had not been vaccinated for rabies in the previous year. In addition, 22% of the biting dogs had been involved in previous attacks, but only 6.8% of the reports indicated any charges filed against the owners of the biting dogs, including failure to vaccinate against rabies.

D. Prevalence of Biting Dogs and Their Breeds

One thing that remains very difficult to estimate is the prevalence of biting dogs and their breeds among the general dog population. The American Kennel Club listing of top 50 registered pure breeds in the United States provides some perspective on breed prevalence, but it does not include mixed breeds, estimated to be over half of the dog population (AKC, 2000). The top five registered breeds are Labrador Retrievers, Golden Retrievers, German Shepherds, Dachshunds, and Beagles. Rottweilers, a breed with a high number of reported bites, were the eighth most popular registered pure breed. Two of the pure breeds that bite most commonly in Texas, Chow Chows and Pit Bulls (Staffordshire Bull Terriers), were much less popular, ranking forty-fourth and ninety-second in popularity.

The SAMHD and TDH do not have prevalence data on biting dogs or the number of dogs in each breed in San Antonio or Texas. Approximately 10,500 pet licenses are purchased for dogs each year in the SAMHD, and dog breeds listed on those licenses are not centrally tabulated. In addition, dog breeds are not reported when veterinary offices throughout the SAMHD give rabies vaccinations.

One available source provided estimated prevalence data on dog breeds in the SAMHD. In 1993, breed data was collected on all dogs receiving rabies vaccinations from a major pet store chain (PetsMart) with numerous locations in San Antonio and Texas. Percentages for the breeds most commonly seen were determined and compared with the percentage of TDH severe bite reports indicating that breed in each location from 1992 through 1994 (Herbold, 1997). Out of the sample of 17,000 dogs vaccinated for rabies in San Antonio, only 18% were identified as belonging to the top 5 biting breeds in Texas

(Table 2). Labrador Retrievers made up 7% of the total dog population, Chow Chows and German Shepherds each were 4%, and Rottweilers and Pit Bulls were the least popular of the 5 breeds, at 2% and 1%, respectively. Results of that study indicated that some breeds, like Chow Chows, German Shepherds, Pit Bulls, and Rottweilers, caused large numbers of bites when compared with their relatively low breed prevalence. Their ratios of percentage of bites versus prevalence were all around four or greater. Other breeds listed, like Labradors and Cocker Spaniels, caused large numbers of bites but those breeds were about twice as prevalent as the others studied, so the ratio of percentage of bites versus prevalence was much lower; 2.7 for Labradors and 1.3 for Cocker Spaniels. To date, those breed prevalence findings have not been used with bite counts for the entire SAMHD to determine bite rates for each breed.

E. Rabies and Other Infections Spread by Dog Bites

Many infectious agents are commonly spread by dog bites (Table 3). The most common pathogens found in the saliva of tested dogs were *S. aureus* (68%), *P. multocida* (66%), and *Corynebacterium* (68%). *P. multocida* was the most common organism causing secondary infection.

The most immediately fatal infectious agent spread by dog bites is the rabies virus. In 1989, there were 2,776 human deaths around the world caused by rabies (WHO, 1990). More than 70% of these cases were contracted from dogs. During 1997 there were 8,509 cases of animal rabies in the continental United States; 7% of the cases were in domestic animals (Garcia, 1999). In the United States from 1991 through 1998, there were six cases of human rabies associated with dog bites. Those cases all were associated with dog bites that occurred outside of the United States.

The proximity of canine rabies epidemics in domestic dogs in urban Mexico and in coyote reservoirs in South Texas greatly increase the risk of canine-to-human rabies transmission in Texas. The canine strain of rabies remains active in the coyote population, and is easily transmissible from coyotes to domestic dogs and then to humans. Mexico has recently experienced problems with rabies outbreaks in urban dog populations less than 200

miles from the Texas-Mexico border (Eng et al, 1993; Garcia, 1999). Since 1988, 21 South Texas counties have been involved in a canine rabies epidemic involving coyotes (TDH, 1996a; 1998b). Starting in February 1995, the TDH began to distribute bait laced with rabies vaccine into South Texas in an attempt to keep the epidemic from significantly affecting domestic animals. The Oral Rabies Vaccination Program is an ongoing effort; 2,700,000 doses of vaccine were dropped during 198 flights in 1999 (TDH, 1999d).

Post-vaccination surveillance conducted in March 1998 demonstrated that the Oral Rabies Vaccination Program has effectively halted the overall expansion of the coyote rabies epidemic in Texas (TDH, 1999b). Only six cases of rabies were detected in coyotes in 1998, decreased from seven cases in 1997 and more in previous years. Sixty-four percent of coyotes trapped and killed in the epidemic area showed a serologic response to the rabies vaccination.

In 1998, 15 cases of rabies in domestic dogs accounted for 6.6% of all positive rabies cases in Texas (Table 4). Overall, the number of rabies cases in Texas dogs each year has remained stable at 15 cases or less each year since 1996; this was a dramatic decline from the 1994 and 1995 levels of 53 and 55 cases. Although human rabies from dog bites is a rare occurrence in Texas, the disease is fatal if prophylactic treatment is not initiated prior to signs and symptoms of the disease. Therefore it is disturbing that in Texas, 48% of the dogs involved in attacks or bites in 1998 had not received a rabies vaccination in the previous year (TDH, 1999b). In 1998, there were 19 cases of rabies in animals in Bexar County, but no confirmed cases of rabies in dogs (SAMHD, 1999b; TDH, 1999a). SAMHD officials estimate that only 20% of dogs were vaccinated for rabies within the last year in Bexar County. Obviously there is a much higher risk of a rabies epidemic spreading to domestic dogs when they are not vaccinated.

F. Environmental Factors in Dog Bites

Nationwide, 45% of fatal bites in children involved unrestrained dogs on the owner's property, 26% involved unrestrained dogs off their owner's property, and 29% involved children too close to a restrained dog (Sosin et al, 1992). In a Denver study, 51% of the bites

occurred away from the owner's or victim's property, but 30% were in the owner's yard, 14% in the owner's house, and 4% in the victim's yard (Griego et al, 1995).

The TDH database records animal restraint information for severe bite cases, but that information is currently unpublished. The SAMHD database does not record details about forms of restraint used on the biting animal, but location in the SAMHD is annotated as "on" or "off" the owner's property.

G. Current Bite Report Databases in Texas

1. Texas Department of Health Severe Animal Bite Database

The TDH Zoonosis Division maintains information on severe animal bites and attacks throughout the state. Case reports are collected from city- or county-level agencies on a voluntary basis, using a standardized form that was revised in the fall of 1995 (Appendix A). This form is distributed and promoted annually to emergency care providers, local health departments, law enforcement agencies, and animal control agencies across the state. A specific definition for a severe bite or attack is used on the form to help assure that only appropriate cases are submitted. In addition, TDH personnel review each case report for content before it is incorporated into the database. The database contains information on animal breed, sex, behavior prior to the attack, and rabies vaccination status. Time, location of attack, and victim characteristics, such as age, sex, and occupation, also are collected. Location of injuries and degree of injury to the victim are included in the database.

The primary limitation to the TDH severe bite database is the voluntary nature of the reporting. Over the last 4 years, less than half of the 254 Texas counties have submitted information to the database each year (TDH, 1999b). In addition, there is no mechanism for the TDH to verify that all appropriate cases have been submitted. Therefore, accuracy and completeness of the state database are dependent upon the local authorities submitting the reports. Despite its limitations, this database provides some very useful data that is used to help direct animal bite education and prevention program emphasis at the state level. Discussions are underway between the Zoonosis Division and each of the TDH regions to

consider establishing a uniform internet-based bite report and tracking program for the state of Texas, but any unified program is still years away.

2. San Antonio Database

The SAMHD Animal Control Division provides animal control coverage to the city of San Antonio, unincorporated areas of Bexar County, and the majority of the county's suburban communities. Over 90% of the Bexar County population lives in areas covered by the SAMHD (SAMHD, 1999b; TSDC 1999). The Animal Control Division collects information on every animal bite in Bexar County that occurs within their jurisdiction, including animal-to-animal and animal-to-human bites. Local veterinarians, law enforcement, animal control, and emergency room personnel routinely transfer animals to the SAMHD for quarantine and provide information on local bite cases in a standardized format to the SAMHD (Appendix B). This allows the SAMHD to follow-up each case as needed, especially if there are concerns of possible rabies or repeat attacks. Once rabies has been ruled out by animal quarantine and the information is as complete as possible, each of the reports is collected into a central location by animal control personnel and entered into a database similar to the one kept by the TDH. The SAMHD does not currently forward information on severe bite cases that occur within their jurisdiction to the TDH, although a handful of reports are forwarded to the state from other Bexar County authorities each year.

3. Database Comparison

The main difference between the two databases is that the SAMHD database contains all reported bites in the district, whereas the TDH database contains only severe bites in the state. There are also differences in the amount of data collected and questions asked on each form. The SAMHD collects most information in a narrative format; the TDH asks for the same information through "check boxes," providing less freedom of choice but more precise data entry and analysis. Many specific questions, such as rabies vaccination status and pre-attack animal restraints used, are asked for on the TDH form but not included on the SAMHD form. Depending on which personnel filled out the reports and their level of

training, the TDH database might contain more detailed information than the SAMHD, or the TDH database might simply have empty data fields for these different questions.

H. Animal Control Departments in Texas

1. State-wide

One of the biggest barriers to animal control law enforcement across the state is the lack of adequately trained, equipped, and staffed animal control departments (TDH, 1999b). Without the personnel to collect stray or biting animals, appropriate equipment to capture them, vehicles to contain them, and facilities to quarantine, observe, and euthanize them as necessary, true animal "control" becomes impossible. In most rural Texas counties, sheriffs' department personnel or one or two county animal control officers perform animal control duties, often working with limited animal control equipment and facilities.

Much of the rural Texas rabies testing and reporting comes from rural veterinarians or regional TDH personnel, making complete records on biting animals difficult to obtain. Regional or county health departments might not have the resources needed to perform the tasks required, especially in remote areas with large geographical jurisdictions. This leaves room for major problems, such as a rabies epidemic, to spread farther than necessary before containment.

2. Bexar County

The busy SAMHD Animal Control Division has 36 full-time animal control officers divided into shifts working around the clock to respond to any animal bite report and take appropriate action, including quarantine, rabies testing, assuring care for the victim, and creating a full record of each incident. Around 50,000 animals are impounded each year in the district's four kennel facilities, often with two animals crowded into each cage. Out of the 36,614 animals impounded in San Antonio from January through October 1999, a total of 33,028 were euthanized, 2,732 were claimed by their owners, and only 854 animals were adopted.

Despite the large number of animals euthanized, the numbers impounded each year remain approximately the same. When animal control resources are saturated, enough stray animals remain at-large each year to increase the stray animal population. Currently, the $2.2 million budget for animal control in the SAMHD does not provide for expansion of the existing facilities or the employment of additional animal control workers. Therefore, SAMHD officials feel that their most important stray animal population control task is to educate the public to neuter pets and to bring unwanted animals to animal shelters or animal control facilities, rather than releasing them into the stray animal population.

Many small communities inside Bexar County also have animal control departments or their police play a similar role. Many of the suburban San Antonio area communities round up animals and take them to the SAMHD kennels for care or disposition. A few of the communities, like Castle Hills, Live Oak, Hollywood Park, and Hill Country Village, perform their own animal quarantine and disposition or use local veterinarians' facilities, separate from the SAMHD.

METHODS

A. Databases Used

The TDH Zoonosis Control Division granted full approval to use the TDH severe animal bite database before this study was initiated. No personal identifiers were released from the database for this study. The database contained voluntarily reported information collected on severe bite victims and biting animals in Texas beginning in 1991. Over the 1995 to 1997 period, the TDH database contained a total of 2,136 records; 1,843 (86%) were dog bites.

The SAMHD Animal Control Division granted full approval to use the SAMHD animal bite database before this study was initiated. The SAMHD animal bite database contained information collected on all reported bite victims and biting animals in Bexar County from 1995 to the present, with a total of 7,617 animal bite reports from 1995 through 1997. Seventy-one percent of the SAMHD database records (5,393) were dog bite reports

(Table 5). Before data analysis, dog-to-animal bites and bites to "unknown" victims were removed from the SAMHD database by searching the "victim name" field for the words "animal exposure" or anything other than an actual person's name. Another seventeen percent of the reports were removed in this step, leaving 59% of the original bite reports (4,456) for analysis as definite dog-to-human bites.

Data from both databases were manipulated using Microsoft Access, Version 2000 (Microsoft Inc, Redmond, Wash; 1999). Microsoft Excel, Version 2000 was used to generate all of the tables and figures presented.

B. Collecting Descriptive Characteristics of Databases

To achieve the first aim of this study, descriptive characteristics of biting dogs and dog bite victims were collected and summarized for both databases for each of the years from 1995 through 1997. Dog breed, dog sex, neuter status, and rabies vaccination status were summarized from both databases into tabular format. Dog breeds listed more than twice in either database were categorized into a master dog breed index in Microsoft Access. Some victim characteristics that were available from the TDH database were not available from the SAMHD database (Table 6). Victim sex data was collected and summarized from both databases, but victim age was only available from the TDH database. The TDH database also contained victim body site bite location data.

C. Estimating Dog Bite Rates in Humans

1. Estimating Severe Dog Bite Rates for Texas

To achieve the second aim of the study, age-specific and sex-specific severe dog bite rates for Texas were estimated using the number of TDH severe bite reports for each year divided by the Texas state population by age and sex projected for each year by the Texas State Data Center (TSDC, 1999). The severe bite rates then were compared with estimated national bite rates from around the same time period.

2. Estimating Dog Bite Rates for Bexar County and Texas

Bexar County crude and sex-specific population estimates were obtained from the TDH (TDH, 1999e) and tabulated with the reported bite counts for each year and the 3-year averaged bite counts for the study period. Dog bite rates for Bexar County were calculated by dividing the reported dog bite counts by the population estimates. Using the direct method of standardization as described in Pagano (1993, p 61), sex-specific rates estimated from the SAMHD database then were applied to Texas male and female population estimates (TSDC, 1999). Projected numbers of dog bites in each sex were added to one another and divided by the total Texas population for each year to provide sex-adjusted bite rates for Texas.

D. Estimating Bite Rates for Commonly Biting Dog Breeds in Bexar County

1. Estimating Overall Bite Rates

To achieve the third aim of the study, estimating the percentage of dogs in Bexar County that were involved in an animal-to-human bite each year, the number of dogs in Bexar County first had to be estimated. The SAMHD had no published dog population estimates; therefore, standardized estimation formulas based upon national surveys performed by the American Veterinary Medical Association were used (AVMA, 1993). The number of households in an area was estimated by dividing the population by 2.63. The number of dogs in that population was estimated by multiplying the number of households by 0.555. These two formulas were applied to Bexar County population estimates to derive an averaged dog population estimate for each of the 3 years of the study period. The numbers of dog-to-human bites then were divided by the estimated Bexar County dog populations to obtain the overall rates of biting dogs among the general dog population for each year.

2. Estimating Bite Rates by Breed

Bexar County breed prevalence information from Herbold (1997) was multiplied by the averaged one-year Bexar County dog population for the study period to determine an estimated population for each commonly biting dog breed. Averaged one-year bite counts

for each breed then were divided by the estimated breed population to determine dog-to-human bite rates by breed.

E. Statistical Analysis

1. General Statistical Information

The student edition of the statistical software package Minitab, Release 12 (Minitab Inc, State College, Pa; 1998) was used for all statistical calculations, including all proportions, chi-square comparisons, 95% confidence intervals, and *P* values. All statistical testing was conducted at a 95% level of significance (*P* value of < .05). The data compared in the study were mainly dichotomous, categorical characteristics such as male or female, rather than continuous numerical data. This limited most of the testing performed to tests of proportions and chi-square analysis, rather than tests of continuous data, like two-sample *t*-testing or analysis of variance.

The ideal minimum sample size for the statistical tests performed was determined by estimating the minimum sample size required to perform one-proportion tests at a 95% level of significance with a power of at least 0.80. The majority of statistical testing was performed on proportions; with proportions the size of the smallest sample greatly influences the statistical significance of all test results based upon that sample. Using Minitab, a sample size of approximately 200 was identified as the minimum for a one-proportion test to generate results with a power of 0.80 and a 95% level of significance. Because both databases contained much larger samples than 200 reports each year, all tests were expected to yield statistically powerful results.

2. Descriptive Characteristics of Databases

a. Proportional Testing of Dichotomous Data

Dog sex, neuter status, rabies vaccination status, and victim sex were all characteristics with only two resulting values (male or female, yes or no). Counts of each value for each of these characteristics were expressed as proportions of the total sample size. Confidence intervals for each proportion were calculated using the value proportion as the

equivalent of the mean for a set of continuous data and applying the standard normal (z) distribution as described in Pagano (1993, p 297). Because the sample sizes were consistently larger than 30, the t distribution was statistically equivalent to the standard normal distribution for these tests.

Then a one-proportion comparison was performed on each characteristic. The two dichotomous proportions were compared against one another for statistical equivalence using a 2-tailed z test, just as if the proportions were mean values of continuous data sets (Pagano, 1993, p 299). Each one-proportion comparison then yielded a P value based upon the z test results. Finally, the values for each characteristic were listed in the rows of a contingency table with the years represented in the columns. The table for each characteristic was then evaluated for consistency among the years using the chi-square test.

Odds ratios were then obtained on the "victim sex" characteristic. Subtracting counts of reported male and female bite victims from the male and female population projections for Texas and Bexar County, estimates of non-bitten males and females were available for comparison with the bite victim counts. Counts of bitten males and females were placed in a row above non-bitten males and females to produce a 2 x 2 table. Then the odds ratio was calculated as described in Pagano (1993, p 322). The resulting odds of a male being bitten versus the odds of a female being bitten were tabulated, along with 95% confidence intervals for the odds ratios calculated using Minitab. Odds ratios could not be calculated on the dog characteristics because data were not available on the prevalence of those characteristics among the general dog population for comparison with the biting dogs.

b. Testing of Other Categorical Data

For each database, the counts of dogs in each breed were listed and compared by year using the chi-square test. The TDH annual summaries listed breeds that caused more than 3% or 4% of the reported severe dog bites (TDH, 1997; 1998a; 1999b); therefore breeds that were identified in more than 3.5% of bite reports were listed for each database in this study. Breeds that were identified in 3.5% or more of the bite reports were listed in separate rows; all other breeds were combined into a final row labeled "other." Each proportion was tested

with the standard normal distribution to obtain 95% confidence intervals. The data were then sorted into three columns by year from 1995 through 1997. The chi-square test was performed on the resulting contingency tables to evaluate if the results significantly differed between the three years.

Body locations of severe dog bites were identified in the TDH database. The counts of bites reported to each body location each year were categorized and then compared using the chi-square test. Seven body locations were listed in rows; the three years of the reports were listed in columns. Only one case was identified as involving the groin; it was removed before the analysis to prevent invalidation of the test by having a cell in the table with an expected count of less than one (Pagano, 1993, p 314). The chi-square test was performed on the resulting 7 x 3 contingency table to evaluate if the locations significantly differed between the three years.

c. Testing of Continuous Data

Descriptive statistics were generated for the TDH "victim age" variable for each year, including the mean, median, and standard deviation. One-way analysis of variance was then performed on the sorted yearly data to test for variance of the mean ages among the three years.

To evaluate the effects of sex and age on one another in the TDH database, the two were tabulated and tested for independence with the chi-square statistic (McKenzie, 1999, p T-337). Using victim age in 5-year increments as the rows, the data were separated into columns by victim sex. Reports with unknown victim age or sex data were not included in this comparison. The resulting 17 x 2 contingency table was tested using the chi-square test.

3. Dog Bite Rates in Humans

Confidence intervals were derived for the crude and sex-specific rates for severe dog bites in Texas by applying the value of each proportion to the standard normal distribution as described above (Pagano, 1993, p 297). Two-proportion comparisons using the 2-tailed *z* test

were used to compare the male and female severe bite rates for each year (Pagano, 1993, p 301) and *P* values were determined.

Using direct standardization (Pagano, 1993, p 61), sex-adjusted dog bite rate estimates for Texas were obtained. Estimated annual rates for all dog bites in Bexar County were multiplied by the estimated sex-specific Texas populations. Then the projected numbers of bites in Texas males and Texas females were added together. The total projected number of bites then was divided by the estimated Texas population for each year to obtain estimated sex-adjusted dog bite rates. Confidence intervals also were derived for the sex-adjusted rates. Those estimates for all dog bites in Texas were then compared with the crude and sex-specific rates for severe dog bites in Texas.

4. Bite Rates for Commonly Biting Dog Breeds in Bexar County

a. Overall Bite Rates

The rate of biting dogs among the estimated dog populations for each year were expressed as proportions and 95% confidence intervals were obtained and compared with the average for the 3-year period using the 2-tailed *z* test.

b. Bite Rates by Breed

Confidence intervals were measured for the dog bite rates by breed, as above. Percentages of breeds that differed statistically from the overall average (0.53%) were identified with the 2-tailed *z* test and *P* values were determined.

Odds ratios for each breed also were obtained based upon this estimation. For each breed a separate 2 x 2 table was constructed (Table 7). Counts of biting dogs from that breed versus biting dogs from all other breeds were placed side-by-side in a row above non-biting dogs from that breed versus all others. Then the odds ratio was calculated for each breed along with a 95% confidence interval (Pagano, 1993, p 322).

RESULTS

A. Database Characteristics

1. Texas Department of Health Severe Animal Bite Database

a. Dog Characteristics

Nine breed categories made up 55% of the reports (Figure 2). Chow Chows were listed the most frequently (12%), followed by Rottweilers (7.4%), Chow Mixes (6.9%), and Pit Bulls (6.2%). Chow Chows were the only breed that had a statistically greater proportion of bites than all others (Table 8). Breed distributions did not vary statistically by year ($\chi^2_{18} = 26.54$, $P = .09$).

Seventy-five percent of severe bite records identified the biting dogs as male (Table 9). Male dogs were reported significantly more often in Texas severe bite reports than female dogs ($z = 22.27$, $P < .01$). The proportion of males to females remained the same each year ($\chi^2_2 = 1.67$, $P = .43$).

Only 15% of the dogs had been spayed or neutered (Table 10). Non-neutered dogs were reported significantly more often in Texas severe bite reports than neutered dogs ($z = 31.66$, $P < .01$). Although neuter status was unknown in all of the reports for 1995, neuter status varied significantly from 1996 to 1997, with 54% more dogs neutered in 1997 than in the previous year ($\chi^2_1 = 4.04$, $P = .04$). In addition, neuter status varied by dog sex ($\chi^2_1 = 7.38$, $P < .01$). Neutered female dogs and non-neutered male dogs were identified in more bite reports than expected in comparison with their neutered and non-neutered counterparts (Table 11).

Over half of the dogs (55%) had not been vaccinated against rabies in the year prior to biting (Table 12). Vaccinated dogs were reported significantly more often in Texas severe bite reports than non-vaccinated dogs ($z = 4.38$, $P < .01$). Rabies vaccination status varied significantly among the years ($\chi^2_2 = 10.82$, $P < .01$). Rabies vaccination status did not vary significantly by dog sex ($\chi^2_1 = 0.643$, $P = .42$). Proportions of bites caused by vaccinated and non-vaccinated dogs were the same for both males and females (Table 13).

b. Victim Characteristics

The average severe bite victim was 21 years old (95% confidence interval, 20.0-22.0 years). Children under 15 years of age received an average of 59% of the bites over the 1995 to 1997 time period; 65% of those children were male (Table 14). The distribution of ages did not vary significantly by year ($F_{2, 1801} = 2.26$, $P = .10$).

The age distribution of bite victims varied by sex ($\chi^2_{16} = 54.61$, $P < .01$); most of the younger victims were male (Figure 3). Males 5 through 9 years old received the greatest number of severe bites reported in any age group (16% of the total).

Males received an average of 58% of the severe bites. Males were much more likely than females to be victims of severe bites in Texas ($z = 6.98$, $P < .01$). The relative odds of a male being severely bitten were 1.4 times greater than those of a female being severely bitten (Table 15). For males from 5 through 9 years old, the relative odds of becoming a severe bite victim were the greatest, almost 2 to 1 versus females. For all age groups older than 15, the relative odds of males being bitten were not statistically greater than those of females.

c. Body Sites Bitten

Many severe bite episodes reported involved multiple body sites (Table 16). The leg was the site most frequently bitten (included in 35% of reports), followed by the head (29%), arm (21%), and fingers (19%). Bites to the face and groin were least commonly reported, at 2.3% and less than 0.1%, respectively. There was no significant difference in the distribution of bite locations among years ($\chi^2_{12} = 20.48$, $P = .06$) or by sex ($\chi^2_6 = 7.98$, $P = .24$).

Age was an important influencing factor in the distribution of severe bite locations ($\chi^2_{30} = 272.48$, $P < .01$). Most of the severe bites in children under 15 involved the head or leg; all areas except the fingers were more frequently bitten in children than in any other age group (Figure 4). Children under 15 had the highest number of facial bites reported, at 15 bites, but that number was miniscule when compared to the 1,325 bites they received overall. In older teenagers and adults, ages 15 through 59, legs and fingers were bitten most frequently. Adults older than 59 held a very small relative share of the bites, but they also were bitten mostly on the legs, arms, or fingers. These older adults experienced the highest

rate of bites to the face, at 3.6%. In the elderly (older than 74 years old), over 6% of the bites were to the face.

Among children under 15, the distribution of bite locations was very different (Figure 5). In children under 5 years old, 59% of the bites were to the head, but less than 0.1% of bites were reported specifically to the face. Elementary-school-aged children from 5 through 9 years old were bitten on the leg (24%) and arm (19%) almost as often as the head (28%). They also had the highest rate of bites to the torso (16%) for any age group. In older children, aged 10 through 14, the legs were targeted most frequently, receiving 37% of bites, followed by the arm with 18%.

d. Severe Bite Reports from Bexar County

None of the TDH reports matched any of the SAMHD reports by more than two of the following factors: date, location, and dog breed. Therefore, none of the TDH reports were identified as originating from the SAMHD database. Only 32 reports were sent to the TDH database from Bexar County, and two of those reports contained no dog or victim information for comparison. This sample of only 30 reports was much smaller than the minimum sample size of 200 required to provide significant results. These factors prevented any direct comparison of dog or victim characteristics between the two databases.

2. San Antonio Metropolitan Health District Animal Bite Database

a. Dog Characteristics

Breeds identified most frequently in the SAMHD database included Chow Chows, Pit Bulls, Rottweilers, German Shepherds, and Labrador Retrievers, as well as mixed breeds (Figure 6). Chow Chows and Chow Mixes made up 25% of the reported known breeds, followed by German Shepherd Mixes and mixed breeds not otherwise specified, at 11.1% and 8.9%, respectively (Table 17). The distribution of reported breeds varied significantly by year, ($\chi^2_{20} = 112.1$, $P < .01$).

Sixty-seven percent of the biting dogs identified by sex were male (Table 18). Male dogs were reported significantly more often to the SAMHD bite database than female dogs (z

= 15.12, $P < .01$). The proportion of males to females did not vary by year ($\chi^2_2 = 1.37$, $P = .50$).

Out of 1,692 identified dogs, 1,564 (92%) were not neutered (Table 19). Non-neutered dogs were reported significantly more often to the SAMHD bite database than neutered dogs ($z = 37.92$, $P < .01$). Neuter status varied significantly among the years ($\chi^2_2 = 15.77$, $P < .01$). Neuter status also varied significantly by dog sex ($\chi^2_1 = 9.17$, $P < .01$). Neutered female dogs and non-neutered male dogs were identified with more bites than expected in comparison with their neutered and non-neutered counterparts (Table 20).

Seventy-three percent of identified dogs were not vaccinated against rabies in the year prior to the bite incident (Table 21). Non-vaccinated dogs were reported significantly more often to the SAMHD bite database than vaccinated dogs ($z = 20.39$, $P < .01$). Rabies vaccination status varied significantly among the years ($\chi^2_2 = 34.22$, $P < .01$). Rabies vaccination status also varied significantly by dog sex ($\chi^2_1 = 6.31$, $P = .01$). Vaccinated male dogs and non-vaccinated female dogs were identified with more bites than expected in comparison with their vaccinated and non-vaccinated counterparts (Table 22).

b. Victim Characteristics

In the SAMHD database, "victim sex" was the only victim characteristic evaluated (Table 23); out of 4,280 identified victims, 2,504 were male (59%). Males were reported significantly more often to the SAMHD bite database than females ($z = 7.60$, $P < .01$). Victim sex did not vary significantly by year ($\chi^2_2 = 0.82$, $P = .66$).

B. Dog Bite Rates in Humans

The average severe bite rate reported in Texas was 3.1 bites per 100,000 (Table 24). The average rates for males (3.7 per 100,000) and females (2.6 per 100,000) were significantly different than one another ($z = 4.28$, $P < .01$). Rates for children under 15 were generally higher than those for adults, at 7.7 per 100,000 versus 1.8 or lower. Males from 5 to 9 years old experienced the highest severe bite rate of all groups, at 12 per 100,000, and rates for children in other age groups were only slightly lower.

The average rate for all reported dog bites in Bexar County was 113 per 100,000 (Table 25). The estimated rate of bites in male victims was 130 per 100,000; the dog bite rate in males was statistically greater than 88 per 100,000, the incidence rate in females (z = 7.44, $P < .01$).

Overall Bexar County bite rates then were sex-adjusted and applied to the state population projections for the study period. The average sex-adjusted bite rate for Texas was 109 per 100,000 (Table 26). This rate was not statistically different from the overall average SAMHD dog bite rate of 113 per 100,000 ($z = 1.43$, $P = .15$).

C. Bite Rates for Commonly Biting Dog Breeds in Bexar County

1. Overall Bite Rates

An estimated 278,037 dogs were present in Bexar County during the study period (Table 27). An average of 1,485 dog-to-human bites were reported each year during the study period. On average, one-half of one percent (0.53%), or about one out of every 200 dogs in Bexar County were involved in a reported dog-to-human bite each year (Table 28). The rates varied slightly from the average in 1995 and 1997; the bite rate was 617 per 100,000 dogs for 1995 ($z = 4.11$, $P < .01$), 531 per 100,000 dogs for 1996 ($z = 0.17$, $P = .87$), and 456 per 100,000 dogs for 1997 ($z = 4.15$, $P < .01$).

2. Bite Rates by Breed

One out of every 40 Pit Bulls (2.5%) and about one out of 75 Chow Chows (1.4%) generated a reported human bite each year (Table 29; Figure 7). One out of 100 Rottweilers (1.0%) caused a reported bite, and less than one out of 250 German Shepherds (0.37%) bit a human each year, not statistically different from the average for all dogs combined (0.53%). Huskies, Dobermans, and Australian Shepherds had bite rates slightly lower than German Shepherds but higher than Labrador Retrievers. Less than one in every 500 Labrador Retrievers (0.15%) was associated with a reported bite each year. All other breeds examined individually, including Poodles, Cocker Spaniels, and Dachshunds, had bite rates lower than Labrador Retrievers.

Odds ratios for each of the five most commonly biting dog breeds versus all others presented similar findings (Table 30). The odds of a Pit Bull in Bexar County causing a bite were 5 times greater than the odds for all other breeds combined, at 4.9 to 1. Chow Chows and Rottweilers also had odds ratios significantly greater than the average, at 2.9 to 1 and 1.8 to 1, respectively. The odds ratios for German Shepherds and Labrador Retrievers were significantly lower than the average, at 0.67 to 1 and 0.26 to 1.

DISCUSSION

A. Database Characteristics

1. Texas Department of Health Severe Animal Bite Database

a. Agreement with Published National Statistics

The TDH data were in good agreement with published United States statistics on dog bites. The breeds most frequently identified with severe bites in Texas (Figure 2) were dog breeds identified in United States dog-bite related fatalities (Figure 1; CDC, 1997). The majority of biting dogs in Texas were non-neutered males (Table 11; Table 20), as seen in Sacks et al (1996b). Victim characteristics also followed expected trends. Young males from 5 to 9 years old received severe bites the most frequently (Figure 3), matching the findings of Quinlan and Sacks (1999). Children under 5 received the highest number of bites to the head (Table 16; Figure 5), similar to the findings reported in Boenning (1983). Older children and adults in Texas were bitten most often on the legs and arms (Table 16; Figure 4), as mentioned in Boenning (1983) and Tuggle (1993).

b. Relevance to Local Animal Control Departments

Overall, the TDH database is full of valuable information relevant to animal control departments throughout the state. Gathering information on severe bites alone allows the TDH to focus limited resources on the two aspects of the issue that will provide the greatest return on the time and money spent: information on dogs that cause severe bites and information on the common characteristics of severe bite victims. Animal control legislation

is reviewed with the characteristics of severely biting dogs in mind, and education efforts are focused on the victims that are at the highest risk of severe trauma or death from dog bites. All health departments throughout the state can benefit from the information and activities generated by this database. Even in a small town with very little animal control resources or limited numbers of exotic dog breeds, animal control workers benefit from knowing which dogs are the most likely to be dangerous and how best to provide protection to the public at risk for severe bites.

c. Relevance to Bexar County

Despite the overall benefit of the TDH severe bite database, its direct relevance to dog bites in Bexar County was limited. Since the San Antonio Metropolitan Area is the third largest in Texas , at least 10% (187) of the TDH severe bite reports were expected to originate in Bexar County. Only 32 Bexar County reports were incorporated into the TDH database from 1995 through 1997. All 32 of the Bexar County reports came from small communities like Hill Country Village and Hollywood Park that do not receive animal control coverage from the SAMHD. The TDH data did not include any bite reports from the SAMHD during the study period. The small number of records that were reported to the TDH from Bexar County greatly limited the statistical significance of TDH severe bite data from Bexar County and the ability to test those data in comparison with the SAMHD database.

2. San Antonio Metropolitan Health District Animal Bite Database

a. Comparison With Texas Severe Bite Data

SAMHD studies yielded similar results to the TDH data, once animal breed names and category labels were standardized. Many more of the data fields were left blank or unknown in the SAMHD database when compared with the TDH database. In addition, SAMHD reports were apparently not forwarded to the TDH for incorporation into the TDH severe bite database. None of the 32 TDH severe bite reports from Bexar County originated from the SAMHD database. Suburban police departments and small animal control agencies

in Bexar County sent in the reports to the TDH. Because many small suburban agencies in Bexar County do not use the SAMHD database, the actual number of dog bites in Bexar County is certainly higher than estimated by this study. Only communication between the SAMHD, other local agencies, and the TDH can effectively guarantee that all bite information is shared appropriately.

B. Dog Bite Rates in Humans

1. Severe Dog Bite Rates for Texas

The severe bite rates based upon the TDH database are much smaller than expected. When compared with the national bite rate estimates of 1,800 bites per 100,000 (Sacks et al, 1996a) and 129 emergency department visits for bites per 100,000 United States population each year (Quinlan and Sacks, 1999), the estimated rate of 3.1 severe bites per 100,000 in Texas is miniscule. In other words, the bites reported to the TDH represent less than 0.2% of the overall dog bites expected and only 1.8% of the expected bites that lead to emergency department visits in the general population.

The apparent under-reporting of dog bites in Texas is also apparent when sex-specific or age-specific rates are compared between the national estimates for all dog bites and the reported severe dog bites here in Texas. The United States incidence rate estimate for all dog bites in males was 2,325 bites per 100,000 in 1994 (Table 1). The rate of reported severe bites in Texas males was 3.7 bites per 100,000 from 1995 through 1997, or less than 0.2% of the expected overall rate. The reported severe bite rate in Texas females was 0.2% of the projected national female dog bite incidence rate. The reported severe bite rates in children were all 0.34% or less of the expected rates.

2. Overall Dog Bite Rates for Bexar County and Texas

It is estimated that an average of one out of every 770 males and one out of every 1,142 females was a bite victim in the SAMHD each year from 1995 through 1997. Slightly more than one out of every 1,000 Bexar County residents was involved in a reported dog bite incident each year. Although these rates are 30 to 40 times larger than the severe

bite rates reported to the TDH severe bite database, they still represent only a fraction of all bites expected. In comparison with the 1994 national dog bite rate estimate of 1,800 bites per 100,000, these reported bites account for only 6% of that number. Likewise, only 5.6% of the expected male bites and 6.1% of the expected female bites were reported to the SAMHD. If Texas dog bite rates are truly comparable to national rates, this indicates that 94% of the dog bites in Bexar County (around 20,000 bites) might not be reported to the SAMHD database each year.

A sizable portion of the unreported bites can be severe, as indicated by the lack of duplication between the TDH and SAMHD databases. None of the 32 severe dog bite cases reported in the TDH database were listed in the 5,393 SAMHD dog bite records reviewed. There are two independent systems for dog bite tracking in Bexar County, and neither system is receiving more than a fraction of the expected reports.

C. Bite Rates for Commonly Biting Dog Breeds in Bexar County

When the biting breeds are looked at in relationship to their estimated prevalence in the general dog population, the risk of being bitten by a member of each identified dog breed is clearer. Less than one percent of San Antonio dogs bite each year, and the overall bite rates appear to be significantly increased by only a few breeds with a high predilection to bite.

Pit Bulls, Chow Chows, and Rottweilers made the largest contributions to the dog bite rates as shown by their odds ratios. Findings from this study suggest that certain breeds might be inherently more vicious than other breeds, regardless of training. Further study is still needed to evaluate the "nature versus nurture" aspect of dog bites.

This data also explains the presence of Labrador Retrievers among the most frequently biting breeds in the SAMHD and Texas. Looking at the bites in perspective, it is clear that the large number of bites generated by Labradors are explained by their high prevalence in the district (7% of all dogs), rather than any vicious streak in the breed.

D. Recommended Changes to Dog Bite Report Databases in Texas

1. Improve Accessibility

A database that is accessible in "real-time" by the involved parties, either by a computer network or on the internet would make a vast difference in accessibility and utility of the data in both databases. A common internet database should be established by the TDH and actively marketed to local public health and animal control agencies. With only limited training required, animal control officers and local agencies could enter bite reports directly into the database, where they could easily be checked for accuracy and integrated within hours of the event. Local officials could also compare their bite information with surrounding areas and the state as a whole. This concept of a "real-time" internet database could also be applied to public health departments other than animal control. With a relatively small investment of time, effort, and resources, the processes duplicated countless times across each city, county, and region could be integrated into a seamless whole, available and useful to all.

2. Standardize Data Formatting for Consistency

a. Standardize Within Databases

The data available from the SAMHD database were not in a standardized format. The narrative nature of much of the data hindered its manipulation and comparison. Data fields often had variations in spelling and abbreviations, and the order of encoded information varied. No standardized rules were used for the names or abbreviations for common dog breeds. In addition, over 40% of the data fields in the SAMHD database were blank or incomplete. In contrast, data in the TDH database were clear, concise, and in an easily searchable format. All narrative data fields enclosed were fairly well standardized. Over 90% of the TDH data fields searched were appropriately filled out. The SAMHD would benefit greatly by adopting the TDH database or a similar format.

b. Standardize Between Databases

One of the reasons the SAMHD does not forward any severe bite reports to the TDH is a lack of standardization between the databases. The TDH form is available and simple to use. However, the TDH form would be an additional form generated for each of the 1,200 or more animal bites reported in the SAMHD each year. In addition, the TDH severe bite reporting program is not considered relevant to day-to-day operations in the SAMHD and there is no direct contact or feedback from the TDH to stimulate participation in the program.

The best solution to the lack of standardization would be to integrate the different forms into one database that meets the needs of both the TDH and the SAMHD. Appendix C contains a copy of one currently proposed form that would allow standardization of all relevant bite data for every agency involved. The form could be filled out during an animal pickup and entered later into a database, but the primary design is for integration into an internet-based database for "real-time" entry. An internet-based data entry and search system for all users would improve access to the data and communication between the TDH and local animal control departments. The internet-based system would also make it easy to consistently analyze and compare data through the use of well-defined data sets.

3. Increase Completeness of Dog Bite Reporting

The bite data available to the TDH are good and useful as a whole, but they do not always provide a large enough sample to accurately answer questions that arise about dog bites in local areas of Texas. This leaves our state public health policy decision-makers operating without solid facts and figures on the issues.

The primary way to improve the number of reports made to the TDH and local databases would be to legally enforce reporting, similar to the communicable disease reporting processes already in place. Human rabies reporting to the TDH and CDC already is required. The high incidence of dog bites, the severe consequences of many dog bites, especially in children, and the risk of rabies transmission and short treatment window are all good reasons for legally mandating dog bite reporting. Two major issues must be overcome to make dog bite reporting a legal requirement. First, legislators and the public need to be

better educated about the severity of the public health impact of dog bites, especially in children. Second, legally empowered agencies like the TDH or local law enforcement must take action to enforce the legislation, using fines, citations, or other means specified.

E. Recommendation for Future Study

A future test to measure the consistency between local and state-level databases would be fairly simple to execute and very useful as an evaluation tool. Once the SAMHD or other local animal control departments are sending their severe bite reports to the TDH in a regular fashion, the variables for each shared bite report may be compared between the two databases. Dichotomous characteristics as well as other categorized data may be compared in this fashion with proportions and chi-square analysis. In addition, completeness of reporting could be tested by evaluating what percentage of the reports are transferred from the SAMHD database to the TDH database each month. By setting a quality standard for consistency of the data between the databases, information can be checked over time and data entry can be adjusted to improve the quality of the data transfer.

CONCLUSIONS

The first aim of this study was to summarize the descriptive characteristics of biting dogs and dog bite victims as described in the TDH and SAMHD bite report databases from 1995 through 1997. Both databases showed the same general trends throughout, and supported national biting dog and victim characteristics found in the existing literature. Pit Bulls, Chow Chows, and Rottweilers were the three breeds most likely to bite in Bexar County and Texas; all three breeds were among the top breeds causing bite fatalities nationwide. Male, non-neutered dogs were the most likely to bite in Bexar County, in Texas, and in the United States. Five to 9 year old males were bitten the most frequently of all age groups in Bexar County, in Texas, and nationwide.

The second aim of this study was to estimate annual crude and sex-specific dog bite rates in humans for Bexar County and Texas. The annual crude rates for severe bites

reported in Texas reflected less than 0.2% of the expected total rate based upon national statistics, indicating a significant lack of voluntary reporting to the TDH database. Estimated crude dog bite rates for the Bexar County area were much larger, but still only reflected about 6% of the expected total. Sex-specific rates gave similar findings. If national statistics are applicable to Texas, neither database currently provides comprehensive dog bite information; 20,000 dog bites might be going unreported in Bexar County alone each year. Although each database is large enough to provide statistically significant biting dog and victim characteristics, the TDH and SAMHD could greatly improve the quality and quantity of their data by working together using a common, standardized database.

The third aim was to use biting dog data from the SAMHD database to estimate the annual bite rates for commonly biting dog breeds in Bexar County. Although less than one percent of San Antonio area dogs bite each year, the majority of those biting dogs come from a small number of breeds. This study provides evidence that Pit Bulls, Chow Chows, and Rottweilers truly do provide a greater risk of biting than all other breeds. Public health officials and legislators in Texas should consider these breed-specific biting trends when determining future dog bite prevention and legislation efforts.

The fourth aim was to discuss the administrative procedures for dog bite data collection currently employed by both the TDH and the SAMHD and to make recommendations for future improvements to increase the accessibility, consistency, and completeness of data reported to both databases. The TDH database was relatively small, but easily accessible for comparison and review. The SAMHD database was much larger than the TDH database, but data access was more limited. There was no evidence that either database was in communication with the other. If the TDH can convince local public health departments like the SAMHD to adopt a standardized internet-based data entry and retrieval system, accessibility and consistency of dog bite data will be greatly improved. The net result will be an increase in the effectiveness of dog bite prevention programs for all communities involved.

Table 1. Incidence Rates of Dog Bites in the United States, 1994*

Children		Adults		Total	
Group	**Rate†**	**Group**	**Rate†**	**Group**	**Rate†**
Male	2,920	Male	2,130	Male	2,325
Female	2,000	Female	1,120	Female	1,317
0-4 years	2,490	18-24 years	2,930		
5-9 years	2,840	25-34 years	1,970		
10-14 years	2,100	35-44 years	2,120		
		45 and older	790		
Average	2,450	Average	1,610	Average	1,800

* Data from Sacks *et al.,* 1996a.
† Rate indicates incidence rate per 100,000.

Table 2. Percentage of Dog Bites Versus Breed Prevalence in San Antonio, 1992-1994*

Breed	% of Bites	Prevalence†	Bites *vs.* Prevalence
Chow Chow	25.0	4.0	6.3
German Shepherd	17.5	4.0	4.4
Pit Bull	3.8	1.0	3.8
Husky	3.8	1.0	3.8
Rottweiler	7.5	2.0	3.8
Labrador Retriever	19.0	7.0	2.7
Australian Shepherd	2.5	1.0	2.5
Doberman	4.0	2.0	2.0
Dachshund	6.3	4.0	1.6
Lhaso Apso	3.0	2.0	1.5
Poodle	4.0	3.0	1.3
Cocker Spaniel	8.0	6.0	1.3

* Data from Herbold, 1997.
† Prevalence is the percentage of the dog population belonging to each breed.

Table 3. Some Microorganisms Isolated from Animal Bite Wounds*

Aerobes		
Acinetobacter sp.	*Eikenella corrodens*	*Pasteurella multocida*
Actinobacillus actinomycet.	*Enterobacter* sp.	*Proteus mirabilis*
Aeromonas hydrophila	*Escherichia coli*	*Pseudomonas aeruginosa*
Bacillus subtilis	*Haemophilus* sp.	*Serratia marcescens*
Bordetella sp.	*Klebsiella pneumoniae*	*Staphylococcus aureus* and sp.
Brucella canis	*Moraxella* sp.	*Streptococci* α, β, and γ-hemo.
Capnocytophagia canimorsus	*Corynebacterium* sp.	*Clostridium perfringens*
Anaerobes		
Actinomyces sp.	*Peptococcus* sp.	*Propionobacterium acnes*
Bacteroides fragilis	*Peptostreptococcus* sp.	*Fusobacterium* sp.
Rare Pathogens		
Blastomyces dermatiditis	*Leptospira* sp.	*Sporotrichia* sp.
Clostridium tetani	Rabies virus	*Streptobacillus* sp.
Francisella tularensis	Rio Bravo virus	*Yersinia pestis*

* Data from Griego *et al.*, 1995.

Table 4. Percentages of Rabies Cases in Texas Dogs*

Category	1995	1996	1997	1998
Total Texas rabies cases in animals	590	351	266	303
Rabies cases in dogs	55	15	11	15
Percentage of rabies cases in dogs	3.4	5.7	7.5	6.6

* Adapted from published TDH data, 1996 through 1999.

Table 5. Dog-to-Human Bite Reports in the San Antonio Metropolitan Health District Animal Bite Database

	Remaining Records (% of Original)			
Filtering Criteria	**1995**	**1996**	**1997**	**Total**
All SAMHD bite records	2974	2437	2206	7617
Dog only	2077 (70%)	1793 (74%)	1523 (69%)	5393 (71%)
Dog-to-human only	1694 (59%)	1477 (61%)	1285 (58%)	4456 (59%)

Table 6. Comparison of Dog and Victim Data Fields Contained Within the Texas Department of Health and San Antonio Metropolitan Health District Animal Bite Databases

Data Field	TDH Database	SAMHD Database
Dog Characteristics		
Breed	X	X
Sex	X	X
Neuter Status	X	X
Vaccination Status	X	X
Victim Characteristics		
Sex	X	X
Age	X	
Bite Location	X	

Table 7. Example of Table Used for Odds Ratio Calculations

Ratio Criteria	Pit Bull	Other Breeds	Total
Number biting	69	1,416	1,485
Number not biting	2,711	273,840	276,552
Total	2,780	275,257	278,037

Odds Ratio (ad/bc) = 4.92

Table 8. Texas Department of Health Severe Dog Bite Reports by Breed

Breed	1995	1996	1997	Total	%*	95% CI†
Chow Chow	67	81	64	212	12.3‡	(10.8, 14.0)
Rottweiler	23	64	40	127	7.4	(6.2, 8.7)
Chow Mix	39	46	34	119	6.9	(5.8, 8.2)
Pit Bull	33	34	40	107	6.2	(5.1, 7.4)
German Shepherd	26	41	35	102	5.9	(4.9, 7.2)
Mixed (no other breed)	24	26	34	84	4.9	(3.9, 6.0)
Labrador Mix	16	24	28	68	4.0	(3.1, 5.0)
German Shepherd Mix	20	17	25	62	3.6	(2.8, 4.6)
Labrador Retriever	14	29	17	60	3.5	(2.7, 4.5)
Other breeds	230	279	269	778	45.3	(43.0, 47.7)
Unknown	43	45	36	124	...	
Total	535	686	622	1843	100.0	

* Unknown breeds not included in percentage calculations.
† CI indicates confidence interval.
‡ Percentage is statistically different than the others listed ($P < .01$)

Table 9. Texas Department of Health Severe Dog Bite Reports by Dog Sex

Dog Sex	1995	1996	1997	Total	%*	95% CI†
Female	115	148	150	413	25.1‡	(23.0, 27.3)
Male	363	465	405	1233	74.9‡	(72.7, 77.0)
Unknown	57	73	67	197	...	
Total	535	686	622	1843	100.0	

* Unknown sex not included in percentage calculations.
† CI indicates confidence interval.
‡ Percentages are statistically different from one another ($P < .01$).

Table 10. Texas Department of Health Severe Dog Bite Reports by Neuter Status

Neutered	1995*	1996	1997	Total	%†	95% CI‡
Yes	...	41	63	104	14.6§	(12.1, 17.4)
No	...	304	303	607	85.4§	(82.6, 87.9)
Unknown	535	341	256	1132	...	
Total	535	686	622	1843	100.0	

* Neuter status not collected for 1995.
† Unknown status not included in percentage calculations.
‡ CI indicates confidence interval.
§ Percentages are statistically different from one another ($P < .01$).

Table 11. Texas Department of Health Severe Dog Bite Reports by Dog Sex and Neuter Status

	Neutered		
Animal Sex	**Yes***	**No***	**Total**
Female	38 (27)	142 (153)	180
Male	66 (77)	452 (441)	518
Total	104	594	698

* Expected values computed for χ^2 testing shown in parentheses.

Table 12. Texas Department of Health Severe Dog Bite Reports by Rabies Vaccination Status

Vaccinated	1995	1996	1997	Total	%*	95% CI†
Yes	283	249	228	760	54.9‡	(52.2, 57.6)
No	181	222	221	624	45.1‡	(42.4, 47.8)
Unknown	71	215	173	459	...	
Total	535	686	622	1843	100.0	

* Unknown status not included in percentage calculations.
† CI indicates confidence interval.
‡ Percentages are statistically different from one another ($P < .01$).

Table 13. Texas Department of Health Severe Dog Bite Reports by Dog Sex and Rabies Vaccination Status

	Vaccinated		
Animal Sex	**Yes***	**No***	**Total**
Female	195 (189)	146 (152)	341
Male	532 (538)	441 (435)	973
Total	727	587	1314

* Expected values computed for χ^2 testing shown in parentheses.

Table 14. Victim Ages by Sex for Severe Bites Reported in Texas, 1995-1997

	Male			Female		
Ages	**Number**	**%**	**95% CI***	**Number**	**%**	**95% CI***
Under 15	671	64.7†	(61.8, 67.7)	385	51.0†	(47.4, 54.6)
15-29	117	11.3†	(9.4, 13.4)	106	14.0†	(11.6, 16.7)
30-44	120	11.6	(9.7, 13.7)	105	13.9	(11.5, 16.6)
45-59	69	6.7†	(5.2, 8.4)	82	10.9†	(8.7, 13.3)
60-74	40	3.9†	(2.8, 5.2)	46	6.1†	(4.5, 8.0)
75-99	19	1.8†	(1.1, 2.8)	31	4.1†	(2.8, 5.8)
Total	1036	100.0		755	100.0	

* CI indicates confidence interval.

† Percentage of males statistically different from percentage of females in this age group ($P < .05$).

Table 15. Male to Female Odds Ratios for Texas Severe Dog Bite Victims, 1995-1997

Age Group	Odds Ratio	95% CI*
Under 5	1.39	(0.95, 2.03)
5-9	1.82†	(1.30, 2.56)
10-14	1.80†	(1.18, 2.73)
Under 15	1.66†	(1.34, 2.07)
15-29	1.07	(0.68, 1.68)
30-44	1.14	(0.72, 1.79)
45-59	0.88	(0.51, 1.53)
60-74	1.03	(0.50, 2.15)
Overall	**1.41†**	**(1.20, 1.66)**

* CI indicates confidence interval.
† Ratio statistically greater than 1.00 ($P < .05$).

Table 16. Body Locations for Severe Bites in Texas, 1995-1997

	Age									
Site Bitten	**< 5**	**5-9**	**10-14**	**15-29**	**30-44**	**45-59**	**60-74**	**> 74**	**Total**	**%***
Leg	34	140	135	109	92	61	35	23	629	34.9†
Head	230	160	41	39	27	16	3	5	521	28.5†
Arm	34	109	66	39	61	35	29	17	390	21.2†
Fingers	38	50	55	48	67	45	27	12	342	19.3†
Torso	35	93	52	12	19	12	8	2	233	12.8†
Neck	17	13	7	3	3	3	1	1	48	2.8
Face	1	8	6	7	8	6	2	4	42	2.3
Total	389	573	362	257	277	178	105	64	2205	

* Percentage of bite reports (n = 1843) containing site bitten. Many reports listed multiple sites.
† Percentage was significantly greater than the one ranked below ($P < .05$).

Table 17. San Antonio Metropolitan Health District Dog Bite Reports by Breed

Breed	1995	1996	1997	Total	%*	95 % CI†
Chow Mix	175	210	190	575	13.5	(12.5, 14.6)
German Shepherd Mix	180	161	130	471	11.1	(10.1, 12.1)
Chow Chow	180	165	125	470	11.0	(10.1, 12.0)
Mixed (no other breed)	224	95	59	378	8.9	(8.0, 9.8)
Labrador Mix	101	95	67	263	6.2	(5.5, 6.9)
Pit Bull	75	71	61	207	4.9	(4.2, 5.6)
Pit Bull Mix	59	58	46	163	3.8	(3.3, 4.5)
Rottweiler	48	54	57	159	3.7	(3.2, 4.4)
German Shepherd	42	33	47	122	2.9	(2.4, 3.4)
Labrador Retriever	30	32	23	85	2.0	(1.6, 2.5)
Other breeds	479	451	432	1362	32.0	(30.6, 33.4)
Unknown	101	52	48	201	...	
Total	1694	1477	1285	4456	100.0	

* Unknown breeds not included in percentage calculations.
† CI indicates confidence interval.

Table 18. San Antonio Metropolitan Health District Bite Reports by Dog Sex

Dog Sex	1995	1996	1997	Total	%*	95% CI†
Female	542	469	394	1405	33.0‡	(31.6, 34.5)
Male	1055	951	843	2849	67.0‡	(65.5, 68.4)
Unknown	97	57	48	202	...	
Total	1694	1477	1285	4456	100.0	

* Unknown sex not included in percentage calculations.
† CI indicates confidence interval.
‡ Percentages are statistically different from one another ($P < .01$).

Table 19. San Antonio Metropolitan Health District Dog Bite Reports by Neuter Status

Neutered	1995	1996	1997	Total	%*	95% CI†
Yes	22	49	57	128	7.6‡	(7.2, 10.4)
No	281	839	444	1564	92.4‡	(89.6, 92.8)
Unknown	1391	589	784	2764	...	
Total	1694	1477	1285	4456	100.0	

* Unknown status not included in percentage calculations.
† CI indicates confidence interval.
‡ Percentages are statistically different from one another ($P < .01$).

Table 20. San Antonio Metropolitan Health District Dog Bite Reports by Dog Sex and Neuter Status

	Neutered		
Animal Sex	**Yes***	**No***	**Total**
Female	56 (41)	479 (494)	535
Male	72 (87)	1077 (1062)	1149
Total	128	1556	1684

* Expected values computed for χ^2 testing shown in parentheses.

Table 21. San Antonio Metropolitan Health District Dog Bite Reports by Rabies Vaccination Status

Vaccinated	1995	1996	1997	Total	%*	95% CI†
Yes	326	420	330	1076	27.2‡	(28.4, 33.4)
No	1150	904	826	2880	72.8‡	(66.6, 71.6)
Unknown	218	153	129	500	...	
Total	1694	1477	1285	4456	100.0	

* Unknown status not included in percentage calculations.
† CI indicates confidence interval.
‡ Percentages are statistically different from one another ($P < .01$).

Table 22. San Antonio Metropolitan Health District Dog Bite Reports by Dog Sex and Rabies Vaccination Status

	Vaccinated		
Animal Sex	**Yes***	**No***	**Total**
Female	131 (152)	349 (328)	480
Male	365 (344)	718 (739)	1083
Total	496	1067	1563

* Expected values computed for χ^2 testing shown in parentheses.

Table 23. San Antonio Metropolitan Health District Dog Bite Reports by Victim Sex

Victim Sex	1995	1996	1997	Total	%	95% CI[†]
Female	672	580	524	1776	41.5[‡]	(40.1, 43.0)
Male	964	833	707	2504	58.5[‡]	(57.0, 60.0)
Unknown	58	64	54	176	...	
Total	1694	1477	1285	4456	100.0	

* Unknown sex not included in percentage calculations.
[†] CI indicates confidence interval.
[‡] Percentages are statistically different from one another ($P < .01$).

Table 24. Reported Severe Dog Bite Rates in Texas, 1995-1997*

Ages	Male Rate†	Female Rate†	Total Rate
Under 5	8.1	5.8	7.1
5-9	12.4†	6.8†	9.7
10-14	8.2†	4.6†	6.4
Under 15	9.5†	5.7†	7.7
15-29	1.8	1.7	1.8
30-44	1.7	1.5	1.6
45-59	1.6	1.8	1.7
60-74	1.6	1.6	1.6
Total	**3.7†**	**2.6†**	**3.1**

* Rates are per 100,000 population.

† Male and female mean severe bite rates are statistically different from one another for this age group ($P < .05$).

Table 25. Reported Dog Bite Rates per 100,000 Bexar County Population*

	Males		Females		Total	
Year	**Bitten**	**Bite Rate**	**Bitten**	**Bite Rate**	**Bitten**	**Bite Rate**
1995	964	152.5	672	100.7	1,694	130.9
1996	833	129.8	580	85.7	1,477	112.0
1997	707	108.8	524	76.5	1,285	96.3
Average	**835**	**130.1†**	**592**	**87.5†**	**1,485**	**112.7**

* Counts derived from SAMHD data and TSDC population estimates (TDH, 1999e).

† Average male and female rates are statistically different from one another ($P < .01$).

Table 26. Sex-adjusted Dog Bite Rate Estimates for Texas*

Sex	1995	1996	1997	Average
Male	14,127	12,295	10,476	12,299
Female	9,526	8,276	7,506	8,436
Total	23,653	20,572	17,982	20,736
Sex-Adjusted Rates	**126.3†**	**107.6**	**92.5†**	**108.8 (106.9, 109.9)**

* Based upon calculated SAMHD incidence rates and Texas population estimates (TDH, 1999e). Rates are per 100,000 population.

† Rate is statistically different than the average for the study period, 108.8 ($P < .05$).

Table 27. Estimated Number of Dogs in Bexar County*

Year	Human Population	Households†	Dogs‡
1995	1,299,486	494,101	274,226
1996	1,318,431	501,305	278,224
1997	1,334,722	507,499	281,662
Average	**1,317,546**	**500,968**	**278,037**

* Bexar County population estimates from TDH, 1999e.

† Human population divided by 2.63.

‡ Households multiplied by 0.555.

Table 28. Estimated Rates of Biting Dogs in Bexar County

Year	Bites	Dog Population	% Dogs Biting (95% CI)*
1995	1,694	274,226	0.62 (0.59, 0.65)†
1996	1,477	278,224	0.53 (0.50, 0.56)
1997	1,285	281,662	0.46 (0.43, 0.48)†
Average	**1,485**	**278,037**	**0.53 (0.51, 0.56)**

* CI indicates confidence interval. Rates are expressed as dog bites per 100 dogs in Bexar County (%).

† Percentage is statistically different from the average ($P < .01$).

Table 29. Estimated Bite Rates for Commonly Biting Dog Breeds in Bexar County, 1995-1997

Breed*	Prevalence†	Breed Population	Average Bites/Year	% of Breed Biting	95% CI
Pit Bull	0.01	2,780	69	2.5	(1.9, 3.1)‡
Chow Chow	0.04	11,121	157	1.4	(1.2, 1.6)‡
Rottweiler	0.02	5,561	53	0.95	(0.71, 1.24)‡
German Shepherd	0.04	11,121	41	0.37	(0.26, 0.50)
Husky	0.01	2,780	10	0.36	(0.17, 0.66)
Doberman	0.02	5,561	15	0.28	(0.15, 0.44)
Australian Shepherd	0.01	2,780	7	0.24	(0.10, 0.52)
Labrador Retriever	0.07	19,463	28	0.15	(0.10, 0.21)
Lhaso Apso	0.02	5,561	8	0.14	(0.06, 0.28)
Poodle	0.03	8,341	11	0.13	(0.07, 0.24)
Cocker Spaniel	0.06	16,682	20	0.12	(0.07, 0.18)
Dachshund	0.04	11,121	13	0.12	(0.06, 0.20)
Other Breeds	0.63	175,163	1,054	0.60	(0.57, 0.64)‡
Average	1.00	278,037	1,485	0.53	(0.51, 0.56)

* Specified mixed breeds not included with breed (Chow Mix, etc.).

† Prevalence data from Herbold, 1997. Prevalence is per 100 dogs in Bexar County.

‡ 95% confidence interval (CI) is greater than the average, 0.53 ($P < .05$).

Table 30. Odds of Biting for Commonly Biting Dog Breeds in Bexar County, 1995-1997

Breed *vs.* All Others	**Odds Ratio**	**95% CI***
Pit Bull	4.92†	(3.85, 6.28)
Chow Chow	2.86†	(2.42, 3.37)
Rottweiler	1.82†	(1.38, 2.40)
German Shepherd	0.67†	(0.49, 0.92)
Labrador Retriever	0.26†	(0.18, 0.37)

* CI indicates confidence interval.
† Odds Ratio is statistically different than 1.00.

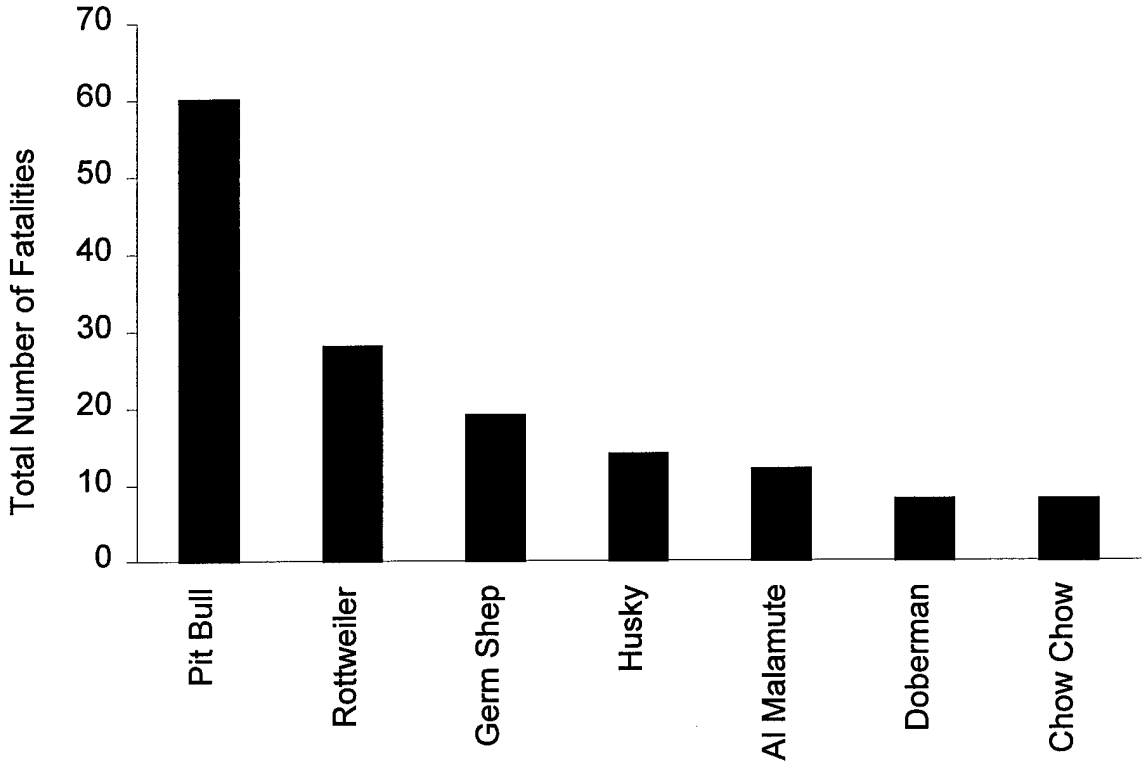

Figure 1. Dog breeds most frequently involved in United States dog-bite related fatalities, 1979 through 1996. Adapted from CDC, 1997.

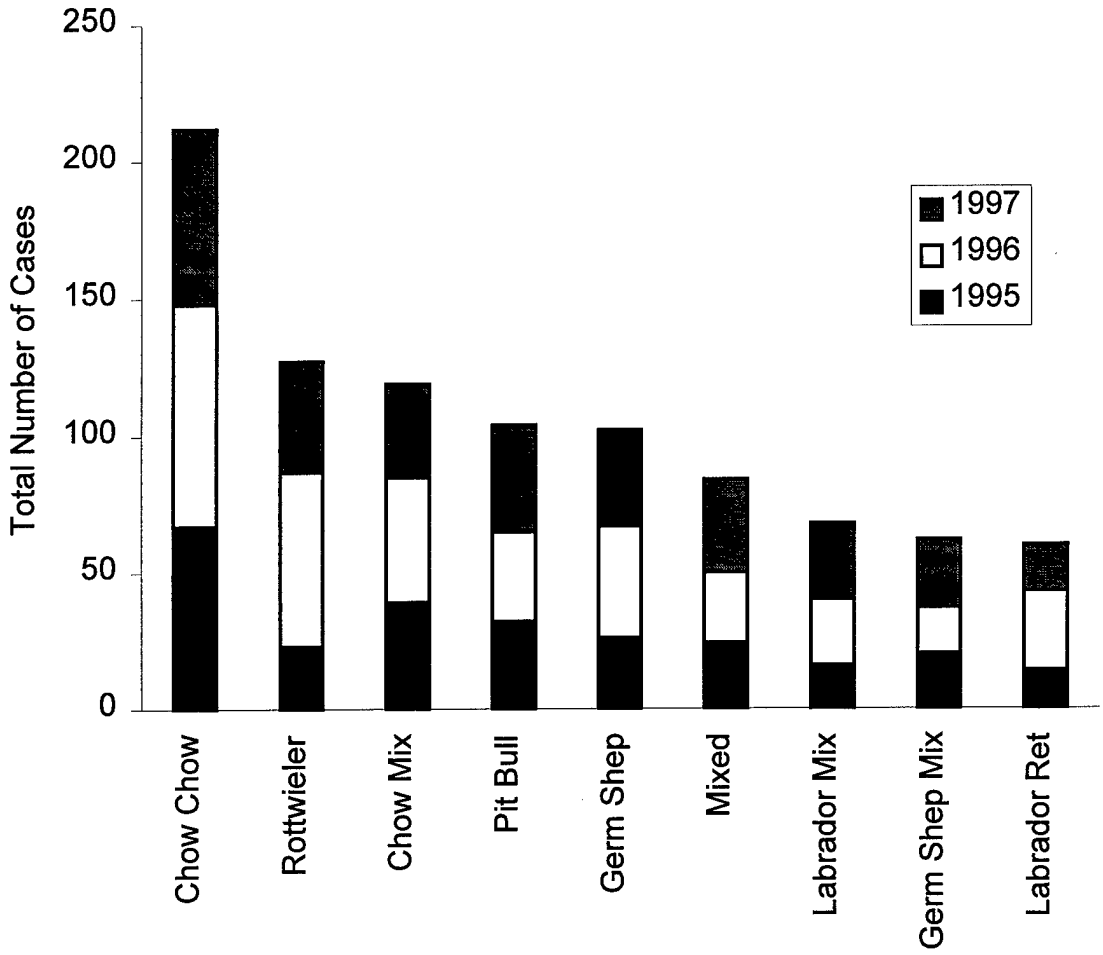

Figure 2. Nine dog breeds most frequently involved in severe bites reported in Texas, 1995 through 1997.

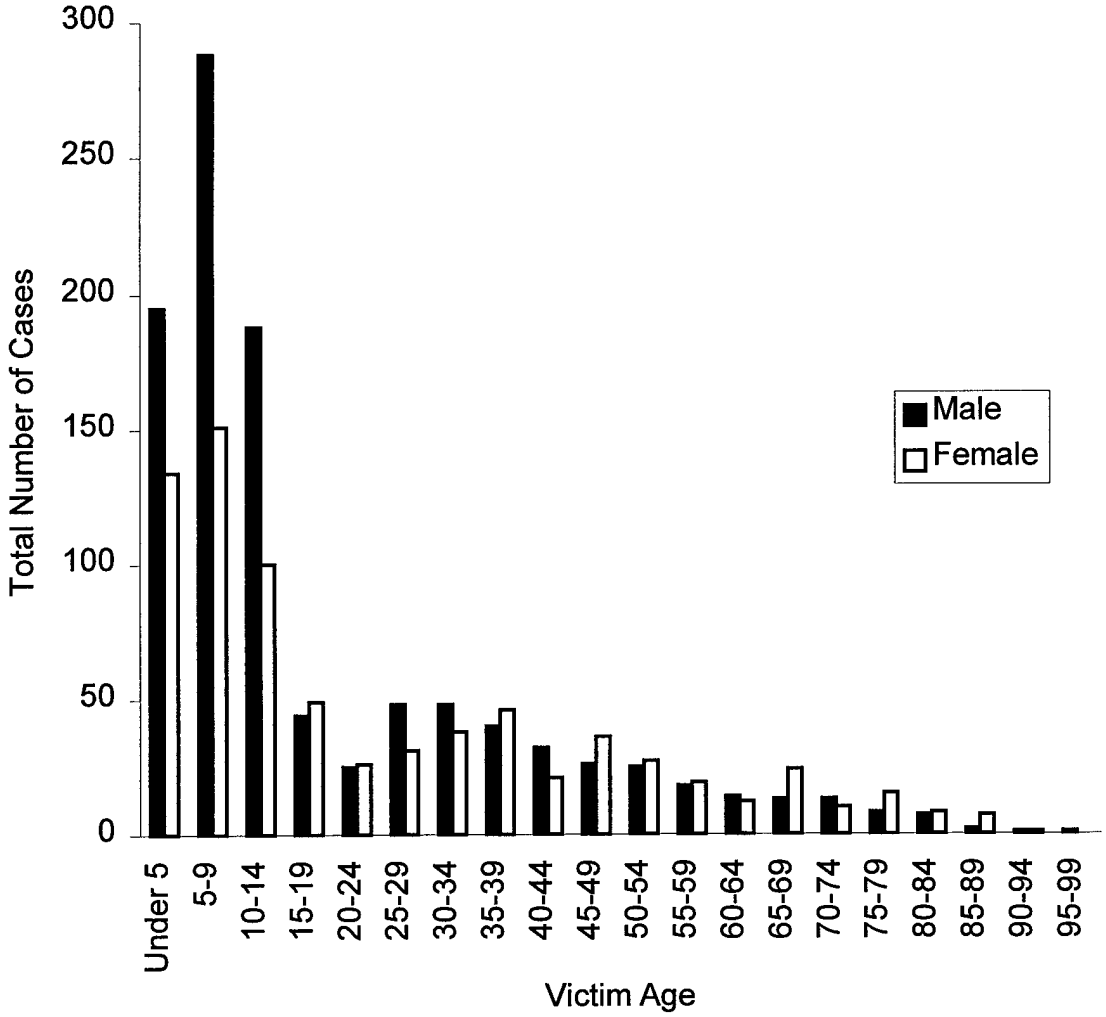

Figure 3. Age distribution of severe bite victims reported in Texas, 1995 through 1997.

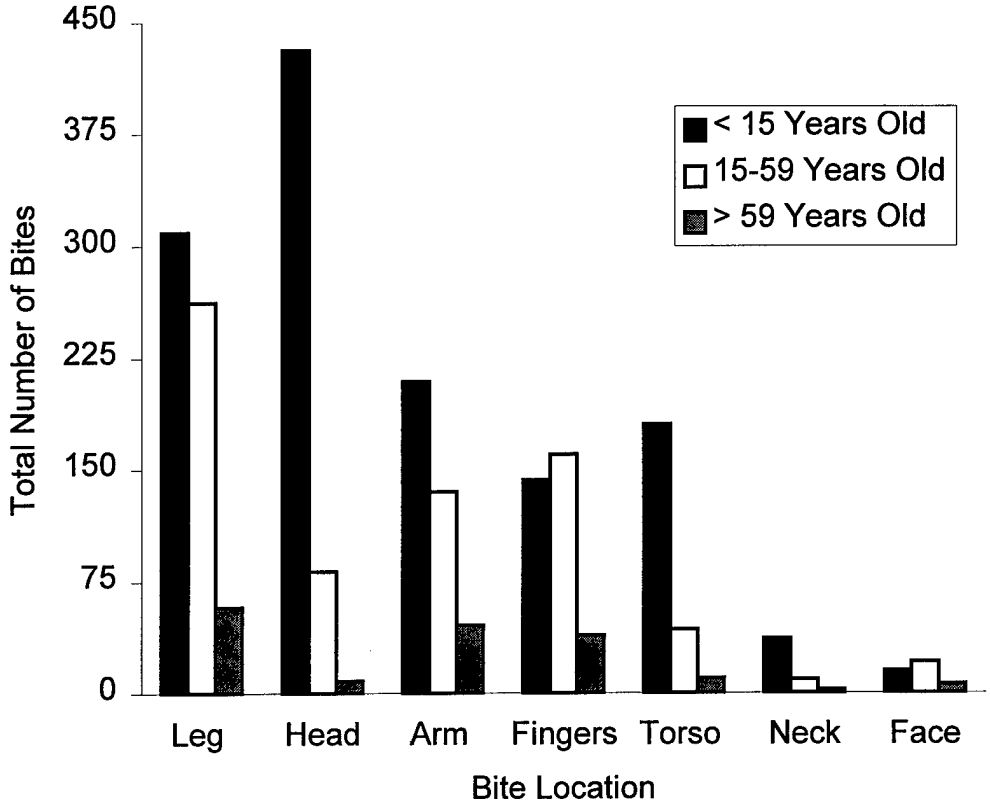

Figure 4. Body locations of severe dog bites reported in Texas by age groups, 1995 through 1997.

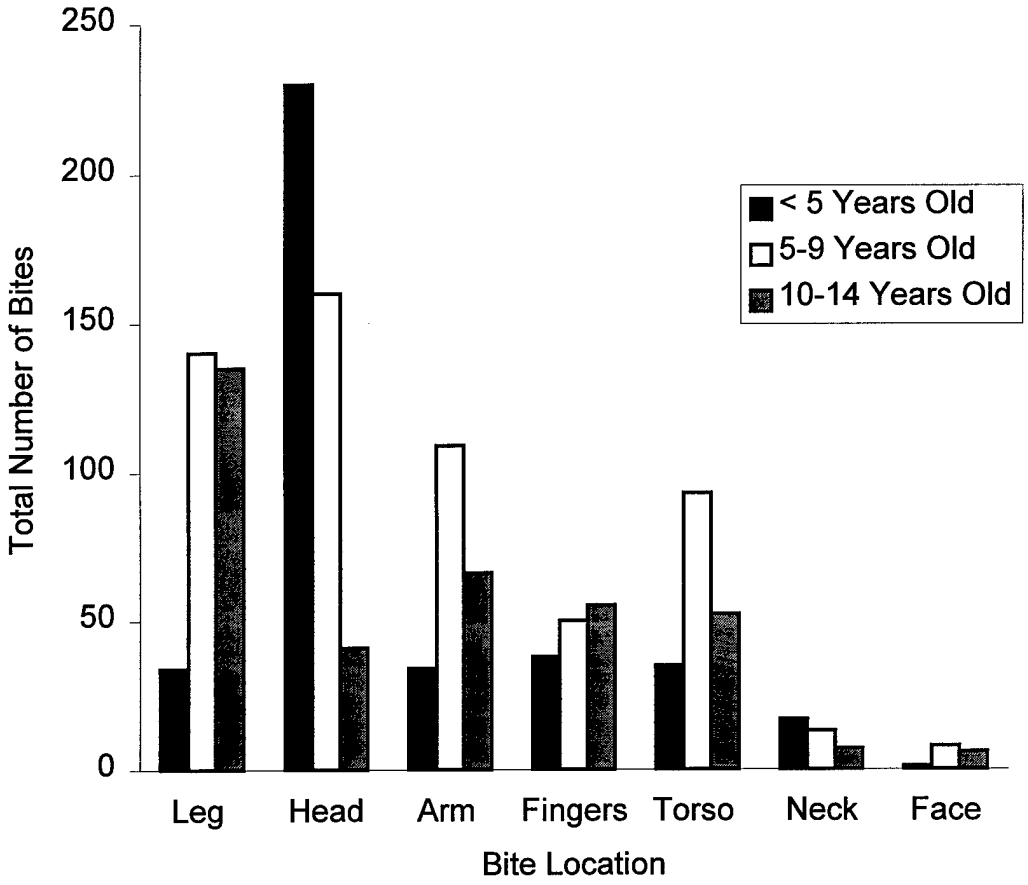

Figure 5. Body locations of severe dog bites reported in Texas children, 1995 through 1997.

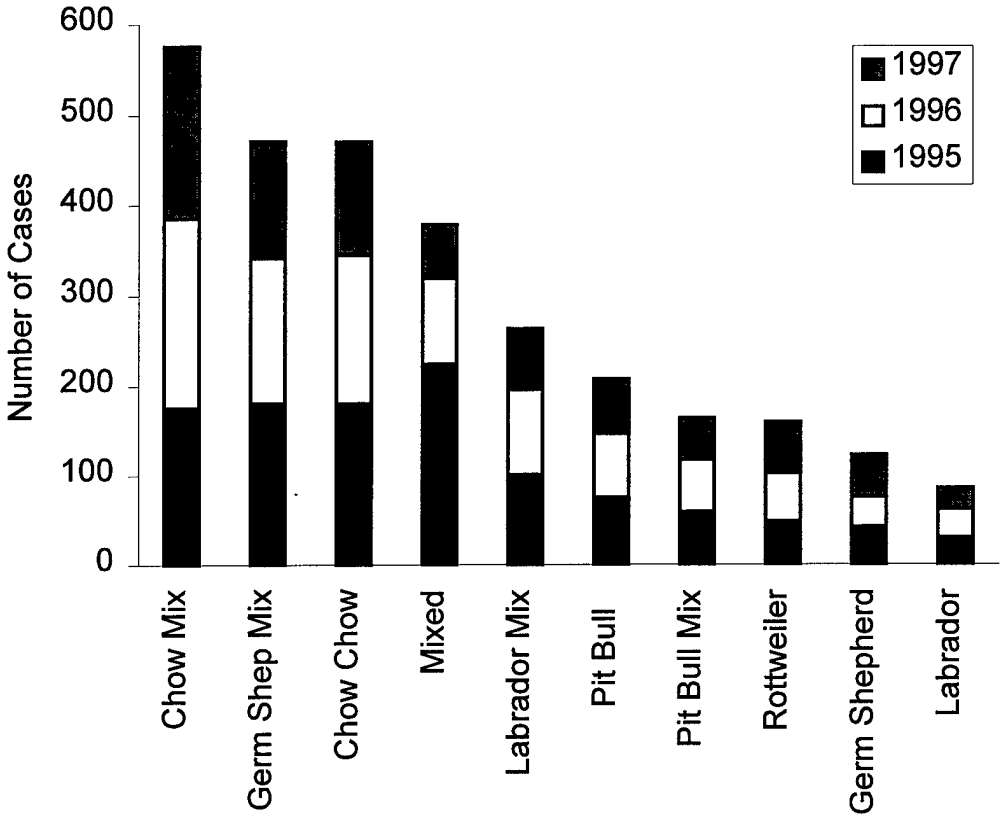

Figure 6. Dog breeds most frequently involved in reported bites in Bexar County, 1995 through 1997.

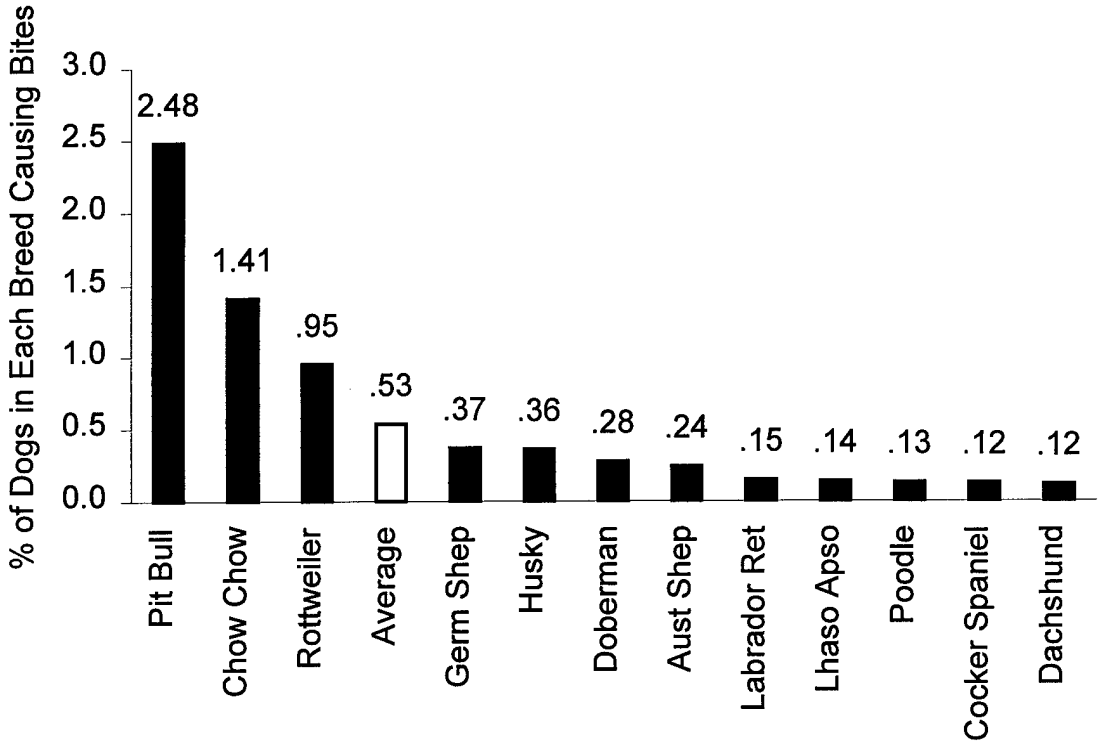

Figure 7. Estimated bite rates for commonly biting dog breeds reported in Bexar County, 1995 through 1997.

APPENDICES

Appendix A. Texas Department of Health Report of Severe Animal Bite or Attack

REPORT OF SEVERE ANIMAL BITE OR ATTACK*
TEXAS DEPARTMENT OF HEALTH

* "Severe Bite" is defined as a puncture or laceration made by an animal's teeth which breaks the skin, resulting in a degree of trauma which would cause most prudent and reasonable people to seek medical care for treatment of the wound, without consideration of rabies prevention alone.
* "Severe Attack" is defined as one in which the animal repeatedly bites or vigorously shakes its victim, and the victim, or a person intervening, has extreme difficulty terminating the attack.

INCIDENT

Date _____ Time _____ am ☐ pm ☐

City _____

County _____

Location Owner's Property ☐ Victim's Property ☐ Other ☐

Brief Description of Event

Owner Present When Incident Began No ☐ Yes ☐ Unk ☐

Were Charges Filed against Owner No ☐ Yes ☐ Unk ☐

If Yes, what charges

VICTIM

Age_____ Sex_____

Was the Incident Job or Hobby Related No ☐ Yes ☐

If Yes, Specify _____

Location of Injuries Head ☐ Neck ☐ Torso ☐

Arms ☐ Hands ☐ Legs ☐ Feet ☐

Required Surgery ☐ Hospitalization ☐ Suturing ☐

Was the Attack Provoked No ☐ Yes ☐

If Yes: Puppies/kittens ☐ Dog Fight ☐ Female in heat ☐ Teasing ☐

Eating ☐ Guarding/Protecting ☐ Injured ☐ Startled ☐ Other ☐

Was Victim Familiar with Animal No ☐ Yes ☐ Unk ☐

Was victim given rabies post-exposure treatment No ☐ Yes ☐ Unk ☐

ANIMAL

Species _____

Breed If Mixed, Predominant Breed_____

Sex Male ☐ Female ☐ Unknown ☐

Spayed/Neutered No ☐ Yes ☐ Unknown ☐

Rabies vacc. within last 12 Months No ☐ Yes ☐ Unknown ☐

Pre-Attack Behavior Friendly ☐ Docile ☐ Threatening ☐ Sick ☐

Vicious ☐ Withdrawn ☐ Other ☐_____

Was Any Warning Observed No ☐ Yes ☐

If yes: Barking ☐ Growling ☐ Other ☐_____

Pre-Attack Restraint None ☐ Chain ☐

Rope ☐ Leash ☐ House ☐ Fence ☐ Other ☐

Animal Involved in Previous Attacks

No ☐ Yes ☐ Unk ☐ If Yes: On Animals ☐ On People ☐

Part of a Group of Dogs No ☐ Yes ☐

Place any additional information on back

Report Prepared by _____

Name & Complete Address of Agency_____

_____

Phone Number of Agency _____ Date_____
(area code) number

Mail or Fax Report to:

Zoonosis Control Division
Texas Department of Health
1100 W. 49th Street
Austin, Texas 78756
fax (512) 458-7454

If pictures or newspaper articles are available, please include a copy with this report.

10/95

Appendix B. San Antonio Metropolitan Health District Animal Bite Report

ANIMAL CONTROL FACILITY
ANIMAL BITE REPORT

LOCATION OF INCIDENT__________/__________/______________________________
Date Time Address

INCIDENT OCCURRED:ON PROPERTY ______ OFF PROPERTY__________(check one)

TYPE OF BITE: ANIMAL TO HUMAN________ ANIMAL TO ANIMAL________(check one)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

VICTIM

VICTIM'S NAME______________________________ ADDRESS______________________________
(PARENT'S NAME IF A MINOR)__________________________ CITY & ST.______________________________

TELEPHONE NUMBER: HM._(____)________________ WK. (____)____________________

DATE OF BIRTH_____________AGE_____SEX________

WHAT PART OF THE BODY WAS INJURED?______________________________________
(HEAD, NECK, ARM, LEG, ETC.)

WAS THE SKIN BROKEN YES________NO______

WHAT TYPE OF INJURY OCCURRED? ______________________________
(Puncture/Scratch, scab formed/bleeding)

Brief description of Incident____

____
____

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

ANIMAL

ANIMAL OWNER'S NAME________________________ADDRESS______________________________

PHONE NUMBER: HM. _(____)._______________________ WK._(______)____________________

DESCRIPTION OF THE ANIMAL ____
(Breed, Color, Sex, Distinguishing Marks)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

FACILITY

NAME OF REPORTING OFFICIAL____

NAME OF HEALTH CARE FACILITY____
ADDRESS AND PHONE NUMBER____

NAME OF PERSON TAKING THIS REPORT______________________________

DATE AND TIME OF THIS REPORT____

ACD 98-02

Appendix C. Texas Department of Health Proposed Animal Bite Report (2 pages)

Approved TDH ZCD 8/99

TDH ANIMAL BITE REPORT - Page 1 of 2
See TDH Publication No. 6-108, "Rabies Prevention in Texas" for treatment guidelines

ANIMAL CONTROL CASE NUMBER _____

Part I- Bite History (Completed during first report from owner/victim)

1) Biting Animal

☐ Dog (Breed) _____
☐ Wolf/Dog Hybrid
☐ Cat (Breed) _____
☐ Ferret
☐ Wildlife* _____
☐ High Risk* ☐ Low Risk*
☐ Other _____

Color _____
Size (for breed) ☐ S ☐ M ☐ L

Age ☐ 0-3 mo ☐ 4-12 mo ☐ over 12 mo ☐ Unk

Sex ☐ M ☐ F ☐ Unk

Neutered ☐ Y ☐ N ☐ Unk

*=High Risk- bats, coyotes, foxes, raccoons, skunks
Low Risk- armadillos, hares, moles, opossums, rabbits, rodents (hamsters, gerbils, gophers, mice, nutria, prairie dogs, rats, squirrels, etc.), shrews

2) Rabies Risk Assessment

☐ Owned by victim/family
☐ Owned by another person
☐ Appears owned
☐ Unowned or abandoned**

At time of bite, animal was:
☐ Unrestrained off owner's property**
☐ Unrestrained on owner's property
☐ Restrained (fence, leash, cage)

Rabies tag # _____
Vaccination date _____

☐ Vaccination not current**
☐ Vaccination status unknown**

**=Not eligible for Home Quarantine

3) Circumstances of Bite

Date _____
Time _____ ☐ AM ☐ PM

Address/Location of Incident:

County: _____

☐ Animal abused or teased
☐ Animal protecting territory, food, pups
☐ Animal appeared injured or sick
☐ Animal fighting with another animal
☐ Victim attempted to pet or pick up
☐ Victim playing with animal
☐ Victim chased while jogging, bicycling
☐ No apparent reason
☐ Other (comments section on back)

4) Animal Owner's Information (if known)
Name:
Address:

Day Phone: Night Phone:

5) Victim's Information ☐ Male ☐ Female
Name: _____ Birthdate: _____
Guardian (if under 18): _____
Address:

Day Phone: Night Phone:

6) Part I completed by: Name/Title:
Agency: Phone: Date/Time:

Part II- Medical Management (Completed by medical personnel/physician)

7) Injury Description (Attach medical note or comments in Part IV for details)

Location:
☐ Upper Extremities
☐ Lower Extremeties
☐ Head or neck
☐ Torso (body)

Severity:
☐ Hospitalized for bite treatment
☐ Medical exam, treated out patient
☐ Minor injury, home treatment

8) Rabies Risk Estimate (required):
Follow "Rabies Postexposure Prophylaxis Decision Tree"

☐ Minimal Risk ☐ High Risk

9) Treatment Given:

☐ Local wound cleansing with soap and water
☐ Tetanus toxoid (0.5 ml IM or SC)

High Risk cases:
☐ Human Rabies Immune Globulin (20 IU/kg) at wound site
☐ Rabies vaccine (HDCD, RVA, or PCEC) (1.0 ml IM (deltoid), on days 0, 3, 7, 14, 28)
☐ Abbreviated rabies vaccination (vaccine given on days 0, 3) only if HDCV, RVA, or PCEC in last 2 years or adequate rabies titer

Date/Time Rabies vaccine started: _____

10) Part II completed by: Date:
Name/Degree:
Address:

Phone:
Signature: _____

Approved TDH ZCD 8/99

TDH ANIMAL BITE REPORT - Page 2 of 2 See TDH Publication No. 6-108, "Rabies Prevention in Texas" for treatment guidelines	ANIMAL CONTROL CASE NUMBER _____

Part III- Animal Management (Completed by Local Rabies Control Authority (LRCA) or designee)

11) Disposition of Animal

☐ Animal NOT captured
☐ Animal NOT tested (reason): _____

☐ Animal quarantined at:
- ☐ Owner's Home (cage, kennel, etc.)
- ☐ Veterinary Clinic _____
- ☐ Licensed Rabies Quarantine Facility

Dates observed: from _____ to _____

☐ Head or body (bat) submitted for rabies testing
Date: _____

☐ Citation issued:
- ☐ Failure to vaccinate against rabies
- ☐ Dangerous/vicious dog
- ☐ Animal-at-large
- ☐ Failure to license

☐ Vaccination current upon release

12) Results of Rabies Testing (if indicated)

Fluorescent Antibody Test results
- ☐ Positive
- ☐ Negative
- ☐ Unsatisfactory/decomposed/destroyed/inconclusive

13) Notification of results

☐ Physician notified, date: _____
☐ Victim notified, date: _____

14) Part III completed by: Date:
Name/Title:

Address:

Phone:
Signature: _____

Part IV- Comments

Reference section numbers and initial each comment. Attach additional sheets as needed.

_____
_____
_____
_____
_____
_____
_____

Part V- Local Animal Control Internal Use Only

Part VI-TDH Use Only

15) Local TDH Public Health Center Name/Location: _____

☐ Parts I, II, and III completed by each authority
☐ Follow up with physician and LRCA to confirm case complete
☐ Distribute completed copies of form to each authority as appropriate (Animal Control, physician, veterinarian, LRCA)
☐ Send copy of completed original to TDH Regional Office

Date completed: By (Name): Phone:

16) Regional TDH Staff Region: _____ Date Received: _____

☐ Data entry from TDH Animal Bite Report form into database
☐ Forward data and hardcopy (photocopy or fax) to TDH State Offices/Zoonosis Division as needed

Date completed: By (Name): Phone:

REFERENCES

American Kennel Club. Top 50 breeds. Available at: http://www.akc.org/breeds/top50.cfm. Accessed February 28, 2000.

American Veterinary Medical Association. *U.S. Pet Ownership & Demographics Sourcebook.* Schaumberg, Ill: AVMA; 1993.

Berzon DR, Farber RE, Gordon J, Kelley EB. Animal bites in a large city: report on Baltimore, Maryland. *Am J Public Health.* 1972;62:422-426.

Berzon DR. The animal bite epidemic in Baltimore, Maryland: review and update. *Am J Public Health.* 1978;68:593-595.

Boenning DA. Dog bites in children: epidemiology, microbiology, and penicillin prophylactic treatment. *Am J Emerg Med.* 1983;1:17-21.

Center for Disease Control and Prevention. Dog-bite-related fatalities: United States 1995-1996. *MMWR Morb Mortal Wkly Rep.* 1997;46:463-467.

Chang YF, McHahon JE, Hennon DL, LaPorte RE. Dog bite incidence in the city of Pittsburgh: a capture-recapture approach. *Am J Public Health.* 1997;87:1703-1705.

Eng TR, Fishbein DB, Talamante HE. Urban epizootic of rabies in Mexico: epidemiology and impact of animal bite injuries. *Bull World Health Organ.* 1993;71:615-622.

Gandhi RR, Liebman MA, Stafford BL, Stafford PW. Dog bite injuries in children: a preliminary survey. *Am Surg.* 1999;64:864-865.

Garcia, R. Preventing human rabies before and after exposure. *Nurse Pract.* 1999;24:91-107.

Griego RD, Rosen T, Orengo IF, Wolf JE. Dog, cat, and human bites: a review. *J Am Acad Dermatol.* 1995;33:1019-1029.

Herbold JR. Breed predilection and severe animal bites. Paper presented at: 134th Annual Meeting of the American Veterinary Association; 1997; Reno, Nev.

Humane Society of the United States. Common questions and answers about the dog bite epidemic. Available at: http://www.nodogbites.org/nodogbites/NDBPW_Q&A.html. Accessed October 21, 1999.

Johnson O, ed. *Information Please Almanac: Atlas and Yearbook 1997.* Boston, Mass: Houghton Mifflin Comp; 1997.

McKenzie JD Jr, Goldman RN. *The Student Edition of Minitab for Windows User's Manual: Release 12.* Reading, Mass: Addison Wesley; 1999.

Newman EC. Animal bites as a public health disease. *Tex Med.* 1977;73:49-52.

Pagano M, Gauvreau K. *Principles of Biostatistics.* Belmont, Calif: Duxbury Press; 1993.

Phillips K. Dog bite law. Available at: http:www.dogbitelaw.com. Accessed October 21, 1999.

Quinlan KP, Sacks JJ. Hospitalizations for dog bite injuries. *JAMA.* 1999;281:232-233.

Sacks JJ, Kresnow M, Houston B. Dog bites: how big a problem? *Inj Prev 1996.* 1996a;2:52-54.

Sacks JJ, Lockwood R, Hornreich J, Sattin RW. Fatal dog attacks, 1989-1994. *Pediatrics.* 1996b;97:891-895.

Sacks JJ, Sattin RW, Bonzo SE. Dog bite-related fatalities in the United States, 1979-1988. *JAMA.* 1989;262:1489-1492.

San Antonio Metropolitan Health District. City of San Antonio code: regulating the care and control of animals. Available at: http://www.ci.sat.tx.us/health/Animal/policies/animcode.htm, 1999a. Accessed December 10, 1999.

San Antonio Metropolitan Health District. Health profiles 1998. Available at: http://www.ci.sat.tx.us/health/profiles/profile98/envirohealth.htm, 1999b. Accessed December 10, 1999.

Sosin DM, Sacks JJ, Sattin RW. Causes of non-fatal injuries in the United States, 1986. *Accident Anal Prev.* 1992;24:685-687.

Texas Department of Health. *1991-1995 Severe Attack Surveillance Summary.* Austin, Tex: TDH; 1996a.

Texas Department of Health. *1995 Severe Attack Surveillance Summary.* Austin, Tex: TDH; 1996b.

Texas Department of Health. *1996 Severe Attack Surveillance Summary*. Available at: http://www.tdh.state.tx.us/zoonosis/Reports/BITES/96bite.htm, 1997. Accessed October 21, 1999.

Texas Department of Health. *1997 Severe Attack Surveillance Summary*. Available at: http://www.tdh.state.tx.us/zoonosis/Reports/BITES/97bite.htm, 1998a. Accessed October 21, 1999.

Texas Department of Health. *1998 Rabies Summary Report*. Available at: http://www.tdh.state.tx.us/zoonosis/reports/rabies/1998.pdf, 1999a. Accessed January 13, 2000.

Texas Department of Health. *1998 Severe Attack Surveillance Summary*. Available at: http://www.tdh.state.tx.us/zoonosis/Reports/BITES/98bite.htm, 1999b. Accessed October 21, 1999.

Texas Department of Health. *Epidemiology in Texas: 1997 Annual Report*. Austin, Tex: TDH; 1998b.

Texas Department of Health. *Epidemiology in Texas: 1998 Annual Report*. Available at: http://www.tdh.state.tx.us/epidemiology/98annual/frames/report98.htm, 1999c. Accessed January 13, 2000.

Texas Department of Health. *Oral Rabies Vaccination Programs: 1999 Summary Statistics*. Available at: http://www.tdh.state.tx.us/zoonosis/orvp/1999orvp.htm, 1999d. Accessed January 13, 2000.

Texas Department of Health. *Texas Health Facts 1995-1997*. Available at: http://www.tdh.state.tx.us/dpa/CSHDPA97.HTM, 1999e. Accessed January 13, 2000.

Texas State Data Center. Texas population estimates and projections programs. Available at: http://www-txsdc.tamu.edu/tpepp, 1999. Accessed December 8, 1999.

Tuggle DW, Taylor DV, Stevens RJ. Dog bites in children. *J Pediatr Surg*. 1993;28:912-914.

Voelker R. Dog bites recognized as public health problem. *JAMA*. 1997;277:278-280.

Weiss HB, Friedman DI, Cohen JH. Incidence of dog bite injuries treated in emergency departments. *JAMA*. 1998;279:51-53.

World Health Organization. World Health Organization surveillance data. *Bull World Health Organ*. 1990;71:615-624.

VITA

David E. Blocker was born in Fort Worth, Texas on October 16, 1971. He is the son of Roger Dare Blocker and Linda Istook Blocker. After attending Lake View High School in San Angelo, Texas, he attended Hardin-Simmons University in Abilene, Texas, and Angelo State University in San Angelo, Texas from 1988 through 1992, receiving a Bachelor of Science degree with a Pre-Medical major from Angelo State University. During the following four years, he attended the University of Texas Medical Branch in Galveston, Texas, receiving the degree of Doctor of Medicine in May, 1996. As a participant in the United States Air Force Health Professions Scholarship Program, he also received a commission in the Air Force as a Captain in the Medical Corps.

Over the next year, David completed an internship in Internal Medicine at University Hospital, San Antonio, Texas. In July, 1997, he entered active duty in the United States Air Force as a Flight Surgeon. After a tour of duty as the Officer in Charge of Flight Medicine at Columbus Air Force Base, Mississippi, he was selected for the Air Force Residency in Aerospace Medicine. As the first year of his aerospace medicine residency, he joined the Masters program in Public Health at the University of Texas-Houston Health Science Center School of Public Health San Antonio Satellite Program in July, 1999.

David is married to Tracey Coston Blocker, an Occupational Therapist from Alvin, Texas. They have one child, Brandon, and Tracey is current pregnant with their second.

This thesis was typed by David E. Blocker, MD.

Perry; Alt, Jeffrey; Babcock, David; Babin, Mitch; Blanton, Patricia; Blizzard, Bernard; Bryan, Teresa; Butler, Alan; Davis, Marvin; Diaz, Debbra; Edmonds, Douglas; Fedarko, John; Gendron, Michael; Golden, Tom; Grant, Richard; Gray, Tim; Healey, Deborah; Knighton, Gary; Larrymore, Brien; Marlette, Hans; Morgan, Alvah; Pype, Achiel; Russell, Linda; Sandoval, Edward; Seeloff, Jeffrey; Seiler, William; Smith, Gregory; Trudics, David; Whorton, David; Wyrick, Linda
Subject: FW: Availability of Revised Evaluation Forms (00-322)
Importance: Low

Hello all!

Below message for your info, use, and appropriate dissemination.

Chief Mazza

-----Original Message-----
From: Rich, Dawn, CMSgt, AF/CCC [mailto:Dawn.Rich@pentagon.af.mil]
Sent: Friday, June 30, 2000 2:01 PM
To: 'Carter, Ray, CMSgt, HQ AFOSI/CCC'; CMSgt Bill Milligan (AETC); CMSgt Billy Blackburn, AFRC/CCC; CMSgt Daniel Keane, ACC/CCC; CMSgt David Hill, AIA/CCC; CMSgt Gary Broadbent, NGB/CCC; CMSgt Joseph Markin, USSTRATCOM/CCC; CMSgt Kenneth Van Holbeck, AMC/CCC; CMSgt Kevin Estrem, AFSPC/CCC; CMSgt Larry Palmer, 11Wing/CCC; CMSgt Marc Mazza, AFMC/CCC; CMSgt Mike Myers, USAFA/CCC; CMSgt Mike Reynolds, AFSOC/CCC; CMSgt Ron Crowl, PACAF/CCC; CMSgt Vicki Mauldin (USAFE)
Cc: (11 WG) SMSgt Anthony Twitty; (ACC) MSgt Sherry Ensor; (AETC) TSgt Robel; (AFMC) MSgt Vivian Graham; (AFOSI) SrA Jamie Smith; (AFRC) MSgt Kim Schueler; (AFSOC) MSgt Norm Dykes; (AFSPC) TSgt Shirley DeMagistris; (AIA) MSgt Faye Johnson; (AMC) TSgt Patty Woodham; (NGB) MSgt Carolyn Ferguson; (PACAF) TSgt Jeff Klausing; (USAFA) SSgt Janette Torres; (USAFE) SMSgt Maria Forehand; (USSTRATCOM) TSgt Eric Hittner; Anthony Patterson; Frederick Finch; Michael Gilbert; Rhonda Pelkey
Subject: AVAILABILITY OF REVISED EVALUATION FORMS FOR AFI 36-2406
Importance: Low

FYI. CMSgt Rich

-----Original Message-----
R 291300Z JUN 00
FM HQ AFPC RANDOLPH AFB TX//DPP//
TO AIG 8106
AIG 10607
AIG 7309
ALPERSCOM
INFO RUEAHQA/HQ USAF WASHINGTON DC//DPFPP/REPX//
RHDJANG/HQ ANGRC ANDREWS AFB MD//MPPU/MPPS//
BT
UNCLAS
SUBJ: AVAILABILITY OF REVISED EVALUATION FORMS FOR AFI 36-2406 (AF
A/158/00 B/142/00
PLEASE ENSURE WIDEST DISSEMINATION
FORMS 910, 911, 707A, 707B, 77, 475, 709). THIS MESSAGE IS
AUTHORIZED FOR GENERAL PUBLIC RELEASE.
REF: HQ AFPC MSG DTG 161930Z JUN 00
1. IN CONJUNCTION WITH THE RELEASE OF THE NEW AFI 36-2406, OFFICER AND ENLISTED EVALUATIONS SYSTEMS, REVISED VERSIONS OF AF FORMS 910, 911, 707A, 707B, 77, 475, AND 709 WILL ALSO BE PUBLISHED. THE PUBLISHING IDENTIFICATION DATE AT THE BOTTOM OF THE FORMS WILL BE 20000601 (EF-V1). THE REVISED FORMS WILL BE EFFECTIVE AND AVAILABLE ON 1 JUL 00, ON THE AF PUBS/FORMS WORLD WIDE WEB SITE AT HTTP://AFPUBS.HQ.AF.MIL. START USING THE REVISED FORMS FOR REPORTS CLOSING OUT 1 JUL 00 OR LATER. HOWEVER, REPORTS CURRENTLY IN COORDINATION MAY BE ON THE OLD FORMS (A TWO MONTH TRANSITION PERIOD WILL BE IN EFFECT UNTIL 1 SEP 00). FOR REPORTS

CLOSING OUT ON OR AFTER 1 SEP 00, IT WILL BE MANDATORY THEY ARE ACCOMPLISHED ON THE REVISED FORMS.
2. MPFS: PUBLICIZE FORMS CHANGES AND ENSURE ALL PERSONNEL ON YOUR BASE ARE USING THE MOST CURRENT VERSION. COORDINATE WITH YOUR BASE LEVEL INFORMATION MANAGEMENT SECTION TO ENSURE FORMS ARE UPDATED AND ACCESSIBLE LOCALLY. ENSURE COMMANDERS AND ALL CSS RECEIVE A COPY OF THIS MESSAGE.
3. CHANGES TO THE EVALUATION FORMS INCLUDE:
A. THE AF FORM 707A WAS REVISED TO INCLUDE "(MAJ THRU COL)" ON THE HEADING OF THE FORM. THE AF FORM 707B WAS REVISED TO INCLUDE "(2LT THRU CAPT)" ON THE HEADING OF THE FORM.
B. THE AF FORMS 910 AND 911 NOW HAVE A "BIENNIAL" OPTION ADDED TO THE DROP DOWN MENU IN THE REASON FOR REPORT BLOCK. THE BIENNIAL REASON IS USED FOR RESERVE AIRMAN REPORTS.
C. THE BLOCKS ON AF FORMS 707A, 707B, 910 AND 911 ARE NOW "FILLABLE" I.E., YOU CAN MARK THE "X" ELECTRONICALLY IN ALL BLOCKS INSTEAD OF HANDMARKING.
D. THE AF FORMS 707A, 707B, 910 AND 911 NOW HAVE AN AUTOMATIC FILL FOR THE RATEE'S NAME ON THE REVERSE SIDE OF ALL FORMS. SIMPLY TYPE THE RATEE'S NAME ON THE FRONT OF THE FORM, THEN PRESS THE "TAB" OR "ENTER/RETURN" KEY. THE NAME WILL AUTOMATICALLY APPEAR ON THE REVERSE SIDE IN THE "RATEE NAME" BLOCK AT THE TOP OF THE FORM.
E. THE AF FORMS 707A, 707B, 910 AND 911 NOW HAVE A DROP DOWN MENU FOR THE GRADE BLOCK. YOU MAY TYPE IN GRADE OR ACCESS THE DROP DOWN MENU. THIS FEATURE PREVENTS USE OF THE 707A FOR A COMPANY GRADE OFFICER ON THE 707B FOR A FIELD GRADE OFFICER.
F. ON ALL FORMS, ALL EVALUATOR IDENTIFICATION BLOCKS WILL BE LIMITED TO LAST 4 DIGITS ONLY OF SSN.
G. AF FORMS 910 AND 911 WILL CONTAIN ONE BLOCK FOR DATE OF FEEDBACK AND WILL REQUIRE DOCUMENTATION OF LAST FEEDBACK DATE ONLY, MIRRORING THE AF FORMS 707A/B.
H. HELP BLOCKS WILL BE AVAILABLE THROUGHOUT THE FORMS TO ASSIST EVALUATORS IN COMPLETION AS WELL AS DROP DOWN MENUS. DROP DOWN MENUS MAY BE ACCESSED BY SIMPLY PRESSING THE F3 KEY OR DOUBLE CLICKING ON THE BLOCK.
4. WE HIGHLY ENCOURAGE DOWNLOADING OUR COMPUTER BASED TRAINING (CBT) PROGRAM FOR FAMILIARIZATION AND TRAINING ON THE NEW AFI AND FORMS. ACCESS THE CBT ON OUR WEB SITE AT WWW.AFPC.RANDOLPH.AF.MIL/EVALUATIONS.
5. HQ AFPC/DPPPEP POCS ARE MSGT BASAL AND SSGT DIXON, DSN 665-2571.

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY *(Leave blank)*

2. REPORT DATE
22.Aug.00

3. REPORT TYPE AND DATES COVERED
THESIS

4. TITLE AND SUBTITLE
DOG BITE RATES AND BITING DOG BREEDS IN TEXAS, 1995-1997

5. FUNDING NUMBERS

6. AUTHOR(S)
CAPT BLOCKER DAVID E

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
UNIVERSITY OF TEXAS HSC SAN ANTONIO

8. PERFORMING ORGANIZATION REPORT NUMBER
CY00352

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
THE DEPARTMENT OF THE AIR FORCE
AFIT/CIA, BLDG 125
2950 P STREET
WPAFB OH 45433

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION AVAILABILITY STATEMENT
Unlimited distribution
In Accordance With AFI 35-205/AFIT Sup 1

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*

20000831 091

DISTRIBUTION STATEMENT A
Approved for Public Release
Distribution Unlimited

14. SUBJECT TERMS

15. NUMBER OF PAGES
80

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT

18. SECURITY CLASSIFICATION OF THIS PAGE

19. SECURITY CLASSIFICATION OF ABSTRACT

20. LIMITATION OF ABSTRACT