Dog Bites in Multnomah County, Oregon

By

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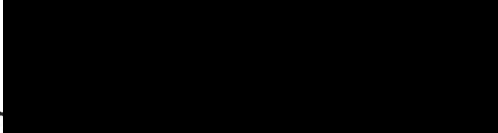## Certificate of Approval

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Abstract

Introduction

Dog bites in the United States cause an estimated 799,700 injuries per year requiring medial attention. Victims are usually children (42 % of bites) and 58 percent of reported bites are by a dog the victim knows. To determine the overall burden of dog bites in Multnomah County, Oregon, we conducted a descriptive investigation of the bite situations, a cohort analysis comparing physical traits of biting dogs to all licensed dogs in Multnomah County, and a case-control study comparing socioeconomic characteristics of owners of biting dogs to owner's of non-biting dogs.

Methods

Data were obtained from the bite records and licensed dog records of Multnomah County Animal Control Services. Cases were selected from bite records reported from June 20, 2002 through July 1, 2003. Descriptive information on the bite situations and dog bite victims were described from the bite reports. Data were obtained on the location where the bite occured, sex of the victim, age of the victim, relationship between the dog and victim, severity of the bite, the season the bite took place, who reported the bite, and whether the dog was classified as dangerous. For the cohort study, controls were the population of licensed dogs during that same period that had not been reported as a biting dog. Breed category, sex status, and purebred condition of the dog and bite status were compared between biting dogs and all licensed dogs. For the case-control study, controls were matched to cases on prominent breed category as listed by the owner on license and bite records. Socioeconomic characteristics, of the owner, including race, education, income, population density and sex/age proportions, were identified using census block

group information from the Multnomah County 2000 census. Geographic information system (GIS) maps connected block group socioeconomic factors with each dog owner's address. A regression model using Generalized Estimating Equations (GEE) was developed to identify predictors between the owner's block group census characteristics and the biting outcome.

Results

In Multnomah County Oregon, 636 dog bites were reported to animal control services and 47,214 dogs were licensed from June 20, 2002 and July 1, 2003. The largest proportion of biting dogs were in the working breed category (19.7%). The largest proportion of biting dogs were un-neutered males (27.4%) and non-biting dogs were spayed females (45.6 %). The largest of bites took place in the summer months (33.8%) and took place in or around the dog's household (35.1 %). While a majority of bite victims in Multnomah County were adults (57.0%). The rate of bites among the 5-9 year old age category was twice as high as the adults (>18 years). The sex of the victim was fairly even: females with 48.1% of the bites and males with 47.2%. Half of the victims knew the dog that bit them (50.3 %). Forty-three percent of the bites were reported by a medical professional and 50.0% sought medical attention.

The non-biting dogs were in the sporting breed category (30 %). When compared to the sporting breeds; hound, working, terriers, and non-sporting dogs were all more likely to bite. The risk of a dog in the terrier category biting was 3.8 times higher than for the sporting dogs. Un-neutered males were 19 times more likely to be in the biting group than spayed females. Purebred dogs were 5.7 times more likely to bite than mixed breeds.

The case-control analysis found a significant relationship between biting dogs and living in a census block with the following variables: lower income levels, higher population densities, lower percentages of female seniors (>65 years), and higher percentages of households on public assistance. Odds of a biting dog living in a block group with the lowest household income (<$36,098) were 1.5 times higher than for non-biting dogs (95% CI= 1.0, 2.1); the odds of a biting dog living in block groups with a population density less than 3940 people per square mile were 1.3 times (95% CI= 1.0, 1.7) higher than non-biting dogs; the odds of a biting dog living in a block group with less than 4.6% of the population being a women over than age of 65 years was 1.1 times the odds of a non-biting dog living in a household with less than 4.6% of the block group population being women over the age of 65 (95% CI= 1.1, 2.1).

Conclusion

There were 636 preventable dog bite injuries in Multnomah County from June 2002 to July 2003. The results of our study confirm that breed of the dog and the dog's sex status are associated with a dog biting. Our study was unique in evaluating the dog owner's characteristics, as described by census data, as factors in dog bites. Census characteristics of the dog's environment including income levels, population density, and percentage of older women were predictors in whether a dog bites. Understanding variables outside of the dog's breed and sex status that can be controlled will further direct intervention programs.

Introduction

Dog Bites in the United States

Dog bites are a significant public health problem in the United States and the number of bites appears to be increasing. In 1986, a National Health Interview Survey (NHIS) determined that dog bites caused 585,000 injuries resulting in medical attention or restricted activity, an estimate that placed dog bites among the top 12 causes of non-fatal injury in the United States.[1] Nine years later, the Center for Disease Control and Prevention (CDC) conducted a similar survey that estimated 4.7 million dog bites occurred in the United States, and approximately 799,700 persons required medical attention.[2] Infection, disability, and psychological trauma can result from a bite. On average in the United States each year, 18 people will lose their lives to a dog bite.[3]

The current number of dog bite injuries is estimated by emergency room case reports analyzed by the National Electronic Injury Surveillance System-All Injury Program (NEISS-AIP),[4] and with hospital discharge data maintained by the Agency for Health Care Policy and Research.[5] In 2001, an estimated 368,245 persons were treated in emergency rooms for dog bites in the United States resulting in a rate of 129.3 bites per 100,000 population, with 5892 hospitalized with serious injuries.[4] Children less than 14 years of age accounted for 42.0% of the dog bite related injuries; the rate was significantly higher for boys than for girls.[4] Dogs were more likely to bite on the arm or hand (45.3%), bite someone they knew, and bite during the summer months.[4]

According to the Insurance Information Institute, dog bite injuries account for more than one-third of all liability claims against homeowner's insurance, costing the insurance industry approximately $310 million in 2001.[6] Medical costs estimated from

emergency room visits total $102.4 million per year, with payment from government sources including Medicaid and Medicare responsible for 26% of the visits.[7] Hospital charges estimated from the Health Care Utilization Project (HCUP) database maintained by the Agency for Health Care Policy and Research showed $62.5 million spent on hospitalized dog bite-related patients in 1994.[5] Due to the fact that not all dog bite victims utilize emergency rooms or are hospitalized suggests that the number of people injured by dogs is underestimated and the emotional, physical and financial burden to the community is substantially higher.

Dog Owners and Canine Populations

As our human population changes and grows, so does the dog population. Dogs are working less, and moving inside and closer to families. The 2001-2002 National Pet Owner's Survey estimated that 68 million dogs were owned in the United States, with 40% of U.S. households owning a dog and 37% of owners having more than one dog. [8] Over half the national dog bite injuries (58.0%) occurred in the dog or victim's home, with the family dog listed as the primary source of the bite.[7, 9] As the interaction between dogs and humans increase, so does the physical and financial impact of dog behavior on human life.

Canine Surveillance

The problem facing animal control agencies and bite injury prevention programs is identifying the true number of dogs in an area; number and type are not obtained by the United States Census. Estimates of the number of dogs in the United States have been

obtained for other reasons, like marketing pet products.[8] An approximate measure of canine ownership is through dog licenses. Owners in Multnomah County are able to license their dogs through their veterinarian or directly with MCAC located in Troutdale, Oregon. Dogs, adopted from Multnomah County Animal Service shelters and the Oregon Humane Society are required to be licensed upon adoption. MCAC officers responding to dog bite reports, complaints/nuisance calls, and neglect cases will verify dog license status. The officer can issue a fine or violation requiring licensing.

In 1984, a telephone survey of Multnomah County, Oregon, was performed to get an estimate of the number of dogs within the county. For that same year, only 43,650 dogs were licensed through animal services, but 101, 794 dogs were estimate to reside in the area.[10] Due to the fact that dog licenses are coordinated with a dog's rabies vaccination, leaves approximately 57% of dogs in the Portland area without verification of a license or vaccination.

Breed Categories

Today's domestic dog has been manipulated and formed from the original wolf for over 12,000 years.[11] Dogs in the past were primarily used to help people with everyday work, including hunting, managing livestock, and guarding property. Many dogs are still bred for these purposes all over the world.[11] Today's dog also serves the function of companion. The American Kennel Club (AKC) was established in 1884 as a non-profit organization devoted to the advancement of purebred dogs.[12] The fundamental means of separating dog breeds into categories is on the basis of their function.[11]

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The AKC has delineated seven classifications and one miscellaneous group for dogs that are in the process of being recognized (Table 1). The sporting group or gundogs are bred to work closely with people and have very responsive natures with high intelligence. These dogs include Retrievers, Setters, and Spaniels, which are naturally active. [11, 12] Hounds are also bred for hunting or pursuing game and include the Beagle, the Basset Hound and the Greyhound. Working dogs have been bred for stamina, strength and size. Some working dogs, like the Siberian Husky or Alaskan Malamute, have physical characteristics for pulling sleds in the snow. Others such as the Rottweiler, Doberman Pinscher, Boxer and Bullmastiff, are built to protect and defend people and property. Terriers are a diverse group including the American Staffordshire Terrier or Pit-bull and the much smaller Jack Russell Terrier. The ancestor to today's terrier was bred to hunt and kill vermin. [11, 12] They are feisty, energetic dogs with a bold and fearless nature. Many of the dogs' traits are not compatible with family life. [12] They require responsible owners with strong determination to handle their dog's personality.[12] The Toy and Non-sporting groups consist of dogs characterized by their size and function as a companion. Toy breeds such as the Maltese or Pug make great apartment dogs and require less exercise.[12] Non-Sporting dogs like the Chow Chow, Shar-pei, or Dalmatian vary greatly in size and personality. Herding breeds, including the Border Collie, the Old English Sheepdog, and the German Shepherd, have been bred to guide livestock. They are very intelligent with an instinct to control the movement of other animals.

The breed of a dog is a physical trait that is easily recognized. Describing a biting dog by breed is one way to describe innate personality traits. All dogs regardless of breed have the capability to bite. The interaction of factors involved in a dog bite is

complex, including the behavior of the person bitten, genetics that may predispose the dog to biting, and how the dog was socialized.[13]

Factors that Influence Bite Behaviors

Characteristics of the victims, the situation surrounding the incident, and the breed and sex status of the dogs are factors associated with a biting dog. In 1994, a case-control study analyzed the biting dog population in Denver, Colorado.[14] Households with more than one child less than 10 years of age were more likely to own a dog that bites.[14] Biting dogs were significantly more likely to be chained while in the yard and exhibit growling or snapping behavior at visitors to their house. [14] Large (>50 pounds), male dogs that had not been neutered are more likely to be reported as biting a person.[14] Chow Chow and German Shepard breeds were over-represented in reported biting dogs compared to non-biting dogs, matched by neighborhood. A Center for Disease Control and Prevention study looked at fatal dog attacks from 1989-1994. Fatalities were more likely to involve a Pit Bull Terrier or a Rottweiler.[3]

While the majority of the current data focuses on physical and genetic traits of the dog and how that relates to bite behavior, detailed information on the dog's environment, socialization experiences, and human-dog interactions could add to our understanding of biting dogs. Although, the breed of a dog cannot be changed, the dog's neuter status, and the dog's socialization environment can be addressed. Identifying amendable behavioral and environmental factors that relate to a biting dog will be crucial for prevention.

Dog Bite Control Strategies

Current policies to control the number of dog bites involve breed discrimination and rely heavily on owners acting and managing their own dog or dogs responsibly.[6] In Denver, Colorado, since 1989, a regulation has been issued to not allowed Pit Bull terriers in the city.[14] Many insurance companies are trying to cut costs by excluding owners of large breed dogs from homeowners' insurance plans.[6] Breeds that have been targeted include pit bull–type dogs, Rottweilers, Doberman Pinschers, Chow Chows, Akitas, Siberian Huskies, and German Shepherds.[6] Breed-specific approaches to the control of dog bites do not address the issue that many breeds are involved in the problem and most of the factors contributing to dog bites are related to the level of responsibility exercised by dog owners.[3]

Multnomah County Animal Services (MCAC)-Bite Reporting System

Current city and county ordinances regulate some aspects of dog-human interactions. In U.S. states, dog bites that break the skin must be reported to either a public health department and/or an animal control agency. However, systems vary from state to state and bite data are not reported nationally. Bites reportable to public health departments are primarily for assessment of the risk of the zoonotic rabies virus. Health officials need to investigate the situation due to. However, not all physicians are aware of the reporting requirements for dog bites. In Oregon, a majority of the reports are from emergency medical facilities to the local/county animal control service.

The City of Portland and four suburban municipalities rely on Multnomah County Animal Services to provide animal control responsibilities including: animal control law

enforcement, dog licensing, animal quarantine and bite investigations.[10] Bite reports are followed up by an animal control officer (See Appendix A for the Dog Bite Report Animal Control Form). All dogs are required to be quarantined for ten days while the situation surrounding the bite is investigated. The victim is given the opportunity to file a Potentially Dangerous Dog Classification and the dog owner is required to show a valid license. If the dog was unrestrained or not licensed, fines can be issued. Owners of an at-large bite dog must improve their dog's confinement. A dog that is not restrained on an owner's premises in a manner that physically prevents the dog from leaving or reaching any public areas is considered a dog at large.[15] The animal control officer is responsible for all follow-up visits to ensure that owners have been compliant with restrictions. The incident is only classified if the victim wants to pursue action against the dog or the owner wants to relinquish the dog for behavioral reasons. Unreported bites and those that do not receive medical care are never known to the animal control system. Those dogs will not be followed and monitored for proper restrain and future injuries are possible.

Potentially Dangerous Dog (PDD) Classification/Regulation

Multnomah County Code of Ordinances/ Animal Control Law establishes a procedure to impose appropriate restrictions for dogs that pose a reasonably significant threat of causing serious injury to humans, other animals or property.[15] Classifications on known aggressive animals are intended to prevent the reoccurrence of similar or worse incidents. Four levels of dangerousness and corresponding restrictions have been set based on behavioral criteria (Table 2).[15] Levels 1-4 dog owners are required to confine

their pets at all times and are required to pay an increased license fee. Level 3 and 4 dog owners must post signs on their property warning of the dangerous dog.[15] Dogs classified as PDD level four many be defined as a "dangerous" by the MCAC director and shall be euthanized or placed in a dangerous animal facility as determined by the director or hearings officer.

A dog can be listed as a PDD by the victim, dog owner, bite witness, or in extenuating circumstances, the animal control officer. Classifications are made based on the behavior exhibited at the time of the inciting event. Past history is not taken into consideration unless the dog has repeated very aggressive (level 4) behavior. The breed and living conditions of the dog do not factor into the classification process. Two situations that directly result in level 4 dangerous classification include: a dog causing serious physical injury or death of any person, or any dog that is used as a weapon in the commission of a crime. Dogs can be classified at any level and do not have to go in order. The MCAC director or hearings officer has discretionary authority to refrain from classifying a dog as dangerous and can order the dog not be euthanized. Once PDD paperwork has been filed with MCAC, an investigation is initiated. Dog owners are provided in writing of any legal action or regulation that have been filed about their dog and have the opportunity to appeal their animal's classification.

Multnomah County, Oregon Census Data

Multnomah County is located in the Northwest corner of Oregon. It is the most populated county in the state with the smallest physical area.[16] In 2000, the county had 660,486 residents with 529,121 (80.1%) living in the city of Portland. Forty-nine

percent of the population was male. The county population had a median age of 34 years, was 82.6% white, with 85.6% having at least received a high school diploma, and 30.7% having a bachelor's degree or higher. Forty-six percent of Multnomah County residents were married and 45% were born in the state of Oregon. The median income in 1999 was $41,27, with 30.7% of families earning below $35,000 per year; 12,593 families in the county were classified as living below the national poverty level. [16]

In 2000, United States Census information was requested from every household member including name, sex, age, household relationship, Hispanic origin, race and whether the housing unit was owned or rented. [17] These results are available in the Summary File 1.[17] Seventeen percent of the households were also sent an extended questionnaire asked for information on ancestry, income, mortgage, and size of the housing unit. The extended questionnaire also asks for data on social characteristics including marital status, disability, language spoken, educational attainment; physical housing characteristics; economic characteristics, including labor force status, work status, and income status; and financial characteristics, including monthly rent paid or the value of the home. These data are found at the block group level in the Summary File 3.[17] The information is confidential, and name and addresses are separated from the individual's answers.

Census data can be correlated with a geography hierarchy. The nation is broken down into regions, divisions, states, counties, census tracts, block groups and finally blocks. A block group generally contains between 300 and 3000 people, with an optimum size of 1500. This was the lowest geographic level that the Census Bureau calculated sample data from the 2000 census. Information from the census block groups

can be used as a proxy for individual data and as a way to measure trends and changes in our population.

Objectives

The true public health burden of dog bite injuries and factors associated with bites (breed and sex status) in Multnomah County has yet to be identified. By controlling for breed category and sex status among our cohort of dogs, the significant non-physical factors (such as SES of owner) can be identified. Prevention programs and education for the community can concentrate on these non-genetic bite factors (i.e. owner variables) in order to actively treat the dog bite epidemic.

The specific aims set forth with this study were:

1. to describe the biting dog population in Multnomah County, Oregon, in terms of breed category, purebred status, sex/neuter condition, the situations where the dog bites took place, age categories of the dog bite victims, the relationship between the dogs and bite victims, severity of the bite, who reported the bite, and owner socioeconomic characteristics

2. to put this information into the larger context of all dogs by describing the non-biting dog population in Multnomah County, Oregon, in terms of breed category, purebred status, sex/neuter condition, address and owner block group socioeconomic characteristics,

3. to determine whether physical traits (breed category, sex/neuter condition, and purebred status) are associated with a biting dog, and

4. after controlling for breed category, determine whether an owner's block group socioeconomic characteristics are associated with a biting dog.

Hypotheses

1. **Large dog breed categories (Working dogs: Rottweiler, Herding dogs: German Shepard and Terrier dogs: Pit Bull Terrier) are over-represented in the biting dog group compared to the non-biting group.**

2. **Biting dogs are more likely to live in lower socioeconomic status block groups and block groups with more children under 18 years of age, when controlling for breed category.**

Research Design and Methods

Data Access, Collection, and Management

Biting dog and licensed dog information was obtained from the records of Multnomah County Animal Services. Dogs reported to have bitten a person were included in the biting dog data set if they had a valid Multnomah County zip code. Dogs that had not bitten a person and had an address inside Multnomah County, Oregon, were included in the non-biting dog data set. Bite reports with the same dog name, address, owner name, victim name and bite date were declared a duplicate and deleted. Dogs with the same license number, address, and owner last name were declared a duplicate and the first entry was deleted. Licensed dogs that were reported as a biting dog were deleted from the non-biting dog data set. Dogs were given a unique subject number for

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identification. Together the two data sets (biting and non-biting dogs) were described as our Multnomah County canine cohort. Information on the physical traits of the dog population in Multnomah County was obtained from these data.

Census information was retrieved from the United States Census bureau from their public web site.[16] Data was obtained at the block group level to describe as close to the individual socioeconomic status of the dog owner.

Dog Cohort

Licensed dog records, police reports on dog bites, physician bite reports, and any written documentation from a victim or a dog owner that had been submitted to Multnomah County Animal Services between June 20, 2002 and July 1, 2003 were reviewed to identify the overall characteristics of the dog population. Descriptive statistics (counts and percentages) were calculated on the entire canine cohort, including the sex of the dog, neuter status of the dog, breed (pure/mix) and breed category as well as the dog/owner's address. Table 3 lists dog specific variables for the descriptive and cohort analysis.

Biting and non-biting dogs were listed by prominent breed and also described as either a mix or purebred dog. Sex status was used to describe, not only an objective characteristic of the dog, but whether the owner had the dog neutered. Neuter status could be visualized on the biting dogs or was reported by the dog owner. Dogs' physical traits were self-reported on the MCAC paperwork by the dog owner but license forms require a sterilization certificate from a veterinarian to verify castration status. Dogs that are neutered are cheaper to license. The victim, dog owner, witness or the animal control

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officer detailed the biting dog's physical traits. The dog breed listed first on any bite documentation was the prominent breed for the study.

Bite Situations

The bite situations were described based on location where the bite took place, the age category, sex of the bite victim, the relationship between the dog and victim, severity of the bite, season the bite took place, who reported the bite, and whether the dog was classified as a potentially dangerous dog (PDD). The location of the bite for postal workers was listed as the dog's household, not place of employment. Dogs that were in the bite data set more than once due to multiple episodes were identified via a different bite date or a different victim name. Dog bite events were counted separately taking into account that a dog may have more than one bite entry in the data set. Denominator counts used to calculate the dog bite rates by victim age were based on data from Portland State University Population Center.[18] Table 3 lists the bite situation variables that were described in the descriptive study.

Cohort Analysis

To identify the most prominent breeds categories associated with biting, the original cohort of dogs was evaluated using a chi-squared test of homogeneity. Due to the fact that few bite dogs were licensed and also found in the non-biting data set, the groups were described as independent populations. The categorical variable, sex status, was evaluated as to association with biting outcome with a contingency table and a Pearson's

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chi squared test of homogeneity. These two associations were evaluated on the data sets that did not include the census data.

The physical traits of the dogs (breed category, sex status, and secondary breed) were also evaluated with risk ratios. Risk ratios were calculated to describe the likelihood of biting between each breed category and the sporting breeds (i.e. Golden Retrievers), between each sex status and spayed females, and between purebred compared to mix secondary breeds. For example, the incidence rate of biting working dogs was divided by the incidence rate of biting sporting dogs (# biting working breeds / # non-biting working breeds + # of biting working breeds ÷ # biting sporting breeds / # non-biting sporting breeds + # of biting sporting breeds). Sporting was chosen as the referent due to the large number represented in the non-biting dog data set. Spayed females have also been shown from previous literature to have the least risk of biting and therefore were chosen as the referent category.

Global Information Systems
Geocoding

Dog owner SES block group information was acquired through the use of the block group census data and mapping with ARC GIS 8.3. [19] The addresses of biting dogs were geocoded with the use of metropolitan street information obtained from the Oregon Department of Human Services. Initial coding was run with the criteria for an 80% match on the address. An address was considered a match when the street number, direction, name and zip code correctly correlated with an existing location in the Portland metropolitan database. Minor misspellings were picked up using the 80% match criteria. Biting dog addresses were then interactively evaluated for unrecognizable errors in data

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entry resulting in a non-valid location (i.e. lane instead of street; a zip code that didn't fall in the Portland metropolitan area). Existence of the address was manually confirmed through use of the Portland Metropolitan Area Thomas Guide. [20] The non-biting dogs were handled in the same manner with the exception of matching interactively. Due to the high number of addresses that coded at 80% (34,833) and the relatively large number of non-biting dogs (47,214), mismatched locations were not individually assessed. The biting and non-biting dogs with their geocoded addresses could then be placed in the corresponding census block group.

Linking with Census Data

Further information was gained on the areas where dog owners lived to identify age/sex demographics, race, income, education, and population density of the block groups in which the dogs reside and whether those variables were associated with a dogs' potential to bite. With the addition of the geocoded location, the block group census variables of the owners in our biting and non-biting groups were joined with the original cohort data set. The system used the block group name/number as the linking variables. Validity of the linking process was verified by a random review of a portion of the cases and controls ensuring the correct match of with existing entries.

Census data were acquired through the United States Census Bureau summary file 3 for the education, income and public assistance variables.[17] Summary file 1 was used to attain block group areas, total population numbers, age/sex distributions within each block group. The SES variables for the census block group that each dog resided were imported into both the biting and the non-biting data set for each individual dog. Dog

households were described by the prominent census block group measures for race, median household income, educational attainment, population density, households with public assistance and distribution of households by age and sex (Table 3). The risk factors were further classified into quartile categories for the census analysis (Table 4). Block group census data will be an estimate for the socioeconomic status of the dog owner and socialization situation of the dog.

Only dogs that had their breed listed and an owner (strays were excluded) with a valid Multnomah county address were used for the census case-control study. Census data could then be obtained on 100% of the subjects in both summary file 1 and 3. Any information on the dog population and bite situations in the county that did not require census data were described (dog physical traits) from the data sets prior to frequency matching.

Breed Category Frequency Matched Data

Complete census and breed information was available on 486 bite report subjects. Only the breeds found in the bite data set were used as controls for the non-biting data. Only 3 dogs in the biting dog data set fell into the miscellaneous category; therefore, the non-AKC breed category was not included in the frequency match. The 7 broad AKC categories were used to describe the breeds in the study (Table 1). With the use of SAS statistical software the non-biting dogs were divided into 7 separate breed category data sets.[21] Each file was shuffled so dogs were listed in random order. The number of controls randomly selected from each group was dictated by the frequency of breed category distributions in the biting dog data set. Twenty-two percent of biting dogs were

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working dogs; twenty-two percent were herding dogs; twenty percent were terriers; seventeen percent were sporting breeds; Eleven percent were non-sporting; five percent were hounds; three percent were toy breeds. Thirty control dogs were selected for each case dog based on these categories and proportions. The 486 biting dogs with valid census data were joined with the 14,580 breed category frequency matched control subjects, for a total of 15,066 dogs were available for the breed-controlled analysis. The control dog data set for the final analysis contained only those breeds also represented in the case data set and with a valid geocoded address.

In this frequency matched case-control study, the probability of exposure (i.e. working breed category) among sampled control dogs (non-biting) was estimated at 0.11 (11.3%). A sample of 486 biting case dogs was obtained. For each case dog, 30 non-biting control dogs were also obtained. This sample of 15,066 dogs achieves 84% power to detect an odds ratio of 1.50 versus the alternative of equal odds using a Chi-Square test with a 0.05 significance level with a two-sided test (power estimates completed with the use of http://www.stat.ucla.edu/ statistical calculator). The limiting factor was the number of reported bite dogs in the June 2002 through July 2003 fiscal year with a valid geocoded address.

Case-Control Analysis

The analysis of the block group socioeconomic predictors of a biting dog was performed on the 15,066 subjects that were breed category frequency matched. Due to the overwhelming association between breed, sex status and likelihood to bite, breed and sex status were controlled for in the regression analysis. Breed category was still

included in the model due to the possibility that breed could modify or interact with other variables and change their association with the outcome, biting.

Each independent variable was selected from the census block group data for its ability to approximate the social and socioeconomic conditions in which the dog was living or raised. There were 508 total block groups found in Multnomah County with 208 block groups were represented within the case data set. In the overall study, 506 block groups were represented. Dogs (biting/non-biting) who lived in the same block group had identical census data therefore the census data would be correlated or have clustered effects. Block group variables needed to be analysis with the possibility of cluster effects (See GEE regression model). Biting status of the dogs was based on the block group information accounting for the clustering effects.

The distribution of each continuous census variable was evaluated graphically. Population density, race, education status, and age by sex were skewed with many outliers. These variables were categorized by quartiles (Table 4). The odds ratios could be used to compare a 25% difference in the predictors. The percent of the block group that had a high school diploma was a combination of both the male and female population over the age of 25 without their high school diploma. Population density was calculated by dividing the total number of people in a block group by the area of the block group in square miles. Due to the large number of small block groups the population density values are larger than the mean values listed for the overall population density for Multnomah County.

The eleven census variables were also evaluated for any evidence of a linear trend across the quartiles. The quartile strata of each variable were tested individually without breed category or sex status. A trend was considered significant at the .05 alpha level.

GEE Regression Model

The census variables were derived from the block group level. Dogs, (cases or controls) which live in the same block group, would have identical information. In order to account for this possible correlation effect, the census variables were modeled with the use of Generalized Estimating Equations (GEE).[22] The census variables were evaluated individually for an association with the biting outcome. All variables were placed in the multiple regression model. The variable with the highest Wald Statistic for Type 3 GEE p value was removed (Table 12). The final model contained census variables with overall Wald values less than or equal to 0.10. Breed category and sex status were included in the main effects model due to their significant association with the bite outcome. Confounding was described when there was a greater than 10% change in the odds ratio between the simple and multiple regression analysis.

To find out whether the odds of biting between census quartiles differed among breed categories, five separate interaction terms were evaluated. The 7 breed categories were linked with the levels of median household income, population density, percent female less than 18 years and greater than 65 years, and percent of households with public assistance.

Results

Dog Cohort:
Licensed Dogs (Non-Biting)

Multnomah County had 47,214 dogs licensed (non-biting) in the one-year study period. Table 5 shows the breed and physical characteristics of these dogs. The majority of the dogs (30%) were sporting breeds (Labrador Retrievers - 18.4% and Golden Retrievers - 4.0%). Herding dogs (German Shepherd-4.5%) were the second most common breeds in the county (18.6%); working dogs, including Rottweilers (3.4%), Akitas (.6%), and Huskies (.8%), were 11.3%, while Terriers (Pit bulls-2.8%) and toy breeds were both 9.9% and Hounds accounted for 8.2 %.

Eighty-eight percent of the non-biting dogs were sterilized, with 45.6% spayed females and 42% neutered males. Only 6.3% of the license dog population was un-neutered male dogs and only 4.2% were unspayed females.

Biting Dogs

There were 636 dog bites reported to MCAC during the study period. Fourteen dogs were listed twice and 1 dog was listed three times in the data set due to separate bite episodes. Table 6 shows breed and physical characteristics of biting dogs. The majority of biting dogs were from the herding category (20.1%), which includes German Shepherds (5.3%), Australian Shepherds (4.7%) and Border Collies (2.5%). The second most common biting breed categories were the working dogs (19.7%), Terriers (Pit Bull-14%) (17.9%), and Sporting dogs (14.2%). A very small proportion of biting dogs were toy breeds (2.5%) or hounds (4.4%). The majority of the biting dogs were purebred

(60.1%) (Table 6). Only 8 out of the 636 reported dogs were classified as a potentially dangerous dog.

The majority of biting dogs were male and un-neutered (27.4%). Neutered males were the second most common dogs found in the biting dog group (24.1%). The least common sex status among the biting dogs was intact females (9.9%).

Descriptive Census Data

Table 7 shows socioeconomic variables of the census block groups where non-biting dogs lived. Non- biting dogs lived in block groups with a mean number of 5925 people per square mile with 19.4% of the total population of the block group being non-white race. Non-biting dogs lived in block groups with 13.9% of the men and 13.8% of the women without their high school diploma (13.9%) than women (13.8%). Non-biting dogs lived in census block groups with a mean median income ($48, 247) higher than the Multnomah county average ($41,278) and in block groups with fewer households (3.8%) on public assistance than the Multnomah County average (4.2%). Non-biting dogs lived in block groups where the mean of the total population that was male children under the age of 18 years of age was 12% and 11.4% were female. Non-biting dogs lived in census block groups with: 33% of the population the ages of 18 and 65, men with 4.4% greater than or equal to 65 years of age, and 6.6% of women greater than 65 years of age.

Table 8 shows the mean, range and standard deviation of the census variables for the biting dogs. Biting dogs lived in block groups with a mean number of 6224 people per square mile with 22.8% of the total population being non-white race and 16% of the block group populations not finishing high school. Biting dogs lived in block groups

with: a mean median income of $43, 928, 4.7% of households that relied on public assistance, and a mean of 11% of the block group population being children under the age of 18 years of age. Biting dogs lived in block groups with: 33% of the block group population the ages of 18 and 65, 4.2% were men over the age of 65, and 6.5% of the population were women greater than 65 years of age

Bite Situations

Table 9 shows the factors related to dog bite situations. A majority of the victims were reported as adults greater than 18 years of age (57%). Ten percent were between 5 and 10 years of age and 7.9 % were teenagers between 10 and 18 years of age. Three percent were very young children less than or equal to 2 years of age. The rates of dog bites in each age category are represented in Figure 1. The rate of dog bites was highest for the 5 to 9 year olds with 3.3 per 1000 people and adults had the lowest rate of bites with 1.4 per 1000 people. Overall, the sex distribution of the victims was very similar; 50.1% were male and 48.9% were female. Child victims under 18 years of age were 16.1% male and only 9.8% female.

While, 36.2% of the victims did not have a relationship with dog, 11.8% of the victims were friends with the dog owner, and 18.7% were neighbors of the biting dog. Roughly four percent of the bites took place at the victim's place of employment such as a veterinary hospital, grooming facility or at the Multnomah County Animal Shelter. If the report came from a medical facility it was listed as a severe bite that sought health services (50.5%). Only 1.3% of reported bites were severe injuries that required either

hospitalization or surgery. Thirty-two percent did not receive medical attention but the skin was broken with the bite and 5.7% were minor injuries that caused bleeding.

Thirty-five percent of the reported dog bites took place either in the dog's house or surrounding environment and 17% of bites occurred in both the victim and dog's household. This led to 19.8% of the bites being from the victim's own dog. Approximately 23% of the dog bites were described as occurring on neutral territory for example at a park or on a sidewalk, not located near the victim or dog's house.

The seasonality of dog bites in Multnomah County is in Figure 2.The summer months (June, July and August) had the highest number of reported dog bites (33.8%) and winter (December, January, and February) had the fewest (24.8%).

The victim initiated the report for 36.2% of the bites and the dog owner only initiated the bite report 3.8% of the time. Physician or emergency room departments submitted 43.2% of the reports for this fiscal year and the remaining reports (12.7%) came from police records or other county animal service agencies.

Cohort Analysis

Table 10 shows the crude risk ratios of breed categories between biting and non-biting dogs compared sporting dogs. Terrier breeds were 3.8 times more likely (95% CI-2.9, 5.0), working breeds were 3.6 times (95% CI-2.8, 4.8), herding dogs, such as the German Shepherd were 2.3 times (95% CI-2.7, 3.0), and non-sporting dogs were 2.0 times (95% CI-1.5, 2.7) more likely to bite. Toys were the only breed category that had a decreased risk of biting (RR=0.5; 95% CI-0.3, 0.9) when compared to sporting breeds (Figure 3).

Table 10 also shows sex status of biting and non-biting dogs. Compared to spayed female dogs, un-neutered males were 18.6 times more likely to bite, females 10.5 times, and neutered males were 2.6 times more likely to bite (Figure 4). Purebred dogs when compared to mix breeds were 5.7 times more likely to bite (95% CI-4.8, 6.8). Purebred dogs were over-represented in the biting dog group; mixed breed dogs were more common in the non-biting group.

Matched Case-Control Analysis of Census Variables

Table 11 shows odds of biting and non-biting dogs living in a census block group by census variables, controlling for breed category and sex status of the dog. The largest quartile was the referent category in every analysis.

Many variables did have significant linear trends among the quartiles as well as significant differences between the quartiles in relation to the biting outcome. The odds of a biting dog living in a block group increased as the percent non-white of the block group increased (linear trend $p < .001$). The odds of a biting dog living in block groups with: less than 10% non-white was 0.8 times (95% CI 0.6, 1.0), less than 10 % of the population males under the age of 18 was 1.5 times, (95% CI-1.1, 1.9), less than 30.7% male 18 to 65 years was 0.7 times (95% CI-0.5, 0.9) the odds of a non-biting dog. As the block group percent of adult males increased so did the odds of a biting dog (linear trend $p = .03$). As the percent of senior men increased within the block groups, the odds of a biting dog decreased (linear trend p value= .02). The odds of a biting dog living in a block groups with less than 3.1 % male over the age of 65 years was 1.2 times the odds of a non-biting dog. No linear trend or significant association was found between the census

variables; female less than 18 years of age, adult females 18-65 years and the biting outcome. The odds of a biting dog residing in block groups with less than 4.6% of the population being women greater than 65 years were 1.2 times (95% CI 0.9, 1.7) the odds of a non-biting dog and as the percent of senior women increased in the block groups; the odds of a biting dog decreased (linear trend p= .02)

The total percent of the population both male and female that didn't finish high school was not a significant predictor of the dog bite outcome. Yet, there was a significant linear trend between the quartiles (p< .001). As the percent that did not finish high school increased within the block groups so did the odds of a biting dog.

The odds of a biting dog living in block groups with median household incomes less than $36,098 were 1.5 times the odds of a non-biting dog. As the percent of the block group median household income increased, the odds of a biting dog decreased (linear trend p< .001). The odds of a biting dog living in a block group with less than 1.2% of the households with assistance were 0.85 times the odds of a non-biting dog (95% CI-0.7, 1.1). As the block group percent of the households with public assistance increased, so did the odds of a biting dog (linear trend; p <.001).

The change in the odds ratios after adjustment for the two known predictors breed category and sex status was not great. The relationship between the census variables and the biting outcome was not confounded by the breed category or the sex status of the dog.

Multivariate GEE Regression Model

Building the multivariate GEE regression model with the use of a backward elimination stepwise selection process allowed variables that were not significant by

themselves to be seen as significant predictors in the final model. Table 12 shows the model building process and the variables as they were removed from the model. The final main effects model contained population density, female less than 18 years of age, female greater than 65 years of age, median household income, and households on public assistance (Table 13). Breed category and sex status were also included in the final main effects model due to their overwhelming association with the biting outcome.

Two of the female age variables were shown to be significant predictors of the biting outcome. The odds of a biting dog residing in block groups with less than 9.7% of the population female under the age of 18 was 1.94 times higher (95% CI-1.3, 2.6), less than 4.6% senior women was 1.1 times higher (95% CI-1.1, 2.1), and living in lower income block groups (median income less than $36,098) were 1.45 times (95% CI-2.0, 2.1) than the odds of a non-biting dog. The odds of biting dogs residing in block groups with less than 1.2% of the households on public assistance were lower than the odds of a non-biting dog (OR= .83/95% CI-.6, 1.2). The odds of a biting dogs living in the block groups with 1.2% to 3.2% of the households on public assistance was 0.60 (95% CI-0.4, 0.8), 6326 to 7839 people per square mile was 1.9 times greater, and 3940 to 6326 people per square mile was 1.00 times the odds of a non-biting dog (95% CI-0.8, 1.3).

The interaction between the census variable quartiles among the breed categories was found to be non-significant (Table 14). The Wald statistic for type 3 GEE analysis was greater than 0.10 for all combination of interactions. The final GEE regression model did not contain any interaction terms.

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Discussion

Dog Cohort Multnomah County

During the study period, there were 636 dog bites corresponding to a rate of 96 dog bites per 100,000 persons. This number is significantly lower than the national rate of 279 dog bites per 100,000 persons estimated from the number reported in literature and census data.[2,16] Our study data was calculated from reported dog bites. National dog bite data are estimated from surveillance reports. The true number of dog bites taking place in Multnomah County may be found to be higher if calculated from active surveillance efforts.

The breed of dog plays a role in whether a dog bites. In Multnomah County, biting dogs were much more likely to come from the terrier, working, herding and non-sporting categories. Sporting breeds are very popular and make up 30% of the license non-biting dog population. Terriers like the Pit bull, working dogs such as the Rottweiler, and herding breeds such as the German Shepherd have been breed to hunt vermin, protect property, and work livestock.[12] Placed in situations where they are out-of-control, can easily lead to instinctual behaviors. Our data is similar to other study showing that Pit Bulls, Rottweilers, and German Shepherds are the top three breeds involved in fatal dog attacks nationwide.[3] Bites from these breeds can results in more serious injury due to their size and strength. When these dogs bite they are more likely to break the skin and result in a bite report.

We assumed that the dog population in Multnomah County was greatly underestimated by the dog license record. During the study period between June 20, 2002

and July 1, 2003, 47,214 dogs were licensed. s. In 1987 the number of dogs in the county was estimated at 101,794 with 43,650 licensed for that same year.[10] In Multnomah County the license dogs do give us an idea of the breed categories and sex status of the dogs that are owned in the county. If the number of certain breeds such as Pit bulls, Rottweilers, and German Shepherds were underestimated in the licensed, non-biting dog data set we may not have found such a strong association with these breeds and biting. There may be just as many non-biting working, terrier and herding breeds as biting but not reflected in the licensed dog data.

Breed relationship to biting is complex. While breeds may have innate tendencies, training by owners also plays a role in whether or not a dog will bite. The relationship between owner and type of breed is multifaceted. Why people choose a certain breed is difficult to answer. An owner may want a dog with aggressive tendencies if they feel they need protection. There is status in certain cultures and environments attached to certain breeds. Pit bulls, Rottweilers, and German Shepherds have a large physical presences as well as a reputation for their behaviors. The type of environment and personality of the owner may not only dictate the socialization and bite potential of the dog they own but also the breed of dog they are likely to acquire

Multiple studies have shown that un-neutered males are the most common biting dog.[3,14] Our Multnomah county study reflected this with un-neutered male dogs having almost 19 times greater risk of biting than spayed females. Male traits towards protection and aggression are enforced in dogs that are not neutered.[14] Sterilizing dogs whether male or female can greatly reduce the bite risk. While sterilizing dogs that are companion pets has been common practice for years reasons for not neutering or spaying a dog can be

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very complex. The cost of the surgical procedure may be a deterrent for lower income families and the personality traits found in intact dogs may be encouraged in certain situations. Dogs that have been bred for protection or status, such as the Pitbull terrier, Rottweiler, or German Shepherd may not be neutered. Dogs cannot discriminate between situations whether acting as protector or hurting and innocent by-stander and unintended bites can happen.

Descriptive and Case-Control Census Data

Block group census frequencies that give an estimate of socioeconomic status were different between the non-biting and biting dog groups. In general, biting dogs came from block groups with an overall lower socioeconomic level. Biting dogs also lived in block groups with median household incomes that were, on average, lower than non-biting dogs. Also, biting dogs tended to live in block groups with a higher mean percent of the households with pubic assistance. Biting dogs lived in block groups with a higher mean population density, higher mean percent of the population non-white, and a higher mean percent of the population without a high school diploma. The age/sex distribution was very similar between the biting and non-biting dogs.

Understanding the physical environment that may lead a dog to bite can be complex. Our study showed dogs that lived in the 50th percentile population density (3940-6326 people per square mile) within the block group had the highest odds of a biting dog. As the population density increases housing structures change. People living in large apartment complexes or condominiums are less likely to own large breed dogs such as the herding, terriers, or working breeds. The physical space lends itself to small

or toy breed dogs or cats. Dogs living in the lowest population density block groups (<3940 people per square mile) would have less contact with people. Therefore, dogs which resided in the block group with 6326 to 7839 people per square mile would have the most likely physical situation (houses with yards) and the human-dog interaction that could lead to a bite situation.

We could more critically evaluate the connection between the dog owner's block group demographic variables and the dog's potential to bite by controlling for breed and sex status, two strong predictors of biting. The social environment of the dog as depicted through the owner's block group census data as well as physical traits of the dog can be seen as predictors of a biting dog.

Previous emergency room surveillance data and hospital discharge data has shown that boy children have the highest incidence of dog bite injuries.[4,5] Our study did not show an increase risk of a biting dog living in a block group with higher percentages of male children. The percent of men in the block group was not a significant predictor of a biting dog. Yet, the odds of a biting dog living in a block group with the lowest percentage of girls under the age of 18 and women over the age of 65 were higher among biting dogs than non-biting dogs. Dogs that lived in block groups with a higher percent of women over 65 had decreased odds of biting. This may be related to the type of block group women over the age of 65 are more likely to live. The environment with more percentages of older women may not be conducive to a bite situation or those dogs owned by older women are more likely to be socialized. Due to the fact that breed was controlled for in the study design and in the analysis, the type of dog that women over 65 years would own could not be taken into consideration.

The results of our study for income and households with public assistance supports our hypothesis that dog owners of lower socioeconomic status, as described by block group census variables, are over-represented in the biting dog group, when controlling for breed category. The odds of biting dog living in a lower income block group and in a block with a higher percent of the households receiving public assistance were higher than the odds of a non-biting dog. This leads to the next question; why do lower income families and those households receiving public assistance as described by block group census variables have dogs that bite? Are they less likely to have their dog neutered? Are those dogs less confined in a secure physical structure? Or are lower income dog owners less likely to be socialized, trained or restricted their dogs interaction with people especially children?

Our study was unique in evaluating the dog owner's characteristics as described by census data as factors in dog bites. Previous studies have shown a strong association between the breed of the dog, sex status, and whether a dog bites.[14] The Denver, Colorado study did evaluate environmental characteristics and previous dog behavior.[14] Yet, none of the variables specifically explained owner socioeconomic conditions. Our study has shown that other factors including block group income levels, population density, the percent of girls and women and the percent of household with public assistance may be a factor in whether a dog bites. Understanding factors outside of the dog's breed and sex status that can be controlled will further direct intervention programs.

Bite situations

The bite situations in Multnomah County are very similar to previously described reports. Children ages 5 to 9 had the highest bite rate (3.3/1000) even though adults greater than 18 years of age were the most common bite victim.[4] Bites occur most frequently on the dog's territory whether in the house or in the yard (52%) (Table 9). This association between bites and the dog's home environment could be explained by dogs having a greater opportunity to express protective, possessive, or fear-induced aggression.[14] Children in particular may not be able to discern between a dog that feels threatened and one that is playing. Dogs may be particularly protective of toys, food, and their yard.[23] Multnomah County is very similar to the rest of the nation when it comes to the time of year most dog bites take place.[4] Dogs are more likely to be outside in the summer months as well as people.

Data on the bite severity was very subjective. The dog bite report form (Appendix A) does not give a space for medical personal to describe the bite. The form was usually filled out by the victim at the time of receiving medical care and faxed from the medical facility to MCAC; this led to physicians being the most common source of a bite report for the study (43%). Previous literature does not detail where most bite reports are received. Yet records from emergency room visits and hospital discharge data could provide more structured information on the type and severity of the bite. [4, 5]

In order to fully understand and prevent injuries related to dog bites, the true magnitude of the problem including severity of bite needs to be known. Gauging the severity of the bite was difficult. Yet, some of the victim reported bites that had sought

medical attention did not have any documentation from the physician. Documentation of medical attention may not have been complete. Victims may have later visited their physician after the report was filed or cared for the injury at home. The victim's need for medical attention may not have been related to the severity of the bite. No systematic objective measure of severity was listed on the dog bite forms. Reports without medical documentation had severity described either by a witness or the victim. The level of severity varied with the concerns of the victim. In order to better assess dog bite related injuries, dog bites need to be systematically reported by health care providers and any one associated with the bite incident. Veterinarians need to take a more active role in identifying potential biting dogs and home situations that may lead to bite situations.

Dog owners that submitted bite reports wanted to involve MCAC in the regulation of their dog. Owners unwilling or unable to manage their dog often relied on MCAC to quarantine or authorized their dog to be euthanized. Only a small percent of the bite dogs during our study period were classified as a dangerous dog (8.8%). A dangerous bite dog with an owner willing to defend and appeal the classification process would not automatically be euthanized. These dogs are hopefully regulated more closely and not placed in environments that may lead to a bite such as being unconfined without supervision.

Limitations

Selection Bias/Miss-classification

The use of license dogs as controls for this study may have resulted in a selection bias. Non-biting dogs were from passively acquired dog license records and biting dogs were selected from actively reported bite reports. All dogs that are reported to Animal Services were required

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to be licensed; so all biting dogs should have become part of the license dog data set. Cases and controls were selected from the same general canine population but how they were selected into each group differed. If the reasons for not licensing a dog were related to their bite behavior or socioeconomic status, this could have affected the study results towards no association. License dogs would not have been a representative sample of the general canine population and would have selected for dogs with less bite potential.

Addresses of the dog owners were matched to an existing database for the metropolitan area. It is possible that addresses were incorrectly reported; therefore, a dog may have been listed in the wrong census block group or deleted from the final analysis. If there were any association between dogs without correct addresses and the likelihood to bite, this would bias the results toward the null.

Dogs that are adopted are usually given a new name. Identifying a dog in the control data set that may have been a biting dog in the past would be impossible if the dog had a new owner and new name. If the dog had the same name, owner name, and address as a case dog they were excluded from the control data set. Yet if a dog had been reported as biting prior to 2002-2003 bite report years, the dog would not have been identified as having the outcome of interest in this study. Dogs that had been classified as a PDD were recognized and excluded from the license data set, but only a small percent of bite dogs ever get classified (8.8 %). If bite dogs were included in the control data set this would have directed the results toward no association.

Reporting Bias

Self-reported data may not be accurate. The owner reported license dog data on a standardized form. If the dog is AKC (American Kennel Club) certified or the owner knows the

breeds of the sire and dam then breed classification is accurate. Many dogs are a mix of breeds and how they are described is subjective. All dog specific variables rely on the owner to report and could be falsely or incorrectly recorded. Due to the recent publicity surrounding Pit Bull Terriers, owners of these dogs may chose to inaccurately report the breed or not license their dog at all. Dog bite data relied heavily on accurate information from a bite victim or visual inspection by an animal control officer. Description of breed of dog both primary and secondary could have been influenced by the situation or past experiences with many of these breeds.

The investigator from all documentation elucidated bite situations and addresses. Specific information of location, relationship, who reported the bite, age and sex of the victim were not explicating stated. For example, if bite location was the same as the dog's address this indicated that the bite took place at the dog's household. If the dogs' name and victims' name were the same, the bite was listed as a family member. Secondary data was collected so allowing for a set protocol in describing the bite situations was not available.

The true number of dog bites that occur in an area like Multnomah County, Oregon, is underestimated with the reported dog bites. Not every person bitten by a dog will report the incident or seek medical attention. Many medical professional do not document or notify animal control services of each dog bite injury they treat. In order to get a better estimate, especially for comparison with national numbers, is to evaluate the dog population with the use of active surveillance. These estimates would better reflect the burden of dog bite injuries in the county.

Generalizability

The majority of dogs including biting dogs were not licensed with Multnomah County Animal Services. If the licensed dogs (biting and non-biting) differed from the general dog

population in regards to their owner's socioeconomic factors and dog physical traits, then generalizability of the results would be compromised. The true number of dogs in Multnomah county was most likely higher that the number of license dogs.

Census Data

Individual socioeconomic data was not used for the socioeconomic variables. With the use of census block group information, estimates were made as close to the individual as possible. Income, race, educational attainment, population density and sex/age distribution of the neighborhood census block group would correlate with a person's socioeconomic status. The smaller area block groups, resulting in large population densities as compared to the Multnomah County average, skewed population density variable. Yet, this variable was calculated the same for both bite and control dogs. Not using individual data could have altered the results. The issue of ecological fallacy will need to be addressed when reporting the study findings.

The socioeconomic variables were obtained from the 2000 Census, yet the bite addresses were acquired from the 2002-2003 MCAC license and bite reports. Predictor variable information could have changed and not been accurate for the time surrounding the dog bite or the dog's socialization period. The dog may have moved or be adopted by a new family.

Public Health Implications

Dog bites are a preventable injury. Our study shows that dog breed and the dog's sex status are associated with a dog biting. Does that mean we should focus all of our interventions toward the dog? MCAC and the local veterinary community strongly

encourage spaying and neutering. License dog fees are less expensive for sterilized animals, but this only an incentive for people that are planning on licensing their dogs.

Bite prevention education needs to be targeted to school age children and their parents, especially in neighborhoods were herding, terriers, and working breeds are likely to live. We cannot regulate what breed of dog a person adopts, but we can teach children how to handle possible bite situations and encourage dog owners to never leave children with any breed of dog without supervision. Previous programs such as Pediatric Animal Awareness and Safety (PAWS) targeted high-risk geographic areas through school children.[24] Children and their families were given a dog bite prevention packet with a coloring book, a hot line number to answer questions and information on rabies for adults.[24] Due to the relatively high number of home owner insurance claims for dog bites, insurance companies would benefit from distributing educational materials on dog bites.

Finally, all dogs that live in the county should be licensed. This is not only a source of revenue for basic animal control services, but also a way to truly know the magnitude dogs in our community and potential areas to focus bite prevention programs. Many dogs are adopted from private parties and never have contact with an animal control agency. Veterinary hospitals, pet stores, and grooming facilities need to take a more active role in licensing dogs in Multnomah County. These data would then be a true representation of the canine cohort in the county and further studies could identify more specific risk factors for biting dogs.

Conclusion

Our study identifies key areas to target dog bite prevention programs. The first step is to recognize the true number of dogs in a community and to systematically identify the number of dog bite injuries. The human and veterinary medical communities then need to work together to help foster healthy relationships between people and their pets. Animal control agencies need to be supported to maximize the regulatory and educational aspect of dog ownership. Counseling people before they adopt a dog about breed types, spaying and neutering and how to socialize a dog to maximize the positive aspects of dog ownership. No child should be left unattended with any dog; situations can change quickly and the consequences can be fatal. Each dog is unique and requires a specific match with an owner and family. The benefits of dog ownership fair outweigh the efforts need to foster a healthy human-animal relationship.

Table 1
American Kennel Club Seven Dog Breed Categories

Sporting Breeds	Hound Breeds	Working Breeds	Terrier Breeds	Toy Breeds	Non-Sporting Breeds	Herding Breeds
Brittany Spaniel German Shorthaired Pointer German Wirehaired Pointer Chesapeake Bay Retriever Curly-Coated Retriever Flat-Coated Retriever Golden Retriever Labrador Retriever English Setter Gordon Setter Clumber Spaniel Cocker Spaniel English Cocker Spaniel English Springer Spaniel Field Spaniel Spinone Itanliano Sussex Spaniel Welsh Springer Spaniel Vizsla Weimaraner Wirehaired Pointing Griffon	Afghan American Foxhound Basenji Bassett Hound Beagle Black and Tan Coonhound Bloodhound Borzoi Dachshund English Foxhound Greyhound Harrier Ibizan Hound Irish Wolf-Hound Norwegian Elkhound Otterhound Petit Basset Griffon Pharaoh Hound Rhodesian Ridgeback Saluki Scottish Deerhound Whippet	Akita Alaskan Malamute Bernese Mountain Dog Boxer Bullmastiff Doberman Pinscher German Pinscher Giant Schnauzer Great Dane Great Pyrenees Greater Swiss Mtn Dog Komondor Kuvasz Mastiff Newfoundland Portuguese Water Dog Rottweiller St. Bernard Samoyed Siberian Husky Std Schnauzer	Airedale American Staffordshire (Pitbull) Australian Terrier Bedlington Terrier Border Terrier Bull Terrier Cairn Terrier Dandie Dinmont Irish Terrier Kerry Blue Terrier Lakeland Terrier Manchester Terrier (Std) Miniature Bull Terrier Miniature Schnauzer Norfolk Terrier Norwich Terrier Jack Russell Terrier Scottish Terrier Sealyham Terrier Skye Terrier Smooth Fox Terrier Soft Coated Wheaten Terrier Staffordshire Bull Terrier (Pitbull) Welsh Terrier West Highland White Terrier Wire Fox Terrier	Affen-Pinscher Brussels Griffon Cavalier King Charles Spaniel Chihuahua English Toy Spaniel Havanese Italian Greyhound Japanese Chin Maltese Manchester Terrier, Toy Miniature Pinscher Papillon Pekingese Pomeranian Pug Shih Tzu Silky Terrier Toy Fox Terrier Yorkshire Terrier	American Eskimo Bichon Frise Boston Terrier Bulldog Chinese Shar-pei Chow Chow Dalmatian Finnish Spitz French Bulldog Keeshond Lhasa Apso Lowchen Poodle Schipperke Shiba Inu Tibetan Spaniel Tibetan Terrier	Australian Cattle Dog Australian Shepherd Australian Kelpie Bearded Collie Belgian Malinois Belgian Tervuren Border Collie Bouvier des Flandres Biard Canaan Dog Cardigan Welsh Corgi Collie German Shepherd Old English Sheepdog Pembroke Welsh Corgi Puli Shetland Sheepdog

Table 2
Multnomah County Animal Control Services
Potentially Dangerous Dog Classification Guidelines

	Behavior	**Restriction**
LEVEL 1	Dog at large-menacing, chasing or displaying threatening/aggressive behavior or endangers the safety of a person	-Must be restrained/confined at all times -$50 annual license fee
LEVEL 2	Dog at large-causes physical injury to any domestic animal	-Must be restrained/confined at all times. -Owner must maintain liability insurance. -Owner must complete a responsible pet ownership program -$100 annual license fee
LEVEL 3	Dog confined-aggressively bites a person	-Must be restrained/confined at all times. Owner must maintain liability insurance. -Owner must complete a responsible pet ownership program -$100 annual license fee
LEVEL 4	-Dog at large-aggressively bites a person or kills any domestic animal -A dog that repeats level 3 behavior- after the owner is notified of level 3 classification.	-Must be restrained/confined at all times. Owner must maintain liability insurance. -Owner must complete a responsible pet ownership program -Risk of Euthanasia -$1500 annual license fee

Table 3

Descriptions of Multnomah County Dog Specific and 2000 Block Group Census Variables

Breed Category	0=Sporting, 1=Hunting, 2=Working, 3=Terrier, 4=Toy, 5= Non-Sporting, 6=Herding, 7=Non-AKC
Sex Status	0=male not neutered, 1=female not spayed, 2= male neutered, 3=female spayed
Secondary Breed	0=Purebred, 1=Mixed
Block group	Continuous: Map 2
Population Density	Total Population per Square Mile
Race	% non-white
Educational Attainment	% male > 25 years of age < high school diploma % female > 25 years of age < high school diploma
Household Income	Median Income-$
Household with Public Assistance	% households with public assistance income
Age/Sex	Male: ≤ 18 years of age Male: Between 18 and 65 years of age Male: > 65 years of age Female: ≤ 18 years of age Female: Between 18 and 65 years of age Female: > 65 years of age

Bite Situation	-Location where the bite took place:
	  0=Dog/victim's household (dog bit household member), 1=Neighbor, 2=place of employment (veterinarian, groom, MCAC employee), 3=Victim's home/yard not dogs, 4=Dog's home/yard, 5= Neutral (Sidewalk, in a car, park etc)
	-Sex category of the bite victim:
	  0=male, 1=female
	-Age category of the bite victim:
	  0=≤ 2 yrs, 1=5 yrs to ≤10 yrs, 2=10yrs to ≤18 yrs, 3=>18 yrs (adult), 4= 2 yrs to ≤5yrs
	-Relationship between the dog and victim:
	  0=no relationship, 1=family member, 2=neighbor, 3=friend of the family
	-Severity of the bite:
	  0=mild or no bleeding, 1=moderate-broken skin-no medial attention, 2=severe-medical attention received, 3=severe-hospitalization-surgery
	-Season bite took places:
	  0=Summer-Jun, Jul, Aug, 1=Fall-Sept, Oct, Nov, 2=Winter –Dec, Jan, Feb, 3=Spring-Mar, Apr, May
	-Who reported the bite:
	0=victim or guardian, 1=dog owner, 2=physician/hospital, 3=other-police, other county
	-Whether the dog was classified as a potentially dangerous dog (PDD):
	0=no, 1=yes-all levels

Table 4
Multnomah County 2000 Census Block Group Variables-Quartiles Values

	0-25%	25-50%	50-75%	≥75%
Pop Density (pop/sq mile)	< 3940.5	≥ 3940.5-6326.8	≥ 6326.8-7839.8	≥ 7839.8
% non-white	< 10.2 %	≥ 10.2 %-16.6 %	≥ 16.6 %-26.1 %	≥ 26.1 %
% male < 18 years	< 10.0 %	≥ 10.0 %-12.5 %	≥ 12.5 %-14.2 %	≥ 14.2 %
% male 18-65 years	< 30.7 %	≥ 30.7 %-32.3 %	≥ 32.3 %-34.4 %	≥ 34.7 %
% male > 65years	< 3.1 %	≥ 3.1 %-4.1 %	≥ 4.1 %-5.3 %	≥ 5.3 %
% female < 18 years	< 9.7 %	≥ 9.7 %-11.8 %	≥ 11.8 %-13.5 %	≥ 13.5 %
% female 18-65 years	< 30.6 %	≥ 30.6 % -32.4 %	≥ 32.6 %-34.5 %	≥ 34.5 %
% female >65 years	< 4.6 %	≥ 4.6 %-6.0 %	≥ 6.0 %-7.8%	≥ 7.8 %
% population w/o HS diploma	< 4.5 %	≥ 4.5 %-8.6 %	≥ 8.6 %-13.4 %	≥ 13.4 %
Median household income ($)	< $36,098	≥ $36,098-42,857	≥ $42,857-54,875	≥ $54,875
% households with public assistance	< 1.2 %	≥ 1.2 %-3.2 %	≥ 3.2 %- 5.8 %	≥ 5.8 %

Table 5
Physical Characteristics of Non-Biting Dogs/Licensed Dogs Multnomah County:
Breed Categories, Sex Status & Secondary Breed

Breed	Number	Percent
Sporting	14,153	30.0%
Herding	8,762	18.6%
Working	5,322	11.3%
Non-Sporting	5,196	11.0%
Terrier	4,684	9.9%
Toy	4,668	9.9%
Hounds	3,853	8.2%
Unknown	275	.6%
Sex Status		
Spayed Female	21,520	45.6%
Neutered Male	19,838	42.0%
Male	2,983	6.3%
Female	1,965	4.2%
Unknown	908	1.9%
Secondary Breed		
Purebred	5,807	12.3%
Mix	17,139	36.3%
Unknown	24,268	51.4%

N=47,214: number of dogs in cohort study

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Table 6
Physical Characteristics of Biting Dogs in Multnomah County:
Breed Categories, Sex Status, Secondary Status & PPD

Breed	Number	Percent
Sporting	90	14.2 %
Hounds	28	4.4 %
Working	125	19.7 %
Terrier	114	17.9 %
Toy	16	2.5 %
Non-Sporting	66	10.4 %
Herding	128	20.1 %
Non-AKC	3	.5 %
Unknown	66	10.4 %
Sex Status		
Male	174	27.4 %
Female	63	9.9 %
Neutered male	153	24.1 %
Spayed female	64	10.1 %
Unknown	182	28.6 %
Secondary Breed		
Purebred	382	60.1 %
Mix	187	29.4 %
Unknown	68	10.5 %
PDD Status		
No	580	91.2 %
Yes	56	8.8 %

N=636: number of reported dog bites

Table 7
Non-Biting Dog/Licensed Dogs
Multnomah County 2000 Census Block Group Variables

Characteristic	Mean	Range
Population Density-People per sq mile	5952.1	5.2- 30048.5
% of Total Pop- Non-white race	19.4%	.0-78.5%
% of Total Pop-Male w/o HS diploma	13.9%	.0-49.7%
% of Total Pop-Female w/o HS diploma	13.8%	.0-50.1%
Median Household Income	$48,247	$8,179-$136,102
% of Households with Public Assistance	3.8%	.0-31.5%
%of Total Pop-Male ≤18 years	12.0%	.6-2.5%
% of Total Pop-Male >18 - ≤65 years	32.8%	18.8-72.2%
%of Total Pop-Male >65 years	4.4%	.8-18.3%
% of Total Pop-Female ≤18 years	11.4%	.4-20.3%
%of Total Pop-Female >18 - ≤65 years	32.8%	20.1-45.2%
% of Total Pop-Female >65 years	6.7%	.9-31.6%

N=506: number of block groups

Table 8

Reported Biting Dog:

Multnomah County 2000 Census Block Group Variables

| Characteristic	Mean	Range
Population Density-People per sq mile	6224.88	30.4-30019.3%
% of Total Pop-Non-white race	22.89%	1.0-78.5%
% of Total Pop-Male w/o HS diploma	15.87%	.0-48.0%
% of Total Pop-Female w/o HS diploma	15.76%	.0-50.1%
Median Household Income	$43,928.33	$8,800-$133,716
% of Households with Public Assistance	4.75%	.0-18.0%
% of Total Pop-Male ≤18 years	11.85%	.6-21.65%
% of Total Pop-Male >18 - ≤65 years	3328%	18.8-65.0%
% of Total Pop-Male >65 years	428%	.9-18.3%
% of Total Pop-Female ≤18 years	11.26%	.4-20.3%
% of Total Pop-Female >18 - ≤65 years	32.81%	20.7-43.5%
% of Total Pop-Female >65 years	6.51%	1.4-29.6%

N=506: number of block groups

Table 9
Reported Biting Dogs Multnomah County June 2002- July 2003:
Descriptions of Bite Situations

Bite Location	Number	Percent
Age of Victim		
≤ 2 years	19	3.0 %
> 2 -5 years	23	3.6 %
≥ 5-10 years	66	10.4 %
≥ 10-18 years	50	7.9 %
≥ 18 years	364	57.0 %
Unknown	114	17.9 %
Sex of Victim		
Male	306	48.1 %
Female	300	47.2 %
Unknown	30	4.7 %
Relationship		
No	230	36.2 %
Family member	126	19.8 %
Neighbor	119	18.7 %
Friend of the dog family	75	11.8 %
Unknown	86	13.5 %
Bite Severity		
Mild	36	5.7 %
Mod-No Medical	206	32.4 %
Severe-Medical	321	50.5 %
Severe-Hosp/Surgery	8	1.3 %
Unknown	65	10.2 %
Dog/Victim household	108	17.0 %
Neighbor	23	3.6 %
Place of Employment	24	3.8 %
Victim's household	64	10.1 %
Dog's household	223	35.1 %
Neutral	149	23.4 %
Who Reported Bite		
Victim	230	36.2 %
Dog Owner	24	3.8 %
Physician	275	43.2 %
Other	81	12.7 %
Unknown	26	4.1 %

N=636: number of reported dog bites

Figure 1
Rates of Dog Bites by Age of Victim
Multnomah County June 2002-July 2003
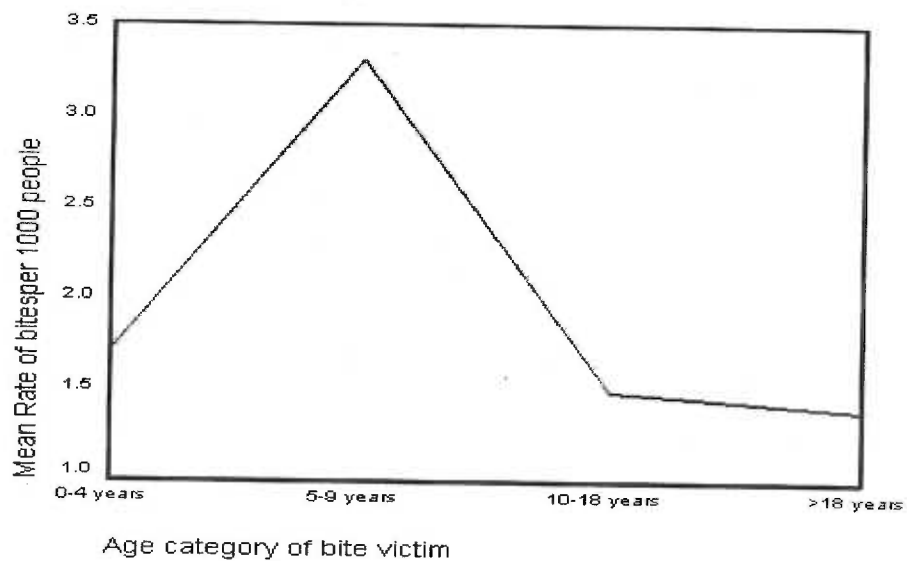
Figure 2
Frequency of Dog Bites by Season
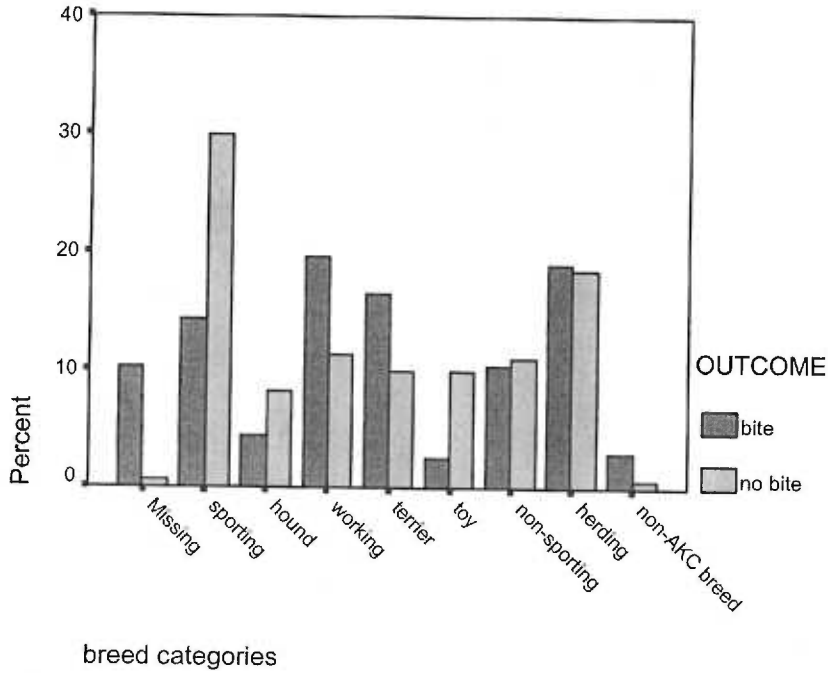**Multnomah County June 2002-July 2003**
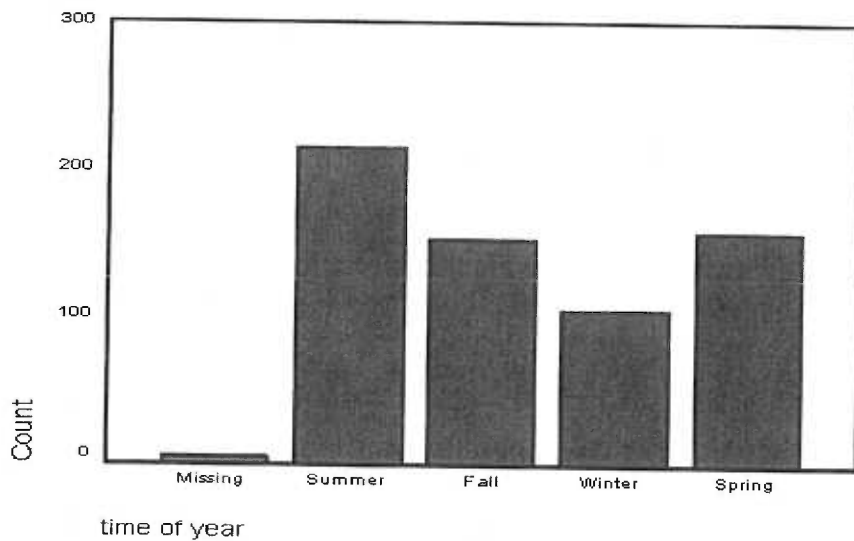
Table 10

Comparison of Physical Characteristics of Biting to Non-Biting Dogs/Licensed Dogs
Multnomah County June 2002-July 2003

	Bite	No Bite	P value*	Crude Risk Ratio (95% CI)
Sporting	15.8%	30.2%	< .001 5 df	REFERENT 1.0
Terrier	20.0%	10.0%		3.8 (2.9, 5.0)
Working	21.9%	11.3%		3.6 (2.8, 4.8)
Herding	22.5%	18.7%		2.3 (1.7, 3.0)
Non-Sporting	11.6%	11.1%		2.0 (1.5, 2.7)
Hound	4.9%	8.2%		1.1 (.8, 1.7)
Toy	2.8%	9.9%		0.54 (.03, 0.9)
Spayed Female	14.1%	46.5%	<.001 3df	REFERENT 1.0
Male	38.3%	6.4%		18.6 (13.9, 24.7)
Female	13.9%	4.2%		10.48 (7.4, 14.8)
Neutered Male	33.7%	42.8%		2.6 (1.9, 3.5)
Mix	32.9%	74.7%		REFERENT 1.0
Purebred	67.7%	25.3%	< .005 1 df	5.7 (4.8, 6.8)

*p value calculated with Pearson's Chi-squared test

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Figure 3
Percent of Each Breed Category among Cohort by Bite Outcome
Multnomah County June 2002-July 2003

breed categories

Figure 4
Percent of Each Sex Status among Cohort by Bite Outcome
Multnomah County June 2002-July 2003

sex status
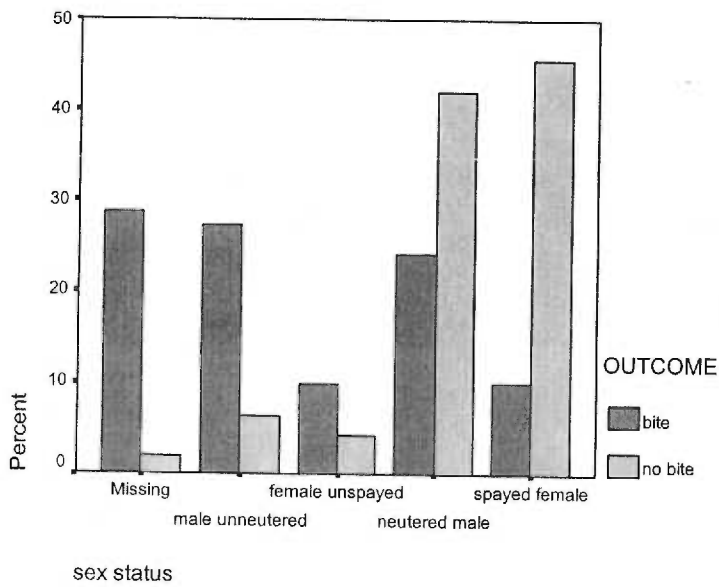
Table 11
Multnomah County 2000 Census Block Group Variables
GEE Odds Ratios for Biting Outcome* and Linear Trend

	Values	Odds Ratio[+]	P value: Linear Trend	95% CI	Odds Ratio**	95% CI**
Pop Density	< 3940.5	0.9	.59	.7, 1.7	.9	.7, 1.2
	≥ 3940.5-6326.8	0.8		.6, 1.1	.8	.6, 1.0
	≥ 6326.8-7839.8	0.8		.6, 1.0	.7	.6, 1.0
Race	< 10.2 %	0.6	< .001	.4, .8	.8	.6, 1.0
	≥ 10.2 %-16.6 %	0.8		.6, 1.0	1.0	.2, 122
	≥ 16.6 %-26.1 %	0.9		.7, 1.2	.9	.7, 1.2
Male <18 years	< 10.0 %	1.0	.89	.8, 1.4	1.5	1.1, 1.9
	≥ 10.0 %-12.5 %	1.1		.8, 1.4	1.4	1.0, 1.8
	≥ 12.5 %-14.2 %	1.1		.8, 1.4	1.3	1.0,1.8
Male 18-65 years	< 30.7 %	0.8	.03	.6, 1.0	.7	.5, .9
	≥ 30.7 %-32.3 %	0.7		.5, 1.0	.7	.5, .9
	≥ 32.3 %-34.4 %	1.0		.8, 1.3	.9	.7, 1.2
Male >65 years	< 3.1 %	1.3	.02	1.0, 1.7	1.2	.9, 1.6
	≥ 3.1 %-4.1 %	1.2		.9, 1.6	1.8	.8, 1.4
	≥ 4.1 %-5.3 %	0.9		.7, 1.5	.9	.6, 1.2
Female <18 years	< 9.7 %	1.1	.45	.8, 1.3	1.5	1.1, 2.0
	≥ 9.7 %-11.8 %	1.2		.0, 1.1	1.51	1.1, 2.0
	≥ 11.8 %-13.5 %	1.1		.8, 1.5	1.9	.9, 1.6
Female18-65 years	< 30.6 %	1.1	.95	.1, 1.5	.8	.6, 1.0
	≥ 30.6 % -32.4 %	1.0		.7, 1.0	.8	.6, 1.0
	≥ 32.6 %-34.5 %	1.2		.9, 1.6	.9	.7, 1.2
Female >65 years	< 4.6 %	1.3	.02	1.0, 1.8	1.2	.9, 1.7
	≥ 4.6 %-6.0 %	1.1		.8, 1.5	1.0	.7, 1.3
	≥ 6.0 %-7.8%	0.8		.6, 1.1	.9	.6, 1.2
Total < HS	< 4.5 %	0.6	< .001	.5, .9	.9	.7, 1.2
	≥ 4.5 %-8.6 %	0.7		.5, .9	.9	.7, 1.1
	≥ 8.6 %-13.4 %	0.9		.7, 1.2	1.0	.8, 1.3
Income-quartiles	< $36,098	2.0	< .001	1.5, 2.7	1.5	1.1, 2.0
	≥ $36,098-42,857	1.6		1.2, 2.2	1.3	1.0, 1.8
	≥ $42,857-54,875	1.1		.8, 1.5	.9	.6, 1.2
Public Assistance-quartiles	< 1.2 %	0.6	< .001	.5, .8	.9	.7, 1.1
	≥ 1.2 %-3.2 %	0.5		.4, .7	.6	.4, .1
	≥ 3.2 %- 5.8 %	0.8		.6, 1.0	.9	.7, 1.2

* ≥ 75% (Highest) quartile was referent for all variables

[+] Crude Odds Ratio

**Adjusted for breed category and sex status

Table 12

Multnomah County 2000 Census Block Group Variables- Model Building

Variable	Wald Statistic for Type 3 GEE Analysis						*FINAL MODEL*
	STEP 1	STEP 2	STEP 3	STEP 4	STEP 5	STEP 6	STEP 7
Pop Density	.04	.04	.05	.05	.05	.06	.085
Race	.79	.78	.77				
Male <18 years	.40	.39	.47	.48	.48		
Male 18-65 years	.42	.42	.47	.53	.44	.32	
Male >65 years	.78	.76	.76	.81			
Female <18 years	.05	.05	.02	.02	.02	< .001	< .001
Female 18-65 years	.82	.81					
Female >65 years	.13	.12	.14	.13	.03	.06	.03
Total < HS	.99						
Income-quartiles	.07	.02	.02	.02	.02	.03	.01
Public Assistance-quartiles	.01	.01	.01	< .001	.01	.01	.01
Breed Category	.02	.02	.02	.02	.02	.02	.02
Sex Status	< .001	< .001	< .001	< .001	< .001	< .001	< .001

Table 13
Final Multivariate Multnomah County 2000 Census Block Group Variables Model

	Values[+]	Odds Ratio*	95% CI	Odds Ratio**	95% CI**	P value
Pop Density	< 3940.5	0.90	0.69, 1.68	1.27	0.96, 1.70	0.10
	≥ 3940.5-6326.8	0.81	0.61, 1.10	1.00	0.77, 1.31	1.0
	≥ 6326.8-7839.8	0.77	0.58, 1.02	1.86	0.65, 1.13	0.27
Female <18 years	< 9.7 %	1.07	0.79, 1.43	1.94	1.35, 2.58	< .001
	≥ 9.7 %-11.8 %	1.21	0.90, 1.61	1.45	1.42, 2.64	< .001
	≥ 11.8 %-13.5 %	1.07	0.78, 1.45	1.50	1.07, 1.94	0.02
Female >65 years	< 4.6 %	1.29	0.96, 1.75	1.10	1.09, 2.05	0.01
	≥ 4.6 %-6.0 %	1.10	0.83, 1.45	1.10	0.81, 1.44	0.60
	≥ 6.0 %-7.8%	0.82	0.60, 1.13	1.01	0.75, 1.37	0.93
Income-quartiles	< $36,098	2.00	1.51, 2.66	1.45	1.03, 2.06	0.03
	≥ $36,098-42,857	1.62	1.17, 2.22	1.41	1.00, 1.97	0.05
	≥ $42,857-54,875	1.10	0.79, 1.52	0.95	0.68, 1.33	0.75
Public Assistance-quartiles	< 1.2 %	0.64	0.49, 0.82	0.83	0.60, 1.15	0.28
	≥ 1.2 %-3.2 %	0.50	0.37, 0.67	0.60	0.44, 0.82	< .001
	≥ 3.2 %- 5.8 %	0.79	0.61, 1.04	0.83	0.62, 1.11	0.22

[+] ≥ 75% (highest) quartile was referent for all variables
* Crude Odds Ratios
**multivariate analysis including breed category and sex status

Table 14
Multnomah County 2000 Block Group Census Variables:
Interaction Terms

Interaction Term	Wald Statistic P value
Breed Cat*Income	0.5
Breed Cat*Pop Density	1.0
Breed Cat*Public Assistance	0.3
Breed Cat*Female <18	0.8
Breed Cat*Female >65	0.9

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DOG BITE REPORT
ANIMAL CONTROL

NAME OF HOSPITAL

DATE & APPROXIMATE TIME OF BITE:
NAME OF VICTIM:

ADDRESS:

CITY, STATE, ZIP:

D.O.B.
PHONE: HOME/WORK

PARENTS/GUARDIAN   NAME

ADDRESS:

CITY, STATE, ZIP:

PHONE: HOME/WORK
BRIEF STATEMENT OF INCIDENT:
(EXAMPLE. INSIDE HOUSE, WALKING
PAST HOUSE, IN COUCH PARK)

LOCATION OF BODY INJURY:

(EXAMPLE, N RIGHT LEG, SKIN BROKEN,
ON SHOULDER LEFT SIDE)

DOG OWNER INFORMATION IF KNOWN:

NAME:
ADDRESS:

CITY, STATE, ZIP:

DOG INFORMATION: (EXAMPLE, CHOW
LARGE BLACK LONGHAIRED DOG)

MUL TNOMAH COUNTY ANIMAL CONTROL

1700 W. COLUMBIA RIVER HWY

TROUTDALE, OR 97060 (503) 988-PETS (7387)

NC - 75 REV. 1/00

ORS 433.345 REQUIRES THAT DOG BITES BE

REPORTED. MCAC FAX 988-3002

SRC#