

**A SURVEY OF URBAN CANADIAN ANIMAL CONTROL PRACTICES:
THE EFFECT OF ENFORCEMENT AND RESOURCING
ON THE REPORTED DOG BITE RATE**

by

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ABSTRACT

Dog bites are a serious cause of human injury. Data from the United States of America indicate that about 1.8% of people receive bites each year, and the rate is thought to be increasing disproportionately faster than the dog population. The Canadian dog bite issue is not well documented although it is a public safety concern. Increased enforcement, education and breed-specific legislation have been used in attempts to lower dog bite incidence. However, the decentralization of the animal control system in Canada, the lack of standardized terms, and the lack of mandated reporting have resulted in unreliable information from which to evaluate the effectiveness of the strategies.

The purposes of this exploratory study were to identify the reported dog bite rate in urban Canadian jurisdictions and to identify animal control strategies that may effectively reduce dog bite incidence.

Thirty-six municipalities responded to a questionnaire about animal control resourcing, enforcement, and reported dog bites.

The study found a median of 1.8 reported dog bites per 10,000 people, far below the number of “non-household” dog bites (bites caused by dogs not known to the victim) expected on the basis of other studies. Enforcement activities varied widely between municipalities, with some distinct regional differences. Contrary to initial expectations, the reported dog bite rate was positively correlated with most indicators of enforcement. This positive correlation is probably due to a greater proportion of bites being reported in municipalities with more active enforcement. However, municipalities with very high ticketing rates had far fewer reported dog bites than would be expected based on the linear relationships. The results are best explained by

a regression of reported dog bites on ticketing rate consisting of a positive linear component and negative quadratic component. Increased ticketing appears to have increased the reporting rate (causing a positive linear regression) and reduced the actual rate of biting (causing a negative quadratic regression), at least when enforcement was high. Within the limitations of this study, the data provided no evidence to suggest that breed-specific legislation is effective in reducing the rate of reported dog bites.

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LIST OF ACRONYMS

ACO – Animal Control Officer

BC – British Columbia

BSL – Breed-specific legislation

CHIRPP – Canadian Hospitals Injury Reporting and Prevention Program

DDA – Dangerous Dog Act

DOLA – Dog Owners’ Liability Act

DTP – Dog Tax Paid

FTE – Full-time Equivalency

GLM – General linear models

PROC –Procedure

REG – Regression

SAS – Statistical Analysis Software

SPSS – Statistical Package for the Social Sciences

UCLA – University of California Los Angeles

USA – United States of America

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CHAPTER 1 - INTRODUCTION

Dog Bite Issue

In a 1994 telephone survey conducted by the Centers for Disease Control and Prevention in Atlanta, Georgia, randomly chosen respondents from across the United States of America (USA) were asked whether a member of their household had been bitten by a dog within the previous 12 months. Sample selection was adjusted and data were weighted to be representative of the USA population. In total, 5,328 interviews were completed for a response rate of 56.1%. Researchers found an overall incidence of 18 bites per 1,000 people and estimated that within the one-year period, 4.7 million Americans or 1.8% of the American population had sustained dog bites. Of these, 800,000 required medical treatment (Sacks et al., 1996), a 37% increase over 1986 when 585,000 victims received medical treatment for dog bite injuries (Sosin et al., 1992).

Interestingly, the American dog population likely grew less than one percent during this same period (American Veterinary Medical Association, 1997). A nationwide survey of 80,000 American households conducted by the Center for Information Management of the American Veterinary Medical Association (AVMA) reported an American dog population of 52.5 million in 1991 (Wise and Yang, 1994) which grew to only 52.9 million in 1996 (American Veterinary Medical Association, 1997).

Amidst evidence that the dog bite incidence is growing disproportionately faster than the dog population (Wise and Yang, 1994) the situation in the USA has been termed a “dog bite epidemic” (Sacks et al., 1996) with dog attacks garnering considerable media attention in both Canada and the USA (Huitson, 2005). One result has been calls from some sectors for more strict legislation, higher penalties and increased animal control enforcement (Sacks et al., 2000; American Veterinary Medical Association, 2001).

Mandated Animal Control Enforcement in Canada

In Canada, such enforcement is the responsibility of civic governments as delegated by the provinces. In British Columbia, for example, municipalities have

“ . . . the power to provide any service that the (city or municipal) council considers necessary or desirable and the power to regulate and in some cases prohibit and/or impose requirements in relation to a number of broad areas or "spheres". Areas in which municipalities have autonomy to regulate, prohibit and impose requirements [include] . . . animals, except for wildlife. . . (Province of British Columbia, undated).”

As well, BC municipalities have the authority to “deal with hazardous conditions and declared nuisances [with] special powers in relation to dangerous dogs” (Province of British Columbia, undated).

In Ontario, issues related to dangerous dogs are governed by the Dog Owners’ Liability Act (DOLA). Amendments to this Act, which took effect August 29, 2005, provided higher penalties for the owners of any dog posing a public danger. As well, amendments created a province-wide generic ban on pit bull ownership which the Act defines as including:

- (a) a pit bull terrier,
- (b) a Staffordshire bull terrier,
- (c) an American Staffordshire terrier,
- (d) an American pit bull terrier,
- (e) a dog that has an appearance and physical characteristics that are substantially similar to those of dogs referred to in any of clauses (a) to (d) (Province of Ontario, 2005)

Municipalities located outside Ontario are responsible for determining their own regulations pertaining to aggressive dogs. Some jurisdictions such as Winnipeg, Edmonton, Prince George and Delta have instituted breed-specific by-laws although there appears to be very little consistency in their content. Edmonton, for example, prohibits the ownership of certain

breeds while other municipalities require that certain breeds be leashed and muzzled while in public. Vancouver (in 1984) was one of the first cities to adopt breed-specific by-laws.

Ownership of pit bulls and other bull breeds was allowed, but they were deemed vicious by virtue of their breed and were required to wear a muzzle and be leashed while on public property. With the rewriting of the Animal Control By-law in 2005, however, this breed-specific language was abandoned (City of Vancouver Animal Control By-law 9150). Instead, the City instituted higher penalties for dog owners who contravene by-laws, and education initiatives to promote responsible dog ownership. In most jurisdictions by-laws include (1) the requirement that all dogs be licensed so that nuisance or dangerous dogs may be identified and their owners held accountable for their behaviour, (2) leash laws that require dogs to be leashed and in the custody of a competent person to ensure the dog is under control at all times, and (3) legal language prohibiting dogs from wandering unsupervised (at-large) on public property.

Although animal control is a mandated service, the local autonomy inherent in local government legislation allows municipal jurisdictions considerable latitude in the way they undertake the role. For example, in larger cities, animal control services are often provided directly by the City as a civic department, whereas this function is contracted out by some municipalities to non-profit agencies or for-profit companies. Furthermore, in some jurisdictions the sole responsibility of the animal control officers is to enforce the animal control by-laws, whereas in others, enforcement personnel are also responsible for additional, unrelated by-laws such as parking, property use or street use.

While affording communities the opportunity to be responsive to local needs and values, the autonomy of animal control agencies results in regional differences in the quantity and quality of resources allocated to animal control issues, differences in the way problems are

defined, interpreted and addressed, and differences in the way information is managed. With no central repository for the information, dog bite data remain localized and are typically not reported outside the animal control agency (author's personal knowledge as former Manager, City of Vancouver Animal Services).

Dog Bite Victims

It is widely held that children under the age of 10 years are most victimized by biting dogs, that boys between 1 and 8 years of age are twice as likely as girls to be injured (Pinkney and Kennedy, 1982), and that children are much more likely than any other age group to be hospitalized for their injuries (Gershman et al., 1994; Weiss et al., 1998). The vulnerability of children is attributed "to the fact that their small size makes them less intimidating to dogs. . . . [and] immaturity and lack of judgment sometimes lead children to act in ways that animals perceive as threatening or aggressive" (Rosenberg et al., 1995 as quoted in CHIRPP News, July 1997). A child's small stature also makes them more susceptible to serious infection and scarring (Guy et al., 2001), and to injuries to the face, head and neck because these areas are closer to the teeth of the attacking dog (Schalamon et al., 2006; Brogan et al., 1995; Mcheik et al., 2000).

A Canadian study which investigated the characteristics of 227 biting dogs and their victims reported that in over 75% of the cases, the aggression was dominance related and the majority of the dog bite victims (56%) were adults (Guy et al., 2001). This finding is in direct contrast to hospital emergency department reports which indicate that children are most often treated for dog bites. This discrepancy may be explained by a higher likelihood that children are treated due to a higher incidence of facial injuries and concerns about infection and scarring. Conversely adults, who typically suffer dog bite injuries to their extremities, are more likely to

treat their own wounds, particularly if the wounds are not severe. Dog bite injuries sustained by adults are, therefore, less likely to be included in hospital emergency room databases from which Canadian dog bite numbers are taken. This is not the only factor contributing to the over-representation of children in Canadian dog bite data, however. The primary source of Canadian dog bite information, the Canadian Hospital Injury Reporting and Prevention Program (CHIRPP), takes its data from the emergency rooms of its 16 member-hospitals, 10 of which are pediatric facilities (Public Health Agency of Canada, 2009). Hence, children are likely to be highly represented in CHIRPP data.

In the majority of dog bite incidents, the dog is known to the victim. One study, which involved an analysis of animal bite cases from the University of California Los Angeles (UCLA) Hospital Emergency Department found that 85% of the dog bite victims either owned the dog or were family, friends or acquaintances of the dog owner (Kizer, 1979). A 1981 survey of more than 3200 Pennsylvania school children revealed that over 15% of the children had been bitten in the previous year; the dog was owned by the child's family or a neighbor in 30% and 50% of these cases, respectively (Beck and Jones, 1985). A study of 100 children treated for dog bites in six Belgian emergency hospital departments in 2001 revealed that 71% were familiar with the dog that bit them (De Keuster et al., 2005).

Dog bite incidents involving dogs known to the victims are referred to as household bites. These incidents rarely come to the attention of animal control agencies. Most dog bites that are reported to animal control are non-household, involving dogs unknown to the victim. DeKeuster et al. (2005) found that fewer than 30% of people who were bitten while in a public area knew the dog that attacked them. Non-household bites account for the majority of attacks reported to

animal control authorities (Kizer, 1979; Beck and Jones, 1985; Wright, 1990; Gershman et al., 1994).

Dog Bite Reporting

It is widely held that the dog bite incidence is under-reported (Sacks et al., 1996; Chang et al., 1997; Overall & Love, 2001) and under-estimated (Voelker, 1997) in the USA and in Canada. In fact, the findings of Guy et al. (2001) suggest that fewer than 10% of Canadian dog-bite injuries receive medical treatment. Inasmuch as Canadian dog-bite data are calculated from emergency room data only—and do not include untreated dog bites or dog bites treated in venues other than hospital emergency departments—it is possible that the Canadian dog bite incidence is underreported by as much as 90%.

Dogs at Risk of Biting

Dogs that tend to bite people unknown to them are typically under the age of five years (Borchelt, 1983; Wright et al., 1987), reside in a household with one or more children, are reproductively intact (Gershman et al., 1994), and are male (Borchelt, 1983; Wright, 1985). Wright (1985) found that nearly half of dogs that bite strangers are unlicensed animals and 60% have a previous history of aggressive behaviour. Dogs that are tethered using a chain for a substantial proportion of time are at risk for serious and fatal bites (Gershman et al., 1994).

Because genetics influence all canine behaviour including aggressive behaviour (Scott and Fuller, 1965), certain breeds, particularly those selectively bred for guarding and aggression, may be at higher risk to bite (American Veterinary Medical Association, 2001). However, Sacks et al. (2000) note that the relative risk for a given breed is

“... extremely difficult to ascertain without accurate knowledge of the total number of dogs of any one breed (denominator) and reliable data on the number

of dogs of that breed that have bitten (numerator). Because neither dataset is readily available there has been a reliance on breed information gleaned from (mandatory) fatal dog bite reporting—even in discussions of non-fatal dog bites” (page 838).

Table 1.1 outlines the breeds and crossbreeds involved in dog-bite-related human fatalities during the 20 years between 1979 and 1998. It is notable that the breeds causing problems changed over this period. Specifically, Pit bulls and their crosses dominated until 1992, whereas Rottweilers have become the most represented breed since 1992. Interestingly, German Shepherd Dogs and their crosses accounted for the same number of fatalities as Pit Bulls prior to 1992.

† Table 1.1 – The number of dog-bite-related human fatalities, and the breeds of dogs involved in the USA by 2-year periods between 1979 and 1998. Adapted from Sacks et al. (2000).

Breed	1979 1980	1981 1982	1983 1984	1985 1986	1987 1988	1989 1990	1991 1992	1993 1994	1995 1996	1997 1998	Total
Purebred											
Pit bull type	2	5	10	9	11	8	6	5	4	6	66
Rottweiler	0	0	1	1	3	1	3	10	10	10	39
German Shepherd	2	1	4	1	1	4	2	0	2	0	17
Husky-type	2	1	2	2	0	2	2	1	2	1	15
Malamute	2	0	3	1	0	2	3	1	0	0	12
Doberman Pinscher	0	1	0	2	2	2	1	0	0	1	9
Chow Chow	0	1	0	0	0	2	3	0	2	0	8
Great Dane	3	1	0	0	0	0	0	1	1	1	7
St. Bernard	1	2	1	0	0	0	0	0	0	3	7
Crossbred											
Wolf-dog Hybrid	0	1	1	2	1	4	1	2	2	0	14
Mixed Breed	0	3	1	2	1	2	0	1	1	1	12
German Shepherd	0	2	0	2	2	2*	0	1	2	0	10*
Pit bull-type	0	1	0	3	2*	3	1	1	0	0	10*
Husky-type	0	1	1	2	1	1	0	0	0	0	6
Rottweiler	0	0	0	0	1*	1	0	1	1	2	5*
Alaskan Malamute	0	0	0	0	0	2	1	0	0	0	3
Chow Chow	0	0	0	0	0	1	0	1	1	0	3
Doberman Pinscher	0	0	0	0	1	0	0	0	0	1	0
St. Bernard	0	0	0	0	0	0	1	0	0	0	1
Great Dane	0	0	0	0	0	0	0	0	0	1*	0*
											<u>238</u>

† Tables are formatted according to requirements for publication in the Journal of the American Veterinary Medical Association.

* In these cases, one purebred dog and one crossbred dog of this breed were involved in a single fatality. The incident is included in the “Total” column under Purebred but not under Crossbred.

A Canadian study of dog-bite related deaths occurring between 1990 and 2007, found that fatal attacks were disproportionately high in rural areas (24/28) and sled dogs and mixed breeds were the most often implicated (Raghavan, 2008). While this study confirmed that each year, one or two Canadian deaths are dog-bite related (Avis, 1999; Ozanne-Smith et al., 2001), statistics on dog-bite related fatalities cannot be responsibly used to document the dangerousness of a particular breed relative to other breeds (Overall and Love, 2001; AVMA, 2001). Nor should this incidence be used to direct public policy since the numbers have remained constant (Sacks et al., 2000) despite a growing population.

Aggressive Canine Behaviour

Aggression is the most common and most dangerous problem in domestic dogs (Borchelt, 1983; Wright and Nesselrote, 1987; Borchelt and Voith, 1986), constituting one-third of dog behaviours considered problematic to people (Jagoe and Serpell, 1996).

In wild canids aggressiveness is a “normal, natural, evolutionarily selected trait” (Cameron, 1997). Aggression is expressed as a continuum of behaviours which include growling, snarling, barking, baring teeth, chasing, snapping and biting (Sherman et al., 1996) with attack behaviour exhibited reluctantly by healthy canids, as a last resort (Lockwood, 2003). This reluctance is referred to as bite inhibition, a learned response in which the canid inhibits the full force of (its) biting ability. Individuals that have learned bite inhibition display it during play and even while engaging in a fight with another individual (Partnership for Animal Welfare [Maryland], 2008), affording pack members the ability to settle conflict without inflicting life-limiting injury to each other.

The domestic dog has retained many of the behavioural patterns of the ancestral wolf, although the process of selecting for protectiveness in the development of guarding breeds may

have exaggerated their agonistic behaviour (Scott and Fuller, 1965). The willingness of these animals to disregard their own safety in order to provide protection or other service to the owner is highly desired. As a result, some breeds of domestic dogs appear less inclined to inhibit their bites and are judged more aggressive than others (Lockwood, 2003).

Even within purpose-bred pure breeds, however, there is a considerable variation in behavioural traits. Within a breed, some strains or lineages may be more predisposed to agonistic behaviour than others, but genetic background alone is not predictive of the agonistic behavioural response of individual animals (Scott and Fuller, 1965). Behavioural patterns are also shaped by environmental factors and the dog's individual life experiences starting with puppyhood. As noted by Scott and Fuller (1965, page 384), "Behavior is never wholly inherited or wholly acquired but always *developed* under the combined influences of hereditary and environmental factors".

Individual Differences

As noted by Jones and Gosling (2005, page 4), "most theoretical and empirical research on personality has been done in the human domain". More recently, however, research modeled on human personality studies has examined the possibility that dogs, too, have measurable individual differences or "personality" traits (Gosling and Vazire, 2002).

Personality is broadly defined as "those characteristics of individuals that describe and account for consistent patterns of feeling, thinking and behaving (Pervin and John, 1997). A more specific definition is offered by the American Psychiatric Association (1994, page 630): "enduring patterns of perceiving, relating to and thinking about the environment and oneself that are exhibited in a wide range of social contexts".

One study conducted by Svartberg and Forkman (2002) examined more than 15,000 dogs of 164 breeds for their reactions to several fear- and aggression-eliciting stimuli. The study found that dogs have individual personalities, that a dog's personality is stable, and that it is possible to describe and compare individual canine personalities.

Role of Heredity, Environment and Developmental Influences

In dogs, as in people, personality traits are thought to be shaped by many factors. Heredity almost certainly plays an important role in basic personality traits such as temperament and emotional tone. However, Scott and Fuller (1965) found that early socialization and unique experiences during the formative stages of a puppy's life are also crucial in creating the individual's approach to the world (Scott & Fuller, 1965).

In a series of classic experiments, Scott and Fuller (1965) proved that a puppy's experiences or lack of experiences in five developmental stages—occurring in the first 16 weeks after birth—will affect that individual for the rest of its life. Failure to achieve the developmental tasks associated with each respective stage, or the experience of unfavourable conditions during these critical periods of social development, creates behavioural responses that are unacceptable to human society. Conversely, appropriate positive experiences during these early stages will result in behavioural responses that are stable and well adjusted to human society.

For instance, if the pup does not have the benefit of sufficient human contact in its fourth to seventh week of life, it will always be timid around people. Similarly, if it does not have sufficient contact with other dogs, or men, or women, or children, it will be forever fearful of dogs, men, women or children, respectively. Moreover, if the puppy has a fearful temperament

and is not properly socialized during this critical period, successfully re-socializing it at a later age will be extremely difficult (Fox, 1972).

The period from 3 – 5 months is crucial according to Fox (1972) who maintained that at this time puppies need to experience many different environments and people. Those that are not given the opportunity to interact with strangers and new environments will be fearful of both, and although some individuals with outgoing temperaments may eventually overcome their fear, those with timid temperaments may be permanently fearful of unknown people and circumstances.

Among the social skills lost if the socialization process is interrupted is the puppy's learning to restrain the force with which it uses its teeth (bite inhibition). This important social skill is learned by the dog as a very young puppy, during a period measured in weeks, through normal interactions with litter-mates, with the adult parent(s) and later through proper teaching and socialization by the puppy's new family (Scott and Fuller, 1965; Pfaffenberger, 1976; Donaldson, 1997). As bite inhibition develops, the use of agonistic behaviours such as biting (to establish and maintain dominance-submissive relationships) is replaced by vocalizations, body postures and facial expressions.

Classifying Aggressive Incidents

Dunbar (1998) distinguishes between low-risk and higher-risk aggressive behaviours according to the dog's willingness to bite. He suggests that bite inhibition is the key difference between dogs that are no threat to people and those that are dangerous. Dunbar classifies aggressive incidents on a 6-point scale where higher scores indicate more dangerous incidents. For example, an incident in which a dog growls, snarls (displays teeth) or snaps (bites at the air) is considered to be a Level 1 incident since the dog's teeth make no contact with the skin and

there is no wound. Biting, defined as “the upper or lower teeth making contact with the victim’s skin with sufficient pressure to cause a visible injury such as an indentation, welt, scrape, bruise, puncture, or tear in the skin” (Guy et al., 2001, page 31), is present in all higher levels of Dunbar’s classification system. A bite is judged to be Level 2 if the action or movement of the teeth cause nicks and slight bleeding although no skin puncture is evident.

Most aggressive incidents fall within the first two levels, and most dogs biting at these levels would benefit from professional behavioural assistance, particularly those engaging in Level 1 aggression in which bite inhibition has been displayed (Dunbar, 1998).

While the bite severity scale classifies aggression according to outcome, many canine behaviourists support a classification system that evaluates aggressive behaviour according to context (Beaver, 1983; Overall, 1997). Although such systems provide a clinical framework for diagnosis and treatment and are, therefore, widely used by practitioners, there are a number of inherent challenges. Most notably, there are numerous schemes and numerous terms, some of which are used interchangeably although their definitions may differ. Some researchers, for example, categorize aggressive behaviour broadly while others break it down further into subsets. Table 1.2 illustrates the variety of terminology (rows) used by prominent researchers (columns) with some categories further divided into subsets.

Common categories are Dominance Aggression, Fear-Related Aggression, Protective Aggression, Punishment- or Pain-Related Aggression, and Predatory Behaviour.

Dominance Aggression

As previously discussed, most dog bites—as many as 94% reported in one study of child victims (De Keuster et al., 2005)—are inflicted by dogs that are familiar with the victim.

Dominance or dominance-related aggression, also termed hierarchical or competitive aggression

(Beaver, 1983), targets people with whom the dog has a relationship (household aggression). Although household aggression is one of the most common and dangerous forms of dog aggression, bites by known dogs are rarely reported to animal control authorities because victims are reluctant to impose enforcement upon the dog owner or, being familiar with the dog, are less worried about zoonotic diseases (Beck and Jones, 1985).

A dog with dominance aggression often displays dominance signals such as hovering or standing over or staring at the household member. Ear carriage is erect and forward, lips are vertically retracted and body posture is rigid resulting in a high tail carriage. These signals are sometimes accompanied by growling, baring of teeth, snapping or biting (Borchelt, 1983; Voith and Borchelt, 1982). Some dominant dogs do not outwardly display aggressive behaviours but will resist being placed in submissive positions (Borchelt, 1983). Still other dogs respond with aggression to routine situations such as being disturbed during sleep, being corrected, groomed or having a collar or leash placed over the head (Overall, 1997).

While the critical issues in the diagnosis of dominance aggression are “control and access”, Overall (2001) asserts that dominant aggressive dogs fall into two basic groups according to the motivation underpinning the aggression: those that know they are in control and compel household members to “do their bidding”, and those that are fearful and anxious due to uncertainty about their social status (Overall, 2001). The latter group, which is responsible for the majority of behaviour deemed to be dominance-related, is thought to be the product of insufficient or improper early socialization (Dunbar, 1998) resulting in deficits in social development including a lack of inhibition of aggression (Reisner et al., 1994).

Table 1.2 - Clinical classification of aggressive canine behaviour by different researchers (modified from Ledger, 1998; adapted from Jagoe, 1993)

Type of Aggression	Moyer (1968)	Borchelt (1984)	Hart & Hart (1985)	Voith (1984)	Beaver (1983)	O'Farrell (1986)
Predatory	•	•	•	•	•	•
Inter-Dog	•	•	•	•	•	
Fearful	•	•	•	•	•	•
Irritable	•					
Territorial	•		•		•	•
Maternal	•		•		•	•
Instrumental	•					
Dominance		•	•	•	•	• 4
Possessive		•				
Punishment		•		•		
Pain		•	•	•	•	•
Protective		•			•	•
Learned			•	•	•	
Competitive			•			
Pathological				•	•	
Towards People						
Food Related				•		
Redirected				•	•	

Note: numbers in the cells indicate that the category was further divided into a number of sub-categories.

The canine social structure is a powerful system in which members clearly understand their social role. Well defined boundaries and non-aggressive signaling among pack-mates preserve the social group without injury. Puppies learn these behaviours through behavioural feedback—a system used in the litter with their dam to learn appropriate behaviour such as bite strength (Overall, 2001). The puppy that bites its dam or its litter-mate too hard receives immediate feedback—a swift disciplinary correction from the dam or a high-pitched scream of pain followed by the playmate's withdrawal (Donaldson, 1997). However, if a puppy misses this early socialization or if the socialization does not continue to include the human pack (family),

the dog becomes uncertain about its place and about which responses are contextually appropriate. Aggressive behaviour is one manifestation of this uncertainty (Overall, 2001).

Fear Aggression

Fear is a widely recognized catalyst for aggressive behaviour (Borchelt, 1983; King et al., 2003) and the behavioural hallmark of a fear-elicited aggression is the dog's submissive or defensive posturing and barking in response to the stimulus—ears back, tail tucked or down. The dog often engages in a dance of “approach/withdrawal” which usually occurs in concert with growling and culminates in biting if/when the dog is approached (Borchelt, 1983).

This type of aggression may be considered “submissive aggression” in that the dog is trying to control the situation by submission, employing behaviour that tends to minimize the risks of physical confrontation (Heath, 2005). However when that approach fails the dog is forced into overt aggression, that is, it is forced to switch to aggressive actions and, as a last defense, attack. This type of attack is often avoided if the opponent accepts the submission of the fearful dog or allows the dog to flee (Abrantes, 2005).

Unfortunately for the victim, the dog's switch from submission to aggression can occur very swiftly, particularly if: (1) the dog is under-socialized and has not learned the signals to indicate submission, (2) the dog has learned from past experience that submissive displays do not accomplish the desired goal of pacifying the opponent, (3) if the dog feels trapped or if it realizes from previous experience that fleeing does not work, or (4) if the dog has experienced previous success by showing rapid aggression (Abrantes, 2005). Unfortunately, a dog that “has had several successful aggressive encounters . . . or a dog who has been rewarded, albeit unintentionally for aggressive behavior” develops a lowered threshold for aggression (Polsky, 2002) and may, therefore, be more inclined to switch to aggressive behaviour (Heath, 2005).

Predatory Behaviour

The term “predatory aggression” is included in several classification systems and is used to describe dog behaviour that includes stalking, chasing, catching and biting a moving object (Moyer, 1968; Borchelt, 1984; Hart and Hart, 1985; Beaver, 1983; O’Farrell, 1986). It is argued that predatory behaviour is unrelated to aggression (Abrantes, 2005). However, the chase behaviour which culminates in a dog bite, regardless of motivation is, at a practical level, very dangerous to small animals, livestock and to people, principally children (Borchelt, 1983). Dogs that are allowed to run at large will sometimes form packs which can stimulate very powerful predatory behaviour even in otherwise gentle pet dogs.

Protection Aggression

Aggressive behaviour that protects the “pack”, territory or, in the case of lactating females, puppies, is referred to as Protective Aggression (Borchelt, 1984; Beaver, 1983; O’Farrell, 1986). Protectiveness is inherent to some extent in all dogs although certain breeds have been selectively bred and are prized for their guarding abilities.

Unless an obvious boundary such as a secure fence delineates the property to be defended, it is difficult for dogs to define territorial borders and to differentiate between real intruders and “accidental” encroachers such as children or those with legitimate access to the territory such as meter readers and postal workers. Dogs that are tethered or that are locked up become more territorial, especially if there is a perceived provocation such as a stream of delivery personnel or passers-by encroaching on the territory (Sacks et al., 1989; Gershman et al., 1994; Heath, 2005).

What dogs perceive as a threat to themselves or their pack, and the way they protect themselves and their owner, depends on their level of socialization and their learning. Those

animals that have deficits in their socialization and that have limited experience (training) may have a tendency, particularly when alone and feeling trapped, to quickly react in a defensive and fearful manner towards a perceived intruder. In this context, aggression appears to be motivated more by fear than by true protectiveness.

Punishment- or Pain-Related Aggression

Aggressive behaviour that is triggered by harsh treatment or punishment is referred to as punishment-related aggression (Borchelt, 1984; Voith, 1984). Similarly, pain due to illness or injury is the characteristic feature of pain-elicited aggression (Beaver, 1983; Borchelt, 1984; Hart and Hart, 1985; Voith, 1984; and O'Farrell, 1986). The triggers for these categories of aggressive behaviour may be the actual pain resulting from harsh human treatment, or from handling a sick or injured dog, or the behaviour may be triggered by a real or perceived threat that such pain will be caused.

Aversive stimuli such as electric shock, heat and physical blows elicit attack behaviour in animals although the intensity of the aggressive response depends on the age, gender, species and social experience of the individual animal (Koolhaas et al., 1999). In a study of 326 dog-owners in the United Kingdom, Hiby et al. (2004) examined dog training methods to compare the efficacy of reward-based and punishment-based training methods. The study found punishment-based methods to be associated with a higher incidence of aggression towards people and other dogs as well as fearfulness and over-excitability, traits found to be associated with aggressiveness (Ledger, 1998). It is concluded that training methods based on punishment “. . . represent a welfare concern without concurrent benefits in obedience” (Hiby et al., 2004, page 63).

Intervention Strategies

In recognition of the high risk to many people, there is substantial support for the development and implementation of strategies to prevent dog bites (Sacks et al., 1996; Weiss et al., 1998; American Veterinary Medical Association, 2001; De Keuster et al., 2005).

Breed-Specific Legislation

In 1991, responding to a surge of highly publicized dog attacks in the 1980's, the United Kingdom introduced the Dangerous Dogs Act (DDA) prohibiting ownership of 4 types of dogs: the Pit Bull Terrier, the Japanese Tosa, the Dogo Argentino and the Fila Brasileiro. Other countries followed; for example, 15 of Germany's 16 states restrict ownership of 47 breeds. In 2003, Italy placed restrictions on 92 breeds although the legislation varies by breed. The ownership of some breeds is banned while ownership of others is restricted.

As noted earlier, a number of Canadian jurisdictions have adopted breed-specific legislation targeting primarily breeds and crossbreeds of pit bull terriers. As in Europe, the breed-specific legislation varies by jurisdiction. Some jurisdictions, such as Winnipeg, Edmonton, Windsor, and Prince George, prohibit the ownership of these breeds whereas others permit ownership but require these breeds to be muzzled and leashed, and invoke higher fines and penalties for their contravention of animal control by-laws.

There is no clear indication, however, that breed-specific legislation is effective in reducing dog bites (Ledger et al., 2005). For example, a study conducted at the Accident and Emergency Department of a Dundee Hospital, compared bite rates for two 3-month periods, one before and one after the Dangerous Dog Act took effect in 1991. In the 3-month period before the ban, there were 99 reported dog bites. Two years after the ban, in the same 3-month period the number of reported dog bites remained at 99 (Klaassen et al., 1996).

Following the adoption of breed-specific legislation in Winnipeg, the number of dog bites reported to Animal Control decreased from 310 in 1989 to 166 in 2003 (personal communication, Tim Dack, City of Winnipeg). It is difficult to ascertain, however, how much of the bite reduction is related to the breed ban since, concurrent with breed-specific legislation, the City implemented a \$70 - \$90,000 per annum education and advertising program designed to raise public awareness of the need for responsible dog ownership (personal communication, Tim Dack, City of Winnipeg).

The City of Calgary also invests significant resources in public education, (\$130,000 per annum) but has maintained firstly that all dogs are capable of biting and secondly that the behaviour, not the breed, needs to be addressed (personal communication with Bill Bruce, Chief By-law Officer, City of Calgary Animal and By-law Services). As a result, the City of Calgary has chosen not to employ breed-specific legislation. Instead, the Calgary model focuses on promoting the responsible ownership of all dogs. This includes high fines for dog owners whose dogs chase and bite, higher fines and muzzling requirements for dogs labeled “dangerous” and, in an effort to identify dog owners for the purpose of owner accountability, zero tolerance for non-compliance of dog licensing. In this city of about one million people, there has been a 70% drop in the number of dog bites reported to the City’s animal control department since implementation of this approach: from 1,000 in 1985 to 260 in 2003 (personal communication, Bill Bruce, City of Calgary).

Many expert organizations believe breed-specific legislation to be an oversimplified solution (American Veterinary Medical Association, 2001). In fact, breed-specific legislation is thought by some to be a costly and potentially dangerous practice because “singling out one or two breeds for control might result in a false sense of accomplishment . . . ignores the true scope

of the problem” (De Keuster et al., 2005, page 484), and does not “address the fact that a dog of any breed can become dangerous when bred or trained to be aggressive” (Sacks et al., 2000, page 840). Much of what has prompted breed-specific legislation is a flurry of media attention around dog-bite-related fatalities. However, according to Overall and Love (2001) and the American Veterinary Medical Association (2001), statistics on fatalities and injuries caused by different breeds cannot be responsibly used to document the dangerousness of a particular breed relative to other breeds. Nor, as Sacks et al. (2000) maintain, should dog-bite-related fatalities direct public policy since, unlike non-fatal dog bites, these numbers have remained constant and constitute less than 0.00001% of dog bites in the USA annually (Sacks et al., 2000).

Public Education

Education is often identified as a priority for reducing the incidence of dog bites (Sacks et al., 2000; Hanna and Selby, 1981; Wright, 1985; Gilchrist et al., 2003; DeKeuster et al., 2005), with education of dog owners a top priority (Wright, 1985).

There may also be merit in providing prospective pet owners with objective, accurate information concerning the behavioural traits and bite risks of various dog breeds so that they are able to make an informed choice. Certain guarding breeds, for example, are at higher risk to bite, and the selection of an intact male dog, particularly if it is kept intact, substantially increases the likelihood of biting (Gershman et al., 1994). Informing the public of such risks could help to limit the number of potentially hazardous dogs brought into the homes of unsuspecting families (Hanna and Selby, 1981).

However, even breeds not normally predisposed to aggression may become aggressive if they are mismanaged (Sacks et al., 2000). It is important that dog owners be made aware of their pets’ potential to cause harm and the management issues that contribute to aggressive

canine behaviour (Wright, 1985), as well as the strategies that prevent such aggression. As noted above, for example, fear is recognized as a major cause of dog aggression against humans (Borchelt, 1983). Puppies that are inadequately socialized are often more fearful (Scott and Fuller, 1965), whereas dogs that are well socialized as puppies are more accepting of human handling and less likely to act aggressively toward a human (Seksel et al., 1999; Donaldson, 1997).

Dog owners are often encouraged to carry out obedience training with their dogs to prevent or treat behavioural problems. However, the efficacy of obedience training is unclear as the scientific evidence is limited and contradictory. Voith et al. (1992), for example, surveyed over 700 dog owners about their dog management practice and their pet's behavioural problems. The study found no association between dogs with behavioural problems and obedience training, or the lack of it. Clark and Boyer (1993), on the other hand, did detect a significant relationship between obedience training and reduced prevalence of behavioural problems. As well, in a retrospective study of 747 dog owners, Jagoe and Serpell (1996) found a significant relationship, finding that dogs that had obedience training were less likely to show competitive or dominance-related aggression. These studies did not control for training methods, a factor which may have contributed to the inconsistency of results. While training methods have been the subject of limited research, there is reason to suspect that training methods that increase the dog's anxiety may also increase the likelihood of problematic behaviours, including aggression (Reisner, 1991). As noted earlier, one study which compared the results of reward-based methods and punishment-based methods found that punishment-based training methods are less effective than positive and reward-based methods (Hiby et al., 2004).

Educational strategies that target potential victims may also be useful (Sacks et al., 1996). Since children are often the victims of dog bites and many bites are the result of human misunderstanding of the animal's behaviour, educational efforts that help school children and their parents understand canine behaviour may reduce the number of dog bite injuries (DeKeuster et al., 2005). For example, most dogs exhibit behaviours that warn of an imminent bite—hardness of the eyes, stiff body posture, growling (Abrantes, 2005)—and sensitivity to such warning signals may help the child avert an injury (Wright, 1985).

Purpose of the Study

The dog bite incidence in Canada is not well documented although dog bites appear to represent a public safety concern that often involves children. Numerous strategies to lower the dog bite incidence have been suggested, most of which involve animal control agencies, the responsibility of local government. Bite prevention strategies include:

“educational programs on canine behavior, especially directed at children, laws for regulating dangerous or vicious dogs, enhanced animal control programs, and educational programs regarding responsible dog ownership and training” (Sacks et al., 1996, page 53).

Because of the decentralized structure of animal control in Canada, there is no central data repository. The number of reported dog bites is unknown, and neither the availability nor the effectiveness of preventive strategies has been assessed.

Objectives

In response, the objective of my thesis is to undertake the first comprehensive study of urban Canadian animal control agencies to:

- (a) gain insight into the extent to which dog bites are reported to animal control agencies in Canadian urban centres;
- (b) examine the extent to which Canadian civic governments allocate resources and provide enforcement and education;
- (c) ascertain what, if any, relationship exists between dog bite rates and provision of enforcement programs and public education.

The data also provided an opportunity to compare dog bite rates in municipalities with and without breed-specific legislation.

CHAPTER 2 - MATERIALS AND METHODS

Participants

Statistics Canada (2006a) data were consulted to identify the municipalities that comprise Canada's Census Metropolitan Areas and municipalities with populations of $\geq 30,000$ that make up Census Agglomerations, as defined by Statistics Canada (2006b).

The municipalities were telephoned by a bi-lingual (French/English) research assistant who secured the name and contact information of the person responsible for animal control services. In jurisdictions where animal control is a direct service of the municipality (municipal department), the manager of animal control was identified. In jurisdictions where the animal control function is contracted to a company or a non-profit agency, the civic employee directly responsible for overseeing the contract was identified. Contact information, including e-mail addresses, for these individuals was secured.

The only exception to this process was Montreal. In January, 2006, Montreal was divided into 19 boroughs. Each borough, overseen by a director who represents the constituency on the City Council, is responsible for animal control in its area. On the advice of a high ranking Montreal official, each borough was sent a questionnaire by Canada Post to the attention of the borough's director.

A cover letter explaining the research project (Appendix A) accompanied each questionnaire. A total of 85 questionnaires were distributed. Most jurisdictions received the English version of the questionnaire, while Quebec jurisdictions received the French-language version. One month later, an electronic reminder was sent to the 73 jurisdictions that had not responded. A second electronic reminder was sent 4 weeks later to the 64 agencies that had not yet responded. In total, 36 completed questionnaires were received, a return of 42%.

Pretest

The questionnaire was pretested, initially, by three volunteers who provided feedback regarding the time required to complete the questionnaire, formatting concerns, unclear wording of some questions and the meaning of certain questions. As a result of this input, the questionnaire was amended for clarity. Two additional volunteers completed the amended questionnaire and had no major concerns. Hence, the questionnaire was not revised further.

The Survey

The survey questionnaire (Appendix B) was composed of open and closed questions concerning dog bite reporting and the agency's practices and programs. Preliminary questions included the city population and area (km²), the number of public parks that include dog-off-leash areas in their jurisdictions, the number of dogs thought to be in the jurisdiction, the method used to estimate the dog population. The questionnaire then queried the number of dogs licensed, the number of tickets issued for animal control violations, the number of dog bites reported in 2003, 2004 and 2005, and the presence of breed-specific by-laws. Participants were asked their opinion as to whether the dog bite issue had improved, worsened or remained the same in the five years preceding the study.

In an effort to determine animal control enforcement levels, participants were asked to indicate full-time staff equivalents for 2003 through 2005 and to indicate the percentage of time spent enforcing other laws or by-laws. Each jurisdiction was also asked to indicate budget allocations for animal control from 2003 through 2005, and to offer an opinion as to the priority rank of five operational functions: enforcement of by-laws, sheltering of impounded animals, rehoming of pets, public education, and the development and maintenance of volunteer programs.

To ascertain the level of educational support provided to the dog-owning community, the questionnaire asked respondents to indicate their municipality's financial commitment to dog-related public education activities, and the number of full-time staff equivalents dedicated to public education.

From the responses, seven variables (items 3 to 9 in Table 2.1) were calculated.

Table 2.1 – Study terms and variables and their definitions

	Term/Variable	Definition
1.	Jurisdiction	The municipal area in which an animal control agency or department has jurisdiction to provide animal control services.
2.	BSL Jurisdiction	An animal control jurisdiction in which laws or by-laws prohibit or restrict the ownership of certain breeds of dogs but do not affect other breeds.
3.	Dog Population	The estimated number of dogs residing in a jurisdiction. This was calculated using Ipsos-Reid findings of 0.4 dogs per household and Statistics Canada data of 13.6 million households and overall population (2006) of 32.8 million people =15.7 dogs per 100 people.
4.	Licensing Rate	The number of dog licenses sold annually in the animal control jurisdiction as a percentage of the estimated dog population .
5.	Ticketing Rate	The number of by-law violation notices (tickets) issued annually by animal control enforcement officers per 10,000 population.
6.	Budget Rate	The annual expenditure on animal control services, expressed in dollars per 10,000 population.
7.	ACO Rate	The number of full-time-equivalent animal control enforcement staff (animal control officers) employed per 100,000 population.
8.	Public Education Rate	The annual expenditure on public education, excluding staffing costs, expressed in dollars per 10,000 population.
9.	Reported Dog Bite Rate	The number of dog bites reported annually to animal control per 10,000 population.
BSL = breed-specific legislation ACO = animal control officer		

Data Analysis

Because of the non-normal distribution of the data, non-parametric analysis was used wherever possible, specifically for correlation and basic comparisons. Fitting of regression lines used parametric statistics because there are no non-parametric equivalents, but with the recognition that P values will not be reliable because of the non-normal distribution of data.

The data were first checked for outliers, defined as values falling more than three units of standard deviation from the mean. However, no outliers were found.

Because only two municipalities had actual data on dog populations, the following method was used to estimate the number of dog in each municipality. According to the findings of an Ipsos–Reid (2001) survey of 1500 urban households across Canada, an average of 0.4 dogs reside in each Canadian household. Statistics Canada (2006) data indicate that there are 13.6 million Canadian households and 32.8 million people in Canada, for an average of 2.4 people per household. Combining these data, there should be 0.157 dogs per person (0.4 dogs per household \div 2.4 people per household) or 15.7 dogs per 100 people as a national average. The estimated number of dogs per municipality was then calculated using this national average applied to the human population of the municipality. These dog population estimates formed the denominator for the calculation of licensing rates.

The jurisdictions were divided into four regions: BC (British Columbia), Prairies (Alberta, Saskatchewan, Manitoba), Ontario and Quebec. The Atlantic region was not included since only one Atlantic jurisdiction participated in the survey. The Kruskal-Wallis one-way analysis of variance was used to compare the four regions on the different variables. Sheffé one-way analysis of variance (SPSS) was used for post-hoc pairwise comparisons of the four regions on the different variables.

Spearman's rank order correlation coefficients (two-tailed) were calculated among the key variables: licensing rate, ticketing rate, budget rate, ACO rate, public education rate and reported dog bite rate.

Linear and quadratic regression analyses of reported dog bite rate against ticketing, licensing, budget and ACO rates were performed using SAS (version 9.1; SAS Institute, 2003). SPSS (version 14.0; SPSS, Inc., 2005) was used for the remainder of the statistical analyses.

Jurisdictions were divided into those that had breed-specific legislation (BSL municipalities) and those that did not (Non-BSL municipalities). Simple comparison of BSL and Non-BSL municipalities was done by the Mann-Whitney U test. To provide a more precise comparison, the municipality's use or non-use of BSL was considered a treatment, and the regression procedure of SAS (PROC REG) was used to test the linear and quadratic relationship between the reported dog bite rate and four key independent variables (ticketing rate, licensing rate, budget rate and ACO rate), after adjusting for these independent variables, each in a separate quadratic regression. The GLM procedure of SAS was used to test the BSL effect on reported dog bite rate, after accounting for the linear and quadratic effect of ticketing rate. A type I analysis was used. The model included variables in the following order: linear effect of ticketing rate, quadratic effect of ticketing rate, BSL, and the pairwise interactions.

CHAPTER 3 - RESULTS

Demographics

The 36 participating animal control agencies served a total human population of 10,480,171 in 2005, or approximately 32% of Canada's estimated population of 32,270,500 (Statistics Canada, 2005).

The estimated dog populations of each municipality, calculated as described above from national averages, showed a significant but moderate correlation with dog population estimates provided by the jurisdictions, themselves ($r=0.46$, $p<0.05$, $n=28$). The low r value was largely because the dog population of Toronto as estimated by the municipality was much lower than the number expected on the basis of the national average (Figure 3.1). This may be because Toronto's estimate is too low, and/or dog ownership in this multicultural city is well below the national average. When Toronto was removed from the analysis, there was a strong correlation between local dog population estimates and estimates based on the national average ($r=0.93$, $p<0.001$, $n=27$).

Enforcement Indicators

A mean of 25% and a median of 20.7% of dogs were licensed in 2005, with a range from 3.8% to 75.0% in different municipalities. Licensing rates were the highest in the Prairie region (median of 41.5%) followed by BC (31.4%), Ontario (15.3%) and Quebec (10.2%) (Table 3.1). Overall differences between the four regions were highly significant by the Kruskal-Wallis one-way analysis of variance ($X^2= 18.99$, $df= 3$, $p<0.01$). Sheffé's test showed significant differences in licensing rate between the Prairie region and Quebec ($p<0.01$), between the Prairie region and Ontario ($p<0.01$), and between Quebec and BC ($p<0.05$).

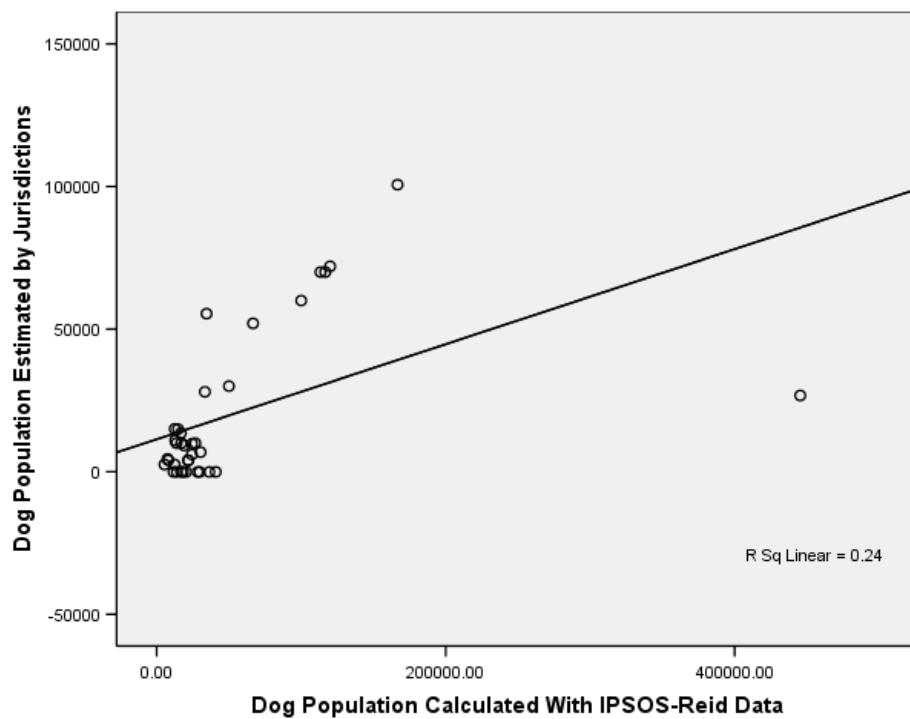


Figure 3.1 – Comparison of jurisdictions’ dog population estimates with Ipsos-Reid dog population calculations. Toronto is indicated by the solid circle. With Toronto included (solid line) the linear regression according to Pearson’s correlation gave an $R^2=0.24$. With Toronto omitted (dashed line) $R^2=0.85$.

Table 3.1 – Reported dog bite, enforcement and resourcing rates by region and jurisdiction

BC Jurisdiction	BSL?	Reported Dog Bites Per 10,000	Ticketing Per 10,000	ACO's Per 100,000	Budget Rate \$ /10,000	Licensing Rate % Dogs
1	BSL	1.8		11.1		31.7
2	No		1.2	1.5		28.4
3	No		2.8	5.3	4,000.	64.0
4	BSL	1.1	0.1	3.5	21,733.	14.9
5	No	0.0		3.1	27,083.	13.5
6	No	5.2	48.5	8.5	100,610.	36.6
7	BSL	9.0		4.5	45,455.	46.7
8	No	4.0	9.9	4.0	48,000.	46.2
9	No	1.6	8.4	1.8	25,492.	21.9
10	BSL		6.1	6.7	39,216.	29.7
11	BSL	2.6	5.5	4.4	78,677.	24.2
12	BSL			4.5		33.7
13	BSL	1.6	4.7	6.6	15,275.	17.0
	Median	1.8	5.5	4.5	39,608.	29.7
	Mean	3.0	9.7	5.1	44,154.	31.4
	Standard Error	0.9	5.0	0.7	8,442.	4.0
	Standard Deviation	2.7	14.9	2.7	26,695.	14.4
BSL = breed-specific legislation ACO = animal control officer						

Prairies Jurisdiction	BSL?	Reported Dog Bites Per 10,000	Ticketing Per 10,000	ACO's Per 100,000	Budget Rate \$ /10,000	Licensing Rate % Dogs
14	BSL	2.0	4.6	1.7	29,764.	34.0
15	No		83.4	3.4	7,406.	30.5
16	No	3.1	36.0	2.2	37,000.	55.8
17	BSL	2.1	14.1	3.1	26,389.	41.5
18	No	2.4	67.5	8.2	48,310.	75.0
	Median	2.2	36.0	3.0	29,763.	41.5
	Mean	2.4	41.1	3.7	29,774.	47.4
	Standard Error	0.2	15.1	1.2	6,736.	8.2
	Standard Deviation	0.5	33.8	2.6	15,063.	18.2
BSL = breed-specific legislation ACO = animal control officer						

Ontario		Reported Dog Bites Per 10,000	Ticketing Per 10,000	ACO's Per 100,000	Budget Rate \$ /10,000	Licensing Rate % Dogs
Jurisdiction	BSL?					
19	No	1.9	5.0	2.1	33,077.	16.1
20	No		2.2	2.7	56,633.	14.5
21	No		1.9	1.9		24.3
22	BSL	0.2	1.7	0.8	21,470.	3.8
23	No		4.1	3.2	22,754.	13.1
24	BSL		1.3	3.7		40.0
25	No			3.1	33,607.	16.1
26	No			2.7	16,821.	10.3
27	No			1.1	31,437.	6.7
28	BSL			5.0	34,330.	20.7
Median		1.1	2.0	2.7	32,257.	15.3
Mean		1.1	2.7	2.6	31,266.	16.6
Standard Error		0.9	0.6	0.4	4,307.	3.2
Standard Deviation		1.2	1.4	1.2	12,181.	1.2
BSL = breed-specific legislation ACO = animal control officer						

Quebec		Reported Dog Bites Per 10,000	Ticketing Per 10,000	ACO's Per 100,000	Budget Rate \$ /10,000	Licensing Rate % Dogs
Jurisdiction	BSL?					
29	No	8.1	14.7	2.0	11,345.	16.2
30	No		20.1	1.3	18,054.	12.4
31	BSL	1.4	1.4	2.9	6,571.	11.6
32	No	0.3	0.1	0.1		8.9
33	No	0.3	0.2	0.7	6,849.	7.0
34	No	0.1	0.5	1.2	7,775.	4.2
35	No					
Median		0.3	0.95	1.3	7,775.	10.3
Mean		2.0	10.0	1.3	10,119.	10.0
Standard Error		1.5	1.7	0.4	2,159.	1.7
Standard Deviation		3.4	8.9	1.0	4,828.	4.3
BSL = breed-specific legislation ACO = animal control officer						

Atlantic		Reported Dog Bites Per 10,000	Ticketing Per 10,000	ACO's Per 100,000	Budget Rate \$ /10,000	Licensing Rate % Dogs
Jurisdiction	BSL?					
36	No	1.5	8.2	6.2	25,239.	4.6
Median		-	-	-	-	-
Mean		-	-	-	-	-
Standard Error		-	-	-	-	-
Standard Deviation		-	-	-	-	-
BSL = breed-specific legislation ACO = animal control officer						

All Regions	Reported Dog Bites Per 10,000	Ticketing Per 10,000	ACO's Per 100,000	Budget Rate \$ /10,000	Licensing Rate % Dogs
All Jurisdictions					
Median	1.8	4.6	3.1	27,083.	20.8
Mean	2.4	25.0	3.6	31,599.	25.0
Standard Error	0.5	4.1	0.4	3,907.	2.9
Standard Deviation	2.4	21.3	2.4	21,039.	17.5
ACO = animal control officer					

All jurisdictions included, the median ticketing rate was 4.64 per 10,000 people, with an extremely wide variation from 0.1 to 84.4. Ticketing rates were the highest in the Prairie region (median of 36.0) followed by BC (5.5), Ontario (2.2) and Quebec (0.95). The Kruskal-Wallis one-way analysis of variance showed a significant difference in ticketing rates among the four regions ($X^2= 7.99$, $df=3$, $p<0.05$). Sheffé's test showed significant differences in ticketing between the Prairie region and BC ($p<0.05$), Ontario ($p<0.05$) and Quebec ($p<0.05$).

Four of the five prairie jurisdictions were among the seven jurisdictions with a ticketing rate greater than 10 per 10,000 people, and at least five of these seven animal control jurisdictions were engaged in formal organizational efforts to increase by-law compliance. There was large variation within certain regions in ticketing rate. Of the seven municipalities with ticketing rates above 10 per 10,000 people, one was in BC and two in Quebec. Licensing and ticketing rates were significantly correlated ($r_s= 0.59$, $p<0.01$, $n= 27$, Table 3.2).

Resourcing Indicators

The 29 jurisdictions that provided information on budget allocations reported that animal control received a median of \$27,083 per 10,000 human population. By region, BC was funded at the highest median rate (\$39,608 per 10,000 people), followed by Ontario (\$32,257), the Prairie region (\$29,763) and Quebec (\$7,775). The Kruskal-Wallis one-way analysis of variance showed a significant difference in budget rates among the four regions ($X^2=10.88$, $df=3$, $p\approx 0.01$),

with the Sheffé one-way analysis of variance showing a significant difference in budget rates between BC and Quebec ($p < 0.05$). Animal control budget was significantly correlated with dog licensing rate ($r_s = 0.61$, $p < 0.01$, $n = 29$) but not with ticketing rate ($r_s = 0.34$, Table 3.2).

Table 3.2 – Spearman rank-order correlation coefficients for reported dog bite rate and four measures of enforcement and resourcing rates

	Reported Dog Bite Rate	Ticketing Rate	Licensing Rate	Budget Rate	ACO Rate
Reported Dog Bite Rate		0.86** n=18	0.82** n=21	0.63** n=19	0.44* n=21
Ticketing Rate			0.59** n=27	0.34 n=23	0.38 n=27
Licensing Rate				0.61** n=29	0.54** n=35
Budget Rate					0.50** n=29
ACO Rate					
ACO = animal control officer				* $p < 0.05$ ** $p < 0.01$	

The 35 jurisdictions that reported staffing rates had a median of 3.1 FTE enforcement officers per 100,000 human population in 2005. The BC region allocated the highest median rate of ACO's (4.5 FTE's per 100,000), followed by the Prairie region (3.0), Ontario (2.7) and Quebec (1.3). The Kruskal-Wallis one-way analysis of variance showed a significant difference in ACO staffing rates among the four regions ($X^2 = 13.77$, $df = 3$, $p < 0.01$). The Sheffé one-way analysis of variance showed significant differences between Quebec and BC ($p < 0.05$). Enforcement staffing rates were significantly correlated with funding rates ($r_s = 0.50$, $p < 0.01$, $n = 29$) and dog licensing rates ($r_s = 0.54$, $p < 0.01$, $n = 35$), but not with ticketing rate ($r_s = 0.38$, Table 3.2).

All jurisdictions reported providing some form of public education to their citizens. The distribution of written materials was the most widely used strategy (26/36) while more interactive methods, such as the provision of face-to-face courses and seminars (dog management, training, by-law, dog bite prevention) or offering canine behavioural counseling and training assistance to dog owners, were employed in only a few jurisdictions.

In 30 of the 36 jurisdictions, public education was provided by enforcement staff as part of their role. Only six of the 36 jurisdictions dedicated staff positions to the development and delivery of public education programming. Apart from staff salaries and benefits, less than 2% of the overall animal control expenditures were related to public education and advertising.

Reported Dog Bites

The 21 jurisdictions that provided information on reported dog bite rate represented a human population of over 5 million people and reported a total of 1,154 dog bites to humans in 2005, for a median of 1.8 and a mean of 2.4 bites per 10,000 people. When asked about their perception of the dog bite issue, the managers of 24 of 34 jurisdictions felt that it was less severe or had not changed over the previous five years.

Regionally, the Prairies had the highest median rate of reported dog bites at 2.2 per 10,000 people, followed by BC (1.8), Ontario (1.1) and Quebec (0.3). Neither the Kruskal-Wallis one way analysis of variance nor Sheffés test found significant differences in reported dog bite rate among jurisdictions.

The reported dog bite rate was generally very low in jurisdictions with very low budget, licensing and ticketing rates. However, it was higher when these variables were in the medium ranges. As a result, the reported dog bite rate showed a clear positive correlation with each of these variables (Table 3.2). However, given that only a small percentage of dog bites were

thought to be reported (see below), the increases associated with animal control effort were hypothesized to be merely increases in reporting rate.

If an animal control effort is effective in reducing the actual dog bite rate, the simple linear relationship would be expected to break down at higher effort levels, as reduction in actual bite rate begins to cancel the higher rate of reporting. This hypothesis was tested by calculating the linear and quadratic regression of reported dog bite rates on the different measures of animal control effort. Standard parametric methods were used because no non-parametric methods are available.

Table 3.3 – Linear and quadratic relationship of reported dog bite rate to four independent variables . Parameter estimates (with standard errors) are intercept (a), linear coefficient (b) and quadratic coefficient (c).

Independent Variables	<u>Parameter Estimates</u>		
	a±SE	b±SE	c±SE
Ticketing Rate	0.77±0.50	0.25± 0.07**	-0.003±0.001**
Licensing Rate	-0.46±1.13	0.19±0.08*	-0.002±0.001†
Budget Rate	0.981.56±	0.00±0.00	0.000±0.000
ACO Rate	0.15±1.4	11.09±6.73†	-8.77±6.12
ACO = animal control officer		*p<0.05 ** p<0.01 †p<0.10	

Table 3.3 provides a summary of the linear and quadratic relationships. Reported dog bite rate showed a strong increase as ticketing rate increased from 0 to about 15 tickets per 10,000 people (Figure 3.2). This presumably accounted for the linear regression of reported dog bite rate on ticketing rate (Table 3.2) However, at very high ticketing rates, the reported dog bite rate was far lower than would be expected based on the linear regression (Figure 3.2) as reflected by a negative quadratic regression (Table 3.3). Both linear and quadratic regressions were

significant at $p < 0.01$, but these probabilities cannot be considered reliable since assumptions about the normal distribution of data were not met.

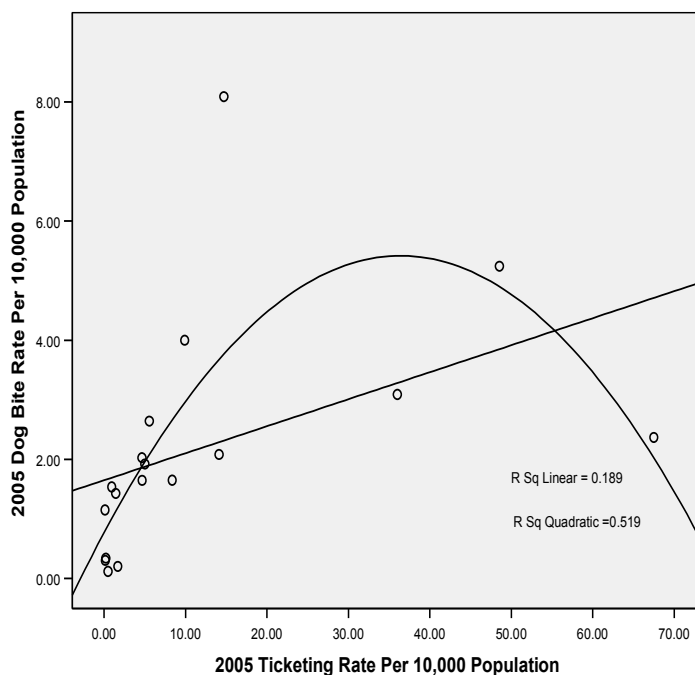


Figure 3.2 – Linear and quadratic regression of ticketing rate and rate of reported dog bites

Similar, but weaker relationships were seen with licensing rate (Figure 3.3). Specifically, the reported dog bite rate showed a significant positive linear regression on licensing rate ($p < 0.05$), and the negative quadratic component approached significance ($p < 0.10$, Table 3.3).

Reported dog bite rate showed no significant regression on budget rate or ACO rate (Table 3.3).

No significant relationships were detected between public education indicators and rate of reported dog bites or other enforcement indicators.

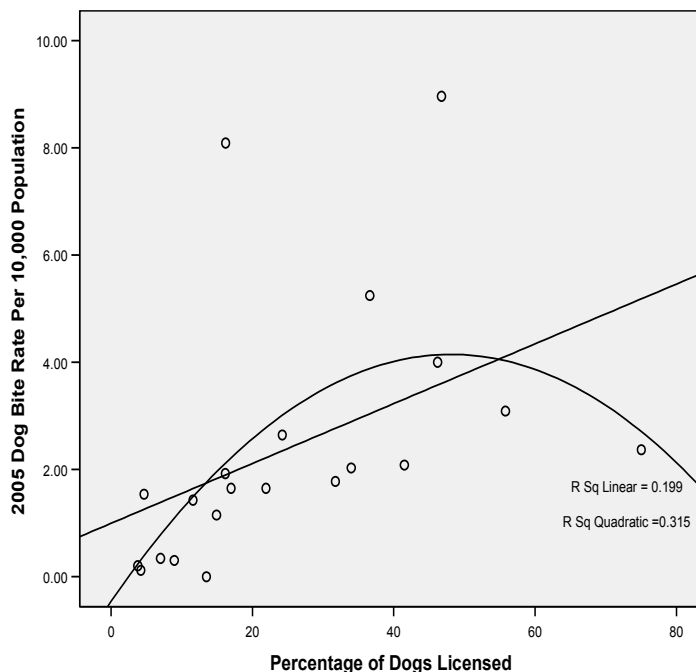


Figure 3.3 – Linear and quadratic regression of licensing rate and rate of reported dog bites

Breed-Specific Legislation (BSL)

Of the 36 jurisdictions, 13 reported having breed-specific by-laws (BSL) in 2005 (before the inception of DOLA in Ontario) while 23 did not (Non-BSL). A simple comparison using the Mann-Whitney U test revealed no significant differences between BSL and Non-BSL jurisdictions in the rates of licensing, ticketing, budget and reported dog bites (Table 3.4). The ACO rate was somewhat lower in municipalities without breed-specific by-laws ($U=84.00$, $p<0.05$).

As a more precise comparison of reported dog bite rate in BSL and Non-BSL jurisdictions, the two types of jurisdictions were compared as treatments in a regression analysis that first adjusted for the variation due to ticketing rate. The model first calculated the linear and quadratic effects of ticketing rate, and then tested for treatment (BSL or Non-BSL) and the

interaction of treatment with the linear and quadratic regressions. Neither the treatment nor the interactions approached significance (Table 3.5).

Table 3.4 – Median values for reported dog bite rate and four measures of enforcement and resourcing for the 13 jurisdictions with breed-specific legislation (BSL) and the 23 jurisdictions without (Non-BSL)

Variable	Jurisdiction	
	BSL n=13	Non-BSL n=23
Reported Dog Bites per 10,000	1.7	1.8
% Dogs Licensed	29.7	16.1
Budget per 10,000	\$28,076.	\$27,083.
Tickets Issued per 10,000	4.6	4.5
ACO's per 100,000	4.4	2.5
BSL = breed specific legislation		

Table 3.5 - Linear and quadratic regression of reported dog bite rate on ticketing rate and the effect of treatment (BSL status) plus its interactions

	Mean Square	F	P<
Ticketing Rate (linear)	12.57	5.18	0.04
Ticketing Rate (quadratic)	21.90	9.02	0.01
Treatment (BSL or Non-BSL)	0.55	0.23	0.64
Treatment * Linear	1.75	0.72	0.41
Treatment * Quadratic	0.52	0.22	0.65
Error	2.43	-	-
BSL = breed-specific legislation			

CHAPTER 4 - DISCUSSION

Limitations

This was an exploratory study to investigate possible links between animal control enforcement and resourcing, and reported dog bites in urban Canadian centres. There were several limitations which should be recognized.

Firstly, since it was intended to examine animal control practices in urban centres, only urban areas with populations $\geq 30,000$ were selected for study. The findings of this research will, therefore, not apply to rural areas or to jurisdictions with populations under 30,000.

This survey's return rate was approximately 42% with some individual variables, including reported dog bites, showing a higher non-response rate. Of the 36 jurisdictions that completed questionnaires, 21 responded to questions about reported dog bites. Seven indicated that the information was unavailable, and eight gave no reason for the non-response. Moreover, of the ten Ontario jurisdictions completing the questionnaire, only two responded to the questions of reported dog bites. Four indicated the information was unavailable and three gave no reason for the non-response. Therefore, the findings of this study may have been affected by a non-response bias. Those jurisdictions that did not respond may experience the dog bite issue and the animal control function differently from those that did respond—perhaps perceiving both issues as less problematic—thus accounting for their non-response or for the lack of record keeping.

Reporting bias seems unlikely in this study. Those individuals who responded on behalf of the jurisdictions were all professional managers within municipal government. There is no obvious motivation for them to distort data, and all indicated an interest in receiving a copy of the study's results.

Relationship of Effort Measures to Reported Dog Bite Rate

The majority of dog bites are perpetrated by dogs known to the victim (household bites), and these are rarely reported to enforcement agencies (Beck & Jones, 1985, Gershman et al., 1994). Therefore, enforcement is less likely to have an impact on household bite incidence. Animal control enforcement is more likely to have a role in reducing non-household dog bites, as these comprise the majority of dog bites reported to animal control (Gershman et al., 1994). For example, data from the City of Vancouver Animal Services show that in 2004 and 2005, non-household bites made up 96% and 98%, respectively, of dog bite investigations (unpublished data, City of Vancouver Animal Services).

In telephone interviews of 5,328 American adults, Sacks et al. (1994) found the total dog bite incidence to be approximately 1.8% per annum. These interviews represented a response rate of 56.1%. This 1994 study may have experienced a reporting bias. People who had been bitten may have been more willing to be interviewed, potentially causing the dog bite rate to be over-estimated. If this bias caused the dog bite incidence to be overstated by a full 50%, then the overall American dog bite incidence would have been more accurately estimated at one-half of the (1.8%) finding, or 0.9% of the American population.

Five million people were represented by the 21 jurisdictions that answered the current study's dog bite questions. When applied to the 5 million, even an estimate of 0.9% should have yielded 45,000 bites.

Kizer (1979) found that approximately 15% of dog bite incidents involved dogs that were unknown to their victims while De Keuster et al. (2005) found that about 30% of dog bites were non-household. If we apply the estimate that 15 – 30% of dog bites are non-household,

then these 21 jurisdictions should have experienced between 6,750 and 13,500 non-household dog bites whereas the data showed only 1,154 reported bites.

From these calculations, we can conclude that data supplied by the municipalities underestimated the true number of non-household dog bites by a large margin. This is consistent with other research that found that Canadian dog bites are under-reported by as much as 90% (Guy et al., 2001).

The literature suggests that enforcement is an important factor in reducing dog bite incidence (American Veterinary Medical Association, 2001). It may be anticipated, therefore, that jurisdictions achieving high licensing and ticketing rates would experience a lower dog bite incidence. This study, however, found evidence of the opposite trend: a strong tendency for jurisdictions to have higher rates of reported bites, if they achieve higher rates of licensing compliance ($r_s = 0.82$) and issue more tickets per capita ($r_s = 0.86$). Given that actual dog bites appear to be greatly under-reported, it seems likely that higher rates of licensing and ticketing are associated with increases in the reporting rate for dog bites, not actual dog bite rates.

A number of high-performing jurisdictions reported having implemented licensing and ticketing campaigns to improve by-law compliance. While dog owners are the primary and intended audience of such efforts, it is hypothesized that these initiatives also raise the general public's awareness of the issue and that they reinforce and validate the community's expectation that dogs be managed safely. Better informed, and perhaps encouraged by the commitment of local animal control, the public may be more inclined to report dog bites, with the result that rates of dog bite reporting are increased.

In addition, however, increased enforcement effort could also reduce the number of dog bites that actually occur. This benefit may be partially concealed by the concomitant increase in

reporting rate, but should become apparent if the reduction in actual bite rate is great enough. This would explain why reported dog bite rate had both a positive linear regression on ticketing rate (corresponding to the increase in reporting) and a significant negative quadratic regression (reflecting a decrease in actual bites at high enforcement rates).

Most jurisdictions have not yet achieved sufficient compliance levels of enforcement for this effect to be apparent. In these jurisdictions, the positive relationship of reported dog bite rate with licensing and ticketing continues to be driven by the rate of dog bite reporting rather than the actual dog bite rate.

On the surface, the experience of Calgary would appear not to conform to this interpretation. In 1985 Calgary began to invest in educating the public about responsible dog ownership. It raised its fines and began an enforcement program which focused on dog licensing and ticketing for non-compliance of animal control by-laws. Instead of the reported dog bite rate showing an initial increase, the rate declined from the first year of the program (Figure 4.1).

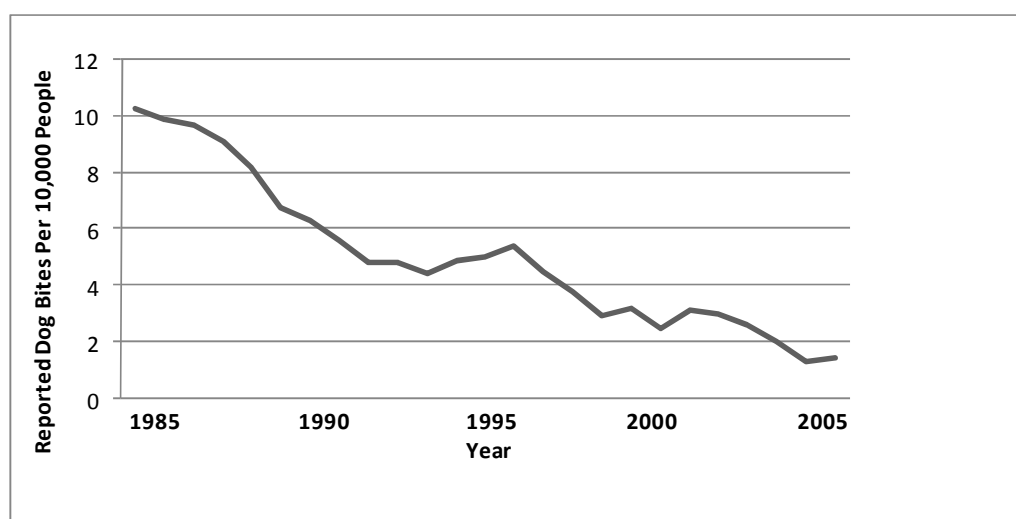


Figure 4.1 – Calgary’s reported dog bite rate (bites reported per 10,000 people) 1985 to 2005

However, in 1984, Calgary's reported dog bites were 10.5 per 10,000 people, much higher than the median rate reported in this study (1.8 per 10,000). Thus, even before the Calgary effort began, its citizens appeared motivated to report dog bites to enforcement authorities. This may explain why increased enforcement did not lead to an increase in reported dog bites.

Regional Differences

Calgary is one of several high-performing jurisdictions in the Prairie region. Overall, the region licenses at a rate higher than the mean, issues tickets at a much higher rate than the other regions, and receives, on average, a higher rate of reported dog bites. It does so with per-capita budgets roughly similar to those seen in BC and Ontario.

The BC region is funded at the highest rate but, compared to the Prairie region, where leadership has guided most jurisdictions into a much greater enforcement effort than elsewhere in the country, BC's licensing and ticketing performance, and its dog-bite reporting rates, are substantially lower than in the Prairie region. Similarly, although Ontario's funding rate closely approximates that of the Prairie and BC regions, it achieved a median licensing rate that is lower than both the BC and Prairie regions, and mean dog bite reporting and ticketing rates that were the lowest in the four regions, Quebec included.

Ticketing rate appeared to be driven more by philosophy than by budget, as the correlation between ticketing rate and budget rate was low ($r_s = 0.34$). Nonetheless, adequate resourcing will still be needed for effective animal control. The Quebec region exemplifies this need. Quebec has the lowest resourcing levels. It employs fewer enforcement personnel per capita and operates with a substantially lower per capita budget than any other region, undoubtedly contributing to its lower rates of licensing, ticketing and dog bite reporting.

Of the issues faced by the Quebec region, poor licensing rate may be the most detrimental for two reasons. Firstly, the inability to identify dog owners and establish culpability poses a serious challenge to the provision of even a basic level of enforcement. Secondly, low licensing compliance essentially means that the Region must forgo a great deal of potential income from licensing fees—posing perhaps an even more fundamental issue for the region. The significant correlation between licensing rates and per capita funding ($r_s=0.61$, $p<0.01$, $n=35$) may indicate that low licensing compliance has an impact on resourcing levels. In the case of the Quebec region, an initial investment to improve licensing compliance could ultimately lead to more adequate animal control funding levels.

Breed-Specific Legislation

This study found no significant difference in reported bite rates between jurisdictions with breed-specific legislation and those without, and found no them, even after the effects of animal control efforts were taken into account by regression analysis.

Winnipeg and Calgary provide an instructive comparison of two jurisdictions with active animal control programs, one with BSL and one without.

The City of Winnipeg recorded 214 dog bites in 1989 (28 of which were blamed on pit bulls) and 275 in 1990 (11 blamed on pit bulls). The City responded in 1990 by enacting breed-specific legislation (BSL), prohibiting the ownership of “pitbull-type” dogs, and by allocating more resources (from \$70,000 to \$90,000 each year) for public education and advertising.

Responding to a similar escalation in dog bites, Calgary chose a different, albeit more complex, approach. Often referred to as the Calgary Model, the City began in 1984 by introducing tougher animal control by-laws which reflected the expectation that all dog owners would be accountable for their pets’ behaviour. Calgary’s model focused on improving the

city's ability to identify the owners of dogs, a task it accomplished by very strict enforcement of its dog licensing by-law. Concurrently, the City took action against those individuals causing problems, ticketing those who permitted dogs to run at large and/or become a nuisance or danger to the community. As well, the minimum fines for non-compliance of certain by-laws—at large, licensing and no leash—were raised from \$30 to \$250 in the belief that ticketing is most effective when fines for non-compliance are approximately ten-fold the cost of obeying the by-law (Toellner, 2008). Finally, Calgary invested heavily in on-going advertising and public safety campaigns. By 2005, Calgary's annual public education budget was \$135,000 and the public education initiative included six specific programs emphasizing respect for living things which formed part of the public school curriculum but were developed, coordinated, and delivered by Calgary Animal Services educational staff (Grove, 2007).

Winnipeg's dog bite rate was reduced from 4.3 per 10,000 people in 1991, to 2.0 per 10,000 people in 2006, 16 years following the introduction of BSL, whereas Calgary saw a fivefold reduction—from 10.0 per 10,000 people in 1986 to 2.0 per 10,000 people in 2006—in the 20 years following the inception of its model (Figure 4.2).

Licensing and Ticketing

As demonstrated in the Calgary Model, licensing and ticketing appear to be important and correlated ($r_s=0.60$) elements of effective animal control perhaps because they have complementary roles. Licensing offers a means of identifying those individuals who assume responsibility for particular dogs (dog owners). Establishing this accountability enables the enforcement agency to issue by-law violation notices (tickets) to dog owners who are not in compliance with animal control by-laws. Since tickets carry fines and/or require court

appearances, the practice of ticketing—or the threat of receiving a ticket—is a powerful deterrent to dog owners who would ignore these by-laws.

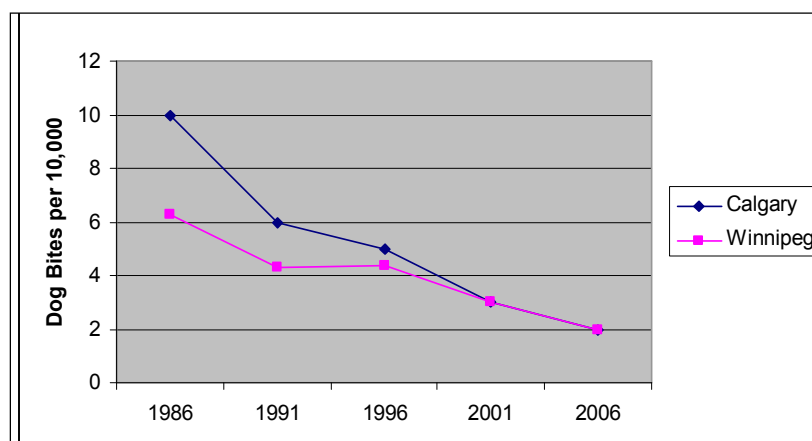


Figure 4.2 – Reported dog bites per 10,000 population in Calgary and Winnipeg census years 1986 - 2006

In addition to its enforcement role, licensing has a second function as a revenue source, as previously mentioned. Many dog tags are still marked with the initials “DTP”, meaning ‘dog tax paid’. This dog tax—now referred to as a licensing fee—is used in many jurisdictions to fund the animal control operation. For example, half of the City of Vancouver’s animal services budget, and all of Calgary’s, are funded through dog licensing (author’s personal knowledge as former Manager of the City of Vancouver Animal Services, Vancouver, BC, 2002 – 2008; personal communication with Bill Bruce, City of Calgary Animal and By-law Services, Calgary, Alberta, April, 2003).

Despite these advantages, licensing seems to be under-exploited, as the overall licensing rate was found to be only 25% in 2005, with many jurisdictions falling well below even this level.

The percentage of dogs licensed in each jurisdiction is, however, an estimate only since the denominator (dog population) was calculated using an average national rate of dog ownership (Ipsos-Reid, 2001). Few jurisdictions have empirical dog population data and so they used a number of schemes to estimate their canine population. Some jurisdictions estimated the dog population to be 10% of human population, while others estimated licensing compliance to make the calculation. It seemed most reasonable to apply national figures since there was only a moderate correlation between local estimates and national figures when all jurisdictions were considered together. However, it was noted that Toronto's dog population estimates seemed inordinately low. Perhaps Toronto's dog population is actually lower than other jurisdictions due to the City's large multicultural population. The removal of Toronto's data resulted in a strong correlation between local dog population estimates and estimates based on the national average. This gives a reasonably high level of confidence in the dog population estimates.

Ticketing appears even more underutilized than licensing. In this study, a full-time (40 hour per week) animal control officer issues median of 0.41 tickets each week per 10,000 people. This equates, in a jurisdiction of 500,000 people, to a median of 11 tickets per officer over a one-year period, or less than one ticket per month.

Ticketing rates, however, do not appear to increase with higher per capita staffing, in contrast with licensing rates that do seem to be positively related to increased staffing rates. It is theorized that higher staffing levels lead to a higher probability that dog owners will be approached by an animal control officer to license their dogs. The fact that ticketing rates do not increase with increased staffing rates may reflect differences in the emphasis placed on ticketing and licensing in a given municipality. In five of the seven high-ticketing jurisdictions, animal

control had been provided clear and formal direction to improve by-law compliance through enforcement, a mandate that was supervised closely by those in authority.

Public Education

The literature suggests that public education is a key factor in dog bite reduction (Sacks et al., 2000; Hanna and Selby, 1981; Wright, 1985; Gilchrist et al., 2003; DeKeuster et al., 2005). Although most jurisdictions indicated that they provided at least one form of public education, their reported educational expenditures equaled less than 2% of the overall animal control budget. However, this figure probably does not accurately capture the investment in education since in most jurisdictions (29/35), the educational role is integrated into the duties of enforcement staff, and the questionnaire did not capture information about the amount of time that enforcement personnel spent providing educational services. Consequently, further research is needed to adequately reflect the role of public education and advertising in the reduction of dog bite incidence.

CHAPTER 5 - CONCLUSIONS AND RECOMMENDATIONS

If the Canadian dog bite incidence and the proportion of non-household bites are close to the American estimates, then we must conclude that only about 10% of non-household dog bites in urban Canadian centres are reported to Canadian animal control agencies. This low rate of reported dog bites may explain why the issue does not engender the level of political and organizational commitment necessary to bring about a reduction in dog bite incidence in many municipalities. Moreover, the perception of most of the surveyed animal control managers—that the dog bite problem had remained the same, if not improved, over the five-year period preceding the study—may also preclude any serious investment in strategies to reduce non-household dog bite incidence.

Of the strategies available to animal control, ticketing seems to have the most potential reduce the non-household dog bite rate. Ticketing appears most successful, not as an episodic event but, as an ongoing enforcement practice that is supported by formal organizational policy and sustained over periods of time measured in years or decades.

Dog licensing initiatives appear to raise the rate of dog bite reporting and may also play an important role in reducing dog bites. The contribution of licensing is the identification of dogs and owners, and the subsequent establishment of dog-owner accountability, foundational in an effective and sustainable animal control program. However, without concurrent ticketing, the public may not comply with licensing by-laws. Hence licensing and ticketing are best used together for most effective reduction of the dog bite rate.

Jurisdictions should be prepared, however, to find that the rate of reported dog bites increases during the initial stages of campaigns that include ticketing. Any initial increase in the rate of reported dog bites should subsequently fall as the actual dog bite rate falls.

The authority to issue tickets for by-law non-compliance and the authority to license dogs are within the legal mandate of all Canadian municipalities. Yet in most urban jurisdictions licensing rates appear to be low and ticketing, even lower. The poor usage of these effective and generically-available enforcement tools allows a high dog bite incidence and low rate of dog bite reporting to continue, with consequent risk to the public. Additionally, failure to enforce licensing by-laws represents forfeited municipal revenue that could be invested in programs that ultimately reduce dog bite incidence.

Within the limitations of this study, the data provided no evidence that breed-specific legislation is an effective strategy in reducing the rate of reported dog bites.

Recommendations

1. Committed licensing and ticketing efforts appear to effectively reduce rate of reported dog bites and are within the purview of all municipalities. Therefore, municipalities should use these methods, suitably supported, to reduce the incidence of non-household dog bites. This need not involve an increase in expenditure, but rather a change of philosophy, although in jurisdictions where animal control funding is low, municipalities could use seed money to establish a successful licensing program that would generate revenue to maintain the program.
2. A more coordinated data collection effort, including standard terms and methods, is needed in order to determine the nature and scope of Canada's dog bite issue and so that intervention efforts may be rooted in reliable empirical data.
3. The role of education—as a stand-alone strategy or as an adjunct to enforcement—should be researched further.

4. In light of the lack of evidence of any effect of breed-specific legislation in reducing dog bite incidence, this strategy requires further investigation and analysis.

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APPENDICES

Appendix A

Principal Investigator: Dr. David Fraser
Co-investigator: Nancy Clarke

Re: Survey Questionnaire

We would greatly appreciate your input in a study designed to identify the incidence of dog bites and the effectiveness of possible preventive measures.

This survey, which may take 30 minutes to complete, will assemble statistics on the incidence of reported dog bites to strangers in urban centres in Canada, together with information on municipal strategies designed to promote public safety. By comparing the dog bite incidence and municipal initiatives designed to deal with this problem, we hope to identify which of them appear the most promising.

Nancy Clarke is a graduate student in the Animal Welfare Program at the University of British Columbia. This research will form the basis of her thesis. David Fraser is a professor in the Animal Welfare Program and has 35 years of experience as a researcher and educator of animal behaviour and animal welfare.

The minimal costs of this study are being covered by the UBC Animal Welfare Program which receives funding from the National Science and Engineering Research Council, the BC Veterinary Medical Association, the BC SPCA and other donors on our website at www.landfood.ubc.ca.

You are invited to return the completed questionnaire electronically to nancy.clarke@vancouver.ca. With the completion of the questionnaire it is assumed that your consent to participate has been given. Confidentiality will be maintained by restricting access to completed questionnaires to the principal investigator and co-investigator only and through the use of a code identifier rather than the name of the city or animal control agency on the completed questionnaires.

It is hoped that the information gathered from this survey will contribute to a better understanding of public policy's impact on the incidence of aggressive attacks by pet dogs. Ultimately, this research may provide scientific evidence on which to base public policy. In recognition of the valuable role you play by completing this survey I shall be pleased to provide you with feedback on the outcome of the research.

Should you have any questions or require further information about this study, please do not hesitate to contact Nancy Clarke by telephone (604) 871-6883 or by e-mail. Any concerns about your rights as a research subject may be addressed to the Office of Research Services, UBC, at (604) 822-8598.

Nancy Clarke
Graduate Student

David Fraser
Professor

Animal Welfare Program
Faculty of Land and Food Systems
The University of British Columbia

Investigateur Principal: Dr. David Fraser
Co-investigateur: Nancy Clarke

Re: Questionnaire d'aperçu

Nous apprécierions considérablement votre entrée dans une étude conçue pour identifier l'incidence des morsures de chien et de l'efficacité des mesures préventives possibles.

Cet aperçu, qui peut prendre 30 minutes pour accomplir, assemblera des statistiques sur l'incidence des morsures rapportées de chien aux étrangers aux centres urbains au Canada, ainsi que l'information sur des stratégies municipales conçues pour favoriser la sûreté publique. En comparant l'incidence de morsure de chien et les initiatives municipales a conçu pour traiter ce problème, nous espérent identifier qui d'elles apparaissent le plus prometteur.

Nancy Clarke est un étudiant gradué dans le programme de protection des animaux à l'université de Colombie Britannique. Cette recherche formera la base de sa thèse. David Fraser est un professeur dans le programme de protection des animaux et a 35 ans d'expérience en tant qu'un chercheur et éducateur du comportement animal et de la protection des animaux.

Les coûts minimaux de cette étude sont couverts par le programme de protection des animaux UBC qui reçoit le financement à partir du Conseil "Recherche" national de la Science et de technologie, de l'association médicale Colombie Britannique vétérinaire, Colombie Britannique du SPCA et d'autres donateurs sur notre website à www.landfood.ubc.ca.

Une enveloppe de retour emboutie a été incluse pour votre convenance mais au cas où vous plutôt rempliriez et renverriez le questionnaire électroniquement, svp le E-mail nancy.clarke@vancouver.ca envoyer une copie électronique.

Avec l'accomplissement du questionnaire on le suppose que votre consentement à participer a été donné. La confidentialité sera maintenue par l'accès limiteur aux questionnaires remplis à l'investigateur et à Co-investigateur principaux seulement et par l'utilisation d'une marque de code plutôt que le nom de l'agence de commande de ville ou d'animal sur les questionnaires remplis.

On peut espérer que l'information recueillie de cet aperçu contribuera à une meilleure compréhension de l'impact de l'ordre public sur l'incidence des attaques agressives par des chiens d'animal de compagnie. Finalement, cette recherche peut fournir l'évidence scientifique sur laquelle pour baser l'ordre public. Dans l'identification du rôle valable vous jouez en

accomplissant cet aperçu que je serai heureux de vous fournir la rétroaction sur les résultats de la recherche.

Si vous avez toutes les questions ou avez besoin d'autres d'informations sur cette étude, veuillez ne hésiter pas à entrer en contact avec Nancy Clarke par téléphone (604) 871-6883 ou par E-mail. Tous les soucis concernant vos droites comme sujet de recherches peuvent être adressés au bureau des services de recherches, UBC, (604) 822-8598.

Merci de prendre le temps d'accomplir et renvoyer l'aperçu.

D'Étudiant Gradué
De Nancy Clarke

Professeur
David Fraser

Appendix B

Survey of Animal Control Services in Canadian Urban Centres

I. Demographics

City _____

Population _____ City Area km² _____

Number of dogs you believe to be in your jurisdiction:

In 2003 _____

In 2004 _____

In 2005 _____

How do you arrive at this figure?

Does your jurisdiction have a regular civic census?

Yes No

If yes, are dog-related questions included in the census?

- Always
 Occasionally
 Seldom
 Never

How many dogs were licensed in your jurisdiction?

In 2003 _____

In 2004 _____

In 2005 _____

II. Animal Control Function

The animal control function includes many diverse aspects. Please rank the following categories according to your organization's priorities. 1=highest priority, 5=lowest priority:

- () **Enforcement of by-laws related to the keeping of dogs**
eg patrolling, investigating complaints and writing tickets related to licensing, dogs-at-large, leash laws, dangerous dogs

- () **Sheltering impounded and/or abandoned animals**
eg. provision of food, shelter, exercise and veterinary care

- () **Pet adoption**
eg. placement of abandoned dogs into new homes

- () **Public education and awareness initiatives**
eg. promoting responsible dog ownership, better dog management skills, by-law education, dog bite prevention

- () **Volunteer program**
eg. recruitment and development of volunteers to assist with various aspects of the operation

Total annual budget for animal control in your jurisdiction:

In 2003 _____

In 2004 _____

In 2005 _____

III Enforcement Staffing

Number of staff (full-time equivalency) responsible for enforcement of animal control by-laws:

In 2003 _____

In 2004 _____

In 2005 _____

Do these positions enforce other City by-laws or serve other functions in addition to animal control enforcement?

Yes No

If yes, what percentage of time is spent enforcing animal control by-laws?

- <10%
 10 - 25%
 26 - 50%
 51 - 75%
 >76%

IV. Staff Development

Please outline the minimum educational qualifications of animal control staff:

When recruiting animal control enforcement staff, what are the minimum experience requirements?

Annual expenditure for training and development of animal control staff:

In 2003 _____

In 2004 _____

In 2005 _____

V. Enforcement Information

Please indicate **MINIMUM** fines for the following violations:

	No Fine	Less than \$50	\$50-100	\$101-150	\$151-\$200	More than \$200
Dog Off Leash						
Dog At Large						
Unlicensed Dog						
Dog Chases Person						
Dog Chases Animal						
Dog Bite to Person						
Dog Bite to Animal						

How many dog bites to humans were reported?

In 2003 _____

In 2004 _____

In 2005 _____

How many dog bites to other animals were reported?

In 2003 _____

In 2004 _____

In 2005 _____

How many tickets were written for animal control violations?

In 2003 _____

In 2004 _____

In 2005 _____

Please indicate **MAXIMUM** fines for the following violations:

	No Fine	Less than \$100	\$100-150	\$151-250	\$251-500	\$501-\$500	More than \$501
Dog Off Leash							
Dog At Large							
Unlicensed Dog							
Dog Chases Person							
Dog Chases Animal							
Dog Bite to Person							
Dog Bite to Animal							

VI. Legislation

Does your Province have breed-specific legislation? Yes No

If yes, in what year was breed-specific legislation introduced? _____

Please give the name of the Act and a summary of the breed specific legislation

Does your animal control by-law include breed specific language?

Yes No

If yes, in what year were breed specific by-laws instituted? _____

Please give the name and key details of breed-specific by-laws

In your opinion, how rigorously are these by-laws enforced?

Very strictly Enforced Strictly Enforced Moderately Enforced Poorly Enforced Not Enforced

VII. Public Places

How many public parks are in your jurisdiction? _____

How many public parks within your jurisdiction permit dogs off-leash for some or all of the day?

How many public parks are dedicated exclusively for exercising dogs? _____

VIII. Public Education Information

Please consider the following list of services and supports. Check those which are provided by your City Government or Animal Control Agency to dog owners:

- dog obedience training classes
- seminars, courses or lectures on dog-related topics
- distribution of educational materials (brochures, booklets, website)
- canine behavioural counseling
- dog training service
- by-law education in public school system
- humane (animal welfare) education in school system
- dog bite prevention education
- other _____

Is there a cost (user fee) to citizens for these services?

Yes No Not applicable

Do City or Animal Control Agency staff provide these services?

Yes No

If yes,

How many full-time equivalent staff positions are dedicated to providing direct support and education to citizens concerning the training, care and management of their pet dogs? _____

What are their job titles?

What is the total annual expenditure for dog-related public education, advertising and public relations activities in your jurisdiction:

In 2003 _____

In 2004 _____

In 2005 _____

Please consider the following list of services and supports. Check those which are available to citizens in your community by individuals and agencies other than the City or Animal Control:

- dog obedience training classes
- seminars, courses or lectures on dog-related topics
- educational materials (information brochures, booklets)
- face-to-face canine behavioural counseling
- dog training
- by-law education in school system
- humane (animal welfare) education
- dog bite prevention education
- other _____

We have identified a number of programs and services such as the availability of parks, appropriate legislation and public education, that might be associated with incidence of dog bites. Are there other programs and services which might be helpful in reducing dog bites to strangers? Please give details

IX. Your Insights

We are interested in learning about initiatives taken by your local municipality that have been effective in preventing dog bites. Please describe these measures. When were they introduced and what prompted your municipality to consider them? Any insights that would increase our understanding this issue would be very welcome.

Do you think the dog bite problem has changed in the past five to ten years?

- yes no

If yes, has the dog bite problem become:

- more severe? less severe?

Why the change?

Note: Neither respondents' name nor other identifying information will be included in any presentation or publication of material resulting from this research unless consent is given.

Do you consent to your name, position or other identifying information being used in presentations or publications resulting from this research? _____

Would you be willing to provide more detail if contacted by us? _____

Would you be interested in receiving results of this survey? _____

Animal Control Agency _____

Address _____

Telephone _____ E-mail address _____

(Signature)

(Name – Please print)

Date _____
(Position)

**Sondage sur les services de contrôle animalier
dans les centres urbains canadiens**

I. Démographique

Ville _____

Population _____ Superficie (km²) _____

Nombre de chiens dans votre juridiction:

En 2003 _____

En 2004 _____

En 2005 _____

Comment en êtes-vous arrivés à ces chiffres?

Est-ce que votre juridiction a un recensement municipal?

 Oui Non

Si oui, y-a-t'il des questions au sujet des chiens?

- toujours
- quelque fois
- rarement
- jamais

Combien de chiens fut enregistré dans votre juridiction?

En 2003 _____

En 2004 _____

En 2005 _____

II. Fonction du contrôle animalier

La fonction du contrôle animalier comprend plusieurs aspects variés. Veuillez classer les catégories suivantes selon leur importance pour votre organisation.

1=la plus importante, 5= la moins importante:

- () Exécution des règlements par rapport aux responsabilités en tant que propriétaire de chien ex: patrouille, enquête de plaintes, donner des billets de contravention pour les chiens sans licences, chiens errants, chiens dangereux
- () Fourrière pour les animaux abandonnés ou saisis ex. nourriture, fourrière, exercice et soins vétérinaire
- () Adoption d'animaux domestiques ex. placement de chiens abandonnés.
- () Éducation du public et initiatives de sensibilisation ex. promouvoir ce que sont les responsabilités en tant que propriétaire de chien, quelles sont les règlements, comment prévenir les morsures de chien.
- () Programme de bénévolat ie. recrutement et formation des bénévoles.

Budget annuel du contrôle animalier dans votre juridiction:

En 2003 _____
 En 2004 _____
 En 2005 _____

III. Exécution des règlements

Nombre de personnel (à temps-plein) responsable pour l'exécution des règlements de contrôle animalier:

En 2003 _____
 En 2004 _____
 En 2005 _____

Est-ce que ces personnes ont d'autres responsabilités?

ie. Exécution d'autres règlements municipaux ou autres tâches outre celles de l'exécution des règlements du contrôle animalier.

Oui Non

Si oui, indiqué le pourcentage relié à l'exécution des règlements du contrôle animalier?

- <10%
 10 - 25%
 26 - 50%
 51 - 75%
 >75%

IV. Formation du personnel

Quelle est le minimum d'éducation scolaire requis pour votre personnel de contrôle animalier.

Quelle est le minimum d'expérience requis.

Indiquez les dépenses annuelles pour la formation du personnel de contrôle animalier:

En 2003 _____
 En 2004 _____
 En 2005 _____

V. Information reliée à la mise en vigueur des règlements

Indiquez l'amende MINIMUM pour les infractions suivantes:

		Moins de				Plus de
--	--	----------	--	--	--	---------

	\$0.00	\$50	\$50-100	\$101-150	\$151-\$200	\$200
Chien sans laisse						
Chien errant						
Chien sans licence						
Chien poursuivant une personne						
Chien poursuivant un autre animal						
Chien qui mord une personne						
Chien qui mord un animal						

Combien d'incidents ont été rapportés pour un chien qui a mordu une personne?

En 2003 _____ En 2004 _____ En 2005 _____

Combien d'incidents ont été rapportés pour un chien qui a mordu un animal?

En 2003 _____

En 2004 _____

Combien de contraventions ont été données par rapport aux règlements de contrôle animalier?

En 2003 _____ En 2004 _____ En 2005 _____

Indiquez l'amende **la plus élevée** pour les infractions suivantes:

	\$0.00	Moins de \$100	\$100 - \$150	\$151 - \$250	\$251 - \$500	Plus de \$500
Chien sans laisse						
Chien errant						
Chien sans licence						
Chien qui poursuit une personne						
Chien qui poursuit un animal						
Chien qui mord une personne						
Chien qui mord un animal						

VI. Législation

Est-ce que votre province a une législation pour certaines races de chien considérées dangereuses?

Oui Non

Si oui, en quelle année est-ce que cette législation a été mise en vigueur? _____

Quel est le nom de la loi et expliquer en quoi elle consiste ?

Est-ce que les règlements qui gouvernent le contrôle animalier fait référence aux races de chien dangereux?

Oui Non

Si oui, en quelle année est-ce que ces lois fut instituées? _____

Donnez les noms et une description de ses lois.

D'après vous, est-ce que ses lois sont mises en vigueur rigoureusement?

- très vigoureusement
- vigoureusement
- modérément
- très peu
- pas du tout

VII. Endroits publics

Combien de parc public avez-vous dans votre juridiction? _____

Combien de parc public dans votre juridiction permettent les chiens sans laisse? _____

Combien de parc public sont réservé exclusivement pour l'exercice des chiens? _____

VIII. Enseignement offert au public

Indiquez les services qui sont offerts aux propriétaires de chien soit par la ville, le gouvernement ou l'agence de contrôle aux animaux.

- cours d'obéissance
- séminaire ou conférence sur différent sujets par rapport aux chiens.
- distribution de documents (brochures, livrets, site internet, etc.)
- consultation pour des troubles de comportement canin.
- service d'entraînement pour chiens
- enseignement dans les écoles sur les règlements reliées au contrôle animalier
- enseignement dans les écoles sur le bien-être des animaux
- éducation sur la prévention de morsure de chiens
- autre _____

Est-ce que les gens doivent payer pour ses services?

- Oui Non Non applicable

Est-ce que les employés qui travaillent pour la ville ou l'agence de contrôle animalier sont les personnes qui enseignent et offre les services indiqués ci-haut?

- Oui Non

Si oui,

combien d'employés à temps plein ne font que d'enseigner et/ou de consulter les gens au sujet de l'entraînement de leur chien, les soins à donner, etc. _____

Quels sont leur titre d'emploi?

Quel sont les dépenses annuelles dans votre juridiction reliées à l'éducation, publicité et relations publiques par rapport aux chiens?

En 2003 _____

En 2004 _____

En 2005 _____

Indiquez les services qui sont offerts aux propriétaires de chien dans votre communauté par des individus ou des agences privées.

- cours d'obéissance
- séminaire ou conférence sur différent sujets par rapport aux chiens.
- distribution de documents (brochures, livrets, site internet, etc.)
- consultation pour des troubles de comportement canin.
- service d'entraînement pour chiens
- enseignement dans les écoles sur les règlements reliées au contrôle aux animaux
- enseignement dans les écoles sur le bien-être des animaux
- éducation sur la prévention de morsure de chiens
- autre _____

Nous avons identifiés certains programmes et services (ex. parc pour les chiens, législation, éducation) qui semble réduire l'incidence de morsures de chien. Est-ce qu'il y a d'autres programmes ou services qui pourraient aider à réduire les morsures de chien? Expliquer.

IX. Votre opinion

Nous aimerions recevoir vos idées sur les moyens pris dans votre municipalité pour aider à réduire et prévenir les morsures de chien. Décrivez en détails ces mesures, la raison pour laquelle elles ont été prises et comment elles ont été introduites.

Pensez-vous que le problème de morsures de chien a changé depuis les 5 dernières années?

Oui Non

Si oui, est-ce que le problème a:

augmenté diminué

Pourquoi?

Aucun nom ne sera utilisé dans le rapport de ce sondage sans votre permission.

Est-ce que vous nous permettez d'inclure votre nom ou toute autre information dans la publication du rapport résultant de ce sondage?

Oui Non

Est-ce que vous seriez intéressé à fournir de plus amples détails si on vous contactait? _____

Désirez-vous recevoir les résultats de ce sondage? _____

Nom de la personne qui a répondu au sondage _____

Titre d'emploi _____

Nom de l'organisation _____

Adresse

Code postale

Téléphone (____) _____

Courriel
