

Sterilization and Contextual Factors of Abandonment:
A Study of Pet Overpopulation

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Running Head: Overpopulation

Abstract

In an effort to determine what can be done to curtail current levels of abandonment, the present study examined several factors thought to contribute to pet overpopulation. More specifically, this study examined attitudes and behaviors regarding a number of factors related to unwanted and abandoned companion animals. Attitudes and behaviors related to pet sterilization, allowing pets to reproduce, the purchase price of the pet, and the perceived vs. actual costs and benefits of having a companion animal were all examined.

The present study surveyed randomly selected households and randomly selected registered dog owners in upstate New York. The results of the present study revealed prevailing attitudes and a profile of those pet owners who do not spay/neuter their pets, as well as those who allow (either intentionally or unintentionally) their pets to reproduce, and some surprising findings regarding the relationship between the initial purchase price of an animal and the willingness to abandon that animal, as well as perceptions versus actual costs and benefits of pet ownership.

A key to reducing the amount of unwanted pets abandoned and euthanized each year is to gear public education programs to redress those attitudes and behaviors that are helping to contribute to the problems of pet overpopulation. An important question then is, “What specific perceptions, attitudes and behaviors are contributing to this problem?”

The present study examined the perceptions, attitudes and behaviors surrounding factors thought to contribute to pet overpopulation. More specifically, this study examined attitudes and trends regarding pet sterilization, and several contextual factors of abandonment such as intentional or unintentional reproduction of pets by non-professional breeders, the relationship between purchase price and willingness to abandon, and expectations of costs and benefits of pet ownership versus actual costs and benefits.

Overview: Procedure/Sample

A total of 1,000 surveys were sent to both random households and registered dog owners in upstate New York. Seven hundred surveys were sent to Rensselaer and Albany Counties, while an additional 300 surveys were sent to random residents of those counties. Registered dog owners were randomly selected from a list supplied by the New York State Department of Agriculture and Markets. The list contained a total of 27,989 registrations. The total response rate for all surveys was 36%. Forty percent of respondents were male and 60% were female. The median age for all respondents was 44 years.

Background

While it is clear that the numbers are high, it is difficult to obtain a precise figure on the number of companion animals abandoned and euthanized. According to Hoyt (1983) approximately 13.5 million cats and dogs are put to death in the United States annually in shelters and community pounds. The Humane Society of the United States (1987) estimates the number of pets euthanized each year at 7.5 million, while a study by the American Humane Association puts the number at between 7.3 and 11.3 million. Rowan & Wilson (1985) estimate the number of animals euthanized between 8 and 10 million, Mackie (1992)

estimates 7 to 15 million, Thornton (1991) estimates 16 million, and Carter (1990) estimates 13 to 17 million. Arkow (1994) extrapolated data from nine states to come up with a national estimate of 8.3 million animals sheltered and 5.7 million euthanized every year. On average, for the nine states, 7.6% of the total dog and cat population is sheltered every year and 5.2% is euthanized. The intake rate was found to be higher for dogs, but the euthanasia rates were similar. Arkow also concluded that the rate of animals sheltered is lower than that found in studies from the 1980's which report rates in the high double digits.

Sterilization

One strategy for reducing pet over-population is to offer low cost sterilization to pet owners. Veterinarian groups have often expressed opposition to low-cost sterilization, insisting that it primarily affects *where* owners get their pets sterilized, but it does not cause many people who would not otherwise do so to get their animals sterilized. Obviously, an alternative interpretation to these groups' resistance is that it directly affects their revenues.

Rowan & Williams (1987) have presented some mixed evidence on this subject. In Los Angeles, the percentage of licensed dogs sterilized jumped from slightly more than 5% to around 50%, however the sterilization rate has dropped slightly since then, to 48%. During the same period, the number of dogs impounded by the shelter also dropped dramatically. Rush (1985) attributes the improvement to low-cost sterilization and differential licensing (i.e. charging more for licenses for non-sterilized animals). However, Rowan & Williams (who, incidentally, are both associated with a veterinary school) present a possible alternate interpretation relating to changing demographics in the city which, in turn, lead to a decline in overall dog ownership. Their logic may explain some of the drop in licensing, but it does not explain the change in sterilization figures. The authors also argue that the clinic was not responsible for most of the change in sterilization figures since they estimate that 8,000 out of approximately 75,000 sterilizations were performed by the clinic and the rest by private veterinarians. However, their estimates of the total number sterilized are based on the possibly inaccurate assumption that dogs switching owners or going into shelters are licensed in the same proportion as dogs in general. The authors also cite a study by Grayhovens (1984) as support for the view that a licensing drive did not increase the number of animals spayed and neutered.

However, their logic again appears faulty here, confusing the number of dogs spayed/neutered with the percentage. The authors state that since the number of dogs licensed went up 48% but the percent sterilized only went up 4%, spay/neuter behavior was not effective. However, the study says just the opposite if one assumes that the marginal owner (the ones affected by the drive) had a lower spay/neuter percentage than owners who normally license their dogs. The authors did cite evidence from shelter statistics between 1980 and 1985 indicating that differential licensing programs were correlated with a reduction in animals handled.

Other evidence on the sterilization issue includes a study in Colorado Springs by Arkow (1985). The presence of a sterilization program in that community was correlated with a significant decline in the number and percentage of the total pet population handled by the shelter.

Schneider (1975) also argues that low-cost neutering services are not a good solution and instead advocates that controlling demand is the key to reducing the excess dog population. However, his conclusion is partially based on the high turnover rate found for animals in the study area. In addition, older animals were found to have higher spay rates (but of course this is logically inevitable since once an animal is spayed it stays spayed, unless spayed animals die at a higher rate). From these facts Schneider concludes that owners are reluctant to spay animals because they may not stay long in the household. The flaw in this logic (other than its weak factual basis) is that owners who are reluctant to spay/neuter animals for this reason may be particularly sensitive to the price of the procedure since they allegedly are making a probability-based cost-benefit calculation.

In a popular publication associated with the veterinary field MacKay (1993) stated, "The belief that cost is an important barrier to sterilization has never really been borne out in any major survey" (p. 920). Yet a page earlier, the author states that comparison shopping has made the surgery unprofitable for veterinarians, which would seem to imply that consumers are very price sensitive for this service. The author also estimates that 95% of sterilizations are done by private practice veterinarians. Even if we accept the author's claim that no major survey has shown that cost affects sterilization rate, he does not cite any evidence showing the opposite is true, and in the absence of such evidence, it would appear to be reasonable to assume that cost does indeed play some role.

According to Preece & Chamberlin (1993), some evidence exists that low cost clinics do not substantially increase the number of spay/neuter procedures performed. However, it is unknown precisely what evidence they are referring to. The authors estimate the full-price cost of a spay/neuter procedure as approximately \$100. Though in fact, this must be a very rough average since the price of the two procedures (spaying vs. neutering) have significantly different costs.

Hodge (1976) argued that the decrease in pet reproduction during the early 1970's was evidence that low-cost spay-neuter programs work, although the author also credits enforcement and education programs. He also points out that sterilization can reduce behavioral problems which are a major cause of pet abandonment.

Spay/neuter: Attitudes and trends

The present study asked respondents if they spayed or neutered their dog. Surveys also asked respondents about the decision to spay or neuter their animal; whether cost affected that decision, and how much of a change in cost it would take to change their decision. Of those who responded to the question, 86% had their dogs spayed or neutered or the dog was already spayed or neutered when they purchased it. Two variables were found to be significantly related to spay/neuter behavior using a probit model. Results of the probit model are shown in Table 1, with the spay/neuter variable = 1 if the dog was spayed/neutered and zero otherwise. Females were more likely to spay or neuter their animal and more highly educated people were more likely to spay or neuter their animal. Both of these trends were highly significant. No other variables were found to be significant when added to the multiple probit regression, though the price of the dog and whether somebody lived in a single-family home or multiple residence building were significant when analyzed in isolation.

Insert Table 1 Here

Respondents who did not spay/neuter their animal were also asked to answer a free response question explaining why they did not have their animal spayed/neutered. The results of this question are shown below. The most common reason given was that the dog either would or might be used for breeding, with

about a third of respondents giving this response. The cost of procedure was cited about 15% of the time.

Occurring 15% of the time were responses indicating that the respondent had some issues with

spaying/neutering the dog such as the belief that the procedure was a form of mutilation.

Insert Table 2 Here

Table 1

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Sex (female=1)	0.676782	0.149882	4.515434	0.0000
Education	0.15204	0.029332	5.183461	0.0000
Log likelihood	-151.622			
Obs with Dep=1	273			
Obs with Dep=0	62			
Variable	Mean All	Mean D=1	Mean D=0	
Sex (female=1)	0.602985	0.652015	0.387097	
Education	3.510448	3.553114	3.322581	

Table 2

Reason for not Spaying/Neutering Animal	
May use dog for breeding	33.3%
Cost of procedure	15.2%
"Wanted dog the way God made him", did not want dog mutilated or simply "did not want to"	15.2%
Too young	9.1%
Not necessary/indoor dog	6.1%
Show dog	6.1%
Would give puppies to good home	3.0%
Health reasons	3.0%
No reason given	9.1%

Respondents who did not spay/neuter their dog were asked if money was a factor in their decision. A total of 27% of respondents reported that money was a factor in their decision. Respondents were also asked how inexpensive the spay/neuter procedure would need to be before they changed their mind. The following chart shows how many of those who report price is a factor would spay/neuter their animal as price goes down. The cumulative frequency curve can be interpreted economically as a demand curve. However, it should be noted that only those people who do not spay/neuter their animal at the current market price and would consider spaying/neutering their animal at a different price are included in the curve.

Insert Table 3 Here

Currently, chemical spay/neuter procedures that require a regular injection rather than a one-time surgery are being tested. One such pilot program in Arizona has been funded in part by the Toby Fund. Respondents who did not have their dog spayed/neutered were asked if their decision would change if chemical sterilization was an option available to them. Of those who responded to the question, 56% reported that it would make a difference. If the six people who did not respond to the question are defaulted to assume that they would answer "no", then 45% of those who did not spay/neuter their dog would change their mind if a chemical procedure were available.

Respondents were also asked a free response question to determine whether anything could be done differently to change their decision to spay/neuter their dog. Little additional information was gained from the responses. Most (57%) of respondents who answered the question indicated that nothing would change their mind. The second most common response was that reduced cost would change their mind (30%). The only other recurring response was that 13% respondents indicated they would spay/neuter their animal if there were other health benefits.

Randomly selected segments of the population were sent biased surveys. One type of biased survey contained a paragraph about the implications for dog overpopulation and the importance of spaying/neutering an animal. The purpose of the biased surveys was to see whether they would significantly affect reported future behavior. The biased survey would then be used as a proxy for the potential benefits of a public education campaign to encourage spay/neuter behavior.

Table 3

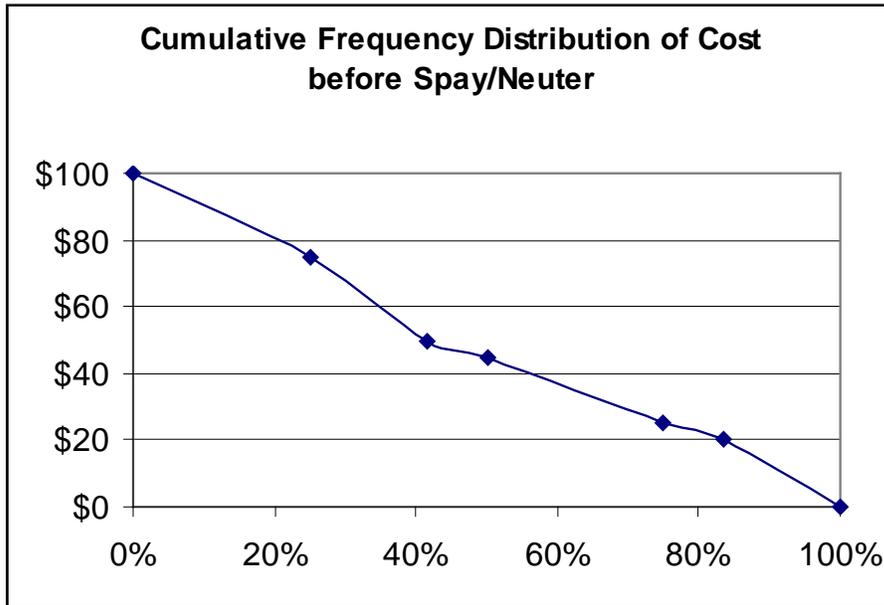


Table 4

	Frequency in Spay-Biased Population	Frequency in Core Population	p-value
Will spay/neuter if price reduced	100.0%	17.7%	0.00%
Change if chemical spay/neuter	88.9%	57.9%	0.73%
Would definitely not change mind regarding spay/neuter	0.0%	9.8%	12.70%

Table 5

	Professional Breeder	Neighbor/ Friend	Pet Shop	Animal Shelter	Stray	Born in Home	Advertisement
Behavior problems	33.9%	24.4%	22.7%	42.2%	25.2%	11.7%	38.8%
Change in Lifestyle	16.9%	30.6%	38.6%	26.8%	21.9%	18.0%	40.7%
Disease or old age	24.5%	10.0%	6.8%	12.3%	10.5%	5.3%	5.5%
Can no longer afford	1.8%	8.1%	4.5%	4.1%	5.6%	5.3%	1.8%
Too large	1.8%	3.0%	0%	3.0%	4.0%	2.1%	1.8%
Too many animals	3.7%	9.5%	4.5%	5.1%	10.5%	46.8%	5.5%
Time/responsibility	15.0%	11.8%	22.7%	2.0%	19.5%	9.5%	3.7%
Other	1.8%	2.3%	0%	4.1%	2.4%	1.0%	1.8%

The results for the spay/neuter biased surveys showed a significant effect on reported future behavior. More respondents who did not spay/neuter their animal receiving the biased survey reported that they would be willing to spay/neuter their animal if the price were reduced. In addition, more respondents receiving the biased survey also reported being willing to change their behavior if a chemical spay/neuter option was available. Fewer respondents who did not spay/neuter their animal in the biased population reported that they would definitely not change their spay/neuter behavior in the future, although this last difference was not significant. The significance levels for all values was obtained by using the binomial distribution with the null hypothesis that the biased results are obtained as a random sample from a population with the same composition as the core.

Insert Table 4 Here

Contextual factors of abandonment and overpopulation

Abandoned animals are a contributing factor to animal overpopulation. The present study examined three factors hypothesized as contributing to abandonment of pets: (1) the purchase price of the pet, (2) pets allowed to reproduce (either intentionally or not) by private pet owners, and (3) mismatch of expectations versus reality of pet ownership: perceived costs and benefits.

Reason for pet abandonment

Before examining the results of the present study, a look at the findings of studies focusing on abandonment is in order. According to a survey studying why people abandoned companion animals to a shelter done by Arkow & Dow (1984), only 6.3% of the people abandoned their animals for financial reasons. For dog owners,, almost half (46.8%) of the animals abandoned to the shelter were obtained from friends or neighbors while only 5.7% came from professional breeders and 4.7% came from pet shops. Of the dogs obtained from friends and neighbors, 83.2% had been obtained for no cost and almost half (46.9%) were obtained while under twelve weeks of age. Over sixty-three percent of these animals were disposed of within a year.

Among dogs from all sources, 68.3% were obtained without any monetary cost. In addition, the authors found a relationship between the cost of the dog and the length of time a dog was kept, with more expensive dogs being abandoned on average after a longer period of ownership. For example, dogs costing over a hundred dollars stayed with their owners an average of 36 months while dogs obtained for free were abandoned on average after only 17 months. The authors concluded that higher investment in an animal may cause owners to be more reluctant to abandon it. This conclusion is a reasonable interpretation of the data and is consistent with the findings of other studies. However, it is difficult to reconcile such conclusions with economic preconceptions of rational decision making. Under such a model the cost of buying a pet is considered a sunk cost and should not have a bearing in itself on any later decisions regarding keeping or abandoning the pet. In addition, even for a pet costing a relatively high amount such as several hundred dollars, the long-term financial costs of ownership are far larger than the purchase price. Therefore, the impact of purchase price should be minor even if it is not viewed as a sunk cost.

There are possible solutions to this dilemma that do not contradict the assumption of rationality. Owners of an expensive dog may expect their dog has resale or breeding value. There may be basic differences in the personal characteristics and perceptions of companion animals between owners who obtain free versus higher-priced pets. Purchasers of higher-priced animals may also be more able to pay for training to solve animal behavior problems and may be less likely to have space problems due to lack of a yard or difficulties with a landlord since they probably are more likely to own homes. However, it is also quite possible that the relationship between animal price and abandonment is due to irrational decision making. The *perceived* value of the animal may be higher when the owners pay to obtain it.

The same study splits the reason for animal surrender (first column) by the source in which the animal was acquired (top row) with the following results:

Insert Table 5 Here

Over all, the top two reasons for abandonment were “behavior problems” and “changes in lifestyle”. There are many interesting observations that can be made regarding the differences in reasons for different sources. For example, people who get their pets from breeders seem especially prone to give up their pet

when it becomes old or diseased. Not surprisingly, people who own animals that were born at home are particularly prone to give up these animals because they have too many animals already.

It is also interesting to note that animals coming from shelters have the highest percentage surrendered for behavioral problems. This may be because these animals quite possibly were turned in to the shelter for behavioral problems to begin with or it may be that the animal's history of prior abandonment may have led to distrust, fear, and future behavioral problems.

A study by Miller et al. (1996) of animals surrendered to a shelter in Ohio also found behavior problems to be a major cause of abandonment. Their data indicated that 30% of dogs were surrendered for behavior problems which included hyperactivity, housebreaking, biting, and destructive chewing. The second most common reason for animal surrender was time/work/cost (21%), followed by moving (19%), other (12%) owner ill (9%), litter (5%), and pet ill (4%). It should be noted that in this study as well as all other studies where the reason for abandonment may be given at time of surrender to a shelter that there may be a tendency for people to state what they think the shelter wants to hear.

Consistent with other studies on the subject, the authors found that dogs originally purchased from private owners and shelters were generally more commonly surrendered and that the animals tended to be young with 67% of dogs under 2 years of age. The authors also concluded that most of the reported behavior problems were part of the pet's normal expected behavior and that education was the real solution to the general problem. The authors also suggest loans for pet deposits when pet owners seek apartments, and educating landlords.

Patronek et al. (1996) improved the insight from studies of owners abandoning a companion animal to a shelter by selecting a similar control group to see how those who abandon pets compare to other pet owners. The authors then created a logistic model to predict pet abandonment. Factors that explained the highest proportion of pet relinquishment included not participating in obedience classes, a lack of veterinary care, owning a sexually intact dog, unrealistic care expectations, and inappropriate elimination. However, many other factors were also related to relinquishment including obtaining animals from shelters, keeping pets in crates, or acquiring pets at more than six months in age. More expensive pets were also less likely to be relinquished.

Kidd, Kidd, & George (1992) contacted a group of people adopting pets from a shelter six months following the adoptions. Those who rejected their pets in the first six months were significantly more likely than the typical adopter to be male, were more likely to be first-time adopters, and were more likely to be parents.

The authors also asked owners turning their animals in to a shelter questions to assess their knowledge regarding pets. Responses to two questions were particularly interesting. Just under six percent of dog owners and 8.3% of cat owners did not know that it can cost more than \$100 a year to maintain a pet. Additionally, only 37.8% of dog owners and 45.3% of cat owners said the statement that "Animals are better off having a litter before being spayed" was untrue.

In an extensive study of animals abandoned by people to shelters, Salman et al. (1998) found that the most common reasons for relinquishing dogs were Housing Issues (29.1%), followed by Behavior-other (28.8%), Human Lifestyle (25.4%), Requests for Euthanasia (16.0%), and Human Preparation-Expectation (14.6%). The authors found that the average purchase price of dogs abandoned to shelters was \$48.75 (6.5% were free) and \$9.67 for cats (15% were free). Forty-six percent of dogs surrendered had been owned for less than a year. The response "Housing issues" appears to be a more common cause of surrender in this study than prior studies. This may be due to changes in behavior over time, it may be due to the structure/tabulation of the questionnaire, or it may be due to the survey group.

In a separate article relating to the same study (Scarlet, et al., 1999), the authors looked more depth at selected health and personal issues which made up 27.1% of dog relinquishments and 35.1% of cat relinquishments. These reasons included (in order of number of times cited for dogs): no time for pet, owner personal problems, allergies in family, child-pet conflict, new baby, divorce, owner traveling, owner deceased, owner pregnancy, and unwanted gift. The topic of uncertainty will be discussed in more detail later, but it should be noted that most of these reasons generally fall under the category of "changes or uncertainty" in the state of nature for the owner.

A third article (New et al., 1999) relating to this same set of national survey data focused on relinquishment due to moving, which was the most common reason for abandoning dogs. About 41% of dogs and cats in the study were given away due to moving. Other reasons reported included landlords or other household members (parents, roommates) as secondary causes for relinquishing the animal. Thirteen

percent of dog owners reported physical characteristics (such as lack of a yard or inadequate space) as a secondary reason for relinquishing the animal.

According to a survey by the National Animal Control Association (1981), the greater the cost of a dog, the longer it was likely to be kept, with over two-thirds of unwanted dogs being obtained for free. This is consistent with other research linking cost of an animal to abandonment rates.

A study by Upton (1992) in Australia found the most common reason for relinquishing adult dogs to be "shifting house" (20%) followed by "biting" (17%), "uncontrollable" (14%), "fence jumper" (8%) and "veterinary health problems" (7%). The author also found that most adult dogs admitted to the shelter were under two years of age. This is consistent with other studies that find abandoned animals tend to be young. For example, Arkow (1987), found that of people bringing their pet to a shelter, 42.2% had owned their animal less than six months and 22.2% had owned the animal from 6 to 12 months.

While studying behavior problems, among the most common causes of pet abandonment, Houpt (1983) found that dogs are the pets that show the greatest number of behavior problems, and the majority of behavior problems that upset the pet-human relationship involve aggression, destructiveness, house soiling, and barking.

Rollin (1983) outlined some of the reasons he heard while working with humane societies from people giving animals to humane societies or pounds, who know that most of those animals will be put to death. The reasons are varied and numerous. They include: owners are moving and don't want the trouble; owners are moving to a place where it is difficult to keep animals; owners are traveling and don't want to pay for boarding; son or daughter is going away to college and cannot take care of it; cannot housebreak or keep off furniture or get to stop chewing or barking; animals are not mean enough or are too mean; animals bark at strangers or do not bark at all; owner is getting old and is afraid of dying before the animal; owners wanted kids to witness "miracle of birth" but have no use for the puppies or kittens; tired of animal or wants a new one; animal no longer cute or getting too big.

In a survey by Cain (1983), 35% of the total respondents surveyed responded affirmatively to the question, "Have you ever not liked a pet and wanted to get rid of him?" Of that 35%, 45% actually had gotten rid of their pet. These respondents gave reasons including: unable to housebreak, pet was

aggressive, pet had a nasty disposition, unable to manage, too big to handle, fear of pet, and the pet was too ill to be treated.

According to Salmon & Salmon (1983), in a survey of Australian dog owners, 15% of respondents felt that their dog had not lived up to their expectations and 6% were sorry to have it. When asked specifically what problems people have had as a result of owning their dog, the following responses were elicited:

"going on holidays" 6%, "restrictions on travel" 5%, "damage and mess" 3%, "medical and health" 2%, "roaming" 2%, "barking" 2%, "fighting with other dogs" 1%, "veterinary accounts" 1%, and "puppies" 1%.

In a study of people who had brought their animal in for treatment of behavioral problems, Voith (1983) found that reasons for people not giving up their pet mostly involved loving or being attached to their pet (55% of respondents). Other responses included humanitarian concerns such as responsibility for the pet. Others simply said that getting rid of the pet was not a consideration. No significant differences were found between dog and cat owners nor were differences based on family structure.

Although Voith (1983) does not give any evidence to show how people reach the decision to get rid of their pets, she does assume that people reach that conclusion through some sort of cost-benefit analysis. According to Voith, owners can recognize their attachment to a pet and at the same time acknowledge that it is causing them inconvenience, financial or social expense, or emotional stress. Voith goes on to say that when owners feel that the cost or disadvantage of keeping a pet outweighs the benefits or advantages, they will decide to get rid of the pet. However, this decision is rarely made without regret or sorrow.

Pets allowed to reproduce

As indicated in the previous studies, private owners who either intentionally or unintentionally allow their companion animals to reproduce help to contribute to pet overpopulation and, consequently, to abandonment. In the present study, the birth rate of dogs of private owners was examined. For all populations, there were 0.0779 litters per dog in the owned population and 0.115 litters per household.

The survey was also used to estimate how many dogs enter the owned population from each source every year. The distribution of dogs by source for the random and total survey population is shown below.

Insert Table 6 Here

Table 6

SOURCE	RANDOM POP	TOTAL POP
Other pet owners	36.9%	27.1%
Shelters	25.0%	29.3%
Strays	3.6%	8.7%
Pet Breeders	26.2%	25.3%
Pet Stores	8.3%	9.7%

Table 7

	All respondents	Breeding population	Significance
Number of dogs	1.46	2.94	3.7%
Donations to animal causes	\$82.90	\$32.40	NS
Price of Dog	\$210	\$150	NS
Dollar cost vs. expectations	2.6	2.88	0.4%
Time/hassle vs. expectations	2.75	2.94	9.6%
Benefits vs. expectations	1.96	2.35	8.6%
Ever abandoned an animal	7%	12%	NS
Respondent % male	35%	31%	NS
Age of respondent	48.2	42.9	NS
Income	\$68,868	\$52,214	3.8%
People in household	2.74	3.25	NS
Education Level	3.53	3.65	NS
% Urban	24%	20%	NS
% Rural	35%	31%	NS
% Suburban	41%	49%	NS
% Living in Multiple Residence	12%	11%	NS

The birth pattern for privately owned animals is noteworthy. First, it appears that the message about being a responsible pet owner by not contributing to unneeded births has generally gotten through to most of the population. Nine out of ten pet owners reported that they spayed or neutered their animal (spay/neuter issues will be discussed in more detail later), and only five percent of dog owners report having any litters born to their dog. This may seem to indicate that the overpopulation problem may not be that serious a problem at all, but a closer look at the numbers reveals that this five percent can make a large difference in the size of the pet population. Those pet owners that did allow their animals to have litters reported not just one litter, but 2.5 litters birthed on average in their household, with some households reporting as many as 10 litters birthed. In addition, 7.2 puppies were reportedly born per litter. So when these factors are added together, the population of owned animals generates about 0.9 new dogs born per dog-owning household or about 0.6 new dogs per existing dog. It should be noted that if anything, this figure is probably slightly lower than the actual birth rate since there is evidence that social desirability had an affect on the survey results (i.e., respondents seemed to understate behaviors that the researcher or society in general may view unfavorably). Based on these figures, it appears that dog owners in the general population produce enough new animals to satisfy most of consumer demand. When dogs born to strays, pet breeders, and through pet shops are added to this figure, it is not surprising that there are more dogs born than the amount demanded by humans. It also becomes quite clear that if a program makes even a small dent in this 5% of the population whose dogs reproduce, the impact can be quite powerful.

An important question then becomes, "Who are the people that either intentionally or unintentionally breed animals?" First, it should be noted that these dog owners are not necessarily people who own purebred dogs and who are intentionally breeding their animals. The exact number of animals giving birth that were pure bred is difficult to say with precision since the source of an animal on the survey includes "gift", "private owner", and other options where the purebred status is not clear. But it should be noted that only about 25% of the animals that had litters came from breeders and only 25% of the animals having litters cost more than \$100.

The following chart compares the general profile of households where dogs have had puppies ("breeding population" in the chart) to all households responding to the survey. The significance level uses a 2-tail t-test for all numerical data. Percentages in various categories in the breeding population were

tested to see if they were likely to occur at random from the total population using the binomial distribution. If the probability was greater than 10% it is listed as not significant ("NS"). The three questions about costs and benefits versus expectations use a five point scale where low numbers indicate more costs/benefits than expected, a three indicates costs/benefits match expectations, and a five indicates much lower costs/benefits than expected. The education level uses categories with a higher number indicating a higher education level.

Insert Table 7 Here

Not surprisingly, the number of dogs owned in households where litters were born was larger on average than in the total sample, and this difference was significant. Households having litters gave less to animal causes, rated both the benefits and costs of ownership as lower relative to expectations, were younger, lower in income, had more people in the household, were more likely to classify their residence as suburban, and abandoned their animals more frequently, though many of these differences were not significant. The only statistically significant differences at the 5% level were in number of dogs, income, and monetary costs versus expectations.

The fact that people breeding their animals had significantly lower incomes could be interpreted as evidence that the cost of the spay/neuter procedure is deterring some people from having this procedure done for their dog and that some of these households later produce new litters. However, this is far from the only interpretation of this finding. It should be kept in mind that of all demographic questions, "income" had the highest percentage of people refusing to respond and that among those who did answer the question, income was reported somewhat higher than the census bureau's regional median. It may be the case that a willingness to admit to breeding animals on this kind of survey is a sign of truthfulness and lack of social desirability bias and that these respondents have a lower average income because they report income more honestly. Two other statistical differences support the view that these respondents are more forthcoming with information (though these figures are not statistically significant in themselves). Respondents who reported birthing litters also reported income 90% of the time rather than about 70% of the time for the total population. In addition, respondents who reported birthing litters also reported more

often abandoning an animal to a shelter or to the wild (though this last statistic also has other likely explanations).

Households that gave birth to litters also reported significantly lower dollar costs relative to expectations, and marginally significantly lower non-monetary costs and benefits. This finding is difficult to explain. It is possible that these owners have a different relationship with their animals, spending less money (for example, not paying for spay/neuter procedures) and time with their dogs. It is also possible that since some of these owners are intentionally breeding purebreds, that these owners have a high level of experience and therefore they are less likely to report greater costs/benefits than expectations (it should be noted that in all cases, average costs/benefits were above expectations).

Table 8 shows the distribution of the source where respondent's who reported having litters got their animals compared to the total population of respondents. The only difference worthy of note is that there are no "found animals/strays" in the breeding dog population, although this sub-population was small enough that this result could easily have happened by chance.

Insert Table 8 Here

A common finding in the companion animal literature is that lower priced and free animals are more likely to be abandoned. Some researchers have taken this to imply that the actual act of paying money for an animal directly causes a greater feeling of investment and a reduced willingness to give that animal up (some shelters have used this as a reason to charge more for animals). However, there are many alternative explanations that could cause this correlation including differences in attitudes towards animals by socioeconomic class, which may also be associated with purchase price (higher income people are also less likely to have space problems or landlord problems and are more able to pay a professional to remedy behavioral problems).

The present study did not find any evidence of a relation between purchase price and any indicator of the owner's perceived value of the animal or willingness to abandon. One measure of a dog's perceived value from the survey is the amount people are willing to accept in trade for their animal, assuming the dog's welfare was not an issue. This study did not find a significantly positive relationship between a dog's purchase price and the amount an owner would accept for that dog. In fact, if anything the relationship was

negative, though it was not significant. Using the free response version of the Willingness To Accept (WTA) question, the regression coefficient with price as the dependent variable and WTA as the independent variable was -0.0000054 with a t-statistic of -0.73004 and a p-value of 0.4677. Using the “yes or no” WTA answers with the dollar amounts predefined similarly resulted in a negative coefficient, but a p-value that was not close to significance. The table below tabulates some data for various purchase price categories. The percentages in the first column give the percentage of people who are unwilling to give away their dog for any price. As the table indicates, the higher the purchase price, the lower the percentage of people who believe their dog is too valuable to put a price on. This is consistent with the negative coefficient in the regression equations discussed above, but inconsistent with the findings of other studies, though it should be noted that the results here were not statistically significant.

Purchase price of pet

The present study also asked respondents about price sensitivity and substitutability. In particular, people were asked how a change in price of one source to obtain an animal would affect their decision to purchase an animal from that source versus substitute sources. Respondents were also asked contingent valuation-type willingness to pay (WTP) and willingness to accept (WTA) questions.

The second column of percentages is the percentage of people who reported having abandoned a dog. Although the sample of people abandoning an animal is too small for a valid statistical test, it should be noted that there does not appear to be any trend towards more abandonment among owners of lower priced dogs. The final column gives the results of a question asking people if they have ever seriously considered getting rid of their animal. A score of four indicates that the respondent would never consider it while a score of one indicates the respondent considers it seriously and frequently. As shown, there is no clear trend here either. A regression using this question as the dependent variable and purchase price as the independent variable also was not statistically significant. A probit regression using the probability of animal abandonment as the dependent variable also showed no relationship with price.

Insert Table 9 Here

The validity of the question regarding how often/seriously people consider getting rid of their companion animal was tested by using a probit regression to see how this question related to actual abandonment. As shown below, there was a highly significant relationship between thinking about getting rid of an animal and actually doing so. (The reason the relationship is negative is because lower scores indicate thinking more frequently and seriously about getting rid of a companion animal on the survey.)

Insert Table 10 Here

Other variables associated with a higher rate of abandonment using a probit regression included sex (with females abandoning less), income (with higher income associated with less abandonment), and the number of years the dog was owned (with dogs owned longer being associated with less abandonment). The results of the probit regression are shown below. The source where the dog was obtained was not a significant predictor of abandonment, nor was the price of the dog.

Insert Table 11 Here

Perceived costs and benefits of companion animals

It was hypothesized in the present study that costs and benefits of animal ownership are greater than expected. There has been evidence to support this statement. In a study on abandonment Miller, et al. (1996) asked respondents a question about the daily benefits and daily problems of the pet. With a score of 1 meaning "a little" and a score of 2 indicating "quite a bit", the mean benefit/mean problem of dogs surrendered was 1.9/1. Although these results were lower than those found in an unrelated study of older pet owners (which yielded benefits/problems of 2.2/0.80), it is interesting to note that the benefits reported still appeared to outweigh the problems of ownership, even when the owner surrendered their companion animal.

For every category except grooming, the problem was less severe than the average expectation (more people reported "less problems" than reported "more problems"). If problems are generally less than expected, it could be the case that many people who currently do not own pets could potentially be satisfied pet owners. They may simply not own pets because they overestimate the costs of ownership. But it

should be noted that even if there were more positive surprises than negative surprises, there are still a fairly large percentage of people reporting more problems than expected.

Other researchers also found that pet ownership can have unanticipated results, including family conflict. Cain (1983) reports 60 % of respondents had disagreements with family members over their pets involving discipline, pet care, or the space used by their pets.

The concept of perceived costs and benefits was tested in the present study by asking respondents if the costs and benefits of animal ownership were greater than anticipated.

Table 8

SOURCE	TOTAL POP	BREEDING POP
Other pet owners	27.1%	28.6%
Shelters	29.3%	35.7%
Strays	8.7%	0.0%
Pet Breeders	25.3%	28.6%
Pet Stores	9.7%	7.1%

Table 9

	% Unwilling to Give Price	% Abandoning Animal	Score on "Getting Rid of" Question
Purchase Price < \$100	21%	7%	3.13
Purchase Price > \$100	20%	4%	3.67
Purchase Price > \$200	18%	4%	3.5
Purchase Price > \$300	17%	4%	3.5
Purchase Price > \$500	16%	6%	4

Table 10

Variable	Coefficient	Std. Error	t-Statistic	Prob.
<i>GETRIDOF</i>	-0.745368	0.06426	-11.5993	0.0000
Log likelihood	-77.23437			

Table 11

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SEX(female=1)	-0.61974	0.21877	-2.83284	0.005
INCOME	-0.008748	0.0026	-3.36483	0.0009
YEARS	-0.141381	0.034804	-4.0622	0.0001
Log likelihood	-63.83143			

Table 12

Problem Area	More problems than expected	Less problems than expected
Housebreaking	15.1%	31.5%
Discipline	17.8%	27.0%
Feeding	6.4%	23.7%
Behavior within family group	10.6%	22.3%
Location/Space/Territory	11.9%	19.7%
Grooming	18.1%	17.1%
Cleaning	14.5%	16.7%

Table 13

	Dollar Costs	Non-monetary Costs	Benefits
Much higher than expected	14.0%	8.7%	46.0%
Slightly higher than expected	14.6%	15.2%	15.4%
About what I expected	69.9%	71.6%	35.6%
Slightly lower than expected	0.9%	1.8%	2.4%
Much lower than expected	0.6%	2.7%	0.6%

Table 14

<i>Regression Statistics</i>						
Multiple R	0.41804644					
R Square	0.17476282					
Adjusted R Square	0.16709808					
Standard Error	0.60679856					
Observations	327					
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	3.55141778	0.172481075	20.59019	9.29E-61	3.212089	3.890746
Dollar Cost	0.04537886	0.045254435	1.002749	0.316732	-0.04365	0.13441
Non-monetary cost	0.18288452	0.046255957	3.953751	9.46E-05	0.091883	0.273886
Benefits	-0.228719	0.034693235	-6.59261	1.76E-10	-0.29697	-0.16047

Table 15

<i>Regression Statistics</i>						
Multiple R	0.13549359					
R Square	0.01835851					
Adjusted R Square	0.0092411					
Standard Error	0.24972532					
Observations	327					
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	-0.0259732	0.070983839	-0.3659	0.714677	-0.16562	0.113676
Dollar Cost	-0.000361	0.018624266	-0.01938	0.984546	-0.037	0.036279
Non-monetary cost	0.00948627	0.019036439	0.498322	0.618596	-0.02796	0.046937
Benefits	0.03463935	0.01427785	2.42609	0.01581	0.00655	0.062729

Table 16

Variable	Coefficient	Std. Error	t-Statistic	Prob.
COSTDOL	-0.277375	0.11747	-2.36123	0.0188
COSTTIME	-0.310617	0.102732	-3.02358	0.0027
BENEFITS	0.050618	0.092193	0.549042	0.5833
Log likelihood	-86.84111			

Table 13 indicates how costs and benefits compared to expectations. For costs, most people reported about the same costs as expected, while for benefits most respondents reported higher benefits than expected, with almost half reporting much higher benefits than expected.

There are some important observations from these results. The first is that as predicted, and in opposition to a simple rational expectations view of companion animal purchasing behavior, both costs and benefits are skewed in the direction of being higher than expected. In addition, the average benefits are more positive relative to expectations than costs relative to expectations. This suggests that if consumers initially purchase a companion animal because they expect the benefits to be higher than the costs, according to the survey results, most consumers should be even more satisfied with their purchase than they originally expected. It is also interesting to note that only 3% of respondents reported less benefits than expected, while many more people reported greater costs than expected. This may imply that if unexpectedly high costs or low benefits are to blame for many cases of animal abandonment, it is the costs rather than the benefits that usually negatively vary from expectations.

Insert Table 13 Here

Not surprisingly, as the unexpected dollar costs and non-monetary costs increased and as the unexpected benefits went down, respondents reported more seriously considering getting rid of their animal. This relationship was tested using a multiple regression with the results shown below. The dependent variable in the regression was the question asking people if they have ever seriously considered getting rid of their animal. A score of four indicates that the respondent would never consider it while a score of one indicates the respondent considers it seriously and frequently. Higher numbers for the independent variables indicate lower costs/benefits. Benefits and non-monetary costs were both highly significant while monetary costs were not at the five percent level.

Insert Table 14 Here

A multiple regression was also done using whether an owner had actually given their animal to a shelter or had their animal euthanized for non-medical reasons as the dependent variable, with a one indicating that

they did and a zero indicating that they did not. As indicated, the coefficients were all in the expected direction, with higher unexpected costs and lower unexpected benefits correlated with a higher chance of abandonment, but only the benefits were statistically significant. This may be due to the sample size since only 22 respondents admitted to abandoning or euthanizing their dog (about 6% of the sample).

Insert Table 15 Here

Since the dependent variable in this case is a binary variable, a probit model was also used to evaluate the relationship between the chance of abandonment and costs/benefits with the results shown below. As indicated, the coefficients for costs/benefits were in the same direction as with the multiple regression, but this time both cost variables were significant while benefits were not significantly related to abandonment.

Insert Table 16 Here

Discussion

The present study examined several factors thought to contribute to the problem of pet overpopulation. The findings indicate that there is an opportunity to change popular attitudes regarding several of these factors. More specifically, common beliefs, attitudes and behaviors concerning sterilization, and mediating factors of abandonment such as non-professional breeding, and the costs and benefits of dog ownership were revealed and hold promise for reducing the current overpopulation problem.

Before examining the implications of the findings, the potential shortcomings of the present study should be discussed. Firstly, the reported future anticipated behavior of respondents concerning sterilization, breeding and considering mixed-breeds over pure-breed animals may differ from *actual* future behavior. Secondly, caution should be used when interpreting the results because as with any survey-based research, there may have been a response bias as to who chose to participate in the study. Caution should also be used when generalizing the findings of the present study as the responses from this regionally-based study may not be representative of attitudes and behaviors of pet owners nationwide. It should also be noted that due to the structure of the survey, reported answers for “actual abandonment” were not necessarily for the same dog as reported answers to questions regarding “thinking about abandonment” and costs/benefits of ownership.

Despite the potential limitations of the present study however, there remains a number of important implications for reducing the number of unwanted pets.

There are implications regarding the people who allow non-professional breeding of dogs. The survey results indicate that only a small percentage of the dog owning population allow their animals to reproduce. However, this small group still has a very powerful impact. It generates enough new dogs to supply most of the pet-owning population with new animals (or put another way, it generates enough new dogs to create all of the surplus dog problem). Because of the profound impact this group of dogs owners has on population dynamics, the small size of this group can be deceptive. An example of this is the assumption that programs subsidizing spaying/neutering of animals are ineffective because they appear to impact only

a small segment of the population. As demonstrated in the present study, a small change in spay/neuter rates can have a very large impact.

The results of the present study also give some insight into the profile of this population. Generally, the owners of breeding animals appear to own mixed breed dogs more often as they own purebred dogs. Therefore, the primary reason for letting these dogs reproduce is not to intentionally create more purebred dogs for sale (although this still may be a common reason for allowing the animals to reproduce). Owners of reproducing animals were lower in income and tended to rate the costs and benefits of ownership as lower relative to expectations. However, no other significant differences were found between this group and the overall dog owning population. This may in part be due to a low sample size for this group since this was not the only focus of this study. Because of the importance of this population, gaining more information on the profile and reasons for breeding in this group would be worthwhile for future research.

There are implications for the lack of support found for financial connections and abandonment. This study failed to confirm prior research findings which has implicated a connection between the price of dog and abandonment, with lower priced dogs being more frequently abandoned. Because this study did not focus on surveying people who abandoned their animal, the sample size of abandoners is relatively low. Therefore, the lack of support for a financial connection with actual abandoners here is not surprising. However, there was significant data in the present study concerning how seriously respondents *considered* abandoning their dog. Once again, there was no connection found between considering abandoning a dog and the purchase price of the same animal. This is a more surprising finding. It should also be noted that considering abandoning a dog was found to be a good predictor of actual abandonment, supporting the validity of this survey question. Lower priced dogs also did not result in lower unexpected benefits nor higher unexpected costs.

There were several implications in the present study with regard to the costs and benefits of dog ownership. It was found that both costs and benefits of dog ownership are systematically underestimated. On the surface, this may appear inconsistent with the economic concept of rationality. However, it is only inconsistent with rationality assuming “perfect” information. Systematic bias is consistent with Simon's concept of bounded rationality (Simon, 1959) where economic actors "satisfice" rather than seek an optimal solution. If potential dog owners share a general set of facts or beliefs and this generally available

information does not give all the costs and benefits of dog ownership, then potential owners will consistently underestimate costs and benefits if they do not seek out further information on dog ownership before making a decision.

These greater-than-expected costs may be a cause of abandonment if for some individuals these additional costs are not balanced by greater-than-expected benefits. This may be particularly true if these costs or the perception of these costs vary over time. Abandonment may occur at a critical moment when these costs are perceived to be particularly high (for example right after the dog causes damage in the household). It should also be noted that benefits were rarely lower than expectations, indicating that if abandonment occurs because of a mismatch between expectations and reality, it is more likely the result of unexpected costs that cause abandonment (with monetary costs more commonly being underestimated than non-monetary costs).

Another interesting result is that in general there were more unexpected benefits than unexpected costs. Presumably, the decision to purchase a dog in the first place implies that expected benefits were greater than expected costs. In reality, however, consumer surplus from the purchase was typically even higher than expected.

And finally, there were implications concerning spay/neuter behavior. The results of the survey regarding spay/neuter behavior indicate the potential to change the decisions made by a large segment of the population. According to the survey results, financial incentives are among the most effective ways of changing spay/neuter behavior. There were also a significant number of survey respondents who gave reasons such as, "I wanted the dog the way God made him", or "I gave the puppies to a good home". It is quite possible that the perspectives of many of these people could be changed if public attitudes towards spaying/neutering dogs were changed through public education. The results of the biased version of the survey also suggest that a public education campaign may be effective in changing peoples' perspectives.

In conclusion, the results of the present study offer a number of insights and implications for changing public attitudes and behaviors with regard to several factors associated with pet overpopulation. Perhaps the most important implication is the need for future efforts designed to create greater public awareness about how one's personal actions can directly influence the amount of suffering and death of unwanted and abandoned animals.

References

- Arkow, P. (1985). Animal control, birth control and community education: impacts on Colorado Springs pet population. In A. Wilson & A. Rowan (Eds.), *Proceedings of a Workshop on Animal Control*, pp. 30-48. Boston: Tufts Center for Animals.
- Arkow, P. (1987). The shelter's role in the bond. In P. Arkow, (Ed.), *The Loving Bond: Companion Animals in the Helping Professions*, pp. 287-307. Saratoga, CA: R&E Publishing.
- Arkow, P. (1994). A new look at pet overpopulation, *Anthrozoos*, 7(3), pp. 202-205.
- Arkow, P., & Dow, S. (1984). The ties that do not bind: A study of the human-animal bonds that fail. In R. Anderson, B. Hart, & L. Hart (Eds.), *The pet connection: Its influence on our health and quality of life*. Minneapolis: Center to Study Human-Animal Relationships and Environments.
- Cain, A. (1983). A study of pets in the family system. In A. Katcher & A. Beck (Eds.), *New Perspectives on our Lives with Companion Animals*. Philadelphia: University of Pennsylvania Press.
- Carter, C. (1990). Pet population control: Another decade without solutions? *Journal of the American Veterinary Medical Association*, 197, pp. 192-195.
- Grayhavens, T. (1984). The values of animal control. *Community Animal Control*, May/June:8-9, pp.28-30.
- Hodge, G. (1976). The reign of dogs and cats' or contemporary concepts of animal Control. *Management Information Service Report*, Oct 8(10), pp. 1-20.
- Haupt, K. (1983). Disruption of the human-companion animal bond: Aggressive behavior in dogs," In A. Katcher & A. Beck (Eds.), *New Perspectives on our Lives with Companion Animals*. Philadelphia: University of Pennsylvania Press.
- Hoyt, J. (1983). The animal welfare perspective. In A. Katcher & A. Beck (Eds.), *New Perspectives on our Lives with Companion Animals*. Philadelphia: University of Pennsylvania Press.
- Humane Society of the United States, Pet overpopulation condemns 7.5 million to die, September, 1987.
- Kidd, A., Kidd, R., & George, C., (1992). Successful and unsuccessful pet Adoptions. *Psychological Reports*, 71, pp.551-557.
- MacKay, C. (1993). Veterinary practitioners' role in pet overpopulation. *Journal of the American Veterinary Medical Association*, 202(6), pp. 918-920.
- Mackie, W. (1992). It's time for early age neutering. *Californian Veterinarian*, Nov/Dec, pp.19-21.
- Miller, D., Staats, S., Partlo, C., & Rada, K. (1996). Factors associated with the decision to surrender a pet to an animal shelter. *Journal of the American Veterinary Medical Association*, 209(4), pp. 738-742.
- National Animal Control Association (1981). *Survey to determine why dogs are turned in to shelters*. Colorado Springs, Colorado: National Animal Control Association.

- New, J., Salman, M., Scarlett, J., Kass, P., Vaughn, J., Scherr, S., & Kelch, W. (1999). Moving: characteristics of dogs and cats and those relinquishing them to 12 U.S. animal shelters. *Journal of Applied Animal Welfare Science*, 2(2), pp. 83-96.
- Patronek, G., Glickman, L., Beck, A., McCabe, G., & Ecker, C. (1996). Risk factors for relinquishment of dogs to an animal shelter. *Journal of the American Veterinary Medical Association*, 209(3), pp. 572-581.
- Preece, R. & Chamberlain, L. (1993). *Animal Welfare and Human Values*. Ontario: Wilfrid Laurier University Press.
- Rollin, B. (1983). Morality and the human-animal bond. In A. Katcher & A. Beck (Eds.), *New Perspectives on our Lives with Companion Animals*. Philadelphia: University of Pennsylvania Press.
- Rowan, A., & Williams, J. (1987). The success of companion animal management programs: A review. *Anthrozoos*, 1(2), pp. 110-122.
- Rowan, A. & Wilson, A. (1985). *Animal management and population control: What progress have we made?* North Grafton, MA: Tufts Center for Animals and Public Policy
- Rush, R. (1985). City of Los Angeles animal care and control. In A. Wilson & A. Rowan (Eds.), *Proceedings of a workshop on animal control*, pp. 55-58. Boston: Tufts Center for Animals.
- Salmon, M., New, J., Scarlett, J., Kass, P., Ruch-Gallie, R., & Hetts, S. (1998). Human and animal factors related to the relinquishment of dogs and cats in 12 selected animal shelters in the United States. *Journal of Applied Animal Welfare Science*, 1(3), pp. 207-226.
- Salmon, P. & Salmon, I. (1983). Who owns who? Psychological research into the human-pet bond in Australia. In A. Katcher & A. Beck (Eds.), *New Perspectives on our Lives with Companion Animals*. Philadelphia: University of Pennsylvania Press.
- Scarlett, J., Salman, M., New, J., & Kass, P., (1999). Reasons for relinquishment of companion animals in U.S. animal shelters: Selected health and personal issues. *Journal of Applied Animal Welfare Science*, 2(1), pp. 41-57.
- Schneider, R. (1975). Observations on the overpopulation of dogs and cats. *Journal of the American Veterinary Medical Association*, 167, pp. 281-285.
- Simon, H. (1959). Theories of decision-making in economics and behavioral science. *American Economic Review*, 99, pp. 253-283.
- Thornton, G., (1991). Veterinarians as members of the humane society. *Journal of the American Veterinary Medical Association*, 198, pp.1352-1354.
- Upton, B. (1992). Animal shelter management, animal control and animal welfare. Paper presented at the 1992 First National Urban Management Conference, Brisbane.
- Voith, V. (1983). Animal behavior problems: An overview. In A. Katcher & A. Beck (Eds.), *New Perspectives on our Lives with Companion Animals*. Philadelphia: University of Pennsylvania Press.