A Quantitative Analysis of the Number of Spay/Neuters and Adoptions Required to Reduce the City of Los Angeles Euthanasia Rate to Zero

Prepared by Humane America Animal Foundation

Background

In this paper, we present a rough model that determines the effects of spay/neuter programs, adoption programs, and pet-owner education programs on the number of euthanasias performed by City of Los Angeles shelters. We then estimate the number of spays, neuters, and adoptions each year that will be required to reduce the total annual number of euthanasias performed by city shelters to zero within five years.

The number of euthanasias performed is strictly the number of adoptable animals that enter the shelter minus the number of animals redeemed to their owners minus the number of animals adopted out. To reduce the number of euthanasias, programs need to do one or both of the following:

- Reduce the number of animals entering the shelters
- Increase the number of animals being adopted out of the shelters

Our two primary sources of information about the Los Angeles pet population are the City of Los Angeles Department of Animal Services, and a survey of City of Los Angeles pet owners that we performed in December of 1999 (See our report, [Ref1]). The following table comes from the City of Los Angeles Department of Animal Services:

Dog Intake:
Cat Intake:
Total Intake:
Dogs Adopted:
Cats Adopted:
Total Animals Adopted:
Dogs Redeemed:
Cats Redeemed:
Total Animals Redeemed:
Adoptable Dogs Euthanized:
Adoptable Cats Euthanized:
Total Adoptable Animals Euthanized:

According to our 1999 survey of City of Los Angeles pet owners, we found the following:

Approximate number of owned dogs in the City of LA:	367,000
Approximate number of owned cats in the City of LA:	254,000
Approximate number of fed stray cats in the City of LA:	157,600

Assumptions:

1. Steady state

We assume that the current owned dog and cat populations are in a steady state; that is, the number of animals leaving each population is equal to the number of animals entering each population. We use the FY 1999 statistics reported by the Department of Animals Services as our starting point.
The number of animals leaving the owned pet population is the sum of city shelter intake and deaths due to natural causes. We are implicitly assuming that the number of animals that migrate out of the city matches the number of animals that migrate into the city. Since dogs have an average life span of 12.5 years, we can calculate a natural annual death rate of 0.08. That means that an average of 8% of the dogs in a population will die of natural causes each year. Similarly, the fact that cats have an average life span of 14 years implies a natural annual death rate of approximately 0.07. This gives us a total of 69,944 (= 367,000*0.08 + 44,961-4,377) dogs and 40,717 (=254,000*0.07+23,157-220) cats leaving and entering the owned population each year if no new programs are put into action.

2. Dogs and cats entering the owned population

Based on our survey of Los Angeles pet owners [Ref1], we found that currently owned dogs come from the following sources:

City Shelter Adoptions:	15%
Private Shelter Adoptions:	10%
Friend/Relative/Street/Born at home:	50%
Pet Store or Breeder:	25%

According to the City of Los Angeles Animal Services Department, there were 6,235 dogs adopted out of city shelters during FY 1999. This is about 10% of the animals entering the population. Private shelters report adopting out a similar number of dogs. We will assume that the fraction of people getting dogs from friends, relatives, the street, or at home has increased by 2.5% as has the fraction of people getting dogs from pet stores or breeders. This gives us the following distribution of dogs entering the population this year:

City Shelter Adoptions:	~10%	(6,235)
Private Shelter Adoptions:	10%	(~6,994 (= 69,944*0.10))
Friend/Relative/Street/Born at home:	52.5%	(~36,721(= 69,944*0.525))
Pet Store or Breeder:	27.5%	(~19,234 (= 69,944*0.275))

We use the same technique to analyze the cats entering the owned population that we do for dogs. Our survey of Los Angeles pet owners tells us that currently owned cats come from the following sources:

City Shelter Adoptions:	25%
Private Shelter Adoptions:	10%
Friend/Relative/Born at home:	45%
Street	10%
Pet Store or Breeder:	10%

According to the City of Los Angeles Animals Services Department, there were 3,437 cats adopted out of city shelters during FY 1999. This is about 10% of the animals entering the population. We will assume that the other sources of cats have all increased equally (~4.125%) to account for the lower fraction of animals currently coming from the city shelters and that the following distribution now approximately holds:

City Shelter Adoptions:	~8.5%	(3,437)
Private Shelter Adoptions:	14.125%	(~5,751 (= 40,717* 0.14125))
Friend/Relative/Born at home:	49.125%	(~20,002 (= 40,717* 0.49125))
Street	14.125%	(~5,751 (= 40,717* 0.14125))
Pet Store or Breeder:	14.125%	(~5,751 (= 40,717* 0.14125))

Since we are assuming the number of dogs leaving the population equals the number of dogs entering the population, we can estimate that in a given year, 52.5% (from Friend/Relative/Street/Born at home) of dogs originated from the fertile females and males in the population. Note we are also assuming that any stray dogs picked up by the city are born to owned dogs as opposed to stray dogs, since we suppose most stray dogs will not be able survive long enough without an owner in the city to be able to have a litter. We are assuming that the number of older animals that people receive from friends or relatives is small and that the migration of animals out of the population cancels out the migration of animals into the population. We assume that the cats that people receive from the street are from litters of feral cats and that only the cats received from friends, relatives, or are born at home are the products of owned fertile cats. We will assume that the number of kittens entering the owned population from the feral population is constant.

When we reduce the number of fertile female and male owned animals in the city, some of the people that would receive animals from friends or relatives or their own home litter will now have to either go to other sources for animals or not get animal at all. We are assuming that half of these people will not get an animal, a quarter will now adopt animal, and a quarter will now go to a breeder or pet store. It is a nice side effect that by performing spays and neuters, we should see an automatic increase in the number of adoptions.

We assume that all animals leaving public or private shelters are spayed or neutered.

3. Dogs and cats entering city shelters

We will assume that the shelter dog (or cat) intake for a given year is a constant percentage of the number of dogs (or cats) that entered the population during that year and the previous two years. We think this is a reasonable approximation since most dogs or cats entering the shelter have been owned for less than three years and a great majority of dogs and cats in shelters are less than three years old. This assumption is in part based on the fact that a negligible number of the cats that come into the shelter are feral. We also assume that each year 5% of the last three years of adopted dogs and cats are returned to the shelter and that 22% of the last three years of dogs (and 23% of cats) received from other sources are brought to the shelter. The primary reason for the difference in relinquishment rates is that a large number of the non-adopted animals relinquished are turned in because the owner could not find a home for them.

Approximately 79% (= (6,235+26,000) / (44,961-4,377)) of dogs and 85% (= (3,437+19,000)/(23,157-220) of cats entering city shelters that were not redeemed to their owner during FY 1999 were adoptable animals. We assume that these fractions will stay constant.

4. Fertile Female and Males

According to our survey, 56% of owned dogs are female, and 23% of female dogs are fertile. This yields a total of 47,280 (= 367,000*0.56*0.23) fertile female dogs. 44% of owned dogs are male, and 17% of male dogs are fertile. This yields a total of 27,452 (= 367,000*0.44*0.17) fertile male dogs.

Our survey also found that 57% of owned cats are female, and 27% of female cats are fertile. This yields a total of 39,091 (= 254,000*0.57*0.27) fertile female cats. 43% of owned cats are male and 40% of these dogs are fertile yielding 43,688 (= 254,000*0.43*0.40) fertile male cats.

We assume that the number of fertile females has a three times greater impact on the number of offspring generated the next year than the number of males. So, to calculate the number of offspring generated by a population of fertile females and males, we multiply the number of fertile females by three, add the number of fertile males, and multiply that by 0.217 (=36,721 / (3*47,280 + 27,452)) for dogs and 0.138 (= 20,002/(3*39,091+27,452)) for cats. This calculation gives us the numbers we observe for the current year. Clearly this is a rough approximation, but it should produce reasonable estimates as long as neither the number of fertile males nor the number of fertile females gets too close to zero.

Each year, we will estimate the number of fertile females/males as follows:

the number of fertile females/males from the year before
_ the number of fertile females/males that die that year
\+ the number new fertile females/males that enter the population
_ the number of additional spays/neuters performed.
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the number of fertile females/males in the owned population for a given year

Estimating Effects

We have implemented the above assumptions in a model using Microsoft Excel that predicts effects of three kinds of changes:

- Increasing the number of adoptions from city shelters
- Increasing the number of spays and/or neuters of animals
- Increasing the retention of non-adopted animals

Dogs:

If no programs are put into effect, we can expect an average of 26,000 euthanasias to continue to occur every year for the foreseeable future, ignoring any major shifts in the Los Angeles human population. This gives us about 130,000 euthanasias over a five year period.

Animals acquired from sources other than shelters are more likely than an adopted shelter animal to be relinquished and euthanized. They can also be unaltered and therefore at risk of reproduction. Since some adopted shelter animals will take a place in a home that might have otherwise been filled by one of these higher risk animals, an increase of 1,000 additional shelter adoptions for one year actually reduces the total euthanasias over the five-year period by about 1,201. After 5 more years only about 18 more lives are saved, since the population is reproducing at a marginally lower rate due to the fact that all adopted animals are spayed or neutered.

If instead, 1,000 additional spays are performed over one year, we estimate that 971 lives are saved over the following 5 year period and that an additional 1,116 are saved over the next 5 years since we have significantly lowered the number of fertile females in the population.

Education of new pet owners can have a large impact on number of euthanasias performed. Increasing the

retention rate of non-adopted dogs by one percentage point for just one year results in saving 1,131 lives over the following 5 years. Of course, since the retention does increase the number of fertile females in the population, the total lives saved over a 10 year period is lower: about 632.

A balanced combination of all three techniques can be used to reach an annual rate of zero euthanasias after 5 years:

Year	Additional Spays	Additional Neuters	Additional Adoptions	Non-adopted dog retention rate	Euthanasias of adoptable dogs at city shelter
0	0	0	0	77%	26,000
1	12,500	4,000	5,000	78%	19,527
2	13,000	4,000	7,250	80%	13,468
3	12,000	4,000	9,160	82%	7,289
4	6,500	2,000	10,700	83%	2,549
5	6,500	2,000	11,816	83%	0

This results in saving a total of approximately 87,169 lives over the five year period and puts the dog population into a new steady state that saves the full 26,000 lives every year from this period onward. Each year after this, only about 3,500 additional spays, 1,100 additional neuters, and 10,800 additional adoptions are needed, as long as the non-adopted dog retention rate is maintained at least 83%.

Cats:

We see very similar effects when modeling the cat population:

Program	Lives saved over a 5 year period	Lives saved over a 10 year period
1000 additional adoptions in first year	1,232	1,269
1000 spays	627	1,427
Increase non-adopted retention rate by 1%	827	576

A balanced combination of all three techniques can be used to reach an annual rate of zero euthanasias after 5 years:

Year	Additional Spays	Additional Neuters	Additional Adoptions	Non-adopted cat retention rate	Euthanasias of adoptable cats at city shelter
0	0	0	0	77%	19,000
1	12,500	4,000	4,000	78%	14,020
2	12,500	4,000	5,750	80%	9,548
3	9,000	4,000	7,900	82%	4,340
4	4,000	1,000	9,100	83%	931
5	4,000	1,000	9,123	83%	0

This results in saving a total of approximately 66,162 lives over the five year period and puts the cat population into a new steady state that saves the full 19,000 lives every year from this period onward. Each year after this, only about 3,000 additional spays, 1,000 additional neuters, and 8,600 additional adoptions are needed, as long as the non-adopted cat retention rate is maintained at least 83%.

References

1: McKee, Doug, “An Analysis of the City of Los Angeles Pet Population and Attitudes Towards Pet Adoption and Spay/Neuter ,” Humane America Technical Report, 2000.