Estimating the Cost to Care for Animals at Austin Pets Alive!
Program Evaluation Report, November 2018

Institute for Human-Animal Connection, Graduate School of Social Work, University of Denver

Sloane M. Hawes, MSW, Josephine Kerrigan, Tess Hupe, Tressa Nawyn,
and Kevin N. Morris, PhD[1]

Introduction

A Humane Community is characterized by the presence of leaders, institutions, and policies working collaboratively across social and political systems to create and implement sustainable human, animal, and environmental welfare. This collective effort to integrate considerations for compassionate engagement into the systems that influence individuals' everyday lives optimizes policy-makers' efforts to achieve an improved quality of life for both the human and non-human animal residents of a community (Hawes, Flynn, Tedeschi, & Morris, in press). While a Humane Community accrues important economic, social, and environmental benefits for society, an increased tolerance for the cost involved in implementing the programs and services that make collective welfare for all living things possible may be required (Hawes, Ikizler, Loughney, Tedeschi, & Morris, 2017).

Animal shelters are an important community resource in Humane Communities that serve as a safety net for pets by providing affordable veterinary care, accessible behavioral support, relinquishment services to those who can no longer keep their pet, and end-of-life care. Most animal shelters will accept all pets, but a majority of unhoused animals are elderly, suffer from a medical condition, or have unmanageable behavior challenges (Arkow, 1991; Coe, Young, Lambert, Dysart, Nogueira, Borden, & Rajić, 2014; Rollin, 2007). Unfortunately, these factors make it difficult for them to be adopted and are frequently the reasons that animals are ultimately euthanized in shelters (Kass, New, Scarlett, & Salman, 2001).

Despite the value of shelters in a community, a significant portion of shelters face issues of being both under-resourced and overpopulated with pets (Zawistowski, Morris, Salman, &

[1] Address correspondence to Kevin Morris at kevin.morris@du.edu.

Ruch-Gallie, 1998). One study documented that shelters may resort to euthanasia when the resources required for an animal's care become too expensive (Arkow, 1991). In the 1970's, it was estimated that about 64 dogs and cats per 1,000 people were euthanized, which accounted for about 13.5 million pets (Rowan & Kartal, 2018). At this time, animal shelters were euthanizing 90% of the animals brought in within a week of housing them, which was compromising the organizations' funding and resources. However, euthanasia rates have dropped substantially over time, and within the past several years it is estimated that anywhere from 5.6 companion animals per 1,000 people to 8.6 cats and dogs per 1,000 Americans are euthanized annually (Clifton, 2014; Herzog, 2018). Rowan and Kartal (2018) recently evaluated long term shelter trends and noted that an increase in pet sterilization, rising adoption rates, and cultural shift in the value of companion animals are all factors that have contributed to a declining euthanasia rate. Yet, there is limited research surrounding how cost for care of shelter animals is related to rates of live outcomes compared to non-live outcomes for animals in care. Although offering more extensive veterinary or behavioral care programs at shelters can be a costly investment in both personnel and supplies, for those populations most at risk of euthanasia, these important services promote an increased quality of life and increase the probability an animal will be adopted (Hawes, Kerrigan, & Morris, 2018). To optimize a shelter's ability to fill these gaps in animal welfare services, an increased understanding of the financial support needed to operate animal shelters is needed. Furthermore, additional evidence is needed regarding how the cost of care relates to quality of life per animal.

Given the magnitude of human social problems to address, investing additional time and resources into addressing animal welfare concerns can be controversial. In Austin, Texas, Resolution 20091105-040, otherwise known as the "No Kill" resolution, requires that the City of Austin's municipal animal shelter maintain a minimum of 90% Live Release Rate (proportion of animals who are either adopted or transferred to other organizations compared to those that are euthanized or die in care) for all companion animals that enter their care. Maintaining this Live Release Rate has been substantially supported by the work non-profit shelters like Austin Pets Alive! (APA) that care for animals particularly at risk for euthanasia in the municipal shelter of Austin. Since implementing the No Kill resolution, the city of Austin has achieved a 98% Live Release Rate for companion animals while also accruing important economic benefits, promoting certain public health improvements, and advancing greater community engagement

(Hawes et al., 2017). However, this high Live Release Rate has been achieved through a substantial increase in funding from the city and other private sources. The increase in Live Release Rate has also resulted in an extended average length of stay for animals in the shelter, which may have detrimental effects for some animals in care.

While there have been a number of studies exploring the factors informing rates of live outcomes in shelters, there has been limited exploration of the benefits and tradeoffs that occur when a shelter dramatically increases their Live Release Rate. In particular, very little research has been committed to the increase in resources needed to sustain an increased Live Release Rate. To understand how an increased Live Release Rate throughout the city of Austin has impacted critical components of shelter operations such as cost per animal, length of stay, and quality of life for Austin's unhoused companion animals, the University of Denver's Institute for Human-Animal Connection conducted a detailed case study of shelter operations at APA. While conducted at a single animal rescue organization, the findings create a template for calculating the direct costs associated with caring for companion animals at other sheltering and rescue organizations.

Study Design and Data Collection and Analysis Procedures

As a private companion animal rescue, APA focuses on serving animals who are at-risk (for euthanasia) at Austin's municipal shelter, Austin Animal Center (AAC), and other shelters and rescue organizations in Texas. APA was selected for this study due to its collection of innovative programs that are reported to result in a higher rate of live outcomes for animals that have been largely considered difficult to find an adopter for in more conventional animal shelters. A retrospective cohort study to examine the relationship between condition, cost of care, and length of stay was conducted using data obtained from APA's ShelterLuv database. Data collected for each animal in the sample included date of intake to APA; intake type; sex; age group; size group; identified primary breed; original source shelter where the animal came from; zip code and county of the animal's most recent source of ownership by either an adopter or source shelter; if the animal had been in APA's custody for less than or greater than 60 days; if the animal was returned, and if so, how many times, and if the length of time owned was less than or greater than 30 days; outcome date; and outcome type.

Data collected for the study included all cats and dogs in APA's care with an intake date between January 1, 2018, and May 1, 2018, and who had an outcome before July 2, 2018. The sample was randomly selected using a random number generator from a spreadsheet containing records of all animals in the care of APA over the period of the study. To support the study goal of understanding the cost of caring for animals within each condition type, any animal that fell under two or more condition categories (e.g., "ringworm positive" and "behavior") was disqualified from the sample list. The final sample consisted of 244 cats and 226 dogs (Tables 1 and 2). Once an animal was selected for the sample, a detailed case history review was conducted in which the cost of each component of the care was collected. This case history review included reading medical notes, staff/volunteer notes, medical summaries, medications or treatments given, and any confirmed diagnosis. The cost for each component of their medical, behavioral, and general care was then calculated using figures obtained from APA's medical supply and payroll invoices.

The cats and dogs included in the sample represented a wide range of different medical or behavior conditions. A detailed description of each of these condition categories is included in Appendix A. These conditions included (but were not limited to) healthy, behavior, ringworm, canine parvovirus, feline immunodeficiency virus (FIV), canine distemper, and feline leukemia virus (FeLV). Intake type for animals in the sample included animals that were either born in care, owner surrendered, returned from a previous adoption at APA within 30 days, or transferred from another shelter. Outcome type included animals that were either euthanized, died in care, adopted, returned to their owner/guardian, stolen/lost, or transferred out. Any animals that were still in the custody of APA on or after July 2nd had a labeled outcome of "still in care."

When possible, data were coded into nominal or ordinal variables for the purposes of analysis. The breed listed for the cat or dog was based upon what was indicated at intake by the APA staff member who conducted the animal's initial evaluation or what breed was assessed by the original source shelter. The age group for cats was assessed as neonates (< 5 weeks), juveniles (5 weeks – 6 months), adults (6 months – 7 years) and seniors (7+ years). The age group for dogs was assessed as neonates (< 8 weeks), juveniles (8 weeks – 1 year), adults (1 year – 7 years) and seniors (7+ years). The cat size group was determined by weight and was coded

into groups of neonate (0-2 lbs) and small (2-19 lbs). The dog size group was coded into groups of neonate (0-2 lbs), small (2-19 lbs), medium (20-59 lbs), and large (60-99 lbs). For cats, the average neonate size was one pound, and the average small size was 10 pounds. There were no medium or large cats in the sample. For dogs, neonate size was estimated at 1 pound, small size was 10 pounds, medium size was 40 pounds, and large size was 80 pounds. When estimating the cost of medications that are adjusted based on the weight of the animal, the average weight for each size group was used.

Cost of care and length of stay at APA was calculated for each animal in the sample. Length of stay included all the time the animal was in the care of APA, from the date the animal had been accepted for transfer from its source shelter to the date of the animal's recorded outcome. Days available was defined as the portion of the animal's total length of stay that was spent available for adoption either on-site or in a foster home. Time in foster was defined as the portion of the animal's total length of stay that was spent in off-site care with an APA registered foster family. Time in pre-adopt was defined as the portion of the animal's total length of stay that was spent in the home of the animal's future adopter while still remaining in the legal custody of APA. Days on-site was defined as the portion of the animal's total length of stay that was spent on-site at APA in one of their kennels. The combination of days on-site, time in foster care, and time in pre-adopt was used as the measurement for length of stay in this study because it represents the total time APA was officially responsible for any costs incurred by each animal. However, animals whose length of stay were primary comprised of time in foster care and/or time in pre-adopt usually have a decreased overall cost of care compared to an animal who spent most of their length of stay on-site because foster care givers and pre-adopters often chose to assume responsibility for basic care costs such as food, toys, and bedding.

APA has a number of basic intake care procedures administered on intake. No matter the condition of the dog or cat at intake, these basic intake care items are a part of the expenses that APA incurs for each animal before putting them up for adoption. For cats, basic intake vaccines include FVRCP and rabies. Basic medications given to cats on intake include flea/tick prevention, Strongid, and Pen-G. Testing for cats on intake includes a SNAP Combo FIV/FeLV test, and if a positive FeLV is obtained, the animal is tested again with a SNAP Antigen FeLV Serum test to protect against the potential of a false positive. For dogs, basic intake vaccines

include DHPP, Bordetella, and rabies. Basic medications given to dogs on intake include flea/tick prevention, heartworm prevention, Strongid, and Pen-G. Testing for dogs on intake includes a heartworm test.

The expense for each basic intake care item was calculated for the 244 cats and 226 dogs in the sample. Ranges for each item are included because certain care items may be more expensive due to the size, weight, or condition of the animal being taken care of. The cost of each basic intake care item for cats includes an intake exam ($3.35-6.90), FeLV ($8.99), FIV/FELV ($13.49-26.98), FeLV serum ($8.99-17.98), FVRCPA ($1.61-4.83), FVRCPB ($1.61-8.04), rabies ($9.40-18.80), Strongid ($0.01-0.09), flea/tick ($0.12-0.48), Pen-G ($0.01-0.05), microchip ($4.95), and spay/neuter ($13.54-14.88). The basic intake care process for dogs is slightly different than cats to appropriately address the health concerns associated with each type of animal. For dogs, the basic intake care items and associated prices include an intake exam ($4.60-9.20), heartworm treatment ($4.99-9.98), DHPPA ($2.78-5.56), DHPPB ($2.78-16.68), Bordetella ($2.72-5.44), rabies ($9.40), Strongid ($0.01-0.36), heartworm prevention ($2.44-13.08), flea/tick ($0.12-0.48), Pen-G ($0.01-0.05), microchip ($4.95), and spay/neuter ($17.52-27.27).

The expenses of the basic intake care items for each animal are not included when calculating the total cost per animal in order to assess how length of stay is impacted by providing treatment beyond basic care for these high-risk cats and dogs. Median values were used to report cost of care for each category due to high levels of variability within each of the sub-samples. The range of cost of care for each category is also reported. Trends in the cost of care data were identified by linear regression analysis as a test for simple monotonic increase or decrease over time.

Table 1. Demographics of Cat Sample (n = 244)

Descriptive Table	Cat	Cat %
Sex	**244**	**100.0%**
Female	116	47.5%
Male	119	48.8%
Unknown	9	3.7%
Age	**244**	**100.0%**
Neonates (<5 weeks)	60	24.6%
Juveniles (5 weeks-6 months)	51	20.9%
Adult (6 months-7 years)	110	45.1%
Senior (>7 years)	23	9.4%
Size	**244**	**100.0%**
Neonates (0-2 lbs.)	91	37.3%
Small (2-19 lbs.)	153	62.7%
Categories	**244**	**100.0%**
Healthy	60	24.6%
Behavior	30	12.3%
Surgery/Procedure	20	8.2%
Medical Other	64	26.2%
Ringworm	20	8.2%
Feline Calicivirus	20	8.2%
FIV	20	8.2%
FELV	20	8.2%

Descriptive Table	Cat	Cat %
Intake Type	**244**	**100.0%**
Born in Care	24	9.8%
Owner/Guardian Surrender	29	11.9%
Return	6	2.5%
Transfer In	185	75.8%
Intake County	**244**	**100.0%**
Travis County	68	27.9%
All other counties	171	70.1%
Unknown	5	2.0%
Length of Stay	**244**	**100.0%**
<60 Days	130	53.3%
>60 Days	114	46.7%
Number of Returns	**34**	**13.9%**
<30 Days Owned	15	44.1%
>30 Days Owned	19	55.9%
Outcome Type	**244**	**100.0%**
Adoption	180	73.8%
Died	6	2.5%
Euthanasia	6	2.5%
Still in Care	51	20.9%
Stolen/Lost	1	0.4%

Table 2. Demographics of Dog Sample (n = 226)

Descriptive Table	Dog	Dog %
Sex	**226**	**100.0%**
Female	118	52.2%
Male	105	46.5%
Unknown	3	1.3%
Age Group	**226**	**100.0%**
Neonates (<8 weeks)	48	21.2%
Juveniles (8 weeks-1 year)	89	39.4%
Adult (1 year-7 years)	62	27.4%
Senior (>7 years)	27	11.9%
Size Group	**226**	**100.0%**
Neonates (0-2 lbs.)	42	18.6%
Small (2-19 lbs.)	78	34.5%
Medium (20-59 lbs.)	93	41.2%
Large (60-99 lbs.)	13	5.8%
Categories	**226**	**100.0%**
Healthy	60	26.5%
Behavior	43	19.0%
Surgery/Procedure	20	8.8%
Medical Other	43	19.0%
Ringworm	10	4.4%
Heartworms	10	4.4%
Canine Distemper	20	8.8%
Canine Parvovirus	20	8.8%

Descriptive Table	Dog	Dog %
Intake Type	**226**	**100.0%**
Born in Care	6	2.7%
Owner/Guardian Surrender	40	17.7%
Return	7	3.1%
Transfer In	173	76.5%
Intake County	**226**	**100.0%**
Travis County	91	40.3%
All other counties	135	59.7%
Length of Stay	**226**	**100.0%**
<60 Days	123	54.4%
>60 Days	103	45.6%
Number of Returns	**49**	**21.7%**
<30 Days Owned	19	38.8%
>30 Days Owned	30	61.2%
Outcome Type	**226**	**100.0%**
Adoption	171	75.7%
Died	10	4.4%
Euthanasia	3	1.3%
Still in Care	39	17.3%
Return to Owner	1	0.4%
Transfer Out	2	0.9%

Results

Cats who spent more days on-site at the animal shelter had a total higher cost of care (Table 3). The median cost of care increased linearly with a slope of $12.26 per day ($p < 0.0001$). Cats who spent only 0-9 days (median = 3) on-site had the lowest cost of care at only $46.08, and the cats with the longest length of stay, from 130-160 days (median = 137), had a median cost of care over $1,800.00.

Table 3. Length of Stay and Cost of Care for Cats (n = 244)

Days on Site	***Days on Site (Median)***	***Cost of Care (Median)***
0-9 (n=123)	3	$46.08 ($11.52-$254.71)
10-19 (n=44)	13	$178.47 ($116.22-$378.12)
20-29 (n=22)	24	$305.09 ($234.35-$453.80)
30-39 (n=16)	35	$437.97 ($350.55-$580.07)
40-49 (n=2)	42	$577.57 ($559.36-$595.77)
50-59 (n=3)	52	$767.51 ($722.84-$802.42)
60-69 (n=13)	66	$784.66 ($691.20-$1,077.48)
70-79 (n=9)	74	$900.90 ($756.43-$1,120.75)
80-89 (n=6)	83	$1,026.93 ($958.86-$1,212.91)
90-99 (n=1)	96	$1,493.81 ($1,493.81)
100-109 (n=1)	106	$1,225.95 ($1.225.95)
110-119 (n=1)	115	$1,486.64 ($1,486.64)
130-140 (n=2)	134	$1,819.85 ($1,525.46-$2,114.23)
150-160 (n=1)	159	$1,831.68 ($1,831.68)

A similar linear relationship between length of stay and cost of care was found for dogs, with a slope of $13.57 per day ($p = 0.004$; Table 4). Dogs with the lowest number of days on-site, 0-9 days (median = 2), had a median cost of care just over $50.00, but the dogs who spent the longest at APA, 120-149 days (median = 129), had a median cost of care at over $2,000.00.

Table 4. Length of Stay and Cost of Care for Dogs (n = 226)

Days on Site	*Days on Site (Median)*	*Cost of Care (Median)*
0-9 (n=149)	2	$56.49 ($2.80-$461.33)
10-19 (n=37)	13	$340.65 ($53.60-$789.04)
20-29 (n=13)	25	$438.60 ($226.67-$706.67)
30-39 (n=4)	32	$553.93 ($344.76-$775.05)
40-49 (n=6)	45	$778.66 ($462.85-$1,808.30)
50-59 (n=4)	54	$992.64 ($910.16-$1,215.57)
60-69 (n=4)	62	$1,050.41 ($1,047.23-$1,083.21)
70-79 (n=3)	78	$1,356.71 ($1,214.73-$1,388.77)
80-89 (n=3)	86	$1,456.52 ($1,410.26-$1,658.20)
100-109 (n=1)	102	$1,072.88 ($1,072.88)
120-129 (n=2)	128	$2,132.10 ($2,113.58-$2,150.61)
140-149 (n=1)	141	$2,356.04 ($1,072.88)

Factors Informing Cost of Care and Length of Stay

Another goal of this study was to analyze how treatment category, age, and size of cats and dogs influenced their cost of care and length of stay. For treatment categories of cats (Table 5 and Figure 1), the cats with behavior challenges were by far the most expensive, with a median cost of care at $727.74, and had the longest length of stay at a median of 63 days on-site. The healthy cats had the lowest cost of care, under $50.00, and their median number of days on-site was just 3.5 days. When the final cost to APA was calculated by subtracting the median adoption fee from the median cost for care, the treatment categories healthy, medical other, and ringworm all showed a median profit for APA. In the age category, neonates had the lowest median cost for care ($55.36) and number of days on-site (3), while senior cats had the highest median cost for care ($269.00) and number of days on-site (16). When looking at the final cost to APA, the neonate and juvenile cats had a median profit for APA. The results related to cat size showed that small cats had a higher cost for care, lower adoption rate, and longer number of days on-site than

the neonate cats, which resulted in the neonate cats having a median profit to APA and small cats having a median loss to APA at the time of recorded outcome.

Table 5. Summary of Cat Cost of Care and Length of Stay Based on Category

CATS- *by Category*	***Sample Size***	***Cost of Care***	***Adoption Fee***	***Final Profit or Cost to APA***	***Days on Site***	***Cost per Day On-Site***
Healthy	60	$46.08 ($11.52- $852.48)	$130.00 ($0.00- $130.00)	$83.92 (-$777.48- 118.48)	3.5 (1.0-74.0)	$13.17 ($11.52-$18.42)
Behavior	20	$727.74 ($34.56- $1,831.68)	$0.00 ($0.00- $130.00)	-$727.74 (-$1,831.68- $95.44)	63.0 (3.0- 159.0)	$11.55 ($11.52- $11.57)
Surgery/ Procedure	20	$191.33 ($44.05- $2,114.23)	$102.50 ($0.00- $130.00)	-$88.83 (-$2,089.23- $85.95)	7.5 (1.0- 137.0)	$25.51 ($12.66- $114.94)
Medical Other	64	$132.36 ($11.65- $1,486.64)	$130.00 ($0.00- $130.00)	$2.36 (-$1,356.64- $118.35)	9.0 (0.0- 115.0)	$14.71 ($0.00- $57.18)
Ringworm	20	$106.63 ($16.23- $1,071.26)	$130.00 ($75.00- $130.00)	$23.27 (-$941.26- $113.77)	7.5 (1.0- 79.0)	$14.22 ($11.52- $18.66)
FIV	20	$99.90 ($18.35- $1,032.34)	$75.00 ($0.00- 130.00)	-$24.90 (-$957.34 - $111.58)	8.5 (1.0- 82.0)	$11.75 ($11.52- $18.42)
FeLV	20	$159.95 ($40.59- $1,021.52)	$0.00	-$159.95 (-$1,021.52- -$40.59)	13.0 (2.0- 86.0)	$12.30 ($11.72- $30.29)
Calici	20	$372.68 ($27.21- $1,493.81)	$102.50 ($0.00- $130.00)	-$270.18 (-$1,493.81- $102.79)	26.50 (1.0- 96.0)	$14.06 ($12.17- $45.59)
CATS- *by Age*	***Sample Size***	***Cost of Care***	***Adoption Fee***	***Final Profit or Cost to APA***	***Days on Site***	***Cost per Day On-Site***
Neonate	60	$55.36 ($11.52- $579.19)	$130.00 ($0.00- $130.00)	$76.64 (-$446.19- $118.48)	3.0 (1.0- 38.0)	$18.45 ($11.52- $114.94)
Juvenile	51	$102.96 ($11.52- $1,486.64)	$130.00 ($0.00- $130.00)	$27.04 (-$1,356.64- $118.48)	6.0 (0.0- 115.0)	$17.16 ($0.0- $42.64)
Adult	110	$193.84 ($11.52- $2,114.23)	$75.00 ($0.00- $130.00)	-$118.84 (-$2,089.23- $118.48)	15.0 (1.0- 159.0)	$12.92 ($11.52- $66.96)
Senior	23	$269.00 ($11.52- $1,057.88)	$0.00 ($0.00- $75.00)	-$269.00 (-$1,057.88- -$11.52)	16.0 (1.0- 75.0)	$16.81 ($11.52- $23.54)
CATS- *by Size*	***Sample Size***	***Cost of Care***	***Adoption Fee***	***Final Profit or Cost to APA***	***Days on Site***	***Cost per Day On-Site***
Neonate	91	$81.76 ($11.52- $1,486.64)	$130.00 ($0.00- $130.00)	$48.24 (-$1,356.64- $118.48)	5.0 (1.0- 115.0)	$16.35 ($11.52- $114.94)
Small	153	$187.85 ($11.52- $2,114.23)	$75.00 ($0.00- $130.00)	-$112.85 (-$2,089.23- $118.48)	13.0 (0.0- 159.0)	$14.45 ($0.00- $66.96)

Figure 1.

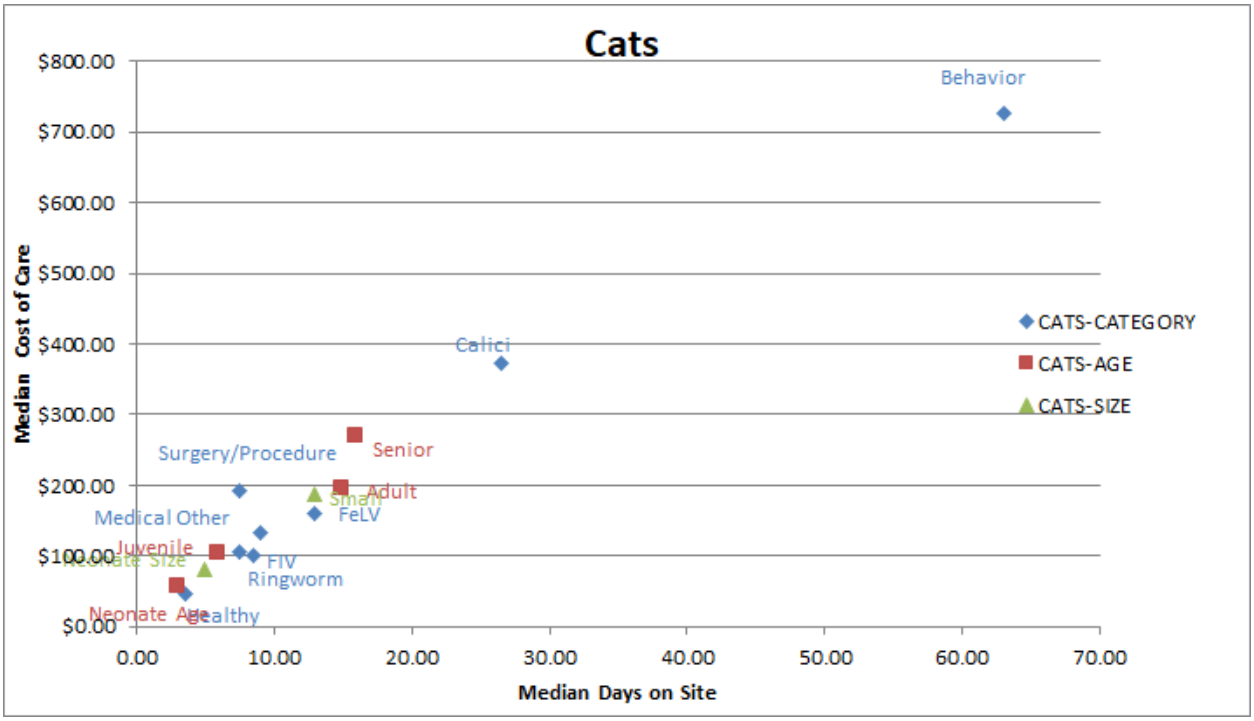

Figure 1: Three variables were used to identify the relationship between the median days on-site and median cost of care for cats in the sample. This chart illustrates the influence condition (healthy, behavior, surgery/procedure, medical other, ringworm, FIV, FeLV, and calici), age (neonate, juvenile, adult, and senior), and size (neonate and small) had on overall cost for care and length of stay.

In the assessment of the costs associated with different treatment categories for dogs (Table 6 and Figure 2), it was found that healthy dogs had the lowest median cost of care at $36.73. Even though the medical other and ringworm dogs had slightly higher median costs of care than the healthy category, they all shared the same median number of days on-site at only 2 days. The dogs with behavior challenges had the longest length of stay at 16 days on-site and the third highest cost of care at $295.35. The dogs with distemper and parvo had the highest median costs of care, at $373.94 for distemper and $333.37 for parvo. When the final costs to APA were calculated by subtracting the median adoption fees from the median cost of care, the heartworm, ringworm, medical other, and healthy categories all showed a median profit to APA. When it comes to dog age, neonate dogs had the lowest median cost of care at $50.39 and shortest median number of days on-site at 2 days. Adult dogs had the highest median cost of care at $224.32 and the longest length of stay with a median of 8.5 days on-site. Senior dogs were the only age group to have a median adoption fee of $25.00, while the other age categories (neonate, juvenile, and adult) all had a median adoption fee of $160.00. The neonate and juvenile dogs had

a median final profit to APA, while adult and senior dogs had a median final loss to APA. As for dog size, the median cost of care was most expensive for large dogs at $200.47 and least expensive for neonate dogs at $40.28. Neonate dogs also had the shortest median number of days on-site at 2 days, while medium dogs had the longest median number of days on-site at 8 days. The neonate and small dogs turned a final median profit for APA, and the medium and large dogs resulted in a final median loss for APA.

Table 6. Summary of Dog Cost of Care and Length of Stay Based on Category

DOGS- ***by Category***	***Sample Size***	***Cost of Care***	***Adoption Fee***	***Final Profit or Cost to APA***	***Days On-Site***	***Cost per Day On-Site***
Healthy	60	$36.73 ($3.46- $532.48)	$160.00 ($25.00- $200.00)	$123.27 (-$507.48- $156.54)	2.0 (0.0- 32.0)	$18.36 ($0.00- $33.32)
Behavior	43	$295.35 ($2.80- $2,356.04)	$150.00 ($0.00- $160.00)	-$145.35 (-$2,331.04- $157.20)	16.0 (0.0- 141.0)	$18.46 ($0.00- $42.44)
Surgery/ Procedure	20	$275.93 ($58.12- $1,092.68)	$160.00 ($25.00- $160.00)	-$115.93 (-$932.68- $101.88)	4.5 (1.0- 48.0)	$61.32 ($19.45- $200.47)
Medical Other	43	$71.75 ($16.69- $1,658.20)	$160.00 ($25.00- $160.00)	$88.85 (-$1,498.20- $143.31)	2.0 (1.0-88.0)	$35.58 ($3.43- $73.19)
Ringworm	10	$55.79 ($21.63- $433.09)	$160.00	$104.21 (-$273.09- $138.37)	2.0 (1.0-30.0)	$27.90 ($11.49- $28.83)
Heartworms	10	$122.04 ($18.52- $1,051.08)	$160.00	$37.96 (-$891.08- $141.48)	6.0 (1.0- 63.0)	$20.34 ($16.64- $25.87)
Distemper	20	$373.94 ($22.39- $1,808.30)	$250.00 ($160.00- $250.00)	-$123.94 (-$1,558.30- $137.61)	13.0 (1.0- 47.0)	$28.76 ($19.92- $104.09)
Parvo	20	$333.37 ($150.07- $706.97)	$250.00 ($160.00- $250.00)	-$83.37 (-$456.97- $99.93)	11.0 (5.0- 26.0)	$30.31 ($25.08- $41.01)
DOGS- ***by Age***	***Sample Size***	***Cost of Care***	***Adoption Fee***	***Final Profit or Cost to APA***	***Days On-Site***	***Cost per Day On-Site***
Neonate	48	$50.39 ($3.46- $1,658.20)	$160.00 ($160.00- $250.00)	$109.61 (-$1,498.20- $156.54)	2.0 (0.0- 88.0)	$25.20 ($0.00- $88.75)
Juvenile	89	$145.72 ($2.80- $1,808.30)	$160.00 ($0.00- $250.00)	$14.28 (-$1,558.30- $157.20)	6.0 (0.0- 86.0)	$24.29 ($0.00- $195.95)
Adult	62	$224.32 ($16.64- $2,150.61)	$160.00 ($25.00- $160.00)	-$64.32 (-$2,075.61- $143.36)	8.5 (1.0- 129.0)	$37.39 ($10.79- $200.47)
Senior	27	$96.34 ($16.64- $2,356.04)	$25.00 ($25.00- $160.00)	-$71.34 (-$2,331.04- $126.72)	6.0 (1.0- 141.0)	$11.33 ($4.97- $96.34)

DOGS- by Size	*Sample Size*	*Cost of Care*	*Adoption Fee*	*Final Profit or Cost to APA*	*Days On-Site*	*Cost per Day On-Site*
Neonate	41	$40.48 ($3.46- $1,658.20)	$160.00 ($160.00- $250.00)	$119.52 (-$1,498.20- $156.54)	2.0 (0.0- 88.0)	$20.24 ($0.00- $88.75)
Small	79	$114.74 ($16.64- $2,356.04)	$160.00 ($25.00- $250.00)	$45.26 (-$2,331.04- $143.36)	5.0 (0.0- 141.0)	$22.95 ($0.00- $195.95)
Medium	93	$188.83 ($2.80- $2,150.61)	$160.00 ($0.00- $250.00)	-$28.83 (-$2,075.61- $157.20)	8.0 (0.0- 129.0)	$23.60 ($0.00- $136.64)
Large	13	$200.47 ($18.94- $532.48)	$160.00 ($25.00- $160.00)	-$40.47 (-$507.48- $136.46)	5.0 (1.0- 32.0)	$40.09 ($16.64- $200.47)

Figure 2.

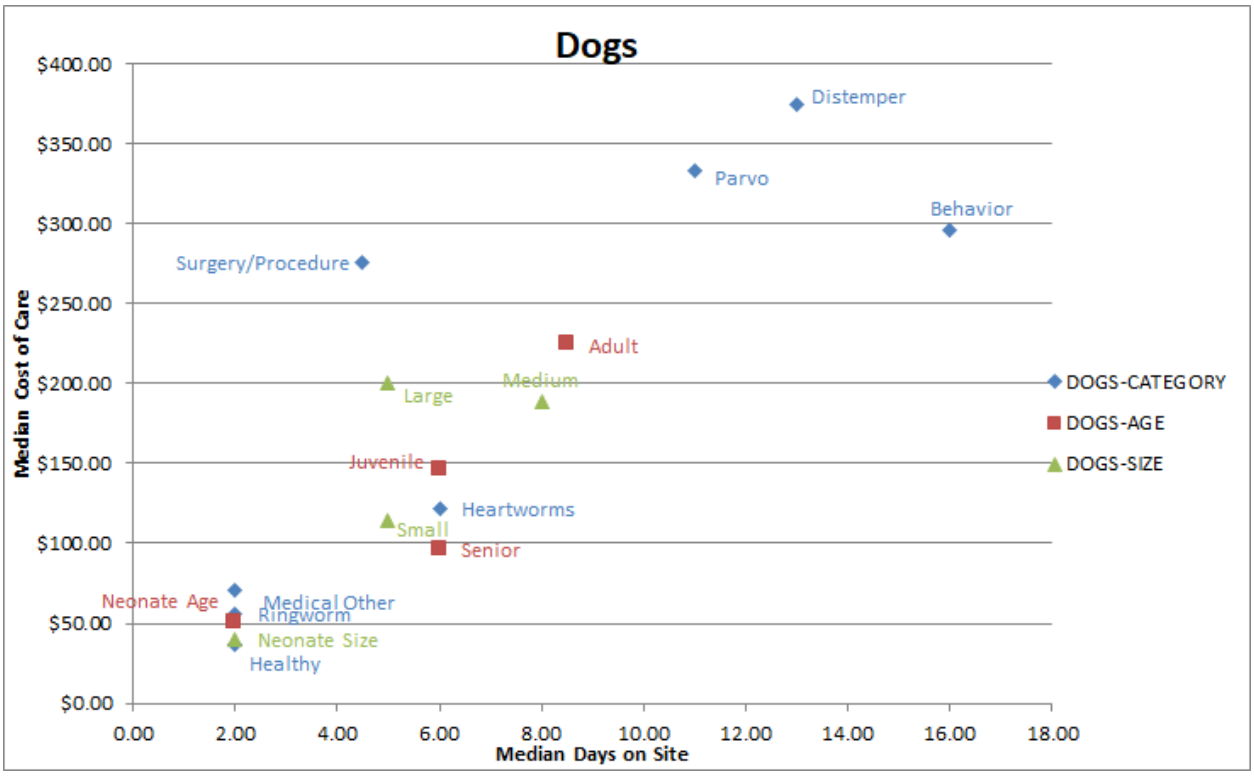

Figure 2. Three variables were used to identify the relationship between median days on-site and median cost of care for dogs in the sample. This chart illustrates the influence category (healthy, behavior, surgery/procedure, medical other, ringworm, heartworms, parvo, and distemper), age (neonate, juvenile, adult, and senior), and size (neonate, small, medium, and large) had on overall shelter cost compared to length of stay on site.

Discussion

Substantial expertise and resources have been devoted to developing evaluation systems that will help shelters understand the population of animals in their care and support their efforts

to achieve live outcomes for as many animals as possible. Systems like the Asilomar Accords use the condition at intake as a predictor of the animal's outcome to help shelters predict the resources needed and risks associated with caring for that animal (Hosgood & Scholl, 2002). These evaluation processes are important because the animals entering the care of shelters may have medical concerns or behavioral challenges that can be both time and resource intensive to address. Although it has been found that dogs who have received more veterinary care, obedience training, or socialization classes have been known to result in more successful adoptions (Duxbury, Jackson, Line, & Anderson, 2003; Patronek et al., 1996), these steps are resource intensive, and cost is often cited as the primary reason to euthanize animals (Arkow, 1991). There is limited evidence to assist shelter administrators trying to balance managing costs and increasing rates of live outcomes. The present study was conducted at an animal rescue organization that focuses on serving the population of animals who are most at risk of euthanasia in the local municipal shelter, providing a large and unique data set that allowed assessment of the costs of care associated with various health conditions, age, and size of cats and dogs across extended timeframes.

A consistent finding within this study between cats and dogs was the linear relationship between an animal's length of stay and cost of care. The results further indicated that the conditions resulting in the longest length of stay and highest cost of care for cats were behavior and calici. For dogs, the conditions resulting in the longest length of stay and highest cost of care were distemper, behavior, and parvovirus. The conditions resulting in the shortest length of stay and least cost of care for cats were neonates, healthy animals, ringworm, and FIV. For dogs, the conditions resulting in the shortest length of stay and least cost of care were neonates, healthy animals, ringworm, and medical other.

Importance of increased resource allocation to ensure quality of life and sustain a high LRR

With technological advancements and growing knowledge in the field of veterinary practice, shelters are better able to address the medical concerns of companion animals to extend their lives and improve their quality of life (Rollin, 2007). Results from our study showed that even though surgery/procedure was costly for both cats and dogs, animals undergoing this treatment category also had a low number of days on-site. Transfer partnerships with other animal organizations have been recognized as a practice in animal welfare to help maximize live

outcomes while minimizing the cost of care and length of stay of companion animals in shelter care (Epstein et al., 2005; Reese & Ye, 2017; Weiss et al., 2013). APA both transfers in and transfers out companion animals depending on their capacity. In this study 171 (70.1%) of cats and 135 (59.7%) of dogs came into APA's care from another county. When looking at the intake type of the sample, 185 (75.8%) of cats and 173 (76.5%) of dogs were transferred in from another shelter into APA's care. For outcome type, APA transferred 0 cats and only 2 dogs to another shelter to receive care. The practice of transferring in animals from other counties could be seen as eliminating available resources for higher need animals in Travis County. However, this study will support APA's decision-making process for transfers by identifying its actual capacity with consideration of both the cost of care and length of stay of different populations of cats and dogs.

Practices to balance increased cost of care and length of stay

Cats, and particularly cats with behavior challenges, continue to be a population that has a high cost of care and longer length of stay than most other populations served by APA. One strategy for balancing costs and length of stay is adjusting adoption fees. An early study declared that cats acquired at no cost have an increased risk for relinquishment (Patronek et al., 1996). However, a more recent study showed that promotions which waived adoption fees resulted in a higher LRR amongst shelters (Weiss, Patronek, Slater, Garrison, & Medicus, 2013). The Wisconsin Humane Society was one of the first to waive the fee for cat adoption after discovering that a majority of people were obtaining cats from other sources in the community for free (New, Salman, King, Scarlett, Kass, & Hutchinson, 2000). The literature indicates that pets acquired for free from the public (such as from a friend) were at a higher risk for relinquishment over those acquired for free from shelters, since there is typically a higher motivation for owners seeking pets from a shelter, given that it requires time, preparation, and paperwork (New et al., 2000; Patronek et al., 1996). One study found that waiving adoption fees increased adoption rates as well as allowed the shelter to better educate the cat owning community. Additionally, they discovered that purchase price of companion animals had no impact on the human-animal bond (Weiss & Gramann, 2009).

Another study looked at a pricing system for shelters that could be beneficial for reducing euthanasia rates and length of stay in shelter for animals. The authors suggest shelters use a

hedonic pricing model to analyze which dog characteristics people are willing to pay more for, which could support efforts to decrease length of stay while minimizing rates of euthanasia (Reese, Skidmore, Dyar, & Rosebrook, 2017). A shelter in Michigan utilized this proactive pricing approach, and they found that characteristics in dogs were more vital in pricing than traits in owners. For example, results revealed that puppies, purebred dogs, and microchipped animals can be priced at a premium, but older, mixed-breed, and black dogs should be priced at a discount. Surprisingly, they indicated that potential medical conditions and behavioral concerns do not warrant a decrease in price for adoptability (Reese, et al., 2017). This article also recommends shelters promote the cost benefits that come along with shelter animals in comparison to animals from breeders. For instance, these animals are typically already spayed/neutered, have received vaccinations and basic medical care, and have engaged in behavioral training. Marketing these features may help increase the attractiveness of shelter animals.

Waived adoption fees make pets more accessible to low income communities. Although there is a concern that people may not be financially able to support their pets, research has found that people's income is not directly correlated with spending on their animal or attachment to their animal (Staats, Miller, Carnot, Rara, & Turnes, 1996). Yet, Dolan and colleagues (2015) found that in low income neighborhoods, the number one reason for relinquishment was inability to afford care for their pet. Therefore, researchers suggest that when making pets more accessible to the community, affordable community resources are needed to help pet retention rates. For instance, due to the increasing cost of basic veterinary care, nonprofit veterinary care services could be beneficial for low income neighborhoods (Blackwell, 2015). Overall, if pet adoption fees are going to be waived to make pets more accessible to the community, there need to be resources available to ensure pet retention and provide pets with a healthy and safe lifestyle.

Yet, there is still opposition to waiving cat adoption fees because many argue that the price of an animal is important to instilling the value of their animal in its owners. There is a lack of research concerning the cost of a companion animal in relation to the human-animal bond that caregivers have with their pet. However, one study found that when comparing cats that were acquired for free versus a $75 adoption fee, there was no difference in the level of attachment between the owner and pet (Weiss & Gramann, 2009). This article concluded that this same post-adoption attachment would result in the equal quality of care of the pets as well. Regardless,

waiving adoption fees would pose new challenges for shelters because they would not be bringing in any income to offset the cost of care for the animal. Shelters primarily struggle because they have limited funding and are already typically understaffed (Anderson, Brandt, Lord, & Miles, 2013). These same concerns make it difficult for shelters to find a way to increase their fundraising efforts to make up for the loss of income they experience when decreasing or waiving adoption fees.

However, there are other options for shelters to maximize their adoption rates. As shelters increasingly care for animal who are more difficult to adopt, they may consider expanding the enrichment and training program opportunities to encourage potential pet-owners to learn more about basic cat and dog health and behavior. Shelters also can offer temporary adoption programs that allow a prospective pet owner to test out having the pet in their home before formal adoption to ensure it is the right fit (like the pre-adopt program at APA), which are shown to prevent returned adoptions and relinquishment (Žák, Voslářová, Večerek, & Bedáňová, 2015). Such efforts are alternatives likely improve the quality of life of animals as well as work to improve a shelter's live release rate.

Limitations

There are a number of other costs related to running a shelter beyond what was included in this study under cost of care. Assets like medical machinery were not included in the cost of care results. Also not included were building maintenance and utilities, trucks, injury liability insurance, administration and marketing wages, and "one-time costs" such as paperwork, adoption processing, and foster program coordination. The assumption made in this study is that these forms of infrastructure are essential to running a shelter, regardless of the animals served, and therefore all shelters will have similar investment in these items.

References

Anderson, K. A., Brandt, J. C., Lord, L. K., & Miles, E. A. (2013). Euthanasia in animal shelters: Management's perspective on staff reactions and support programs. *Anthrozoös, 26*(4), 569–578.

Arkow, P. (1991). Animal control laws and enforcement. *Journal of the American Veterinary Medical Association, 198*(7), 1164–1172.

Bannasch, M. J., & Foley, J. E. (2005). Epidemiologic evaluation of multiple respiratory pathogens in cats in animal shelters. *Journal of Feline Medicine & Surgery*, *7*(2), 109–119.

Brown, W. P., Davidson, J. P., & Zuefle, M. E. (2013). Effects of phenotypic characteristics on the length of stay of dogs at two no kill animal shelters. *Journal of Applied Animal Welfare Science, 16*(1), 2–18.

Brown, W. P., & Morgan, K. T. (2015). Age, breed designation, coat color, and coat pattern influenced the length of stay of cats at a no-kill shelter. *Journal of Applied Animal Welfare Science*, *18*(2), 169–180.

Carlstead, K., Brown, J. L., & Strawn, W. (1993). Behavioral and physiological correlates of stress in laboratory cats. *Applied Animal Behaviour Science*, *38*(2), 143–158.

Clifton, M. (2014, November 14). Record low shelter killing raises both hopes and questions. Retrieved (2018, July 6) from: https://www.animals24-7.org/2014/11/14/record-low-shelter-killing-raises-both-hopes-questions/

Coe, J. B., Young, I., Lambert, K., Dysart, L., Nogueira Borden, L., & Rajić, A. (2014). A scoping review of published research on the relinquishment of companion animals. *Journal of Applied Animal Welfare Science*, *17*(3), 253–273.

Dinnage, J. D., Scarlett, J. M., & Richards, J. R. (2009). Descriptive epidemiology of feline upper respiratory tract disease in an animal shelter. *Journal of Feline Medicine and Surgery*, *11*(10), 816–825.

Diverio, S., Boccini, B., Menchetti, L., & Bennett, P. C. (2016). The Italian perception of the ideal companion dog. *Journal of Veterinary Behavior, 12*, 27–35.

Duxbury, M. M., Jackson, J. A., Line, S. W., & Anderson, R. K. (2003). Evaluation of association between retention in the home and attendance at puppy socialization classes. *Journal of the American Veterinary Medical Association, 223*(1), 61–66.

Epstein, M., Kuehn, N. F., Landsberg, G., Lascelles, B. D. X., Marks, S. L.,…Tuzio, H. (2005). AAHA senior care guidelines for dogs and cats. *Journal of the American Animal Hospital Association, 41*(2), 81–91.

Gourkow, N., & Fraser, D. (2006). The effect of housing and handling practices on the welfare, behaviour and selection of domestic cats (Felis sylvestris catus) by adopters in an animal shelter. *Animal Welfare, 15*(4), 371–377.

Gouveia, K., Magalhães, A., & de Sousa, L. (2011). The behaviour of domestic cats in a shelter: Residence time, density and sex ratio. *Applied Animal Behaviour Science, 130*(1-2), 53–59.

Hawes, S., Flynn, E., Tedeschi, P., & Morris, K. N. (In press). Humane communities: Social change through policies promoting collective welfare. *Journal of Urban Affairs*.

Hawes, S., Ikizler, D., Loughney, K., Tedeschi, P., & Morris, K. N. (2017). Legislating components of a humane city: The economic impacts of the Austin, Texas "no kill" resolution (City of Austin Resolution 20091105-040). *Animal Law and Legislation*, *1*. Retrieved from https://animalstudiesrepository.org/anilleg/1

Hawes, S., Kerrigan, J., & Morris, K. (2018). Factors informing outcomes for older cats and dogs in animal shelters. *Animals, 8*(3), 36.

Hennessy, M. B., Davis, H. N., Williams, M. T., Mellott, C., & Douglas, C. W. (1997). Plasma cortisol levels of dogs at a county animal shelter. *Physiology & Behavior, 62*(3), 485–490.

Herzog, H. (2018, May 11). The puzzling geography of animal shelter dog euthanasia. Retrieved (2018, July 6) from: https://www.psychologytoday.com/us/blog/animals-and-us/201805/the-puzzling-geography-animal-shelter-dog-euthanasia

Hosgood, G., & Scholl, D. T. (2002). Evaluation of age and American Society of Anesthesiologists (ASA) physical status as risk factors for perianesthetic morbidity and mortality in the cat. *Journal of Veterinary Emergency and Critical Care, 12*(1), 9–15.

Kass, P. H., New Jr, J. C., Scarlett, J. M., & Salman, M. D. (2001). Understanding animal companion surplus in the United States: Relinquishment of nonadoptables to animal shelters for euthanasia. *Journal of Applied Animal Welfare Science*, *4*(4), 237–248.

King, T., Marston, L.C., & Bennett, P.C. (2009). Describing the ideal Australian companion dog. *Applied Animal Behaviour Science*, *120*(1-2), 84–93.

Marston, L. C., Bennett, P. C., & Coleman, G. J. (2005). Adopting shelter dogs: Owner experiences of the first month post-adoption. *Anthrozoös*, *18*(4), 358–378.

New, J., Jr., Salman, M. D., King, M., Scarlett, J., Kass, P., & Hutchinson, J. (2000). Characteristics of shelter-relinquished animals and their owners compared with animals and their owners in U.S. pet-owning households. *Journal of Applied Animal Welfare Science, 3*, 179–201.

Patronek, G. J., Glickman, L. T., Beck, A. M., McCabe, G. P., & Ecker, C. (1996). Risk factors for relinquishment of dogs to an animal shelter. *Journal of the American Veterinary Medical Association, 209*(3), 572–581.

Patronek, G. J., Glickman, L. T., Beck, A. M., McCabe, G. P., & Ecker, C. (1996). Risk factors for relinquishment of cats to an animal shelter. *Journal of American Veterinary Medicine Association, 209*(3), 582–588.

Pedersen, N. C., Sato, R., Foley, J. E., & Poland, A. M. (2004). Common virus infections in cats, before and after being placed in shelters, with emphasis on feline enteric coronavirus. *Journal of Feline Medicine and Surgery, 6*(2), 83–88.

Pet Statistics. (n.d.). Retrieved October 8, 2018, from https://www.aspca.org/animal-homelessness/shelter-intake-and-surrender/pet-statistics

Protopopova, A. (2016). Effects of sheltering on physiology, immune function, behavior, and the welfare of dogs. *Physiology & Behavior*, *159*, 95–103.

Reese, L. A., Skidmore, M., Dyar, W., & Rosebrook, E. (2017). No dog left behind: A hedonic pricing model for animal shelters. *Journal of Applied Animal Welfare Science*, *20*(1), 52–64.

Reese, L. A., & Ye, M. (2017). Minding the gap: Networks of animal welfare service provision. *American Review of Public Administration*, *47*(5), 503–519.

Rollin, B. E. (2007). Ethical issues in geriatric feline medicine. *Journal of Feline Medicine and Surgery*, *9*(4), 326–334.

Rowan, A., & Kartal, T. (2018). Dog population & dog sheltering trends in the United States of America. *Animals*, *8*(5), 68.

Shore E. R., Petersen C. L., Douglas D. K. (2003). Moving as a reason for pet relinquishment: A closer look. *Journal of Applied Animal Welfare Science 6*(1), 39–52.

Shore, E. R., Douglas, D. K., & Riley, M. L. (2005). What's in it for the companion animal? Pet attachment and college students' behavior towards pets. *Journal of Applied Animal Welfare Science*, *8*(1), 1–11.

Staats, S., Miller, D., Carnot, M. J., Rada, K., & Turnes, J. (1996). The Miller-Rada Commitment to Pets Scale. *Anthrozoös, 9*, 88–94.

Tanaka, A., Wagner, D. C., Kass, P. H., & Hurley, K. F. (2012). Associations among weight loss, stress, and upper respiratory tract infection in shelter cats. *Journal of the American Veterinary Medical Association*, *240*(5), 570–576.

Weiss, E., & Gramann, S. (2009). A comparison of attachment levels of adopters of cats: Fee-based adoptions versus free adoptions. *Journal of Applied Animal Welfare Science*, *12*(4), 360–370.

Weiss, E., Patronek, G., Slater, M., Garrison, L., & Medicus, K. (2013). Community partnering as a tool for improving live release rate in animal shelters in the United States. *Journal of Applied Animal Welfare Science, 12*, 221–238.

Wells, D. L., Graham, L., & Hepper, P. G. (2002). The influence of length of time in a rescue shelter on the behaviour of kennelled dogs. *Animal Welfare*, *11*(3), 317–325.

Wells, D. L., & Hepper, P. G. (2000). The influence of environmental change on the behaviour of sheltered dogs. *Applied Animal Behaviour Science*, *68*(2), 151–162.

Žák, J., Voslářová, E., Večerek, V., & Bedáňová, I. (2015). Sex, age and size as factors affecting the length of stay of dogs in Czech shelters. *Acta Veterinaria Brno, 84*(4), 407–413.

Zawistowski, S., Morris, J., Salman, M. D., & Ruch-Gallie, R. (1998). Population dynamics, overpopulation and the welfare of companion animals: New insights on old and new data. *Journal of Applied Animal Welfare Science, 1*, 193–206.

APPENDIX A - Additional Descriptives on Sample Composition and Definitions

Healthy Dog or Healthy Cat:

- Sample: 60 dogs and 60 cats
- Definition: Animals that needed no extra attention or medication after their intake.
- Treatment Protocol: Animals receive additional physical exams as their length of stay increased at APA. Medications for healthy animals didn't go beyond basic dewormers or antibiotics (to prohibit any new medical issues).
- Medications: Panacur, Marquis paste, Praziquantel, Fortiflora, Amoxicillin, Azithromycin, Metronidazole, Doxycycline, Benadryl, Ivermectin injection for fleas, Kaolin Pectin, dextrose, lactated ringers, or Gentamicin eye drops.
- Tests: SNAP canine parvovirus test, skin scrape test, Packed Cell Volume (PCV), Wood's lamp test, fecal flotation, or a urinalysis test.
- Additional Costs: Animals incurred no other costs other than the additional physical exams by veterinary technicians that take on average 15 minutes and daily care (food, bedding, and enrichment).

Behavior Dog or Behavior Cat:

- Sample: 43 dogs and 30 cats
- Definition: Dogs that were identified as needing a behavior consult at the time of their adoption. Cats that needed to be isolated before becoming available for adoption either through the adoption program or Barn Cat program.
- Treatment Protocol: Animals receive additional physical exams as their length of stay increased at APA. Medications for healthy animals didn't go beyond basic dewormers or antibiotics (to prohibit any new medical issues). Some animals may have received anti-anxiety/relaxers for animals stressed due to behavior.
- Medications: Panacur, Praziquantel, Amoxicillin, Azithromycin, Metronidazole, Doxycycline, Benadryl, Ivermectin injection for fleas, Cephalexin, Convenia, or Trazadone.
- Tests: SNAP canine parvovirus test, skin scrape test, ear swab, or a Packed Cell Volume (PCV).
- Additional Costs: Adopters interested in a behavior dog were given a behavior consultation. These animals typically received more attention at the shelter from trainers and volunteers including in playgroups run by volunteers, behavior assessments (which took on average 5 minutes), sessions with matchmakers who assist in matching the dog to the potential adopter (which took about 30 minutes each time), and dog behavior adoption follow-up (which took on average 15 minutes of time emailing adopters and assisting with behavior issues). Animals incurred no other costs other than for additional physical exams and daily care (food, bedding, and enrichment).

Surgery/Procedure Dog or Surgery/Procedure Cat:

- Sample: 20 dogs and 20 cats

- Definition: Animal's medical condition required either a surgery to correct an issue or a procedure to further a proper diagnosis.
- Treatment Protocol: Surgery performances included fracture repair, dental work, dental extraction, mass removal, enucleation, amputation, entropion, exploratory, hernia repair, cherry eye repair, surgery repair sourced from a private veterinarian, or other surgery such as jaw wiring and catheter placements. Procedures included x-rays, Antech diagnostics, sedated exams, and suture removals. Medications or treatment for an animal varied on the degree of its condition as well as age.
- Medications: Panacur, Marquis paste, Praziquantel, Amoxicillin, Azithromycin, Erythromycin, Metronidazole, Doxycycline, Clindamycin, Clavamox, Prednisone, Gabapentin, Cephalexin, Buprenorphine, Tramadol, Cefazolin, Meloxicam, Phenobarbitol, Diazapam, Mirtazapine, or lactated ringers.
- Tests: Skin scrape test, Packed Cell Volume (PCV), fine needle aspiration, blood transfusion, urinalysis, Vet Scan chemistry panel, or a fluorescent eye stain.
- Additional Costs: Animals incurred additional medical costs beyond physical exams and daily care (food, bedding, and enrichment). Hospitalization costs took on average 10 minutes of veterinary technician time and 5 minutes of veterinarian time for each day the animal was isolated. Most procedures and surgeries required one veterinarian and one veterinary technician, however time allotted for each type was dependent on the procedure or surgery, ranging from 15 minutes to 150 minutes.

Medical Other Dog or Medical Other Cat:

- Sample: 43 dogs and 64 cats
- Definition: Animal's medical condition did not require either a surgery or procedure but did need continued staff care to treat, medicate, or diagnose a medical issue.
- Treatment Protocol: Monitoring and/or isolating animals with a medical condition such as URI, injury, sickly or malnourished body condition, excess vomiting or diarrhea, gastrointestinal issue, scabies, mange, Leptospirosis, pyometra, ear infection, pregnant or nursing, eye infection, or conjunctivitis. Medications or treatment for an animal varied on the degree of its condition as well as age.
- Medications: Panacur, Marquis paste, Praziquantel, Amoxicillin, Azithromycin, Metronidazole, Doxycycline, Insulin, medicated shampoo bath, Clavamox, Benadryl, Chlorhex, canine serum eye drops, Prednisone, or lactated ringers.
- Tests: SNAP canine parvovirus test, skin scrape test, Packed Cell Volume (PCV), glucose curve, Vet Scan T4 test, or a urinalysis.
- Additional Costs: Animals incurred additional medical costs beyond physical exams and daily care (food, bedding, and enrichment). Hospitalization costs took on average 10 minutes of veterinary technician time and 5 minutes of veterinarian time for each day the animal was isolated.

Ringworm Dog or Ringworm Cat:

- Sample: 10 dogs and 20 cats

- Definition: Animals on intake or while in the custody of APA were either positive, exposed, or being watched for ringworm.
- Treatment Protocol: Ringworm positive animals were typically diagnosed with a Wood's lamp test. Ringworm exposed animals did not show signs of ringworm yet but were housed or in contact with a positive animal. Ringworm watch animals showed hair loss but did not have a positive Wood's lamp reading. Medications or treatment for dogs and cats who were either watch, exposed, or positive varied on the degree of their condition as well as age.
- Medications: Panacur, Marquis paste, Praziquantel, Amoxicillin, Azithromycin, Metronidazole, Doxycycline, Lime sulfur dip (in which the animal was completed bathed), Lime sulfur spot (in which the animal was treated only on specific areas of the body), or Terbinafine.
- Tests: Skin scrape test, Wood's lamp, or urinalysis.
- Additional Costs: Animals received additional medical costs beyond physical exams and daily care (food, bedding, and enrichment). Dogs that were either positive, exposed, or being watched for ringworm did not have to be isolated and therefore did not accrue isolation costs. Cats that were either positive, exposed, or being watched for ringworm were moved to the Ringworm Ward where, on average, a veterinary technician spent 3 minutes per cat, and a ringworm technician spent 5 minutes per cat each day to monitor and medicate.

Heartworms Dog:

- Sample: 10 dogs
- Definition: On intake or while in the custody of APA, the dog tested positive for heartworms.
- Treatment Protocol: Heartworm positive dogs were typically diagnosed by a SNAP heartworm test either at APA or a prior shelter. They are then typically given Doxycycline for 30 days and then two Melarsomine injections. Medication and treatment for dogs that tested positive for heartworms depended on what stage of treatment they were at when running the report for this study.
- Medications: Panacur, Praziquantel, Doxycycline, Tramadol, Methocarbamol, Prednisone, or Melarsomine (immiticide).
- Tests: Skin scrape test or Wood's lamp test.
- Additional Costs: Animals incurred additional medical costs beyond physical exams and daily care (food, bedding, and enrichment). Dogs that test positive for heartworms do not have to be isolated and treatment does not begin until after the animal has an interested adopter. The dog then is placed in pre-adopt and can continue treatment while in the care of its future adopter.

Canine Distemper:

- Sample: 20 dogs
- Definition: On intake or while in the custody of APA, a dog was positive, exposed, or being watched for distemper.

- Treatment Protocol: Distemper positive animals were typically diagnosed when seizures and/or tremors were witnessed after not eating and vomiting. Distemper exposed animals did not show signs of distemper yet but were housed or in contact with a positive animal. Distemper watch animals were dogs that showed symptoms such as vomiting and loss of appetite but did not have enough conclusive evidence to be labeled as a positive animal. Dogs that are exposed or being watched for distemper may be brought to the administrative building for the animals to be isolated from all other dogs. The administrative staff then shares the duties of caring for the dogs until they are cleared. The medications and treatment for dogs who are watch, exposed, or positive vary on the degree of their condition.
- Medications: Panacur, Marquis paste, Praziquantel, Amoxicillin, Azithromycin, Metronidazole, Doxycycline, Famotidine, Vitamin C tablet, Vitamin C injection, Vitamin A, Reglan, Baytril, Polyflex, Cefazolin, Cerenia, Carprofen, dextrose, New Castle/Distemper serum, Keppra, Phenobarbital, Methocarbamol, or lactated ringers.
- Tests: SNAP Parvo test, skin scrape, Packed Cell Volume (PCV), fecal flotation, ear swab, or abdominal palpation.
- Additional Costs: Animals incurred additional medical costs beyond physical exams and daily care (food, bedding, and enrichment). Distemper positive dogs are put into foster and therefore do not accrue costs for being in isolation. However, in accordance with APA protocol, animals are not tested for distemper and so may show initial symptoms of canine parvovirus and will be hospitalized temporarily until more concrete symptoms of distemper appear.

Canine Parvovirus:

- Sample: 20 dogs
- Definition: On intake or while in the custody of APA, a dog was positive, exposed, or being watched for parvo.
- Treatment Protocol: Parvo positive animals were typically diagnosed when the animal tested positive on a SNAP Parvo test. Parvo exposed animals did not show signs of canine parvovirus yet but were housed or in contact with a positive animal. Parvo watch animals were dogs that showed parvovirus symptoms such as vomiting and loss of appetite but did not test positive on a SNAP Parvo test. Animals were isolated to monitor their medical condition until there was noticeable healthy progress or the animal was re-tested on a SNAP Parvo test with a negative result. The medications and treatment for parvo dogs who were either watch, exposed, or positive varied on the degree of their condition.
- Medications: Panacur, Marquis paste, Praziquantel, Amoxicillin, Azithromycin, Metronidazole, Doxycycline, Famotidine, Vitamin C tablet, Vitamin C injection, Reglan, Baytril, Polyflex, Cefazolin, Cerenia, Carprofen, dextrose, Hetastarch, or lactated ringers.
- Tests: SNAP Parvo test, skin scrape, Packed Cell Volume (PCV) or abdominal palpation.
- Additional Costs: Animals received additional medical costs beyond physical exams and daily care (food, bedding, and enrichment). Dogs that are positive, exposed, or watched are brought to the Parvo Ward where, on average, a veterinarian spent 5 minutes per dog

and a parvo technician spent 20 minutes per dog each day monitoring its progress and medications.

Feline calicivirus:

- Sample: 20 cats
- Definition: On intake or while in the custody of APA, a cat was positive, exposed, or being watched for calici.
- Treatment Protocol: Calici positive animals were typically diagnosed when ulcers on the tongue or in the mouth were detected, along with the animal's lack of appetite and nasal/ocular discharge. Calici exposed animals did not show signs of feline calicivirus yet but were housed or in contact with a positive animal. Calici watch animals were cats that showed symptoms such as loss of appetite and nasal/ocular discharge but did not have enough conclusive evidence to be labeled as a positive animal. Animals could have been hospitalized to monitor their condition or isolated in the Calici Ward. The medications and treatment for cats who were either watch, exposed, or positive varied on the degree of their condition.
- Medications: Panacur, Marquis paste, Praziquantel, Amoxicillin, Azithromycin, Metronidazole, Doxycycline, Cerenia, Convenia, Mirtazipine, Meloxicam, Gentamicin, Ofloxacin, Sucralfate, Buprenorphine, Famciclovir, Baytril, Vitamin B injection, or lactated ringers.
- Tests: Skin scrape test, Wood's lamp test, Packed Cell Volume (PCV), or an ear swab.
- Additional Costs: Animals received additional medical costs beyond physical exams and daily care (food, bedding, and enrichment). Hospitalization monitoring of a Calici positive, exposed, or watch cat took about 5 minutes of veterinary technician time and 5 minutes of veterinarian time each day.

FIV Cat:

- Sample: 20 cats
- Definition: On intake or while in the custody of APA, a cat was positive for FIV.
- Treatment Protocol: FIV can target the immune system at any time, so some cats could have been hospitalized to monitor their varying medical conditions while others remained healthy. Medication and treatment for cats that tested positive for FIV depended on the health condition of the cat.
- Medications: Panacur, Marquis paste, Praziquantel, Amoxicillin, Azithromycin Doxycycline, Metronidazole, Meloxicam, Gentamicin, Ivermectin injection for fleas, Vitamin B injection, or lactated ringers.
- Tests: Wood's lamp test, Packed Cell Volume (PCV) or an ear swab.
- Additional Costs: Some animals received additional medical costs beyond physical exams and daily care (food, bedding, and enrichment). Hospitalization for one FIV cat took an average of 15 minutes of veterinary technician time per day and an average 15 minutes of veterinarian time per week.

FeLV Cat:

- Sample: 20 cats
- Definition: On intake or while in the custody of APA, a cat was positive for FeLV.
- Treatment Protocol: FeLV can target the immune system at any time, so some cats could have been hospitalized to monitor their varying medical conditions while others remained healthy. Medication and treatment for cats that tested positive for FeLV depended on the health condition of the cat. FeLV positive animals were placed in the FeLV Sanctuary to not spread the virus to healthy cats.
- Medications: Panacur, Marquis paste, Praziquantel, Amoxicillin, Azithromycin Doxycycline, Metronidazole, Meloxicam, Gentamicin, Ivermectin injection for fleas, Benadryl, Clindamycin, Methocarbamol, Cosequin, Mirtazipine, Vitamin B injection, or lactated ringers.
- Tests: Skin scrape test, Wood's lamp test, Packed Cell Volume (PCV), urinalysis, fluorescent eye stain, or an ear swab.
- Additional Costs: Some animals received additional medical costs beyond physical exams and daily care (food, bedding, and enrichment). Hospitalization for one FeLV cat took an average of 15 minutes of veterinary technician time per day and an average 15 minutes of veterinarian time per week.