Austin Animal Shelter Capstone

July 27, 2018

1 Improving Pit Bull Adoptions

The Austin Animal Shelter (AAS) is the largest No Kill Shelter in the United States. As a government shelter, it is required to take all animals that are found, surrendered, or siezed in Travis County, Texas, regardless of age, breed, or health. In order to maintain its No Kill rating, generally defined as euthanizing less that 10% of animals taken in, the AAS needs to partner with other shelters and organizaions to take care of the pets when there is no more capacity at AAS. They have been successful in these efforts, but the partner organizations are often stretched thin as well.

Another well-known issue in the pet rescue world is pit bull adoption. For a variety of reasons, shelters in the United States are often plagued with high numbers of pit bulls and pit bull mixes. This problem is made worse by the fact that pit bulls are often difficult to get adopted. Legal restrictions in some cities, home insurance exemptions for pit bull damage, and breed characteristics often eliminate them from consideration for many potential adopters. However, the fact is that a large number of pit bulls would make great pets, and are not considered by potential owners.

In this paper, we're going to look to see if this is also a problem in Austin. Specifically, we're going to see if pit bulls and pit bull mixes are more likely to be transferred out of AAS rather than adopted out. We will then propose a way to improve this.

In examining this issue, we will look at a data set from AAS. It contains the records of all the dogs processed by AAS from October 2013 to February 2018.

1.1 Data Set Analysis

```
In [1]: # import needed modules
        %matplotlib inline
        import pandas as pd
        import numpy as np
        import seaborn as sns
        from matplotlib import pyplot as plt
        from scipy import stats

        #import file
        AAS_dogs_raw = pd.read_csv('AAS_dogs.csv')
        AAS_dogs = AAS_dogs_raw
        AAS_dogs.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 44242 entries, 0 to 44241
```

```
Data columns (total 13 columns):
Unnamed: 0          44242 non-null int64
age_upon_outcome    44237 non-null object
animal_id           44242 non-null object
animal_type         44242 non-null object
breed               44242 non-null object
color               44242 non-null object
date_of_birth       44242 non-null object
datetime            44242 non-null object
monthyear           44242 non-null object
name                37186 non-null object
outcome_subtype     13575 non-null object
outcome_type        44238 non-null object
sex_upon_outcome    44240 non-null object
dtypes: int64(1), object(12)
memory usage: 4.4+ MB
```

We first need to identify the pit bull dogs. Even this name is controversial because the term "pit bull" is often applied loosely to dogs showing characteristics from several breeds. We won't try to solve that issue here, but will be using the shelter-assigned breed. Any dog that lists pit bull somewhere in its identified breed will be identified as one.

```
In [2]: AAS_dogs['pitbreed'] = AAS_dogs['breed'].str.contains('Pit Bull')
        print('Pit Bulls:', AAS_dogs['animal_id'][AAS_dogs['pitbreed'] == True].count())
        print('Non Pit Bulls:', AAS_dogs['animal_id'][AAS_dogs['pitbreed'] == False].count())
        print('Total Dogs:', AAS_dogs['animal_id'].count())
```

```
Pit Bulls: 7413
Non Pit Bulls: 36829
Total Dogs: 44242
```

As you can see, pit bulls make up about 17% of the dogs that have gone through AAS. I now want to look at a couple statistics about what happens to those dogs. specifically, I want to look at the transfer ratio. This is the number of dogs transferred divided by the number of dogs adopted.

I'm using transfers because those are dogs that leave the shelter to one of AAS's partner organizations. Ideally, AAS would be able to get these dogs adopted themselves, eliminating the need for the time, stress, and expense of moving the dog.

```
In [3]: ### Adoption and Transfer rates
        pit_adopts = AAS_dogs['outcome_type'][(AAS_dogs['pitbreed'] == True) & (AAS_dogs['outcom
        pit_trans = AAS_dogs['outcome_type'][(AAS_dogs['pitbreed'] == True) & (AAS_dogs['outcome
        print('Pit Adoptions:', pit_adopts)
        print('Pit Transfers:', pit_trans)

        nonpit_adopts = AAS_dogs['outcome_type'][(AAS_dogs['pitbreed'] == False) & (AAS_dogs['ou
        nonpit_trans = AAS_dogs['outcome_type'][(AAS_dogs['pitbreed'] == False) & (AAS_dogs['out
        print('Non Pit Adoptions:', nonpit_adopts)
        print('Non Pit Transfers:', nonpit_trans)
```

```
Pit Adoptions: 2727
Pit Transfers: 1490
Non Pit Adoptions: 17325
Non Pit Transfers: 8028
```

1.1.1 Transfer Ratio

```
In [4]: pit_ratio = pit_trans / pit_adopts
        nonpit_ratio = nonpit_trans / nonpit_adopts
        print('Pit Bull Ratio:', pit_ratio)
        print('Non Pit Bull Ratio:', nonpit_ratio)
```

```
Pit Bull Ratio: 0.5463879721305464
Non Pit Bull Ratio: 0.4633766233766234
```

As we can see, the Pit Bull transfer ratio is over 8 percent higher for pit bulls. If we could get that dropped, that would be over 100 dogs that would have gone to a new home rather than being sent to an overloaded partner.

```
In [5]: # few other useful statistics


        #total counts

        nonpitcount = AAS_dogs['pitbreed'][AAS_dogs['pitbreed'] == False].count()
        pitcount = AAS_dogs['pitbreed'][AAS_dogs['pitbreed']].count()
        total_count = AAS_dogs['pitbreed'].count()
        print("non pit count:", nonpitcount)
        print("pit count:", pitcount)
        print("total", total_count)

        #total adoption rate

        pit_adopt_rate = pit_adopts / pitcount
        nonpit_adopt_rate = nonpit_adopts / nonpitcount
        print('Pit Adoption Rate:', pit_adopt_rate)
        print('Non pit Adoption Rate:', nonpit_adopt_rate)
```

```
non pit count: 36829
pit count: 7413
total 44242
Pit Adoption Rate: 0.367867260218535
Non pit Adoption Rate: 0.4704173341660105
```

As we can see, the adoption rates as a total of intaken dogs is much lower, but this number is coplicated by the fact that there are more outcomes than simply adoption and transfer, which is why I am only using the transfer ratio.

There are many other outcomes besides Transfer and Adoption, such as Euthanasia, Died, Return to Owner, etc. Some of these vary greatly between breeds, e.g., lots of pit bulls are returned to owner. However, in this effort, we are going to work specifically to examine the transfer rates. This has the potential to both help dogs and to help the budgets of several organizations.

1.2 Research Proposal

I propose that we create a campaign to inform potential pet adopters about the benefits of owning a pitbull. Many potential owners reject this option immediately, so we will make sure they know what they are passing up. Becuase many eventual owners visit several times, it can be difficult to pin down exactly what helped them make the decsion.

Hypothesis: Showing potential dog adopters an informative flyer will lower the pit bull transfer ratio.

Null Hypothsis: Showing the potential adopters a flyer will not lower the pit bull transfer ratio.

The rollout plan: We will perfom sequential A/B testing to visitors to the shelter. The control group will be the same month from the prior year. No flyer was offered offered at that time. Intake levels for dogs at AAS seem similar year-on-year for the months from February through November, so we will begin in February. In the begining of the test, when a visitor comes to look at dogs, they will be offered a copy of the "Why you should consider adopting a pitbull" flyer.

Discussion of testing method: Why are we using prior year data as the control group. First, we're lucky that the data appears to be consistent over the years, so at least we have the option. Second, the nature of dog adoption makes it difficult to do a simple A/B test. A potential owner might come in during a week when we were posting a flyer, but not adopt a dog until six weeks later. It is impossible to confirm whether any adoptions after a single test were truly independent. Also, people are allowed to wander in to look at dogs without signing in, so it would be difficult to verify what group they were in. Creating a second shelter is also not an option. Since we can't have a concurrent control group, we will use one that already exists, the previous year's results.

Testing the solution: After the first test month, we will recalculate the transfer ratios for the pit bulls and compare it to the previous year. It is likely that one month won't be enough to see a large swing, but it should be enough to note a difference if there is one. Then we will continue the test for six more months. At the end of this time, we will compare the transfer ratio of the total test group to the ratio of the control group.

Success metric: We will consider this a success if the pit bull transfer ratio decreases 5%. To verify that this is a statistically significant result, we will us a proportion test of the historical and test transfer rates. We will only count this as a success if we can reject the null hypothesis with 95% confidence.

Secondary metrics: We will also be looking at adoption rates for pit bulls and for pitbulls vs. other animals to see if there is any canibalization from increasing one breed's adoptions.

2 Summary

Maintaining a no-kill status is not easy for a shelter. Resources are limited, and shelters need to work to conserve not only money, but the huaman resources that make the no-kill practice possible. We think that one possible way to do this is to get more dogs adopted directly rather than passing them on to parner organizations. We expect that improveing the transfer ratio of a difficult-to-adopt dog like pitbulls will be an excellent way to do this. By encouraging potential

dog owners to consider these dogs, we hope that more dogs will end up in forever homes sooner rather than later.