Pandemic Impact on Dallas Animal Services

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Abstract

The Covid-19 pandemic has impacted many industries, including municipal animal services. Animal shelters are intended to match animals with permanent homes, while providing a safe community for both animals and people. The Covid-19 pandemic has challenged the City of Dallas' Animal Services department to create new innovative strategies to meet the needs of the community. This problem affects all Dallas residents and animals needing to be rehomed. A decline in animal services is first observed in March 2020 when the stay-at-home orders by county officials went into effect. This study will explore the impact of the Covid-19 pandemic on Dallas' animal adoptions, surrenders, and impounds by observing trends and conducting a correlation analysis of Covid19 confirmed cases and animal services over time. The animal services data used for the study is obtained from the City of Dallas open data portal and the Dallas Covid-19 data is from USAFACTS. Inferences drawn from the study will be used to suggest recommendations and strategies to help Dallas Animal Services improve services through the continuation of the pandemic period.

Keywords: t-test, ANOVA, Pearson's correlation coefficient, covid-19 pandemic, animal shelters, Dallas

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Background

Dallas Animal Services (DAS) is a member of Human Animal Support Services (HASS), a national coalition of 13 animal shelters. DAS and the organization have the goal of permanently rehoming animals by introducing a new welfare organizational model. The organization allows animal shelters to identify pets and people as family-units and work to maintain them together. The Covid-19 pandemic has forced organizations across the world to re-think how business is conducted safely and successfully.

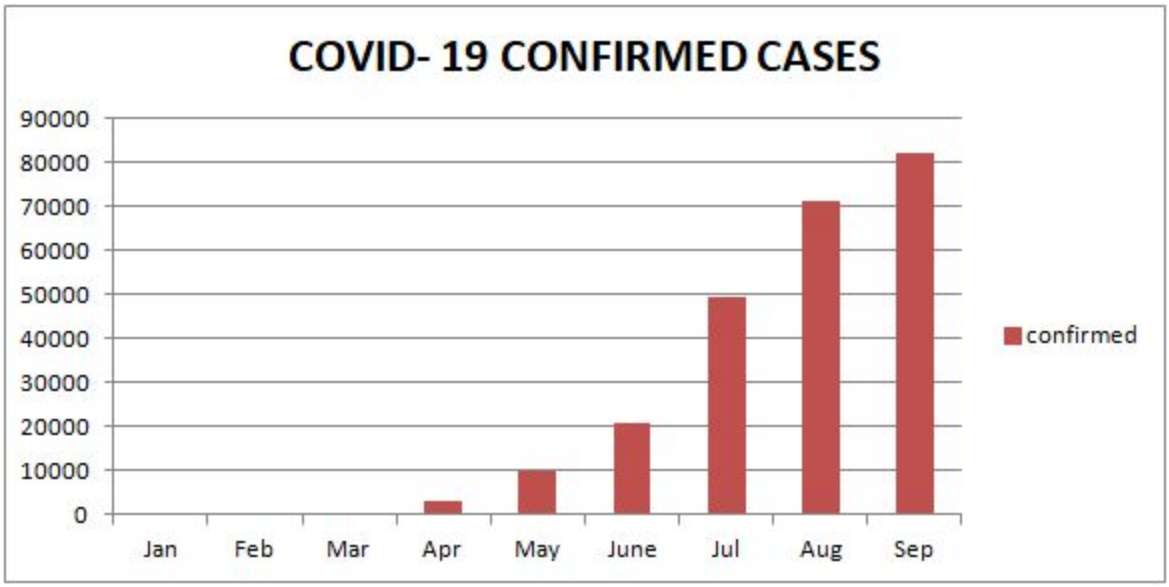
The Covid-19 crisis started in December 2019 and impacted the Dallas metroplex area beginning in March 2020. March 2020 is when the first Covid-19 were positively confirmed; the positivity rate has risen rapidly since then. The pandemic imposes many challenges for economies and animal shelter services. Various organizations have claimed that there isn't any proof that animals can spread the COVID-19 virus to people. However, social distancing remains critical for controlling the spread of the pandemic. The Dallas Animal Services department has been coordinating online adoptions since the start of the pandemic.

In March 2020, Dallas county officials issued stay-at-home orders and shut down various businesses to control the spread of the virus. During this same time frame, noticeable fluctuations can be observed in DAS activities. Facing the threat of the virus, DAS has created several new ways to save animal's lives. DAS has made awareness campaigns for the animals on social media allowing residents and other organizations to share their triumphs and successes; success being adoptions and helping residents find their pets. DAS has been working to keep the

animals safe and deterred from euthanasia. DAS' emergency management plans consist of having a 2-week supply of food, medications, toys, and treats to ensure the needs of the animals are being met. This study will test the theory that 2020 is an abnormal year for animal adoptions, owner-surrenders, and impounds (referred to as strays in the data). The study will further assess whether the abnormality has a strong correlation to the Covid-19 pandemic. Figure 1 below reflects confirmed Covid-19 cases over time.

Figure 1

Covid-19 Confirmed Cases in Dallas County during January 2020 to September 2020



Problem statement

This study will explore the impact of the Covid-19 pandemic on Dallas' animal adoptions, surrenders, and impound services by observing Covid19 confirmed cases over the time period of October 2019 through September 2020. In order to observe the cases and get an overview of the

condition, the data is first visualized and expanded back to Oct 2017 to make a clear comparison between pre-Covid-19 and post- Covid-19 service conditions. See figure 2 and 3 below. The historical data establishes no significant difference and allows the opportunity to make inferences for activities in 2020. Although correlations can be made, causation can't be determined. For example, it is possible that owner surrender cases decrease because more people enjoy animal's companionship during the lockdown period; which leads to the question if owners will surrender their pets back to shelter after the pandemic? If this issue happened, are animal shelters ready to accommodate the influx of surrendered animals? Addressing and analyzing this issue will allow for making recommendations according to the actual data and inform animal shelters to have some preparations for various scenarios to come.

Figure 2

Stray, Owner surrender, Foster Cases from October 2017 to September 2020

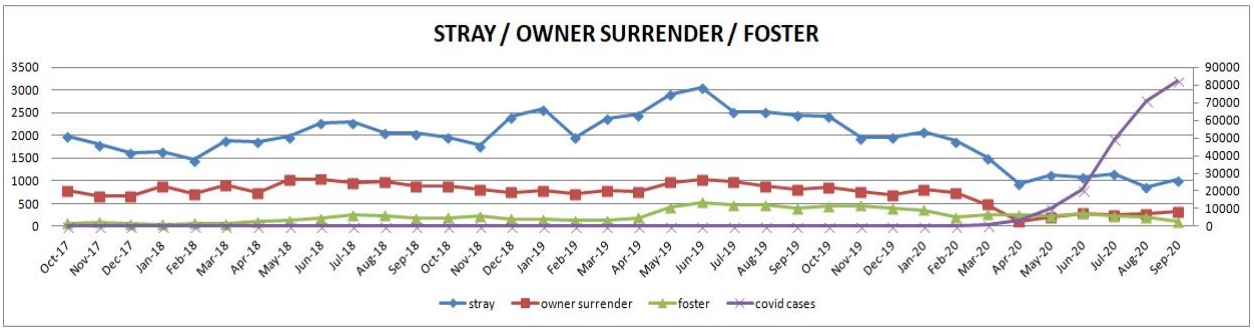
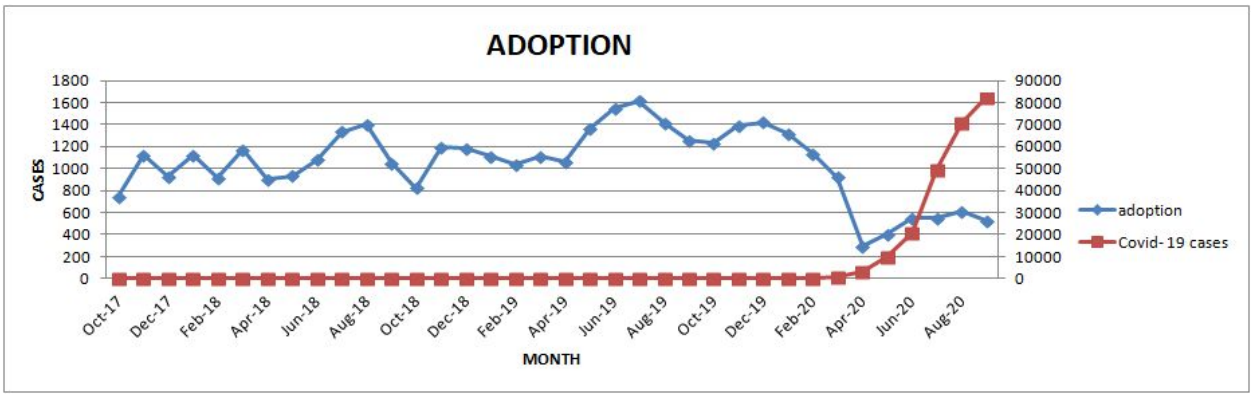


Figure 3

Adoption Cases from October 2017 to September 2020



About the Dataset

Dallas Animal Services reports their operational processes daily. Operational processes include intake and outcome activities. Figures 4 and 5 below reflect the activities by category. Although there are 18 intake and outcome activities types, this study will focus on four categories: owner surrenders, strays, fosters, and adoptions. Intake activities are owner-surrenders and impounds (strays). Owner surrenders are when residents surrender their pets because they can no longer care for them. Strays are listed as an intake activity when animals are impounded and returned to the animal shelter. Outcome activities include adoptions. The City of Dallas' Animal Services department provides opportunities for residents to rescue homeless animals through adoption or fostering. Residents have the option to foster animals when the shelter is overcrowded. Fostering allows residents to care for animals intermittently while saving animals from being euthanized. The dataset used includes all animal services activities from October 2017 through September 2020 and positive confirmed Covid-19 cases

from January 2020 thru September 2020. The dataset for animal services activities from 2017 through 2020 are used to compare means. The dataset for positive confirmed Covid-19 cases will be used to examine if there is a correlation to animal services activities from October 2019 through September 2020.

Figure 4

Intake type proportion

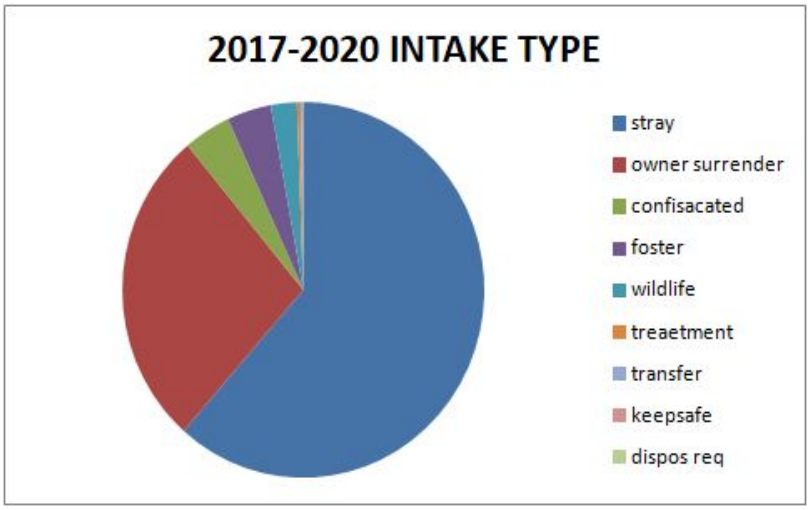
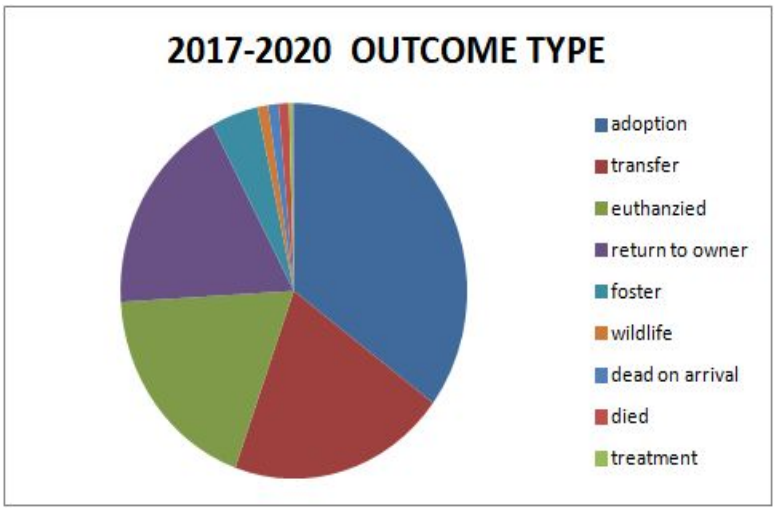


Figure 5

Outcome Type from 2017 to 2020



Exploratory Data Analysis: T-Test and Hypothesis

Table 1

T-TEST result

	STRAY	OWNER SURRENDER	FOSTER	ADOPTION
2017-2018 & 2018-2019	0.0008	0.8920	0.0022	0.0609
2018-2019 & 2019-2020	0.0001	0.0003	0.9197	0.0144

The null hypothesis indicates that variances are the same whereas alternative hypothesis indicates that variances are different. The purpose of the test is to determine whether the Covid-19 pandemic affects the adoption cases, stray impoundment, owner surrenders, and foster cases in Dallas animal services.

Three years of data are compared and grouped into two groups. The control group is defined as data from year 2017 to 2018 and year 2018 to 2019, while the treatment group, or

pandemic affected group, as data from year 2018 to 2019 and year 2019 to 2020. α value set as 0.05, so if the T-TEST value is greater than 0.05, then the null hypothesis is accepted, and vice versa.

After running the test, it was determined that both owner surrender and adoption groups have significant changes from the control group to treatment group, which means before Covid-19 pandemic, owner surrender cases and adoption cases were remaining the same, whereas during the pandemic, it significantly changed.

Figure 6

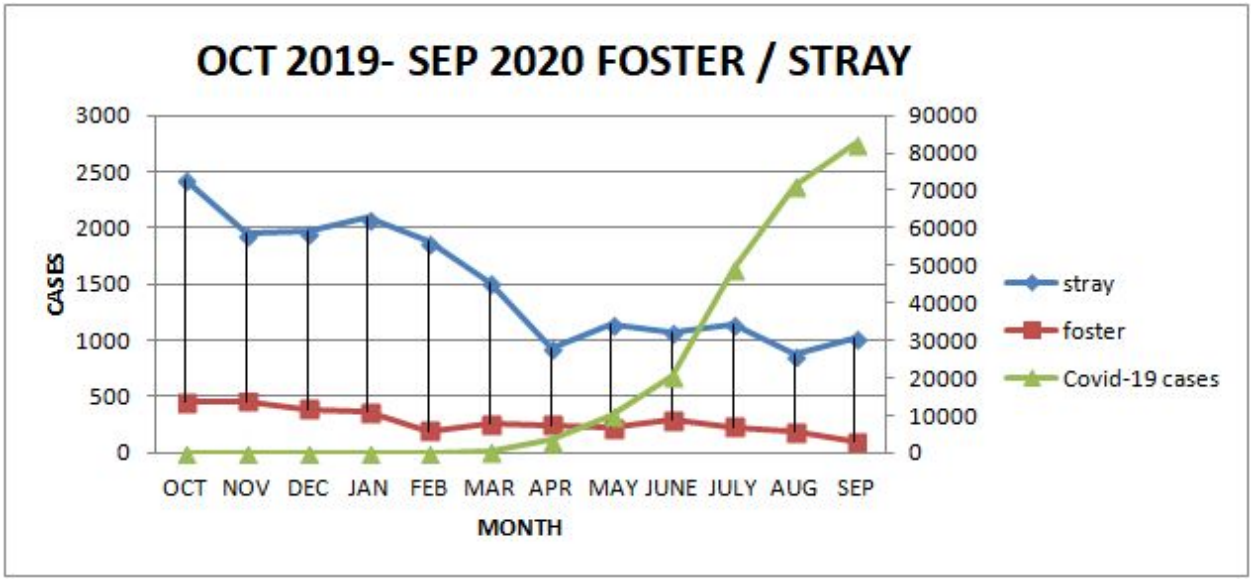
Owner Surrender and Adoption Cases from October 2019 to September 2020

On the other hand, stray groups in recent years including pre-Covid or post-Covid shows are somewhat unstable. The numbers may result from various reasons; it is necessary to dig into the issue before further conclusions can be drawn. The number of fosters shows a change in previous years while unchanged during the pandemic. When observing three years of record,

foster cases rose from summer 2019 and remain relatively stable. However, foster cases started to decrease from July 2020 to Sep 2020. Although not significant enough to affect the p-value, there is still a need to track further to confirm the trend.

Figure 7

Foster and Stray cases from October 2019 to September 2020



An analysis of variance (ANOVA test) was used to confirm that there is any significant difference in the three years prior to the Covid-19 pandemic for each activity type. The table below reflects the Anova results. The mean for FY 2020 is significantly lower than previous years and the P-value for each category is less than the alpha (0.05). Therefore, the null hypothesis is rejected (the means are significantly different).

Table 2

ADOPTIONS SUMMARY				
Groups	*Count*	*Sum*	*Average*	*Variance*
FY 2018	12	12728	1060.667	36379.333
FY 2019	12	14759	1229.917	51720.447
FY 2020	12	10370	864.167	175404.152

ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	804123.5	2	402061.750	4.577	0.018	3.285
Within Groups	2898543	33	87834.644			
Total	3702667	35				

FOSTERS SUMMARY				
Groups	*Count*	*Sum*	*Average*	*Variance*
FY 2018	12	1482	123.500	5008.636
FY 2019	12	3485	290.417	22915.720
FY 2020	12	3419	284.917	12027.538

ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	215787.1	2	107893.528	8.102	0.001	3.285
Within Groups	439470.8	33	13317.298			
Total	655257.9	35				

OWNER SURRENDER SUMMARY				
Groups	*Count*	*Sum*	*Average*	*Variance*
FY 2018	12	10237	853.083333	18494.08333
FY 2019	12	10156	846.333333	10476.24242
FY 2020	12	5824	485.333333	73928.60606

ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	1062427	2	531213.250	15.487	0.000	3.285
Within Groups	1131888	33	34299.644			
Total	2194315	35				

STRAYS (IMPOUND) SUMMARY				
Groups	*Count*	*Sum*	*Average*	*Variance*
FY 2018	12	22897	1908.083	63435.356
FY 2019	12	28949	2412.417	138559.720
FY 2020	12	18016	1501.333	285515.515

ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	4999482	2	2499741.028	15.383	0.000	3.285
Within Groups	5362617	33	162503.530			
Total	10362099	35				

Table Notes: H0 = group means are all equal, HA = Not all group means are equal, α = 0.05.

Result: Reject the null hypothesis because P<0.05 (Means are different)

Furthermore, to determine the strength in correlation between Dallas Covid-19 positive confirmed cases and Dallas animal services activities, the Pearson's correlation coefficient test was used. The results are reflected in table 3 below. Pearson's correlation of adoption to Covid-19 cases is -0.53, indicating a large negative correlation to Covid-19 cases. As part of the data exploration process, the relationship between euthanized animals and Covid-19s was also tested using Pearson's correlation. The results shown in table 4 below indicated a strong correlation. The activities for surrenders, strays, and fosters also indicated a large negative correlation to Covid-19 cases. The largest negative correlations occurred with strays and fosters.

Table 3

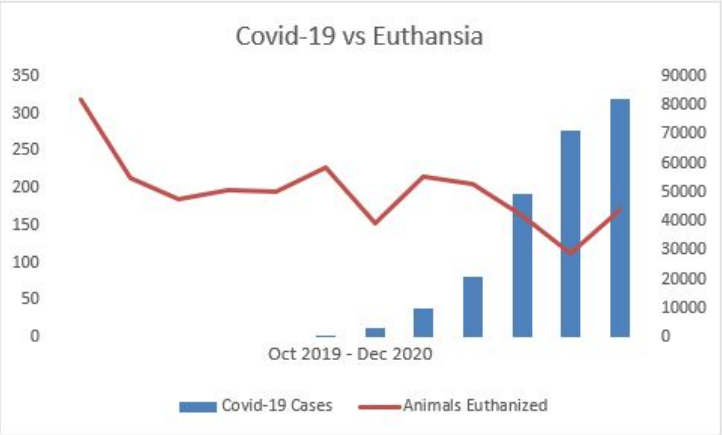
Pearson's Correlation Coefficient (activity types)

Month	Covid-19 Cases	Adoptions	Surrenders	Strays	Fosters
19-Oct	0	1237	865	2426	452
19-Nov	0	1396	760	1947	460
19-Dec	0	1423	693	1966	391
20-Jan	0	1315	809	2091	361
20-Feb	0	1141	749	1879	198
20-Mar	631	923	483	1510	264
20-Apr	3352	293	114	934	251
20-May	10006	406	210	1142	221
20-Jun	20737	551	287	1078	290
20-Jul	49269	547	250	1150	232
20-Aug	71170	607	285	871	194
20-Sep	82161	531	319	1022	105
	Pearson =	-0.53	-0.53	-0.65	-0.67
	Strength =	Large	Large	Large	Large
		Negative Correlation			

Table 4

Pearson's Correlation Coefficient (Euthansia)

Month	Covid-19 Cases	Animals Euthanized
1 (Oct 2019)	0	319
2 (Nov 2019)	0	213
3 (Dec 2019)	0	185
4 (Jan 2020)	0	197
5 (Feb 2020)	0	195
6 (Mar 2020)	631	227
7 (Apr 2020)	3352	153
8 (May 2020)	10006	216
9 (Jun 2020)	20737	206
10 (Jul 2020)	49269	163
11 (Aug 2020)	71170	113
12 (Sep 2020)	82161	170
	Pearson =	-0.569
	Strength =	Large
		Negative Correlation
	Mean =	196.42



Findings Summary and Recommendations

The Pearson's correlation method indicates a high correlation between Dallas Covid-19 positive cases and Dallas Animal Services activities. The Covid-19 pandemic is affecting Dallas Animal Services adoptions, strays, surrenders, and fosters, negatively while T-Test shows some changes in different levels depending on groups.

We could notice that adoption and owner surrender cases dropped from 2000 to 1000 cases and 1200 to 500 cases respectively. To the owner surrender group, the decrease can be considered as a good sign and we could infer that if the pandemic continues, the cases would remain relatively stable in a lower range. However, if people resume to work and fail to generate bonds with their pets, the owner surrender rate would rise back to pre-covid level again. From another perspective, if the pandemic continues and the economy remains stagnant or worsens,

then a support network would be helpful for supporting owners to keep their pets. We could see lower levels of owner surrender cases as a chance to bring down the overall rate by helping owners build bonds with their pets and support owners economically by strengthening the community network. Moreover, we need to be prepared for a situation when surrender rates increase but shelters have undergone low adoption rates during the pandemic, how many more pets could be accommodated in our city shelters? To prevent this situation, it is necessary to address this issue to the public and promote animal knowledge education by teaching people how to get along with their pets and instilling people with the benefits of having a pet companion.

Additionally, it is observed that stray cases largely dropped from April,2020 and remained relatively low until September,2020 in Figure 7. It is inferred that missing pet cases decrease because people are spending more time at home to give more attention to their pets and family life. Foster cases also remain at a low level which indicates people have either decided to adopt their foster pets and/or continue raising their pets.

References

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