

# Waupaca Humane Spay and Neuter Analysis

*Presented By:*

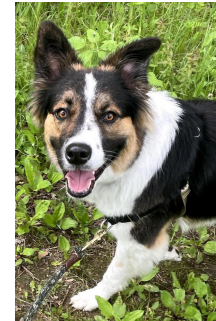
*Karganleh Borh, Alex Mitchell, Carolyn Shaffer, and Jeff Sischo*





# Introduction

The purpose of this project is to analyze data from the Waupaca Humane society. The analysis will support a grant request for Spaying and Neutering free roaming cats and pets of low income families.





# Overview

- Data cleansing and storing
- General information and trends
- Spay and neuter analysis
- Spay and neuter predictions

# Every Row is a Wet Nose





# Data

- Provided with 6 Excel files including medical and intake data over a time span of 3 years
- Performed preliminary cleaning and data organization in Excel
- Performed additional data cleansing with Python to ensure data met our model and dashboards needs
- Designed relational base
- Created database to store data hosted on Amazon RDS
- Connected database to machine learning model

adopted_location		intake	
Animal #	varchar(9)	Animal #	varchar(255)
Out City	varchar(16)	species	varchar(255)
Out Province	varchar(2)	Primary Breed	varchar(255)
Out Postal Code	int4	Secondary Breed	varchar(255)
adopted_lat	float4	gender	varchar(255)
adopted_long	float4	altered	varchar(255)
		Age in Months Intake	int4
		Age Group	varchar(255)
		Intake Condition	varchar(255)
		Intake Date	varchar(255)
		Intake Type	varchar(255)
		Intake Subtype	varchar(255)
		reason	varchar(255)
		Agency Name	varchar(255)
		Outcome Date	varchar(255)
		Release Date	varchar(255)
		Outcome Type	varchar(255)
		Outcome Subtype	varchar(255)
		Outcome Reason	varchar(255)
		outcome_agency_name	varchar(255)

found_location	
Animal #	varchar(255)
found_zip_code	varchar(255)
found_lat	float4
found_long	float4

medical	
record_no	varchar(9)
animal_type	varchar(6)
status	varchar(9)
date	varchar(9)
record_type	varchar(7)
record_sub_type	varchar(30)

# Waupaca Humane Serves the Community's Animal Population



# HSWC Dashboards

- Background Stats
- Spay & Neuter Info
- Projected Spay & Neuter Needs



Spay and Neuter Analysis for  
Humane Society of  
Waupaca County

Background Stats

Spay Neuter Info

Projected S/N Needs

*Best Friends come in all shapes and sizes!*

Adoptable dogs



Adoptable cats

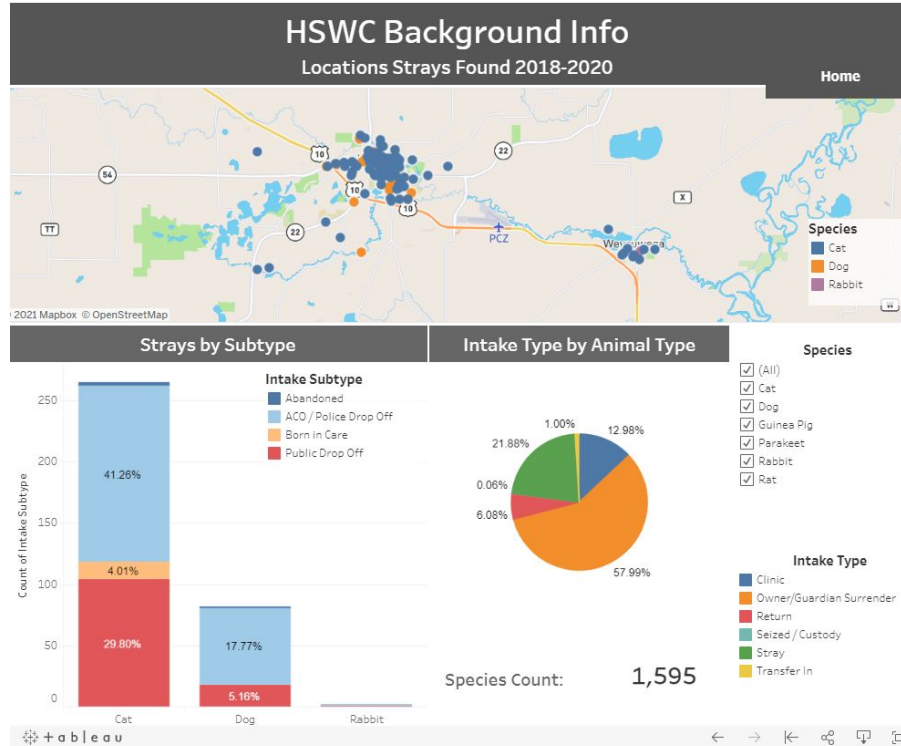


Stray Animals



# HSWC Background Info

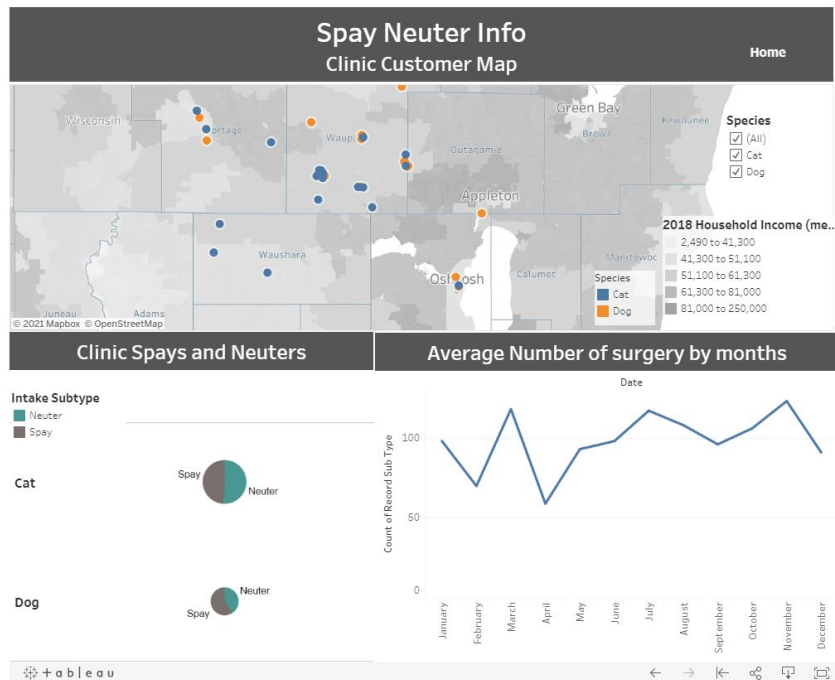
- Map of areas served by the Waupaca Humane Society with locations stray animals were found (2018-2020)
- Percentage of intake types by species
- Comparison of Stray intake by subtype for cats vs dogs
- Overall percentages of intake types for all animals





# Spay and Neuter Dashboards

- Map of Waupaca Humane Society Clinic patient with income level overlay
- Percentage of surgeries performed by species
- Surgeries performed overtime





# Dashboard Demo

[HSWC Dashboard](#)

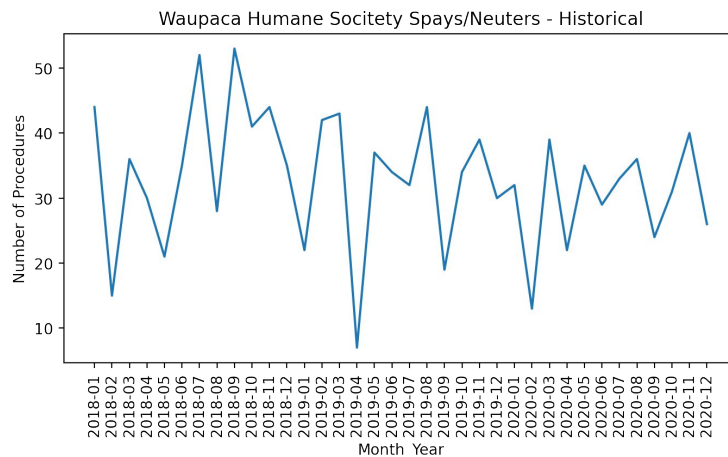
# **Waupaca Humane seeks funding to continue Spay and Neuter Services to Low Income families and Free Roaming Cats**





# Choice of ML model - ARIMA

- ARIMA (AutoRegressive Integrated Moving Average) Model.
  - Plot of cleaned data for initial visualization.





# Choice of ML model - ARIMA

- Limitations/Benefits
  - Outliers can have a large effect on the forecast and they can't be filtered out easily.
  - Univariate - only one series being looked at. Can have a large time series and it is easy to handle.
  - Simple enough to not overfit.



# Data Manipulation - ARIMA

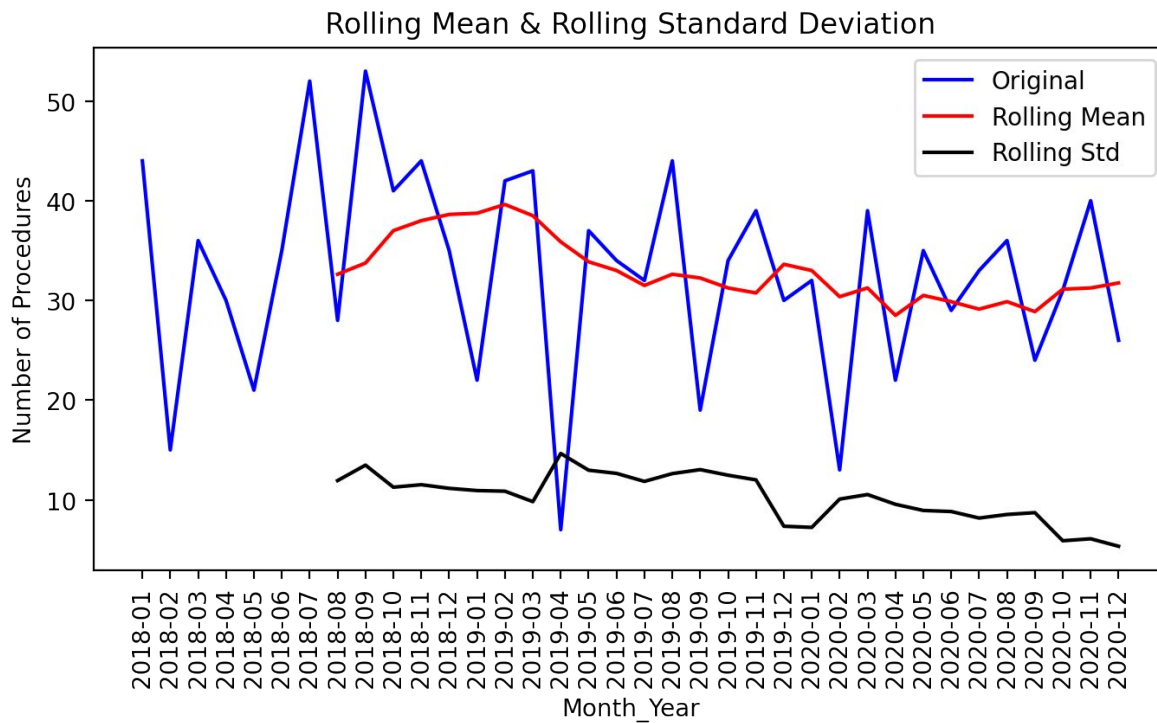
- Features and Engineering
  - Main Features: Date and record\_sub\_type (spay/neuter)
  - Engineering that needed be completed:
    - Extracting M/Y from M/D/Y format
    - Count of the spay/neuter procedures performed
- Split of Test/Train
  - Data series was split into test/train groups of 75% Train and 25% Test:
    - `X = counts.values`
    - `size = int(len(X) * 0.75)`
    - `train, test = X[0:size], X[size:len(X)]`



# Stationary Data Check

Rolling Statistics method

Used 8 period roll





# Stationary Data Check

Augmented Dickey-Fuller (ADF) statistical check

- Desired results:
  - Low p-value
  - 1%, 5% and 10% critical values CIs are close to the ADF.

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ADF Statistic: -4.523442265864301

p-value: 0.00017832531117933361

Critical Values:

1%: -3.639224104416853

5%: -2.9512301791166293

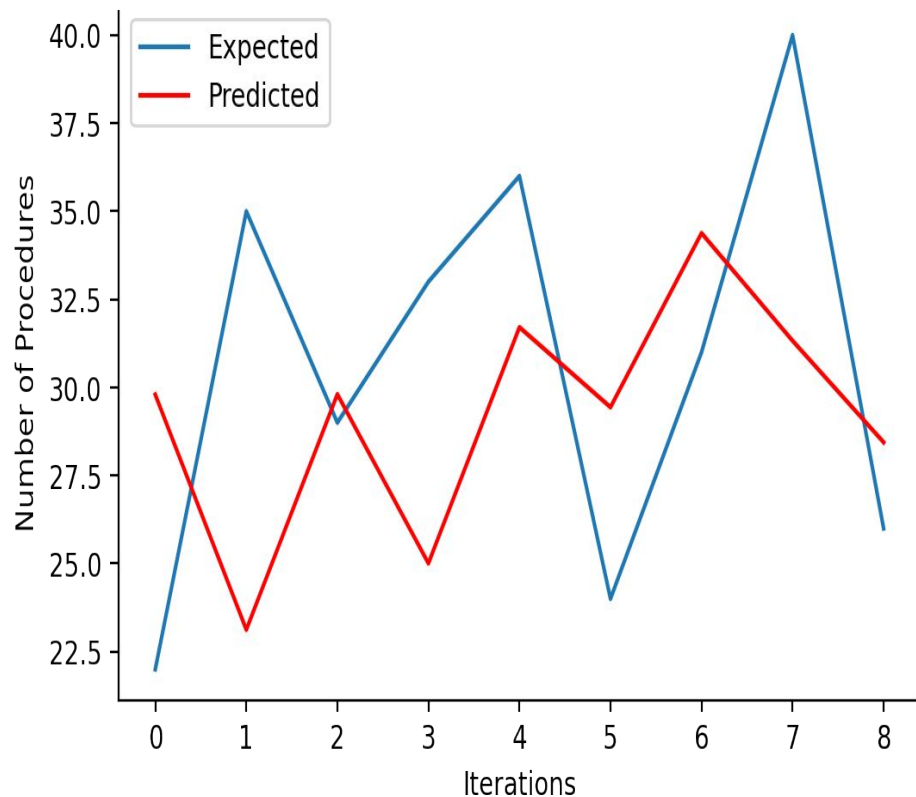
10%: -2.614446989619377





# Validation of Model

```
predicted=29.794556, expected=22.000000  
predicted=23.122617, expected=35.000000  
predicted=29.805987, expected=29.000000  
predicted=25.007105, expected=33.000000  
predicted=31.708055, expected=36.000000  
predicted=29.439180, expected=24.000000  
predicted=34.379528, expected=31.000000  
predicted=31.325659, expected=40.000000  
predicted=28.443528, expected=26.000000  
Test RMSE: 6.725
```





# Final ARIMA Projection

[HSWC Dashboard](#)



# Conclusion

## Outcomes:

- Continued need to Waupaca to perform these surgeries
  - Waupaca will perform about 30 surgeries a month for the next 3 years
  - Clear need for spay and neuter services for cats
  - Data Supports ability to perform surgeries

## Recommendations:

- Additional analysis on seasonality

## What would we do differently?

- More Data
- A relationship between intake tables and medical tables