Understanding Intake and Outcome Patterns in the Long Beach Animal Shelter

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Introduction

About the Dataset

Our chosen dataset is "Long Beach Animal Shelter" data from TidyTuesday's online repository, originally sourced from City of Long Beach Animal Care Services.
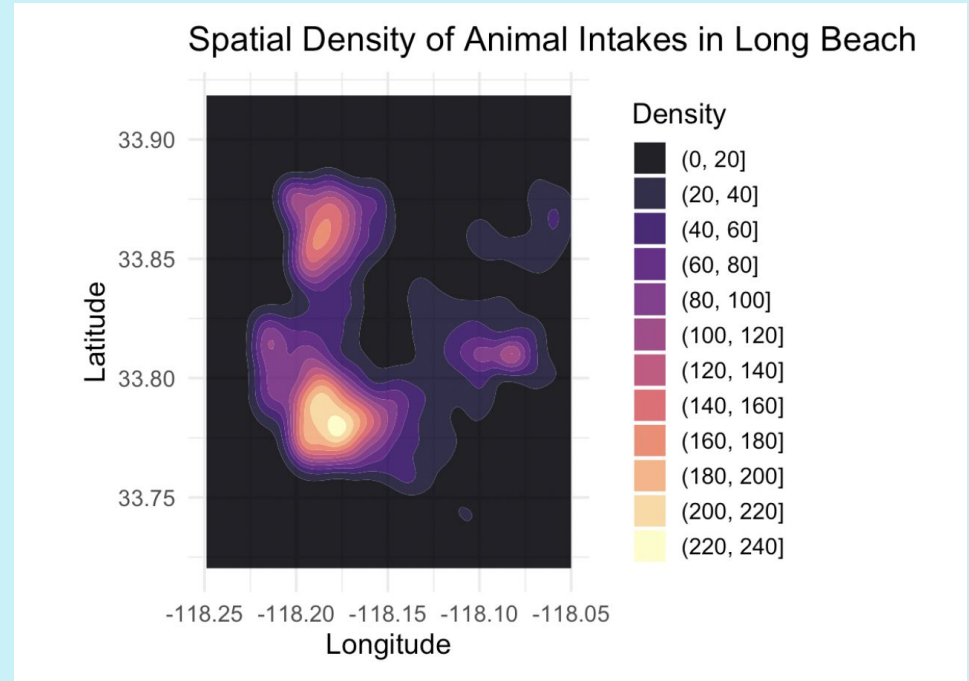
The dataset includes:
- A record of real animal intake cases in Long Beach
- 22 variables (demographic, intake, outcome, and geographic information)
- Over 29,787 observations from Jan 1, 2017 to December 31, 2024.

Research Question 1

How do animal intakes/jurisdiction vary geographically and are there identifiable spatial clusters?
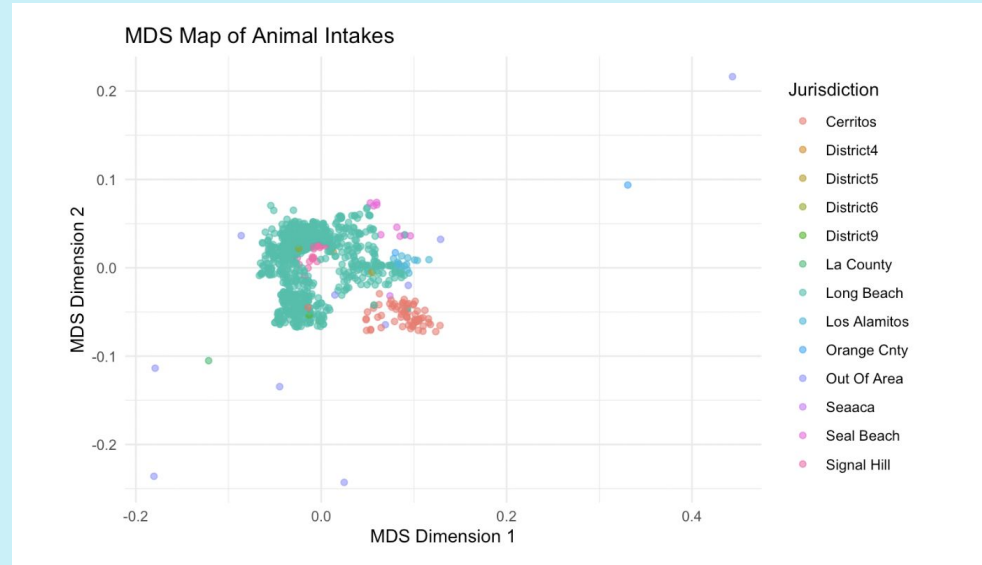
Spatial Density of Animal Intakes

- Visualize where **intakes are concentrated** and in **what areas**
- High-density clusters appear in **central and western Long Beach**
  - Near -118.20 longitude and 33.78-33.80 latitude
- Moderate clusters spread outward into **surrounding areas**
- Low-density regions appear at the **southern and far-eastern edges**
- **Intakes are highly concentrated** rather than evenly distributed across the city
- Clear geographic clusters

Spatial Density of Animal Intakes in Long Beach

Density
- (0, 20]
- (20, 40]
- (40, 60]
- (60, 80]
- (80, 100]
- (100, 120]
- (120, 140]
- (140, 160]
- (160, 180]
- (180, 200]
- (200, 220]
- (220, 240]

Jurisdictions and Animal Intakes

- Most jurisdictions form a **tight, central cluster**
  - **Similar** intake profiles
  - Biggest one = Long Beach
- Smaller surrounding jurisdictions **partially overlap** the main cluster
  - Seal Beach and Los Alamitos
- Cerritos = noticeably **distinct** cluster
- "Out of Area" category shows the **widest spread** across the MDS space
- Animal intake **shaped by local conditions** rather than being uniformly distributed

MDS Map of Animal Intakes

Jurisdiction
- Cerritos
- District4
- District5
- District6
- District9
- La County
- Long Beach
- Los Alamitos
- Orange Cnty
- Out Of Area
- Seaaca
- Seal Beach
- Signal Hill

Research Question 2

Do animal intake patterns in Long Beach show meaningful seasonal or long-term temporal trends?

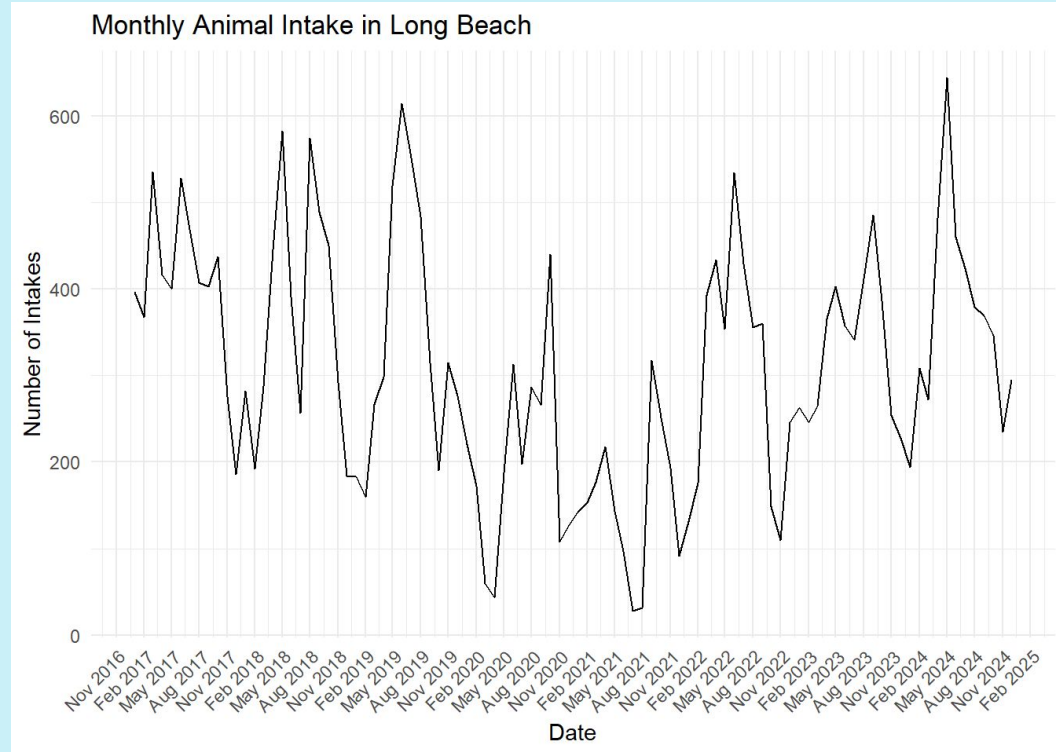# Seasonal Patterns in Monthly Intakes

Plotted monthly intake counts to identify broad temporal trends

Intakes consistently **peak in late spring and summer** (April - August)

Intakes **drop in winter** (December to February)

Seasonal pattern is **stable across years**, even as overall intake volume varies

Pattern aligns with common shelter dynamics (more roaming during longer daylight hours, kitten season, higher owner surrenders)
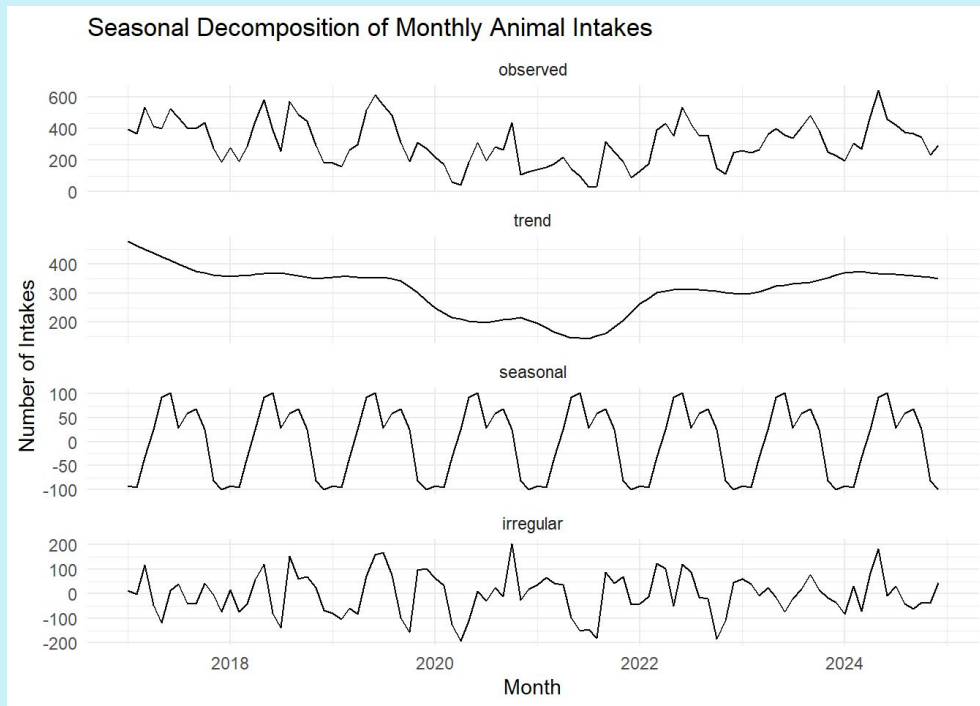

Monthly Animal Intake in Long Beach

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Seasonal-Trend Decomposition

Decomposition results confirm the strong annual cycle seen in the raw data

Trend component reveals **a notable dip around 2020-2021,** likely due to pandemic

After 2021, the trend shows **a gradual recovery**

By the end of the series intake levels return to roughly pre-pandemic baselines
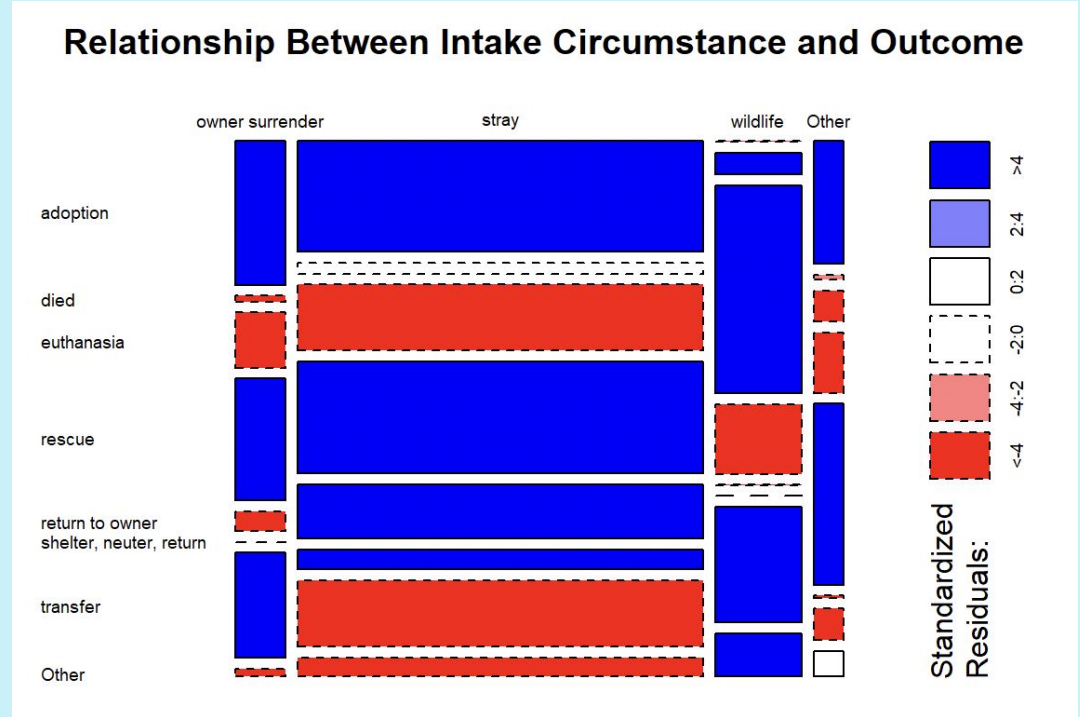

Seasonal Decomposition of Monthly Animal Intakes

Research Question 3

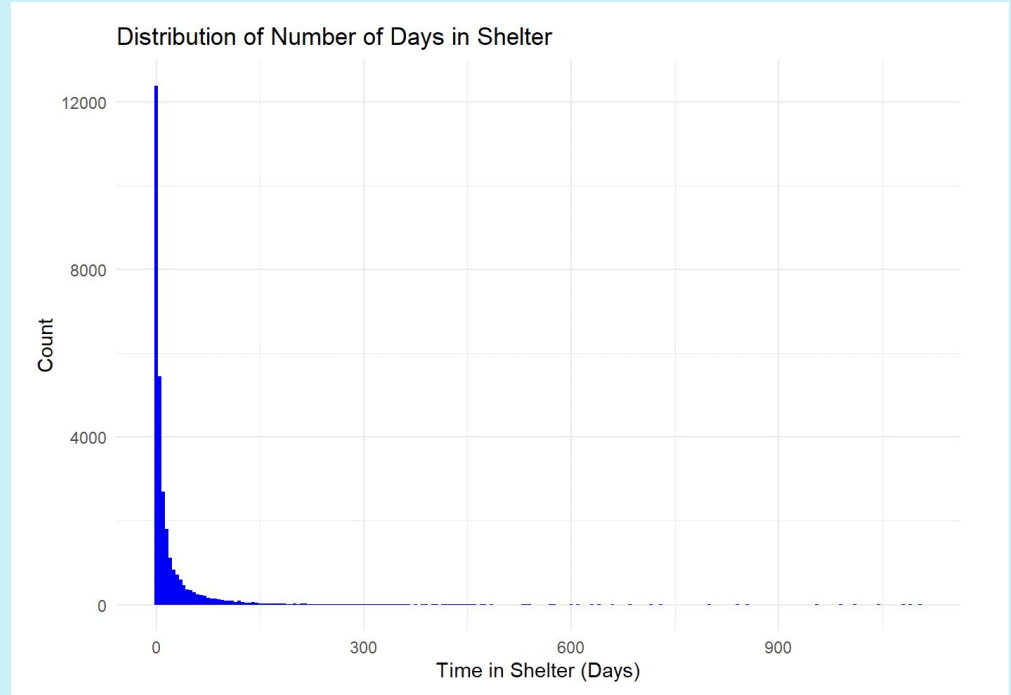**Do intake circumstances or time spent in shelters present trends for case outcomes?**

Intake's Relationship with Outcome

- **Many statistically significant correlations;** indicate intake/outcome pairs that occur more or less often than would occur by chance
- **Key Result: adoption** remains priority and data reflects trend (owner surrender, stray)
- **Key Result:** owner-surrendered pets face high proportion of adoption or transfers, low proportion of return to owners
- **Key Result: wildlife vs. "pet"** distinction is strong (deaths)

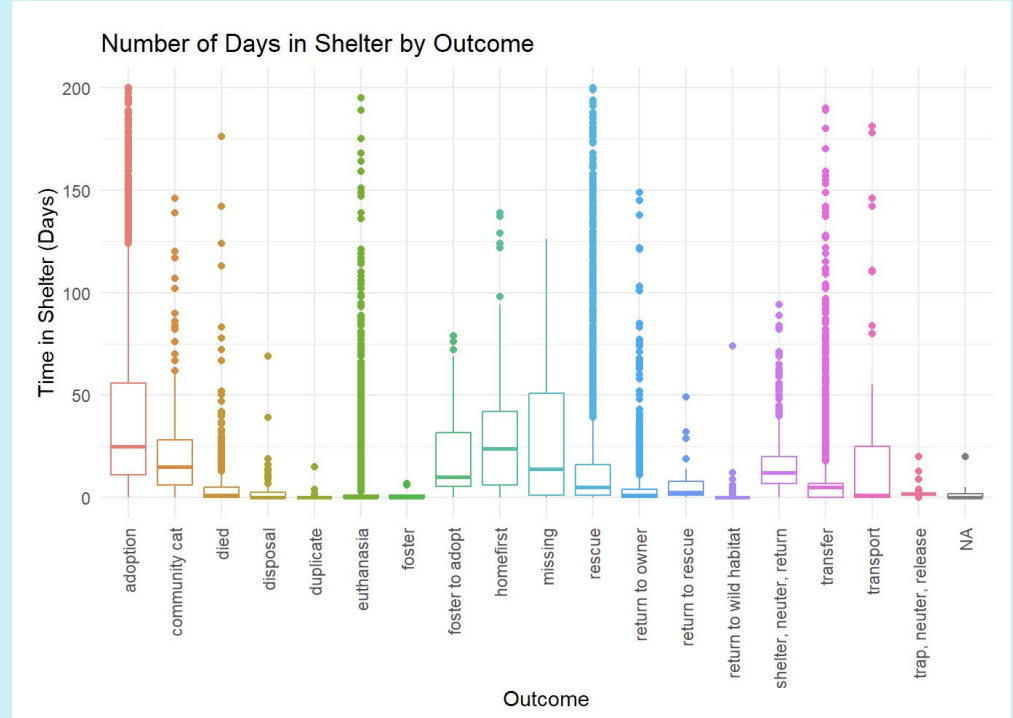Relationship Between Intake Circumstance and Outcome

Number of Days in Shelter

- **Transformed data** to calculate the number of days in shelter for each animal
- Very **right-skewed** distribution, with **outliers** stretching out to **900**+ days
- Data highly concentrated within **100 days** (reflects high turnaround that shelters face with resource shortages)
- For the sake of interpretation in next analysis, **limited** range to less than **200** days

Distribution of Number of Days in Shelter

Number of Days in Shelter

- **High** quantity of **outliers**, especially for adoption, euthanasia, transfer to rescue org., and transfer to other shelter
- **Lower** median and smaller spread for **euthanasia** & **trap, neuter, release**: indicative of performing a prescribed procedure if assigned
- **Higher** median and spread for **adoption**: indicative of "waiting" for adoptable pets
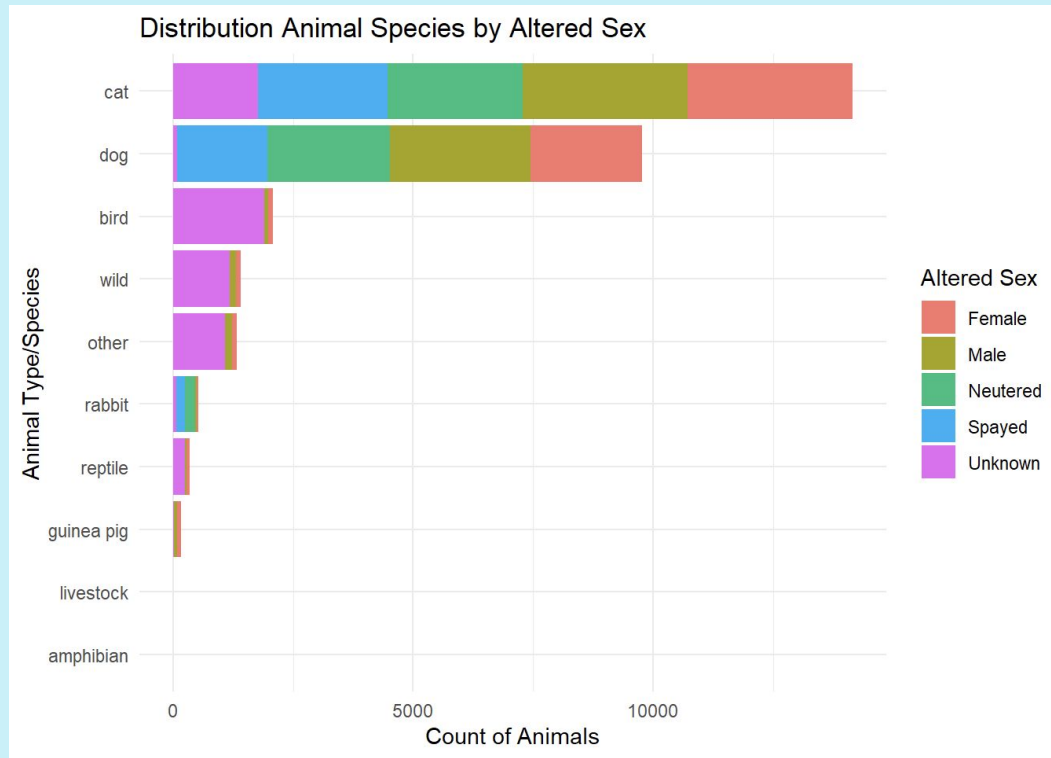- Wanted to perform **ANOVA** to formalize mean differences, but **poor model assumptions** (**normality**)

Number of Days in Shelter by Outcome

Research Question 4

What demographic patterns and naming trends can be observed in the shelter's animal population?

Species-Sex Patterns

- **Cats and dogs** make up most of the shelter population.
  - Many are spayed/neutered, indicating intake of previously owned pets.
  - High numbers of intact cats/dogs point to unplanned litters in the community.
- Unknown sex is more common in small/exotic species due to identification challenges.

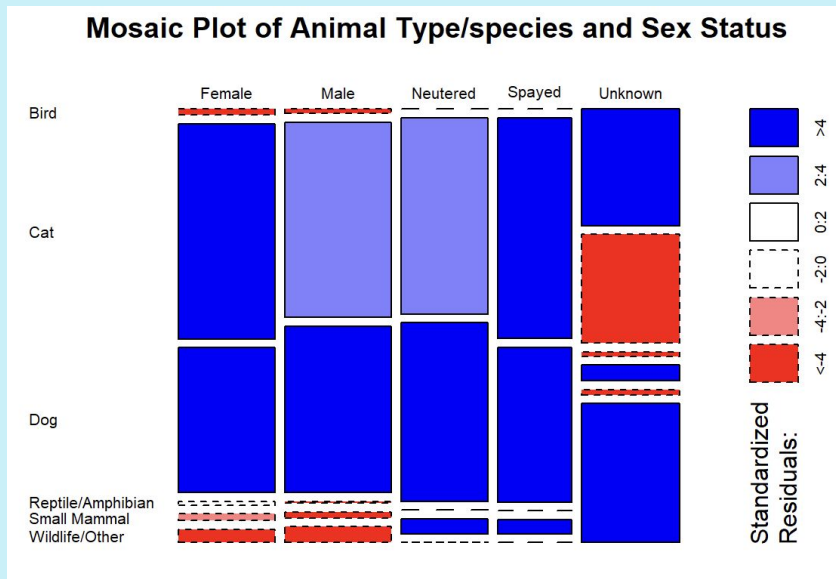Distribution Animal Species by Altered Sex

Species–Sex Associations

Chi- squared Test Results:
- **Highly significant:** p-value far below 0.05 (alpha).
- **Rejects the null:** species and sex status are not independent.
- **Strong association:** species strongly predicts altered sex status.

Mosaic plot support further analysis:
- Strong species–sex association
- Cats are a major source of female animals
- Dogs are a major source of male animals
- Unknown sex varies by species:
  - Cats are strongly underrepresented
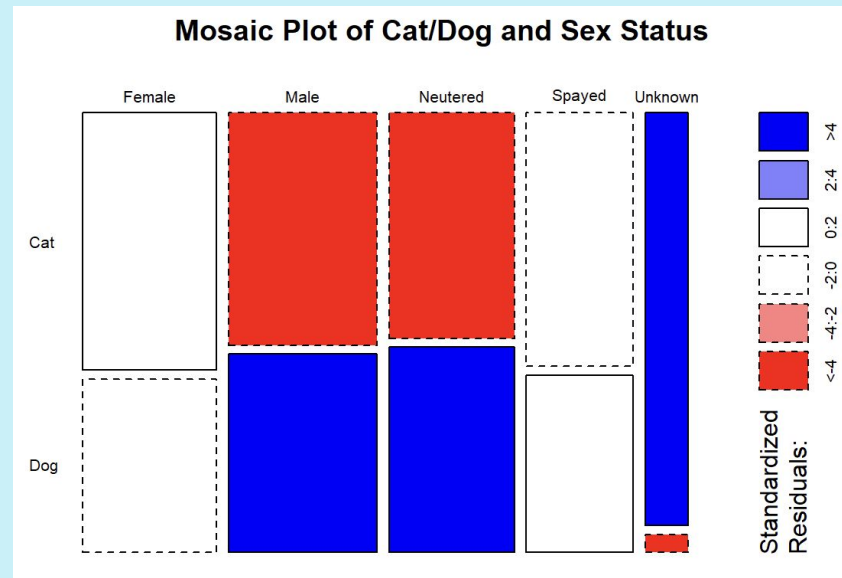 - Wildlife/Other and Birds are overrepresented

Pearson's Chi-squared test
X-squared = 16256, df = 20, p-value < 2.2e-16

Mosaic Plot of Animal Type/species and Sex Status
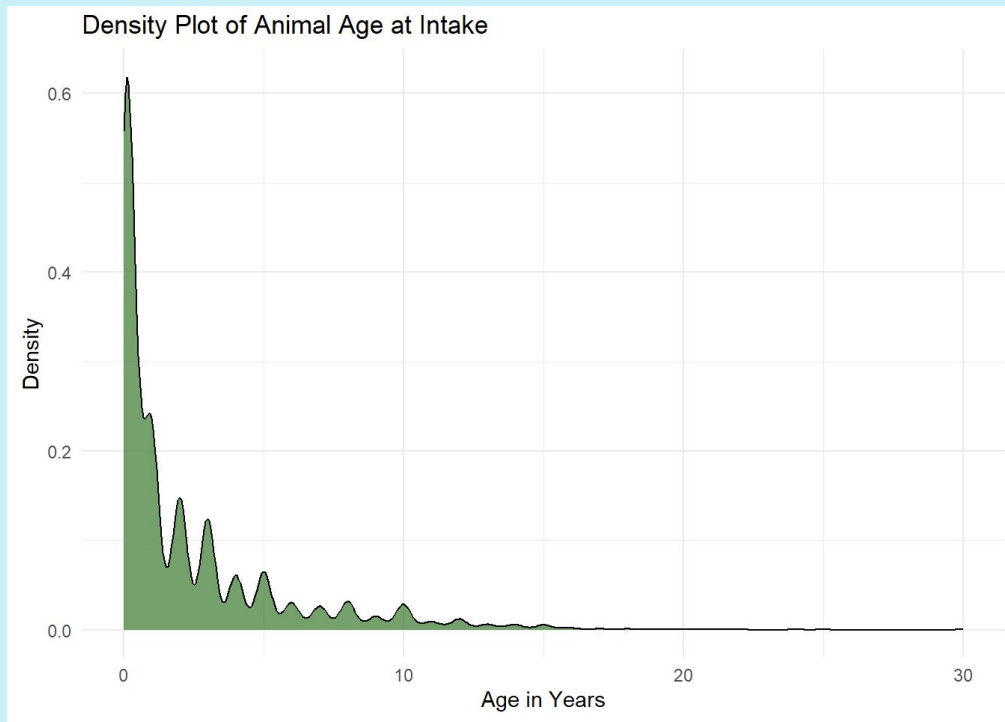
Species–Sex Associations

Zooming in on cats vs dogs:

- Cats are underrepresented among females and unknown-sex entries.
- Dogs are overrepresented among males and neutered animals.

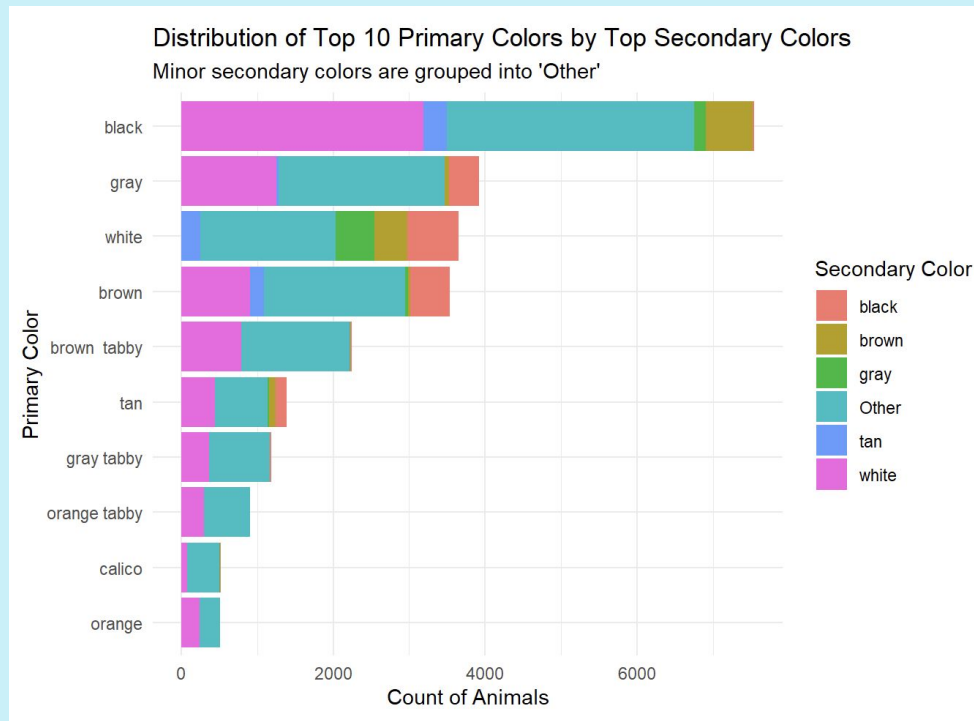Mosaic Plot of Cat/Dog and Sex Status

Age Trends

- **Right-skewed distribution:** Most animals entering the shelter are very young (near 0 years).
- High intake of young animals reflects ongoing unplanned breeding in the community.
- Smaller peaks after 1 year indicate some adult animals are surrendered, though less common.

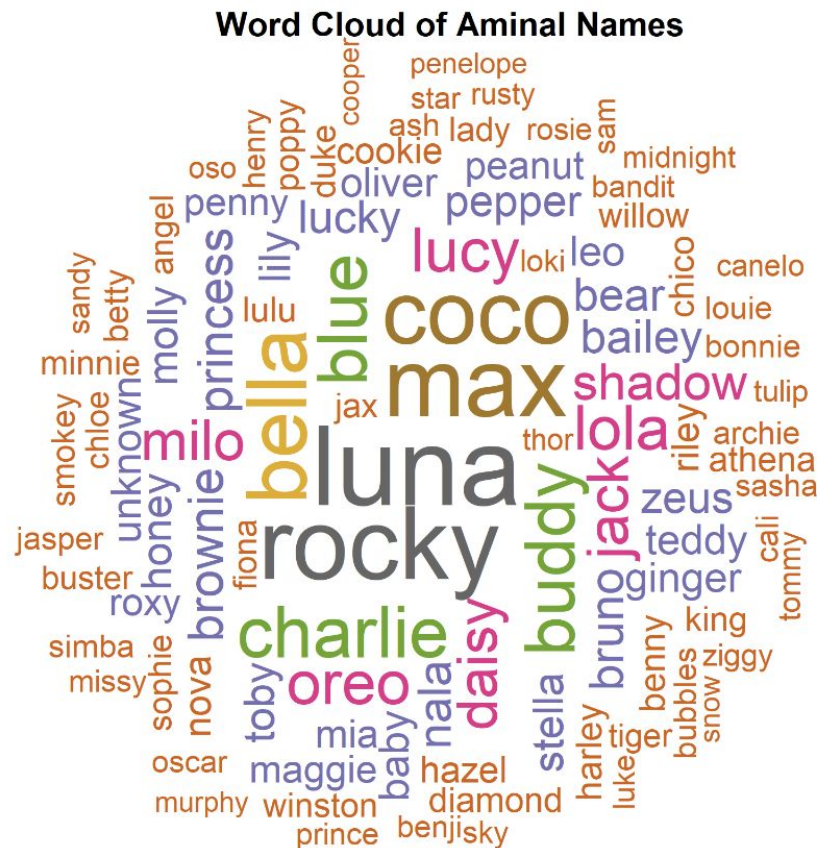Density Plot of Animal Age at Intake

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Coat Color Trends

- **Most common primary colors:** Black, followed by Gray and White.
- **'Other' dominates secondary colors:** Many animals are single-colored or have uncommon secondary colors.
- **White is a common secondary color:** Indicates frequent mixing of white with another primary color.

Distribution of Top 10 Primary Colors by Top Secondary Colors
Minor secondary colors are grouped into 'Other'

Naming Trends

- **Most popular names:** Luna, Rocky, CoCo, Max, Bella, Charlie, Buddy.
- Names are short and simple, reflecting common cultural trends.
- Shelter-assigned names also contribute to naming similarities.

Word Cloud of Aminal Names

Conclusion

Future Exploration

- Animal intakes in Long Beach show clear geographic clustering (central and western Long Beach) and strong seasonal patterns (spring-summer peaks)
- Intake circumstances and shelter outcomes are closely linked, stray and owner-surrendered animals are more likely to be adopted or transferred
- Wildlife cases often involve shorter stays and less favorable outcomes
- Most animal data relates to cats and dogs

For further study, we could merge this dataset with census or city planning data, including neighborhood-level socioeconomic information, stray animal reports, access to veterinary services, and housing stability.

Thanks for Listening!