# BEYOND LABELS: UNDERSTANDING THE TRUE IMPACTS OF LIVE RELEASE RATE AND INTAKE POLICIES

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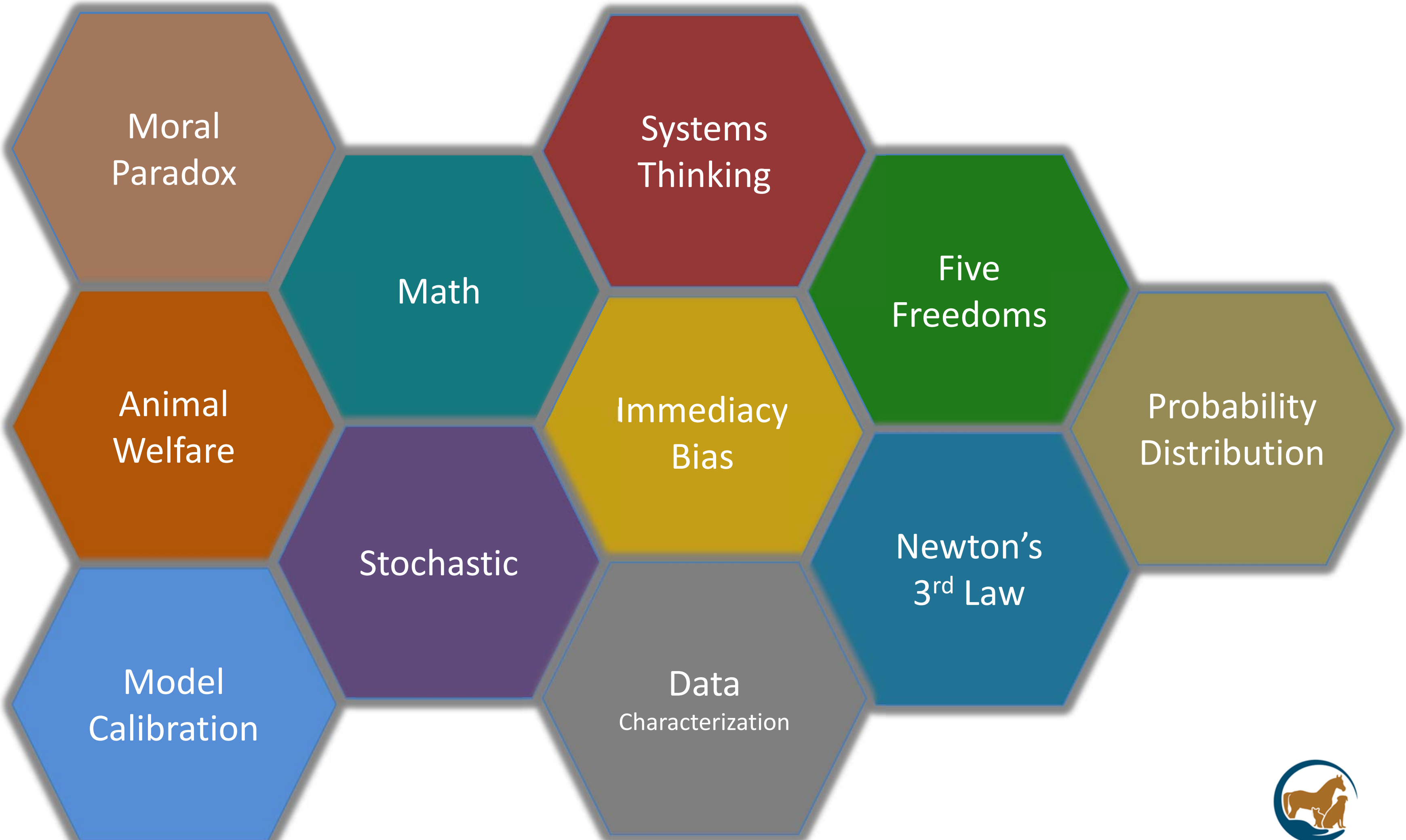
# Connecting Concepts

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# What is Animal Welfare?

The Five Freedoms framework make up a concise and robust definition for animal welfare.

The Five Freedoms:

- **Freedom from hunger or thirst**
- **Freedom from discomfort**
- **Freedom from pain, injury or disease**
- **Freedom to express (most) normal behavior**
- **Freedom from fear and distress**

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The Power of

# STOCHASTIC MODELING & SIMULATION

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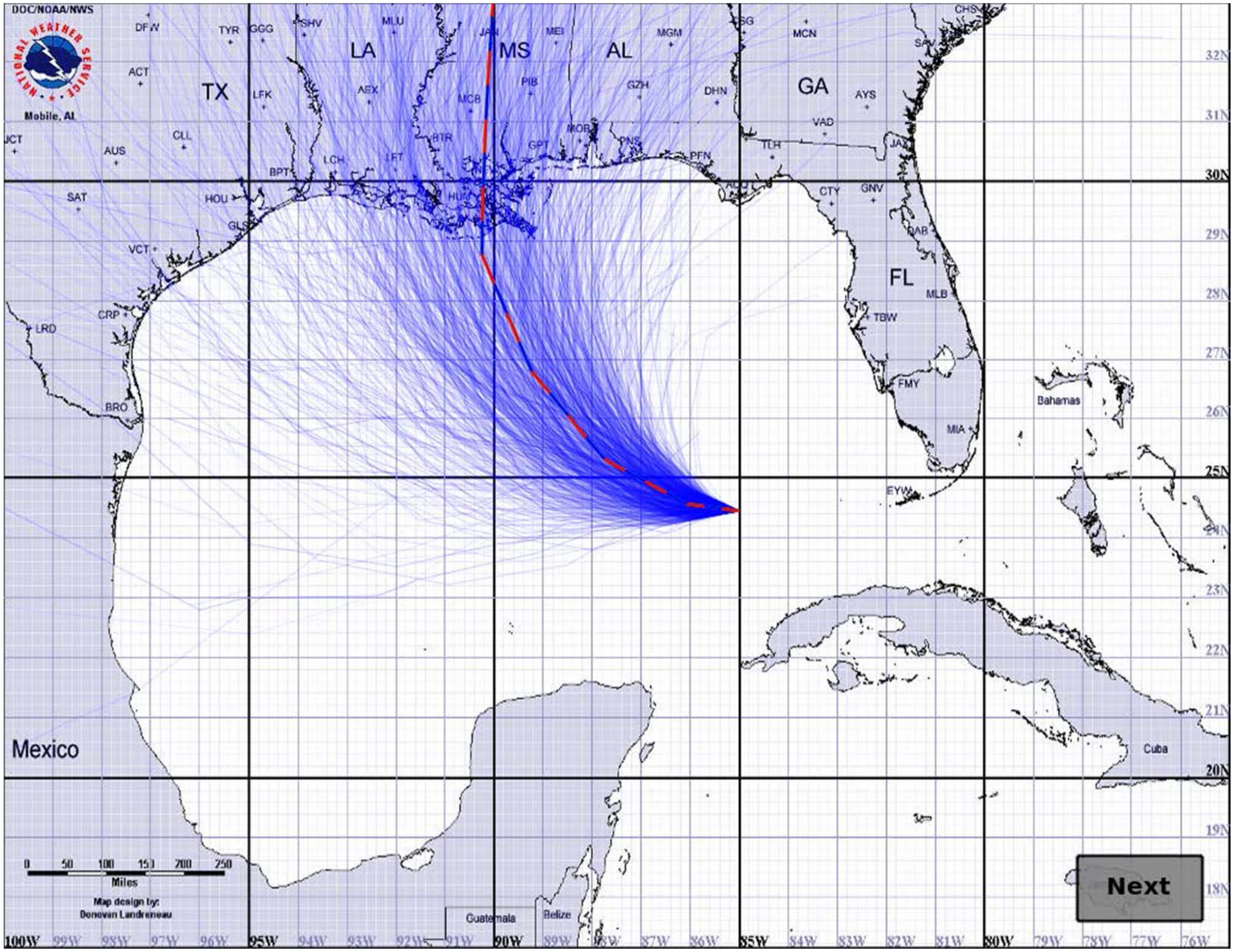
# Stochastic Modeling for Katrina

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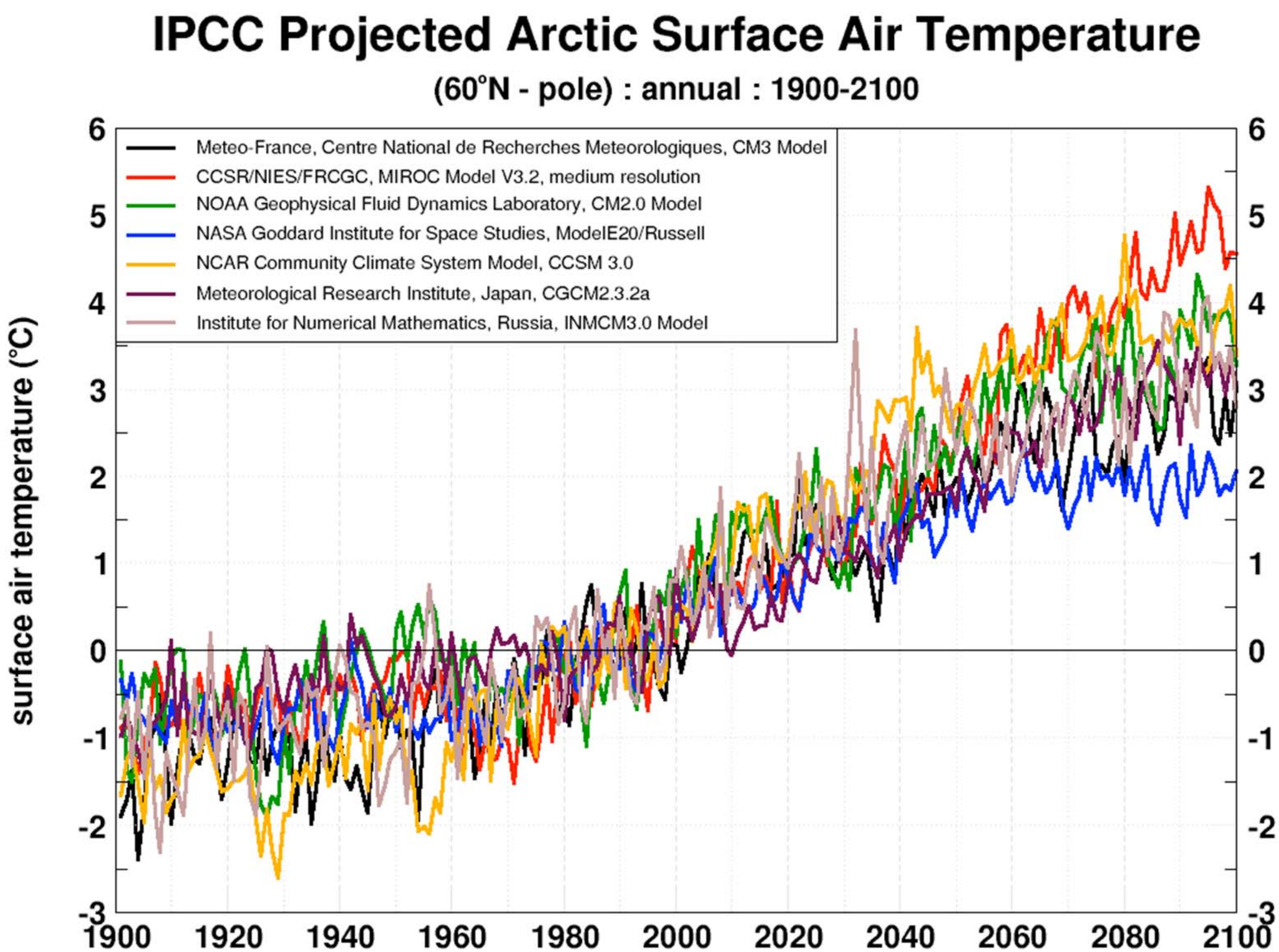
# Global Warming



# Basics of Stochastic Modeling

- A technique for analyzing data and/or predicting outcomes for a set of variables and conditions that contain a degree of randomness or unpredictability (number of intakes on a given day, etc.)

- The model allows us to assess the interactions between all of the variables.

- In order to capture the unpredictable nature of shelter operations, a stochastic model was developed that incorporates the variability of many of the factors within a shelter (e.g. type of animal, daily intake, length of stay, cost).

- Each variable in the model were calibrated to data from actual shelter operations and/or validated with shelter operations personnel.

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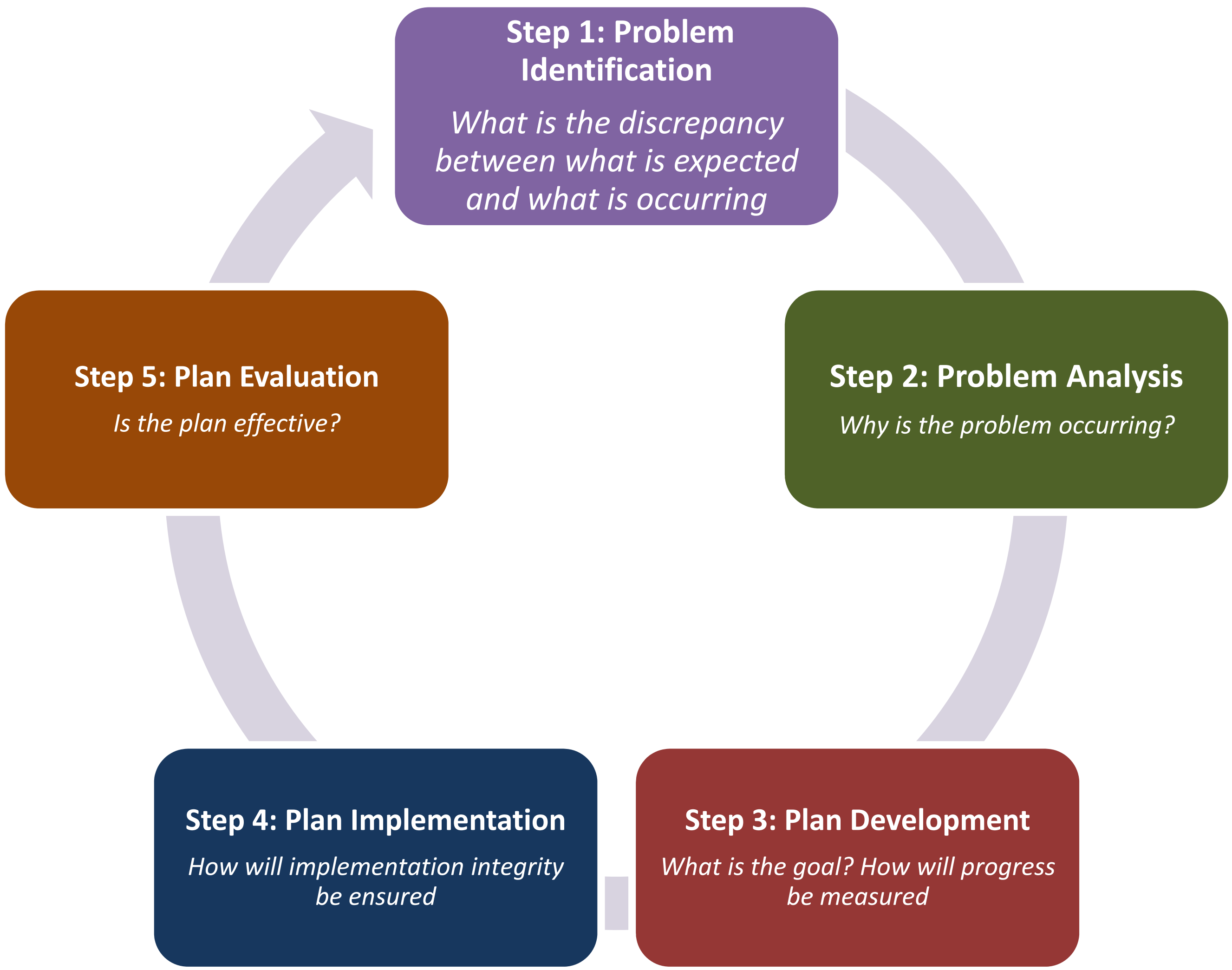
# Problem Solving Theory

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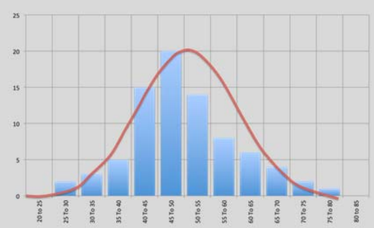
# How the Process Works

**Characterize Data**

Daily intakes
Type
Length of stay
Cost
Adoption revenue

**Probability Distributions**



**Create Model**

Animal population
Shelter Capacity
Intake Policy
Euthanasia Policy
Outputs

**Run Simulation and Track Outputs**

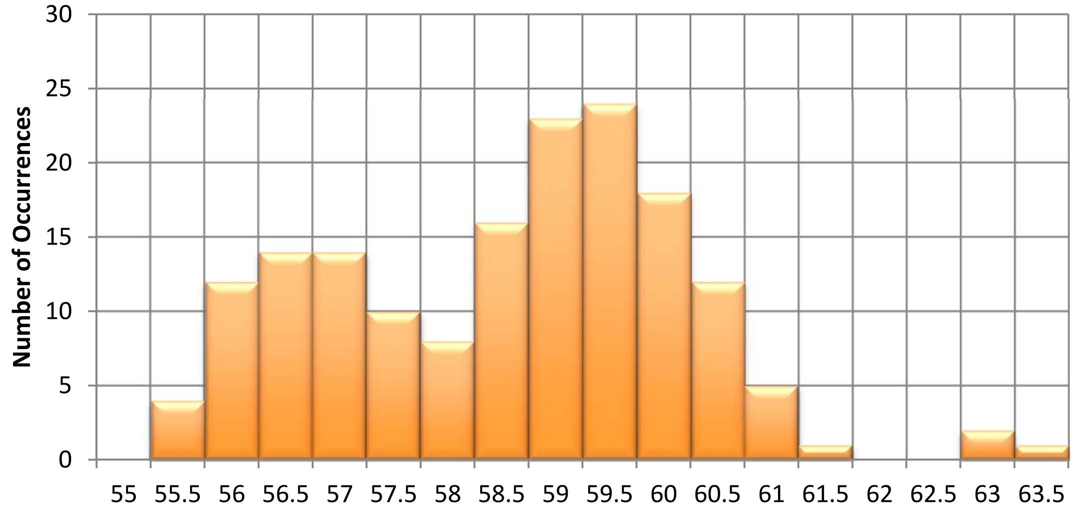
**Compare to Data**

Adoptions
Capacity
Length of stay
Cost
Adoption revenue

Seeing Through the Noise

# DATA CHARACTERIZATION

# The Problem with Outcome Data




- Outcome data is the result of a system. For example adoptions.
  - Adoptions are the result of intakes, kennel space, advertising, etc.
- Understanding causality is difficult because outcome data are often the cumulative effect of multiple variables
- Variance in the outcome data is hard to interpret, however asking the right questions as to why the data has variance is critical

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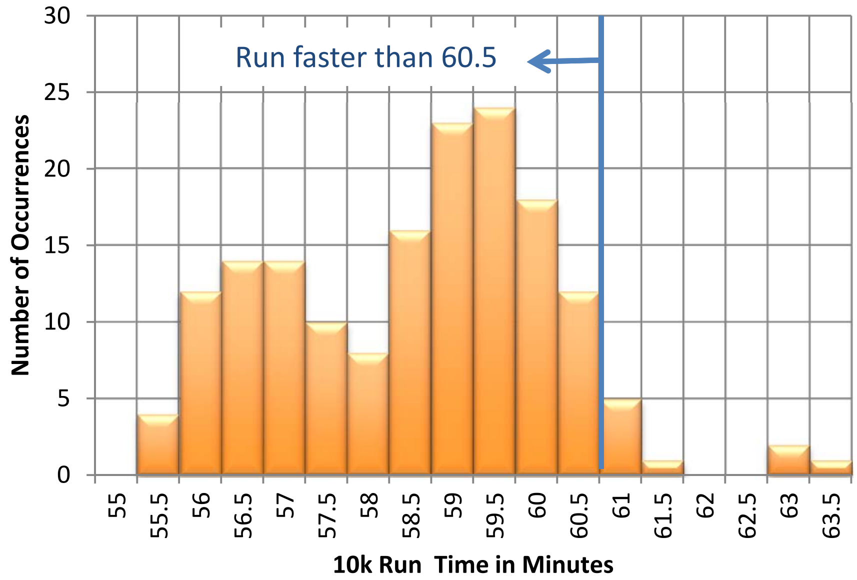
# A Simple Example: Roger's Run Time




*I am about to head out on my morning run, I bet you $100 that I can run the 10k in 60.5 minutes or less*

*Should you take the bet?*

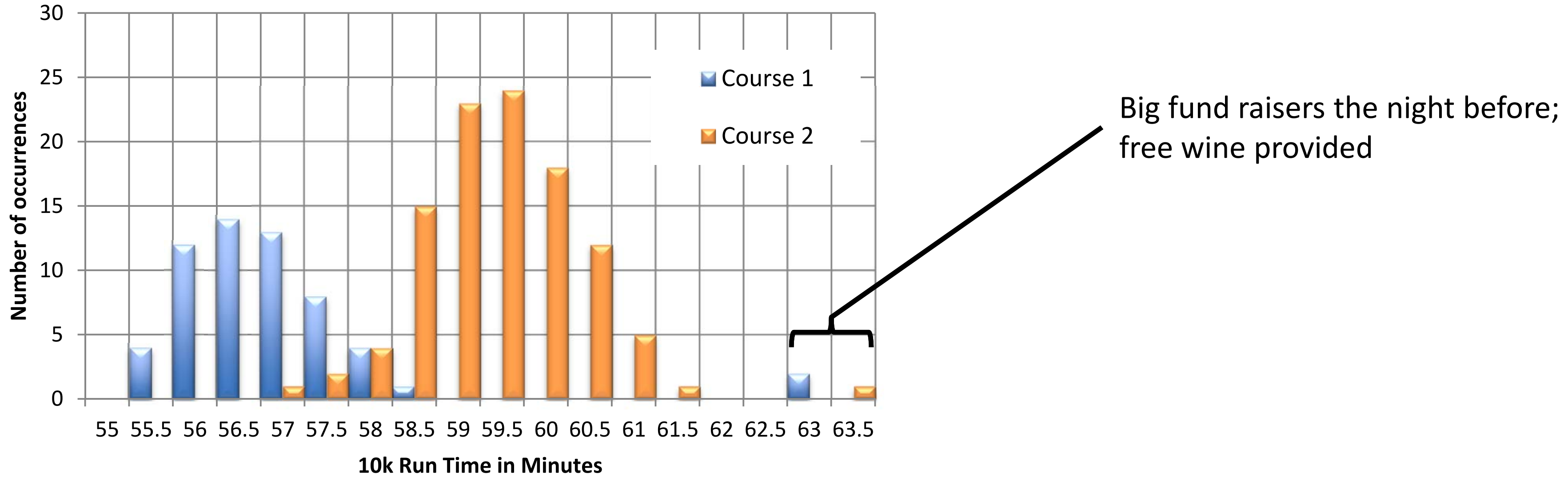
***Hint: 94% of the time in the past I have run faster than 60.5 minutes***

- We see that the data is spread over a large set of times with a few outliers.
- Key question: Why is there so much variability in the data?
- We need to understand what causes variability in the data

You find out that:

- I run on two different courses
- My performance is negatively effected by alcohol

# Properly Characterizing Data




*By splitting the data into a more relevant grouping, we can now see that you can more likely predict my run time if you know what course I am on.*

- If I'm running course 1, I'm likely to be around 56 minutes
- if I am running course 2, then I'm likely to be around 59.5 minutes
- If I went to a big fundraiser I'll be very slow

*You find out that I plan to run on Course 2.*

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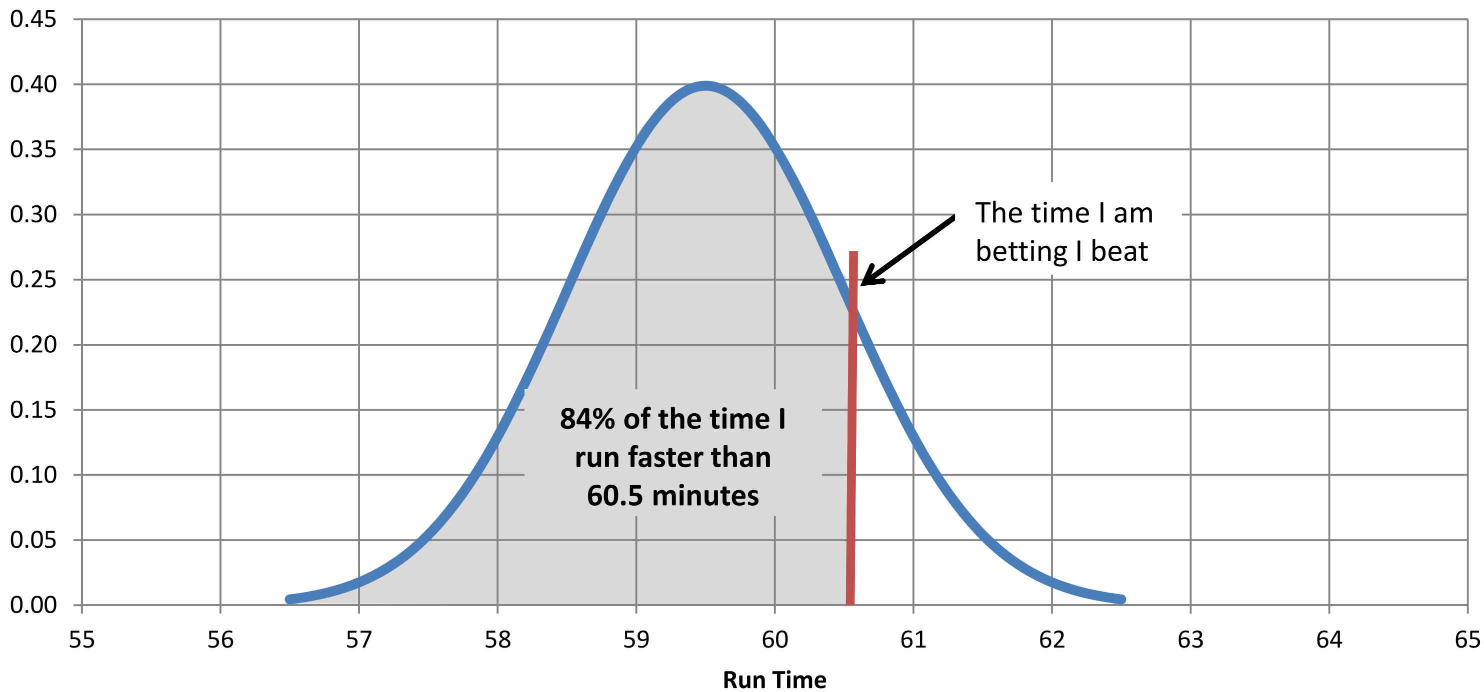
# Probability Distributions from Data




By looking at the data, we see it approximates a normal distribution. Some basic statistics allows us to build a curve that shows the probability of Roger making a particular time on Course 2. There is an 84% chance that my time will be faster than 60.5 minutes.

Should you take the bet?

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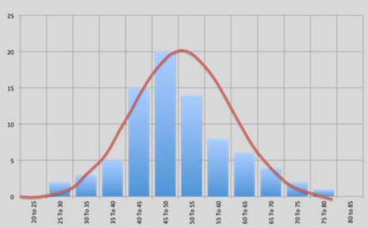
# Building the Full Model

- You find out I am going to a big fund raiser the night before that has Dave Mathews playing. From the data, you see this tends to add 3 to 5 minutes to my time
- ***The Model: Using all the variables together to predict***

| Variable 1: Course | | Variable 2: Wine? | | Expected Outcome |
|---|---|---|---|---|
|  | + | Yes | = | Most likely time is well over 60.5 minutes |
| Mean 59.5 minutes<br>Range from 57 to 61.5 | | Add 3 to 5 minutes | | 60 to 66 minutes |

**Should you take the bet?**

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Animal Shelter Simulation

# WELCOME TO WAGSBERG, USA

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# Wagsberg, USA

Wagsberg, USA has just opened a brand new shelter that is expected to intake around 3000 animals. There is shelter space for 150 animals at a time.

The stochastic model will simulate the operation and performance of the shelter under different live release rate policies.

We will track the shelter operations day by day for 1 year

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# Definitions and Assumptions

- Live Release Rate:
  - number of adoption divided by the number of intakes
- Outcomes
  - There are only two possible outcomes
    - Adoption
    - Euthanasia
- All animals coming to the shelter are owner-surrender
- Unserviced Animals
  - Animals that were brought to the shelter but could not get in due to space

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# Key Input Parameters for Simulation

| **Animal Population** | | |
|---|---|---|
| | Type (percent of population) | Calibrated to shelter data |
| | Expected length of stay | Calibrated to shelter data |
| | Expected cost for additional medical and behavior costs | Estimated |
| | Expected Adoption Revenue | Calibrated to shelter data |
| **Shelter** | | |
| | Intake policy | Based on desired live release rate |
| | Kennel capacity | No doubling up |
| | Base cost per day | Calibrated to shelter information |
| | Euthanasia policy | Based on policy setting |

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# Animal Population Characteristics

| Animal Type | Description | Asilomar Class | % of Pop. | Expected Length of Stay* | | Base Cost/Day | Behavior & Medical Costs per Day^ | | Adoption Revenue |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Mean | Std | | Scale | Degrees Freedo m | |
| Class 1 | Puppies | HH | 10% | 4 | 0.4 | $13.00 | No Additional Costs | | $350 |
| Class 2 | Highly adoptable | HH | 35% | 7 | 0.7 | $15.00 | No Additional Costs | | $250 |
| Class 3 | Minor issues | TR | 30% | 17 | 4.25 | $15.00 | $5.00/ day | 3 | $100 |
| Class 4 | Some behavior and health issues; less desirable breeds | TM | 10% | 60 | 30 | $15.00 | $4.00/day | 3 | $50 |
| Class 5 | Significant issues; adoptable under special circumstances | UU | 10% | 180 | 36 | $15.00 | $3.00/day | 3 | $0 |
| Class 5s | Unadoptable | UU | 5% | Lifetime | n/a | $15.00 | $3.00/day | 3 | $0 |

*Normal distribution
^ Chi Square distribution

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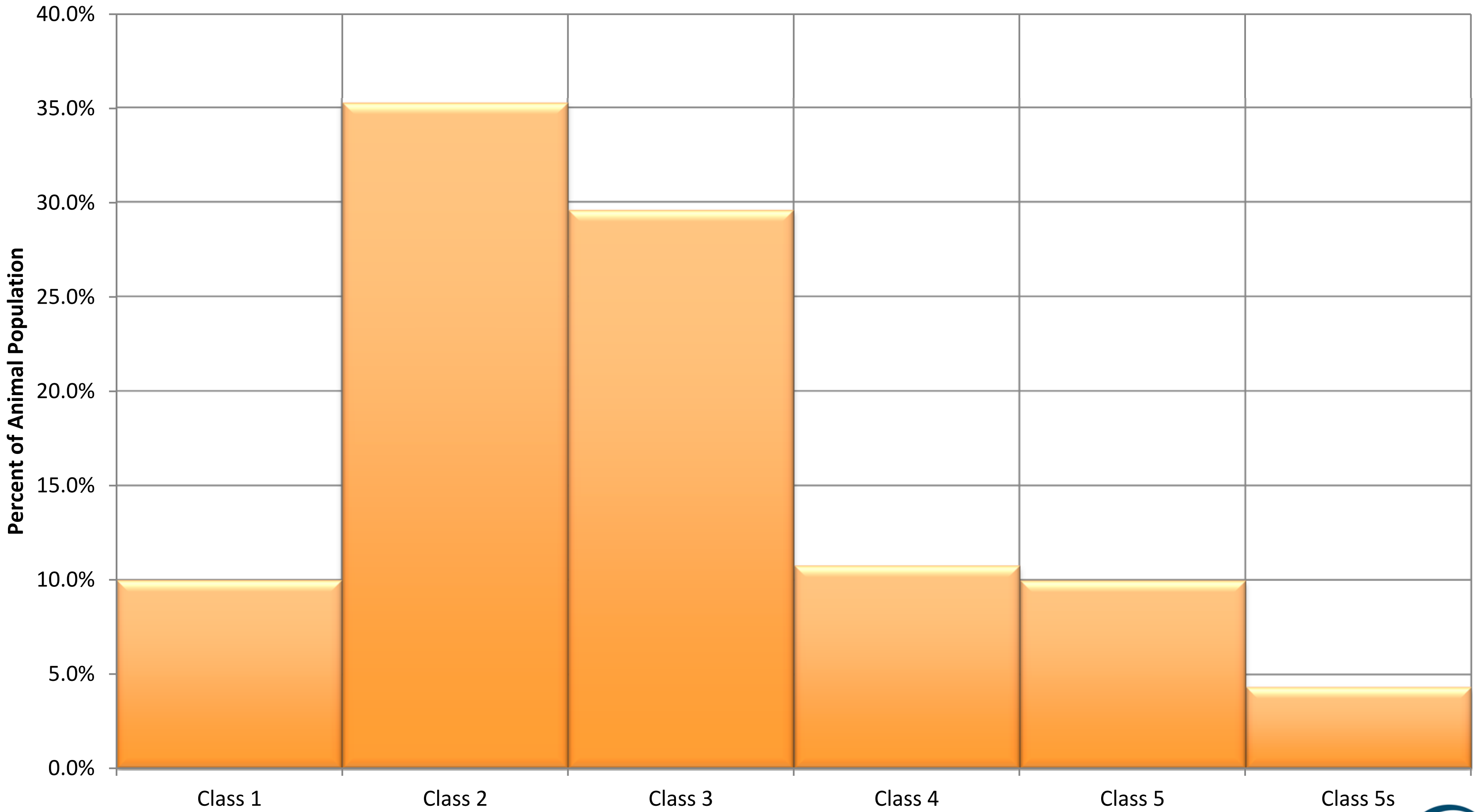
# Population of Animals by Class

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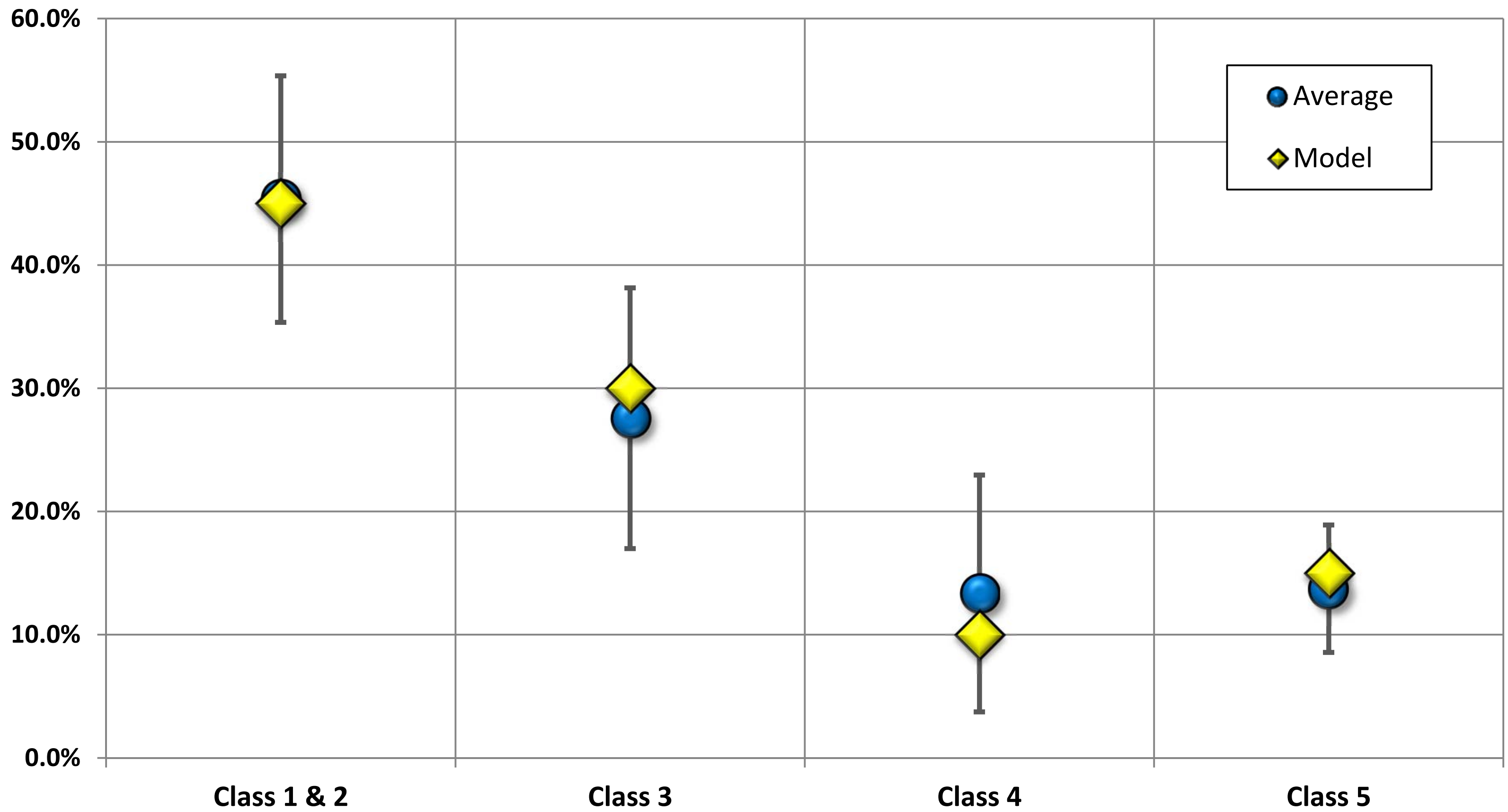
# Population by Animal Class

## (Calibrated to Actual Shelter Data)




The average is reported data from 10 different shelters from around the country. The gray lines are the standard deviations (e.g. variability)

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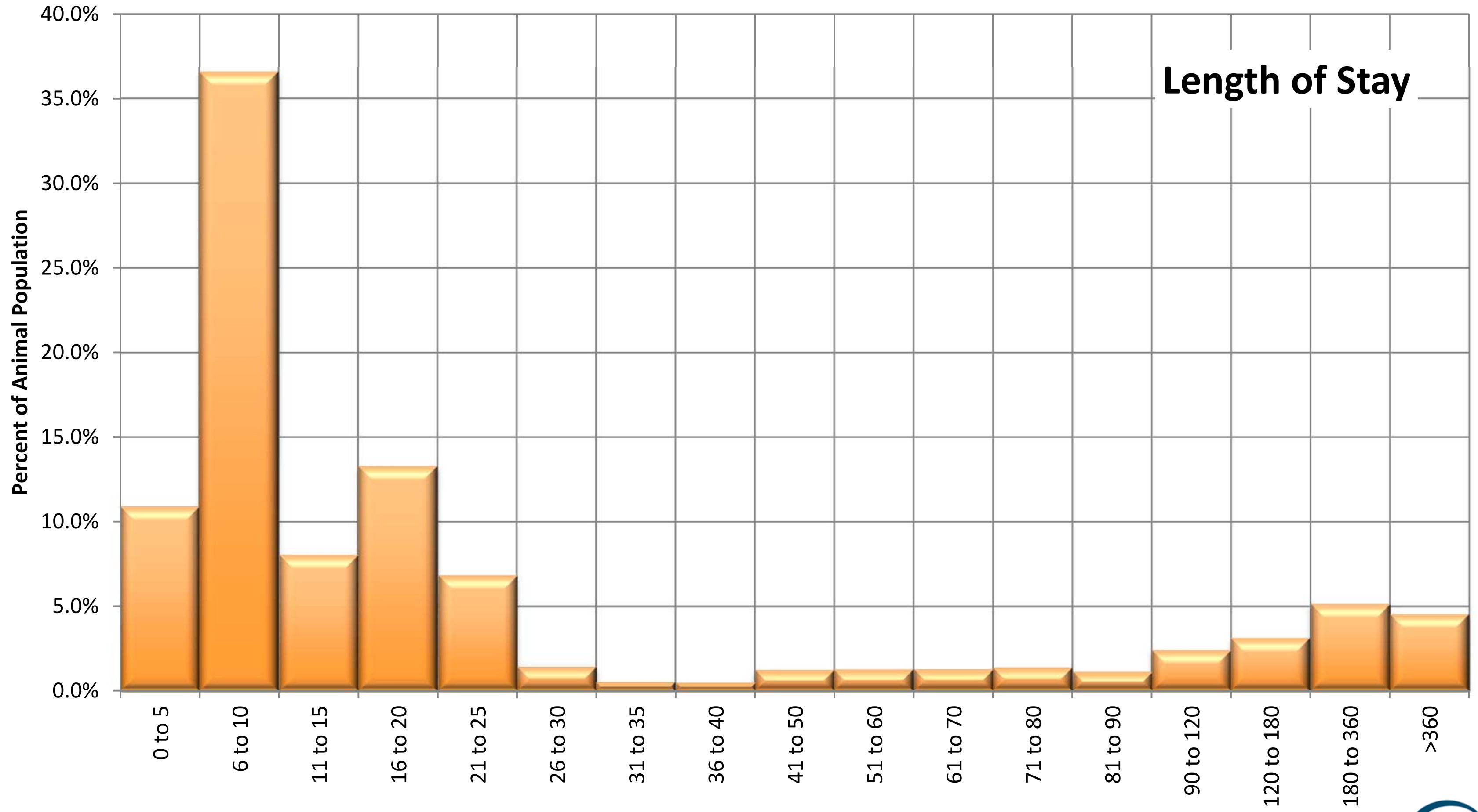
# LOS for Entire Population

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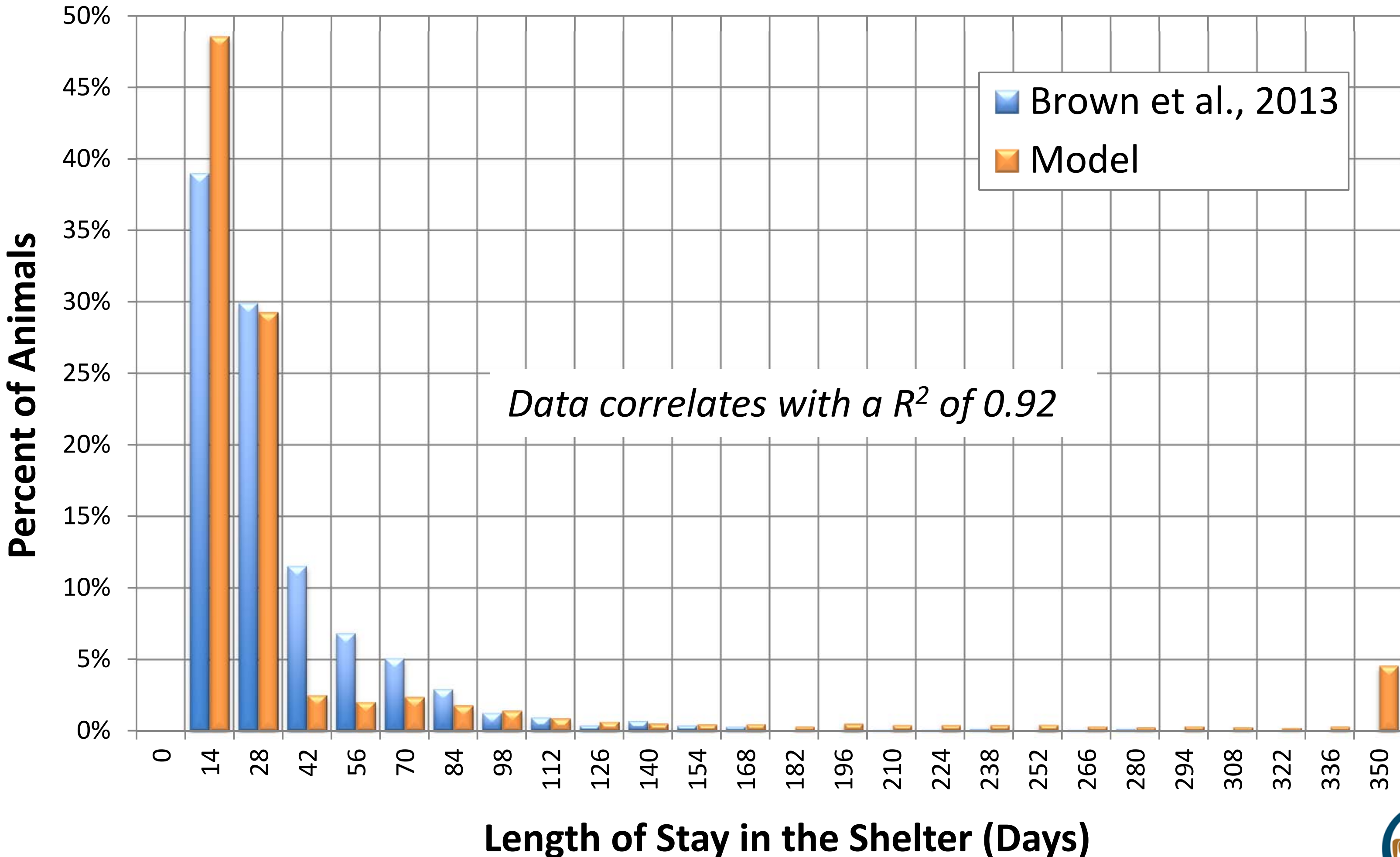
# Length of Stay Calibration

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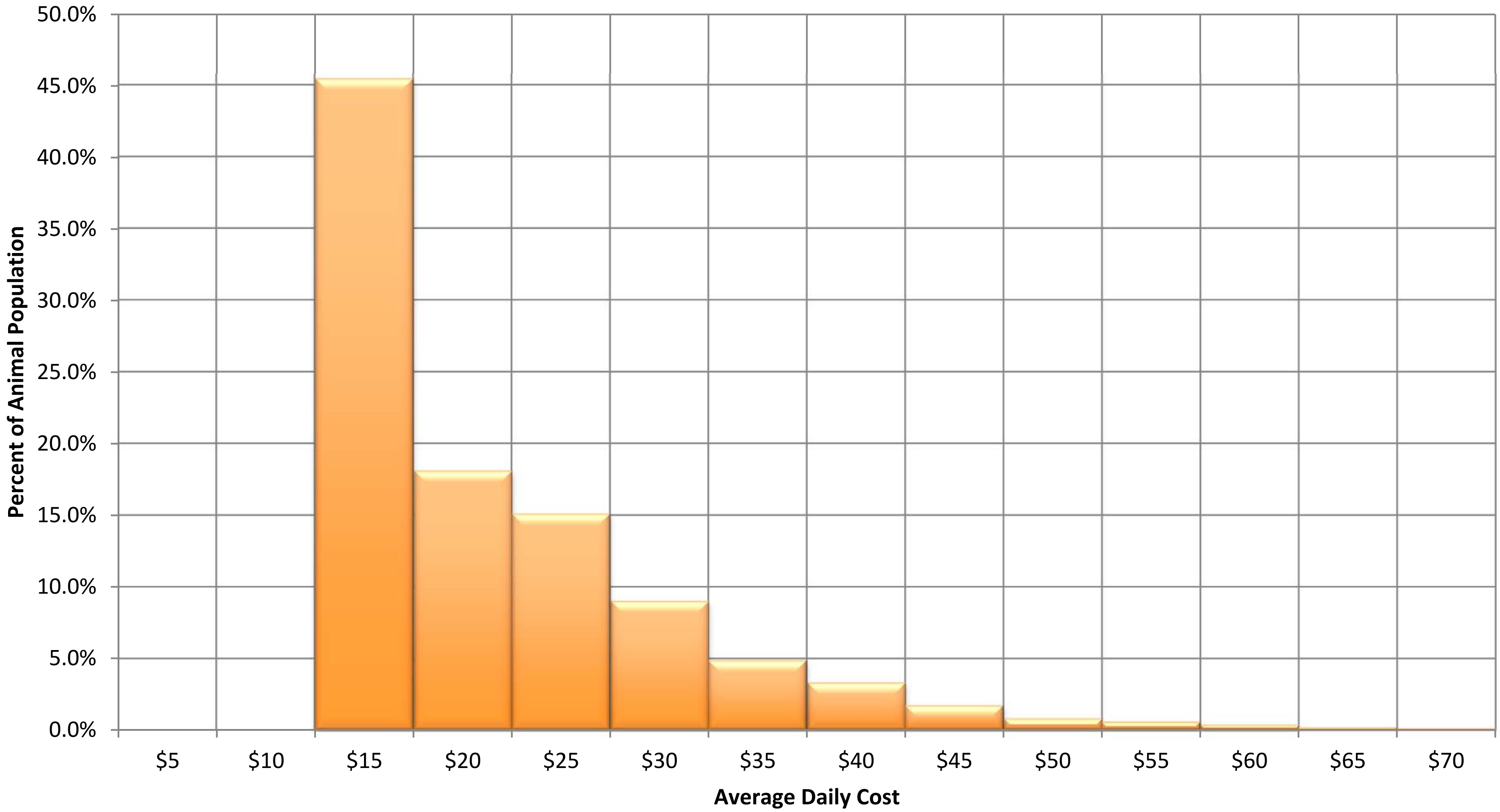
# Expected daily cost distribution

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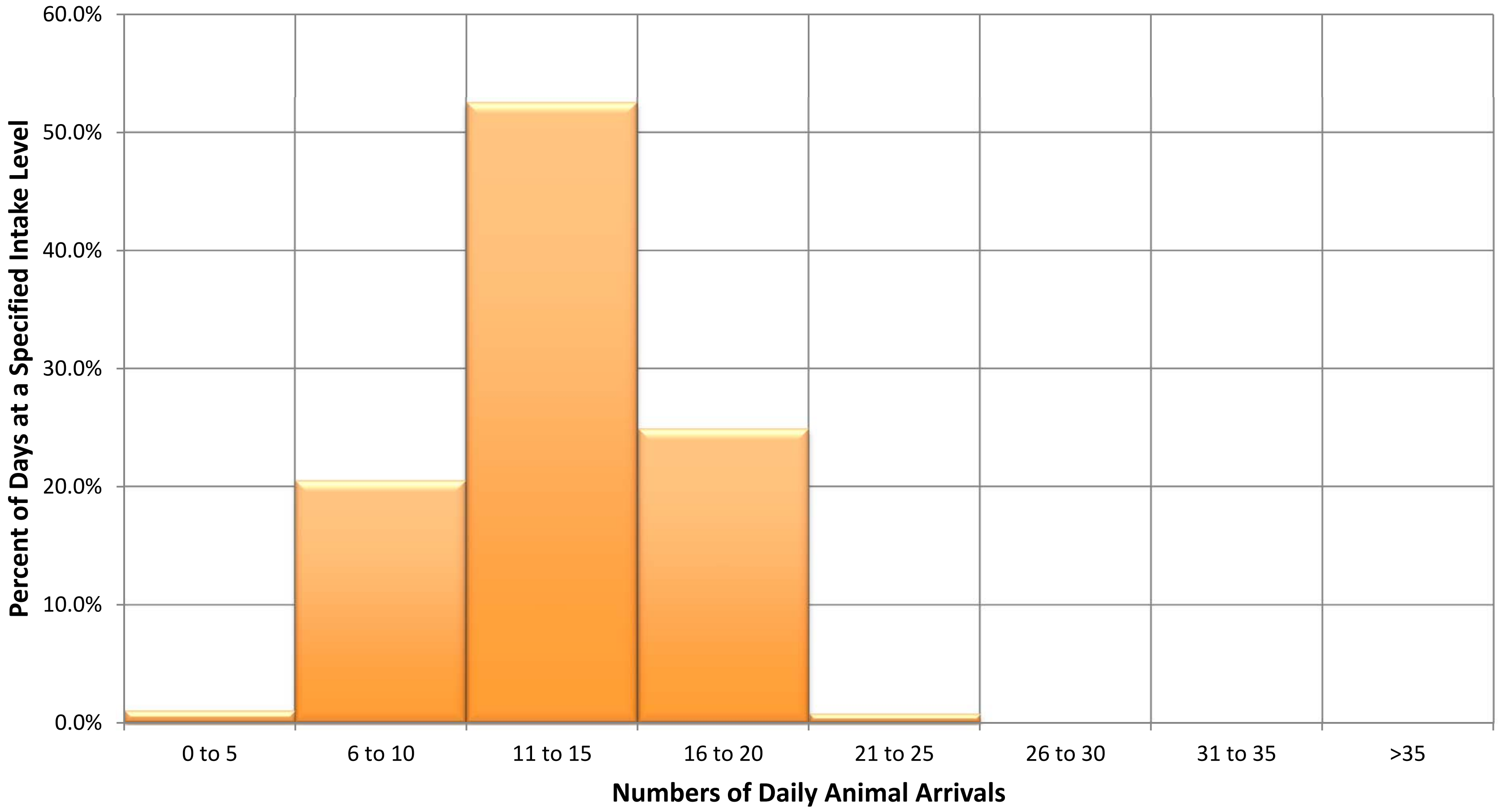
# Expected Arrivals per Day

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# Shelter Operational Characteristics

| | Kennels | Target LRR | Intake Policy | Euthanasia Policy | Expected Arrivals |
|---|---|---|---|---|---|
| Policy 1 | 150 | 85% | Accept if Room | Only Class 5 | 3000 |
| Policy 2 | 150 | 90% | Accept if Room | Only Class 5; Class 5s first | 3000 |
| Policy 3 | 150 | 95% | Accept if Room | Only Class 5s | 3000 |
| | | | | | |

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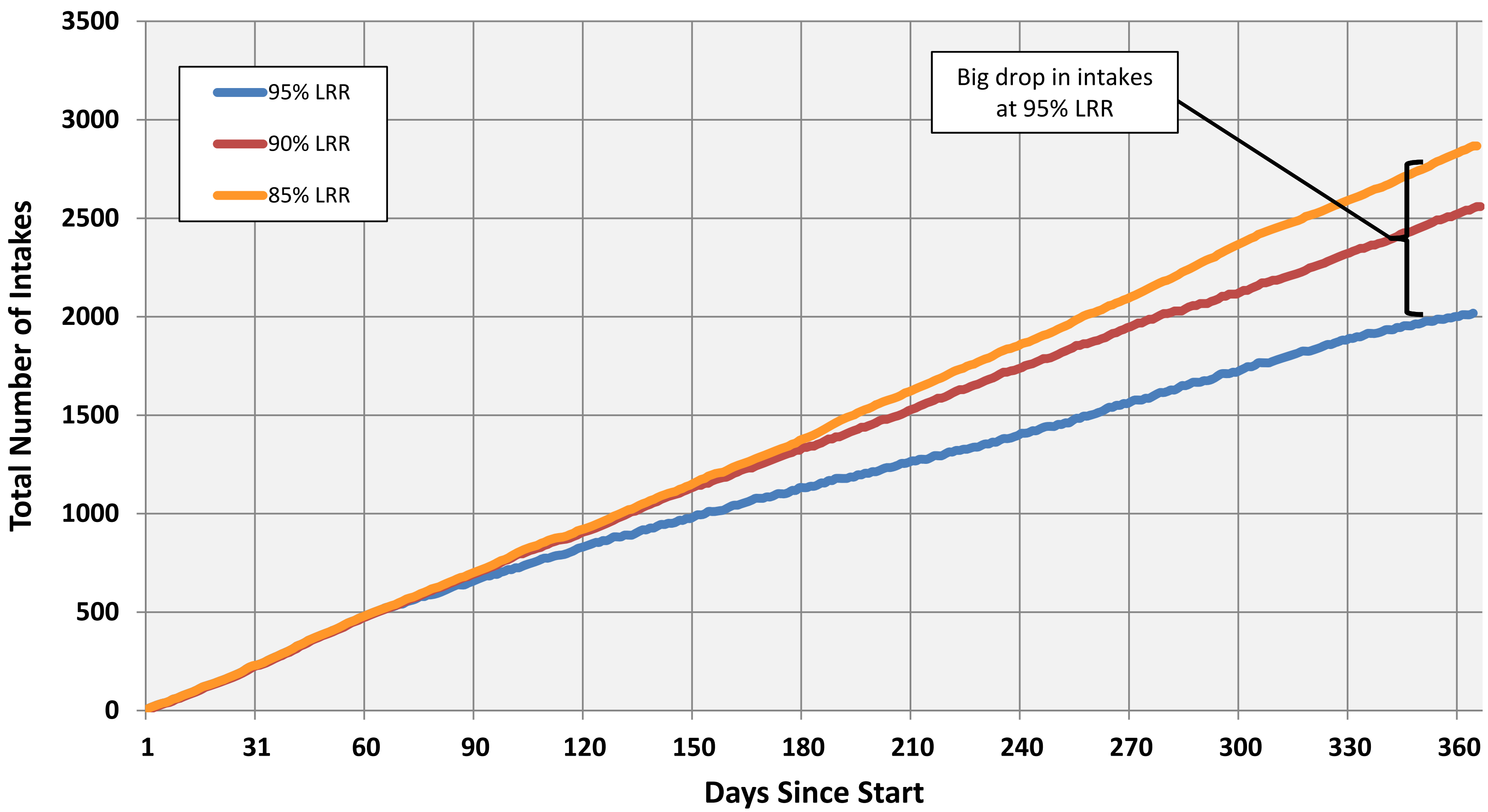
Results

# SINGLE SHELTER
# LIVE RELEASE RATE IMPACT

# Cumulative Intakes

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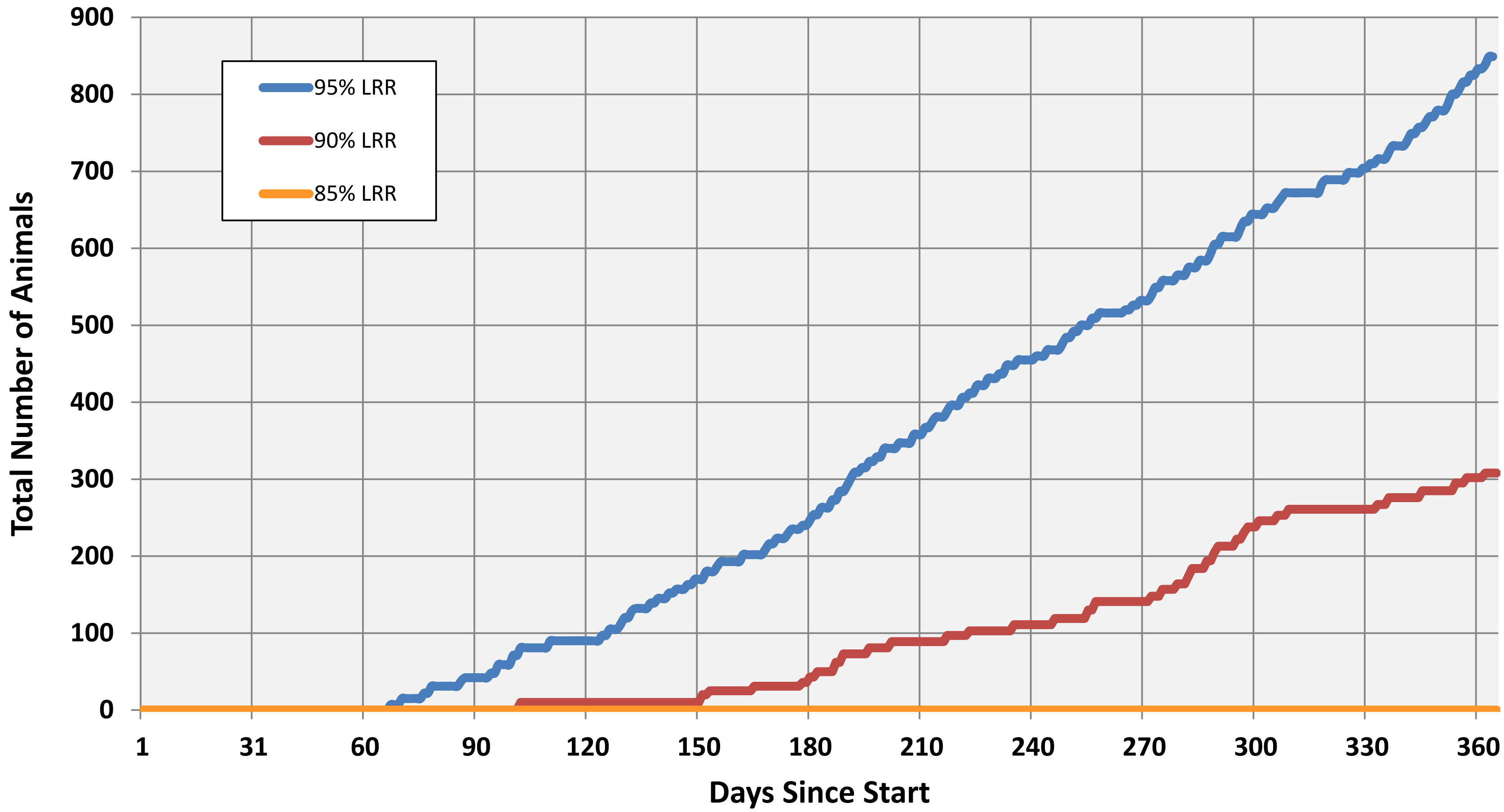
# Animals Turned Away

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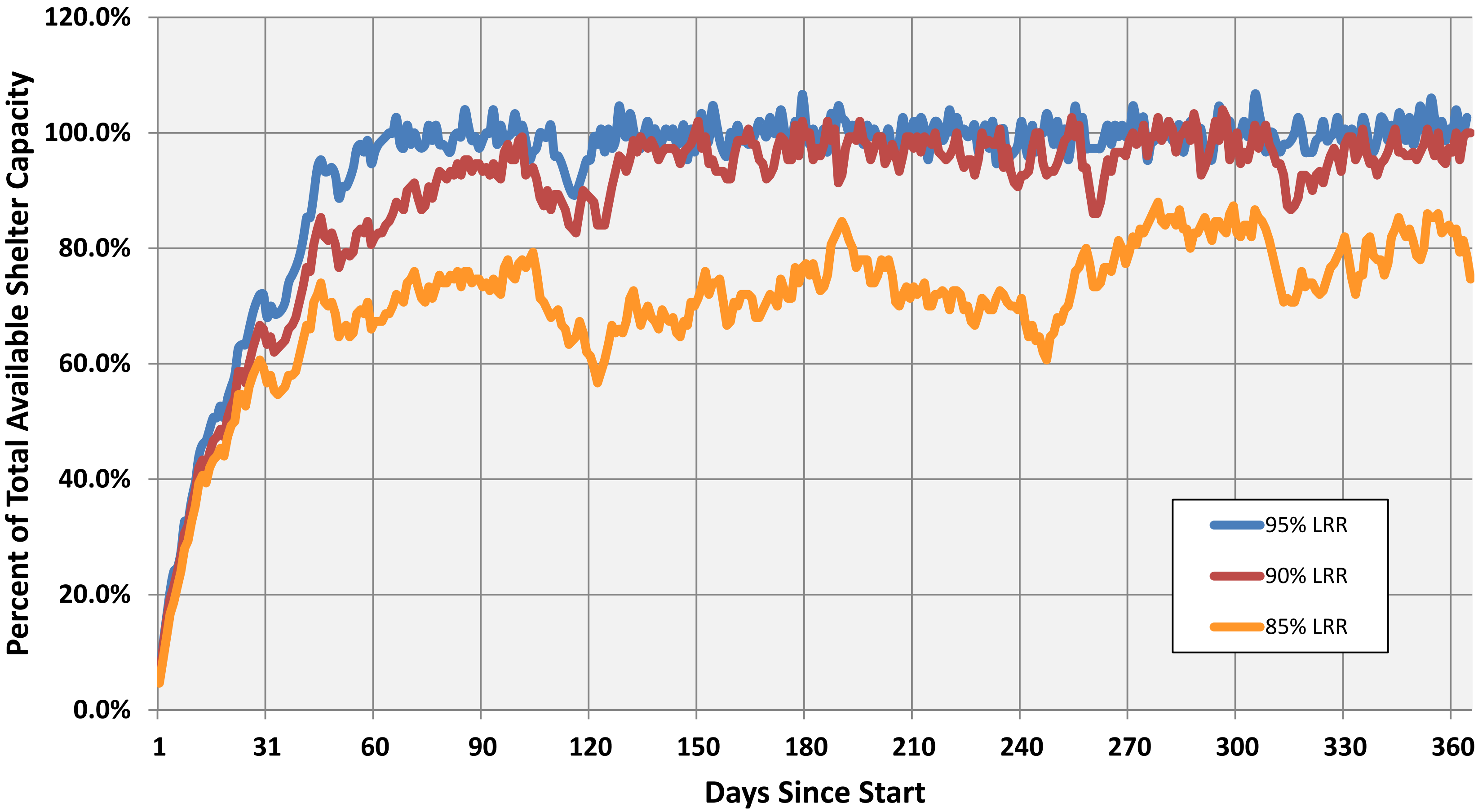
# Shelter Capacity

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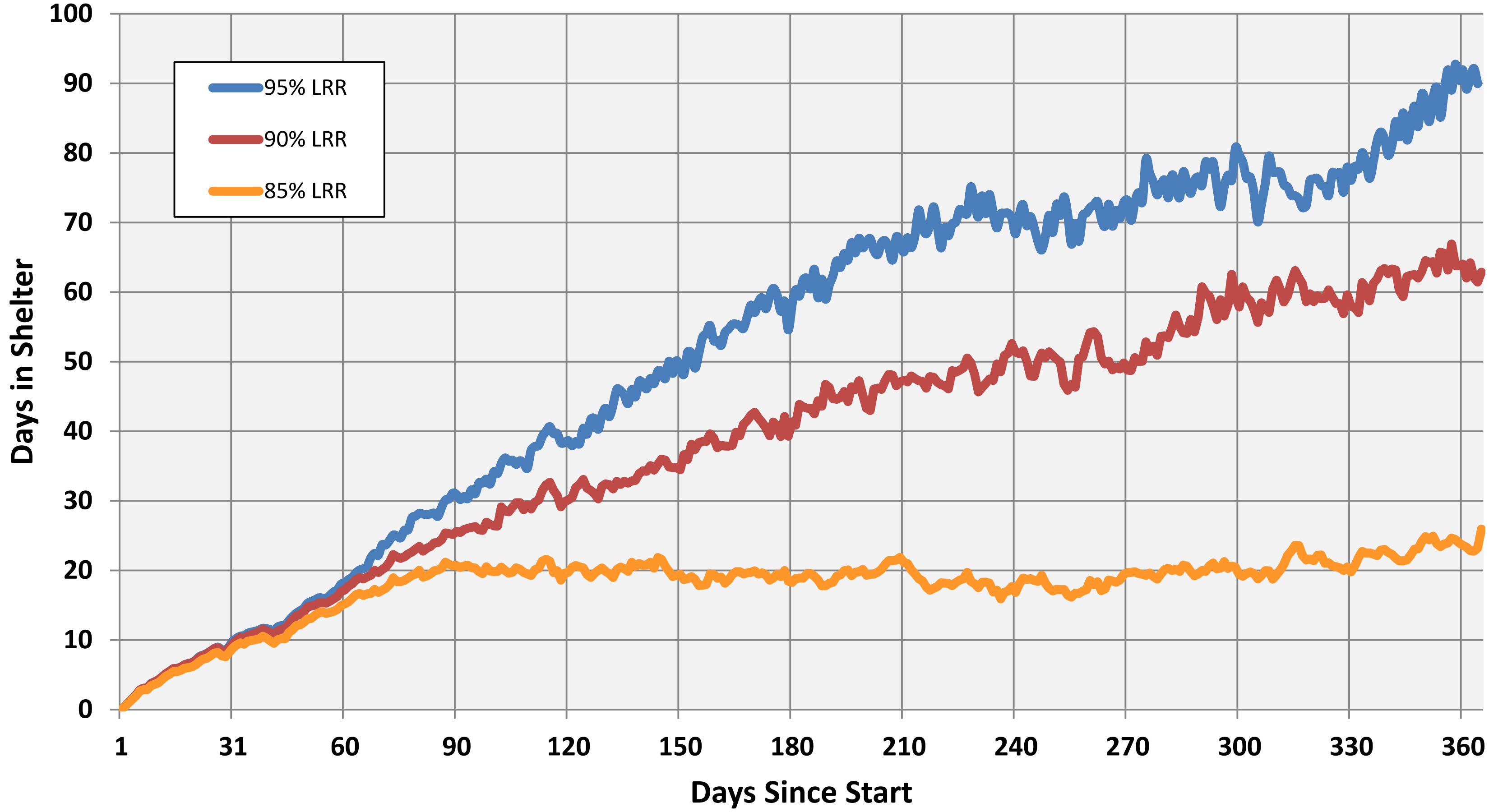
# Average Length of Stay

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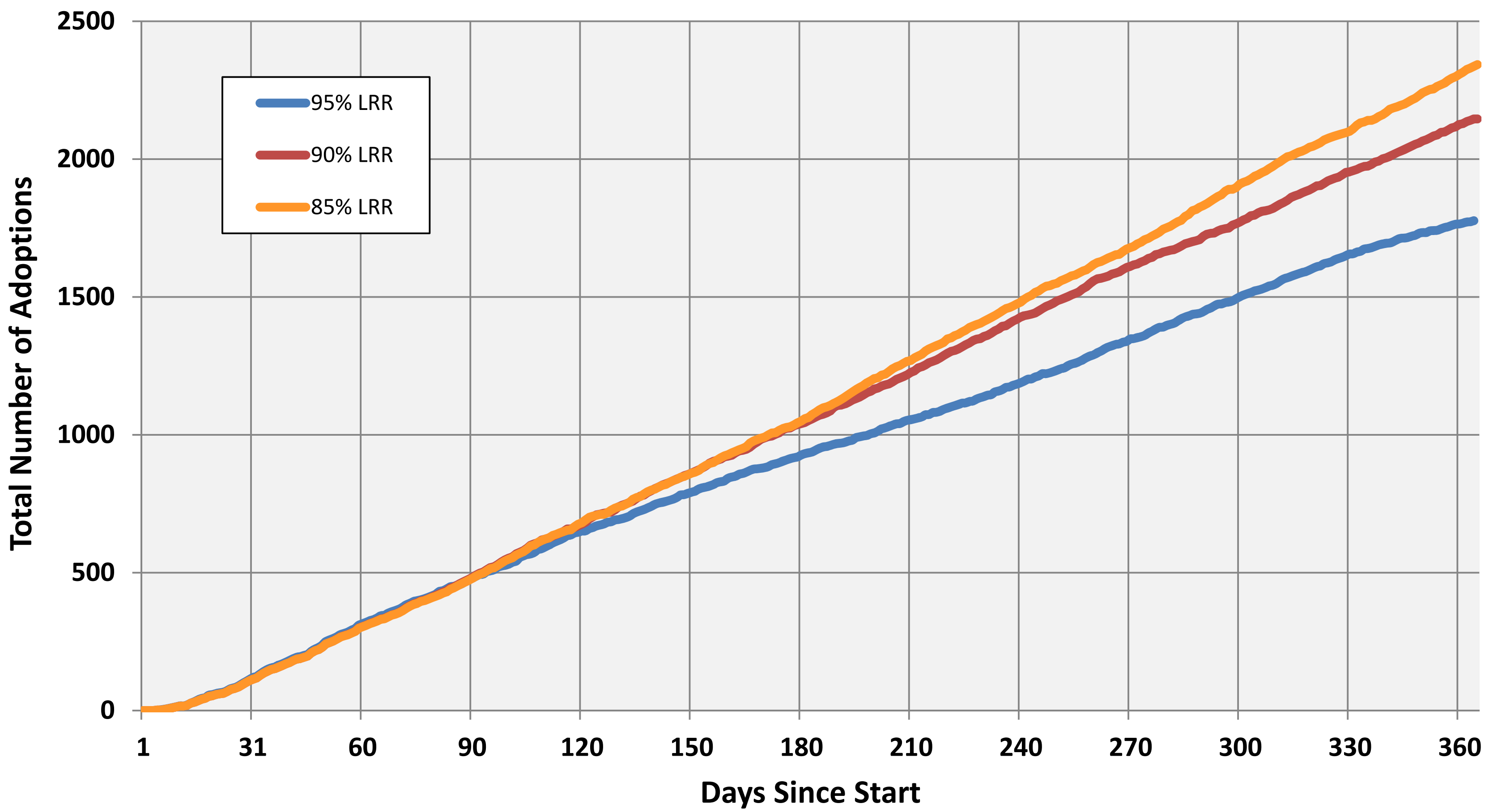
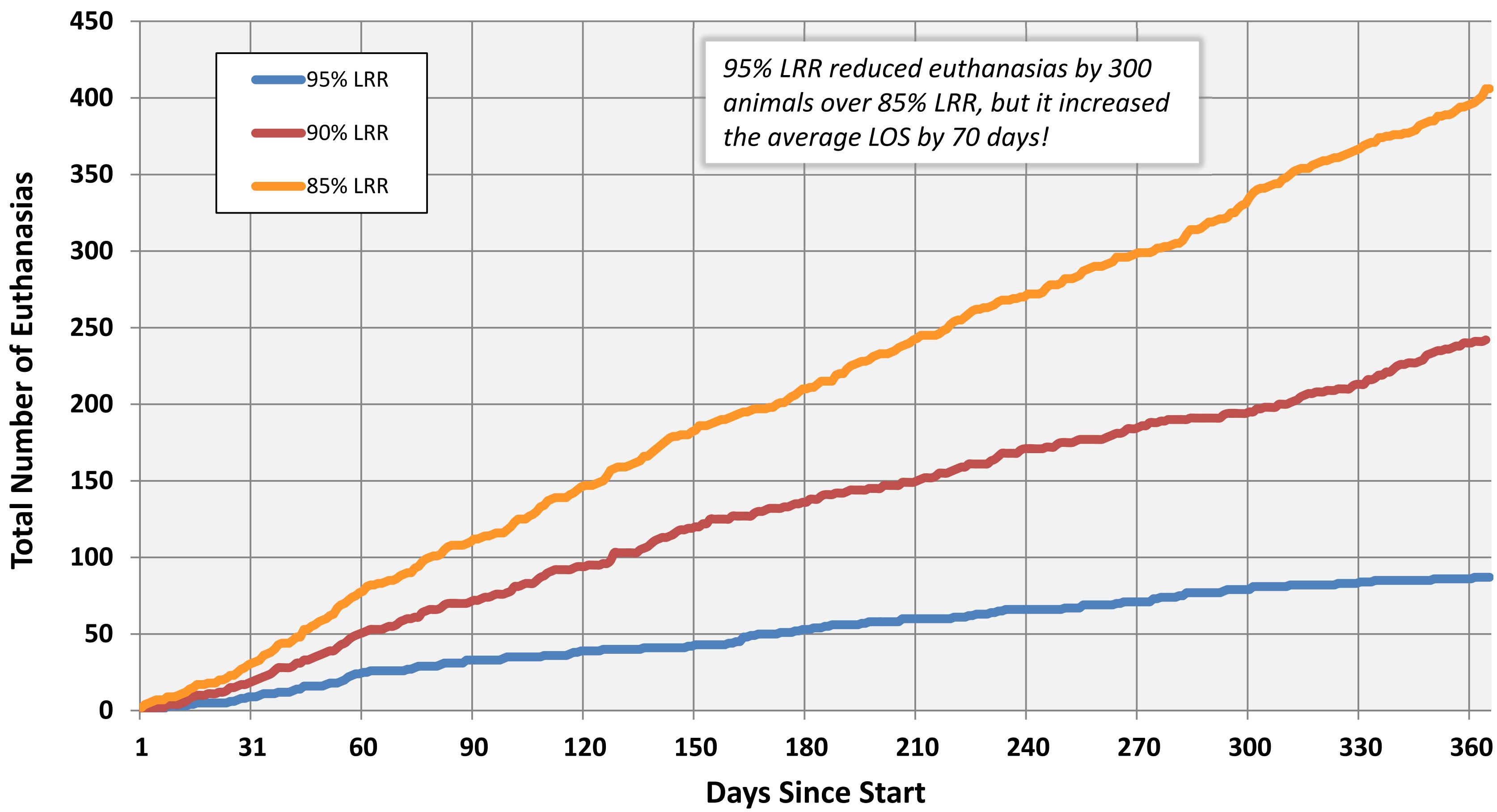
# Adoptions



95% LRR
90% LRR
85% LRR
2500
2000
1500
1000
500
0
Total Number of Adoptions
1
31
60
90
120
150
180
210
240
270
300
330
360
Days Since Start

# Euthanasias

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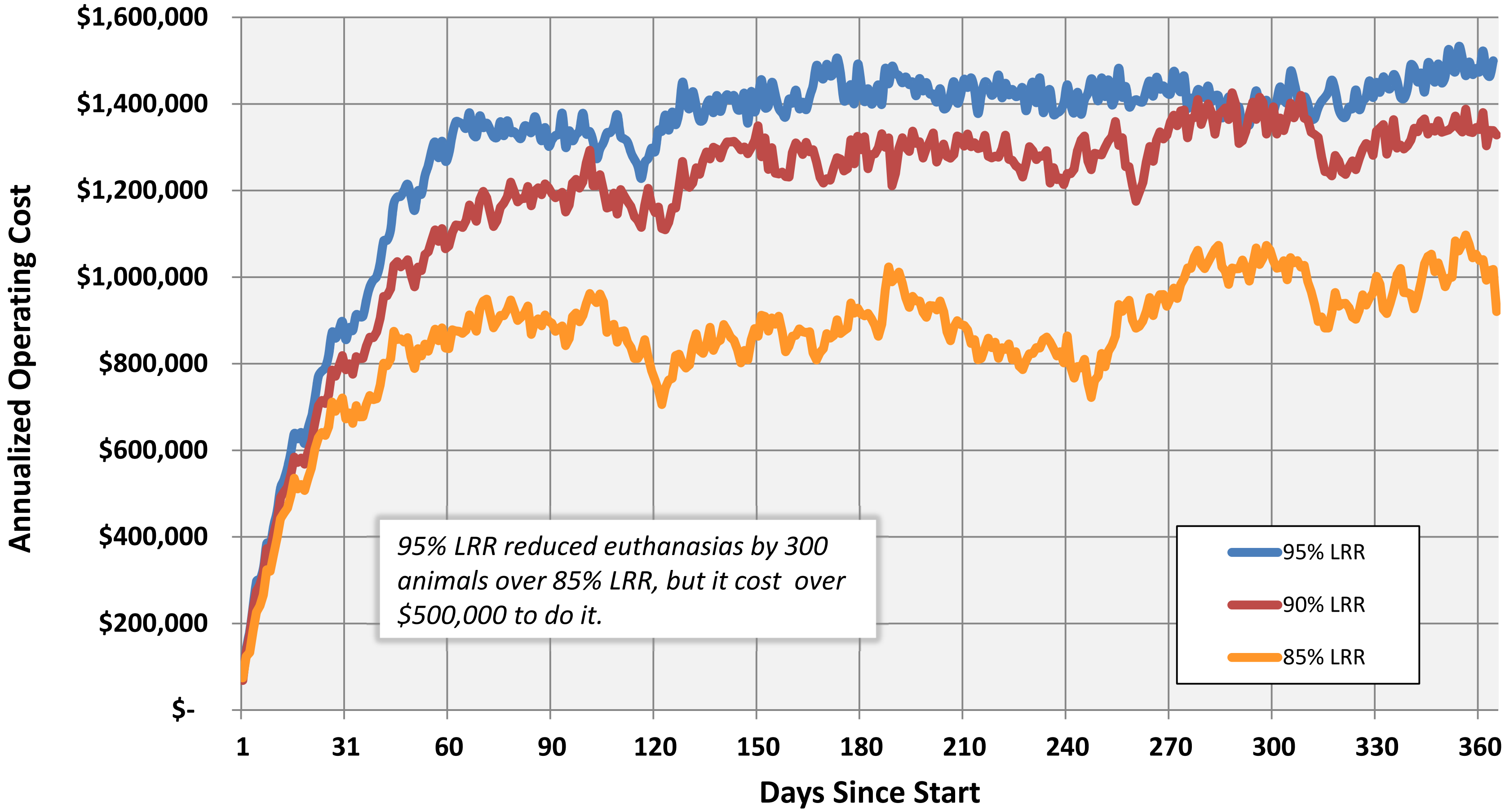
# Operating Cost

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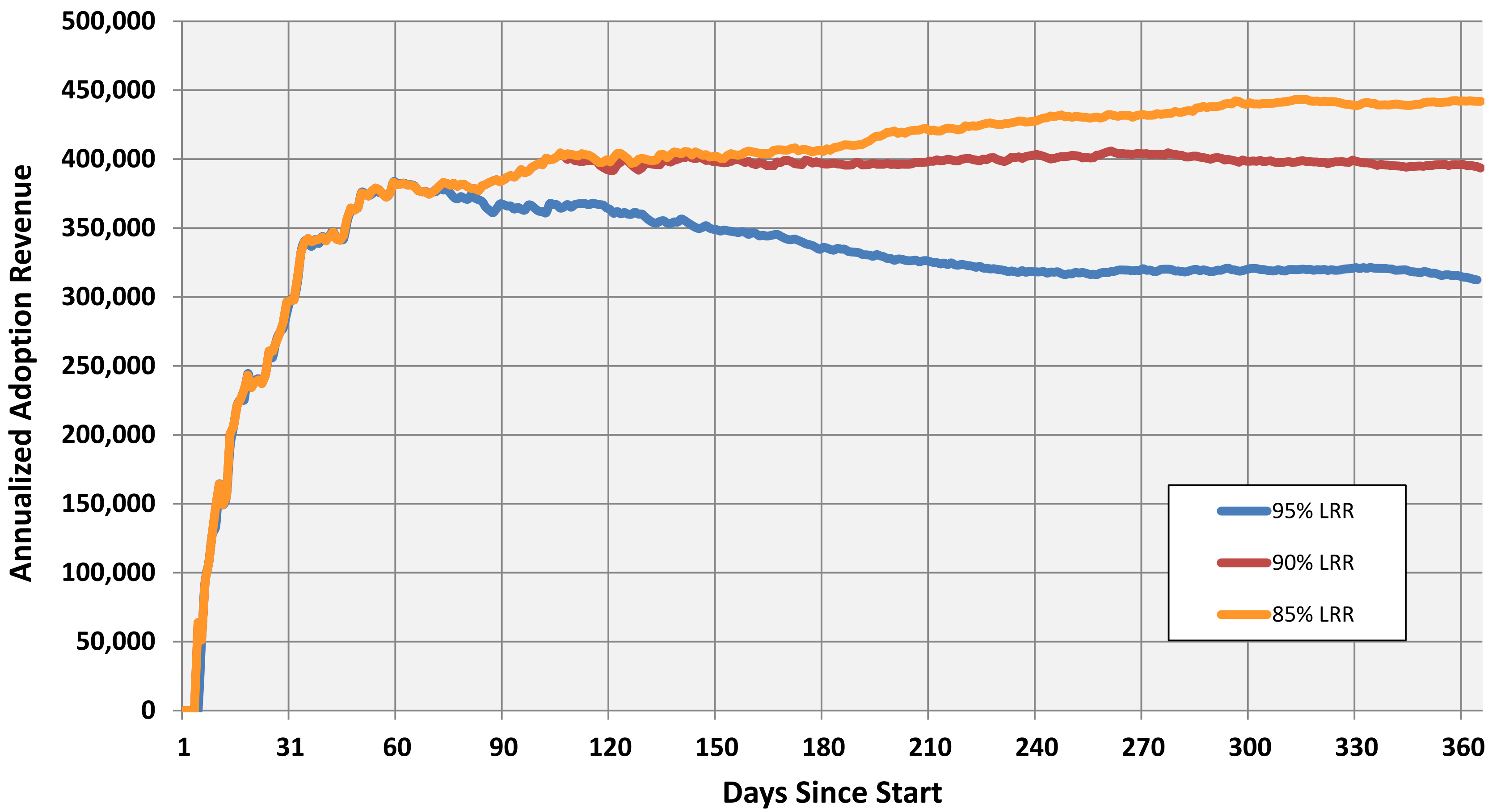
# Annualized Adoption Revenue

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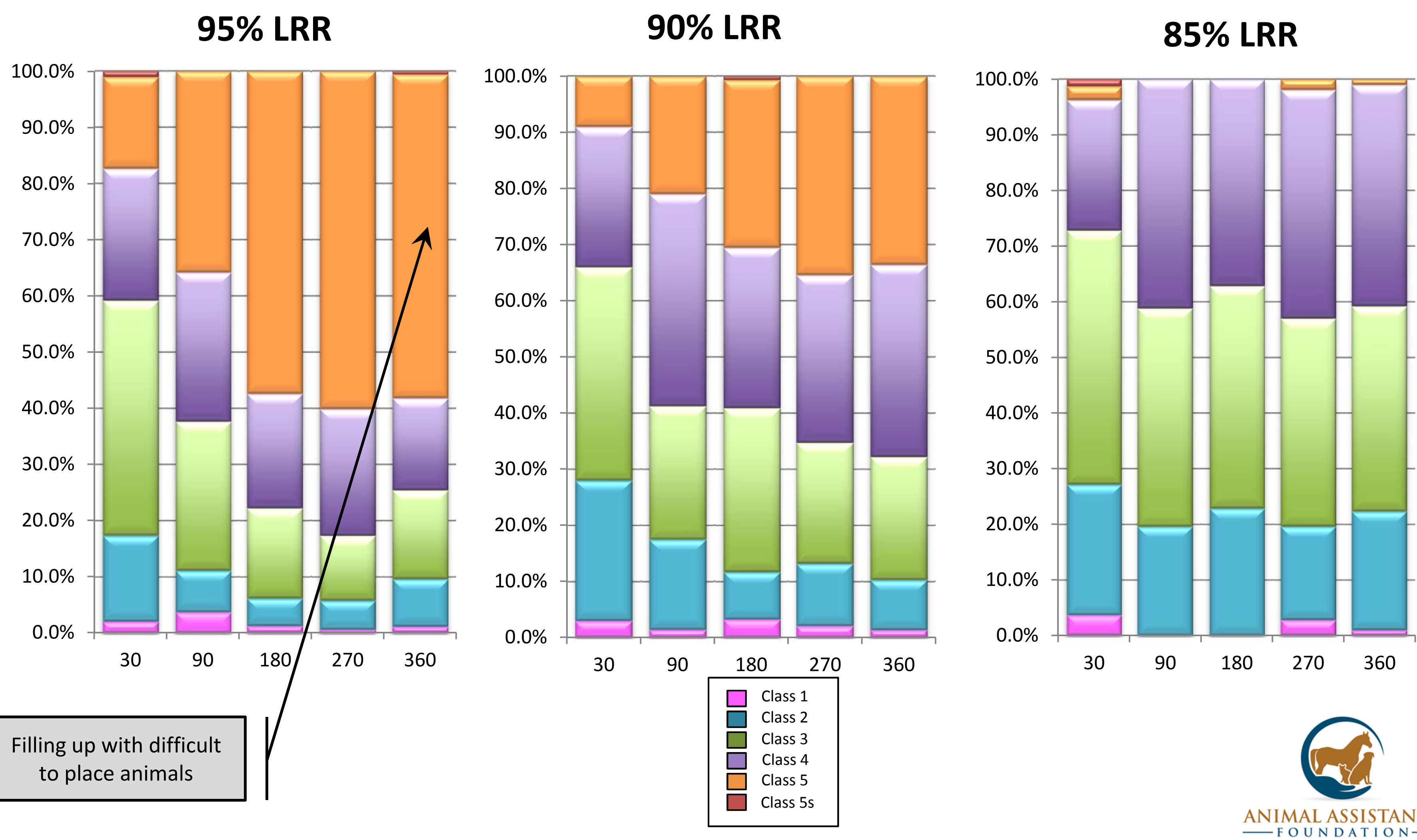
# Animal Inventory over Time




Filling up with difficult to place animals

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Complex systems require more than one metric to measure success

# THE PROBLEM WITH LIVE RELEASE RATE AS A METRIC

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# Problems with Live Release Rate

- Only looks at one aspect of animal welfare
- A metric that is the outcome of division (one number divided by another) loses all information about scale
  - 9 animals adopted from 10 intakes is 90% LRR
  - 90,000 animals adopted from 110,000 intakes is 81% LRR
- Achieving a high live release rate is not necessarily a measure of a successful operation
  - Extremely limited admission (all puppies)
  - No available space for arrivals
  - Warehousing
- It is highly dependent on the input population

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# Impact of Input Population on LRR

Two exact shelters operating at a 90% LRR but with two different input populations. One population has more Class 4 and 5 and animals than the other. All outcome metrics are worse except euthanasias; this is only down because many animals are rejected at intake

| Animal Type | Shelter 1 Population | Shelter 2 Population |
|---|---|---|
| Class 1 | 10% | 10% |
| Class 2 | 35% | 30% |
| Class 3 | 30% | 25% |
| Class 4 | 10% | 15% |
| Class 5 | 10% | 15% |
| Class 5s | 5% | 5% |

Slight increase in more difficult animals

| Outcome Metrics | Shelter 1 | Shelter 2 | Change | Metric Direction |
|---|---|---|---|---|
| Intakes | 2776 | 2170 | 22% Down | Worse |
| Unserviced | 30 | 517 | 1600% Up | Worse |
| Adoptions | 2346 | 1769 | 25% Down | Worse |
| Average LOS | 66 | 88 | 34% Up | Worse |
| Euthanasias | 270 | 198 | 17.3% Down | Better |
| % Long Term | 41% | 58.3% | 42% Up | Worse |
| Capacity | 94.3% | 98.6% | 5% Up | Worse |
| Operating cost | $1,240,032 | $1,645,671 | 33% Up | Worse |
| Cost per Adoption | $529 | $930 | 76% Up | Worse |
| Adoption Revenue | $438,752 | $309,548 | 29% Down | Worse |

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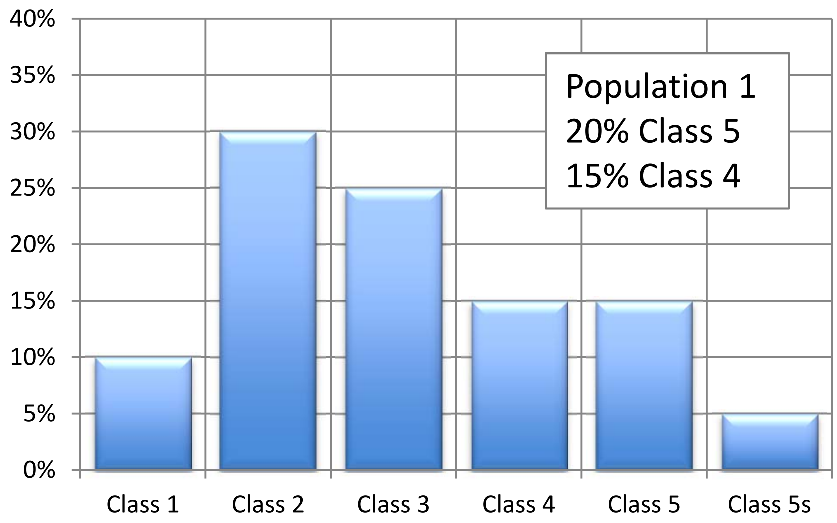
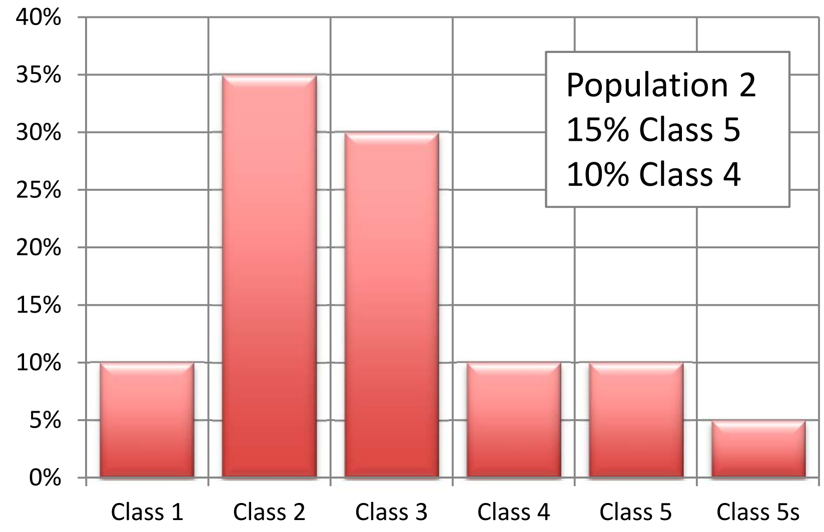
# Sensitivity Analysis to Input Population





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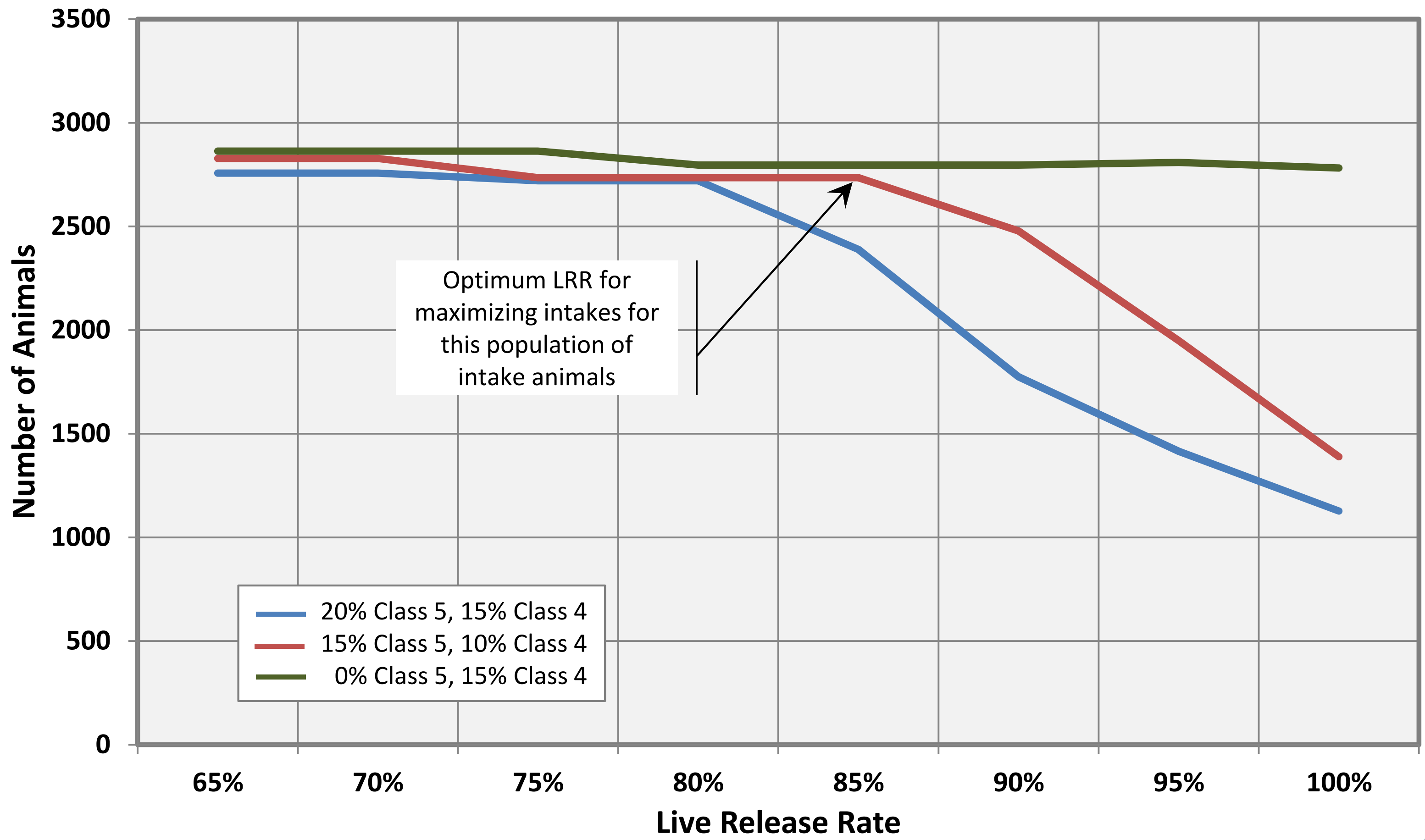
# Total Intake at Different LRR

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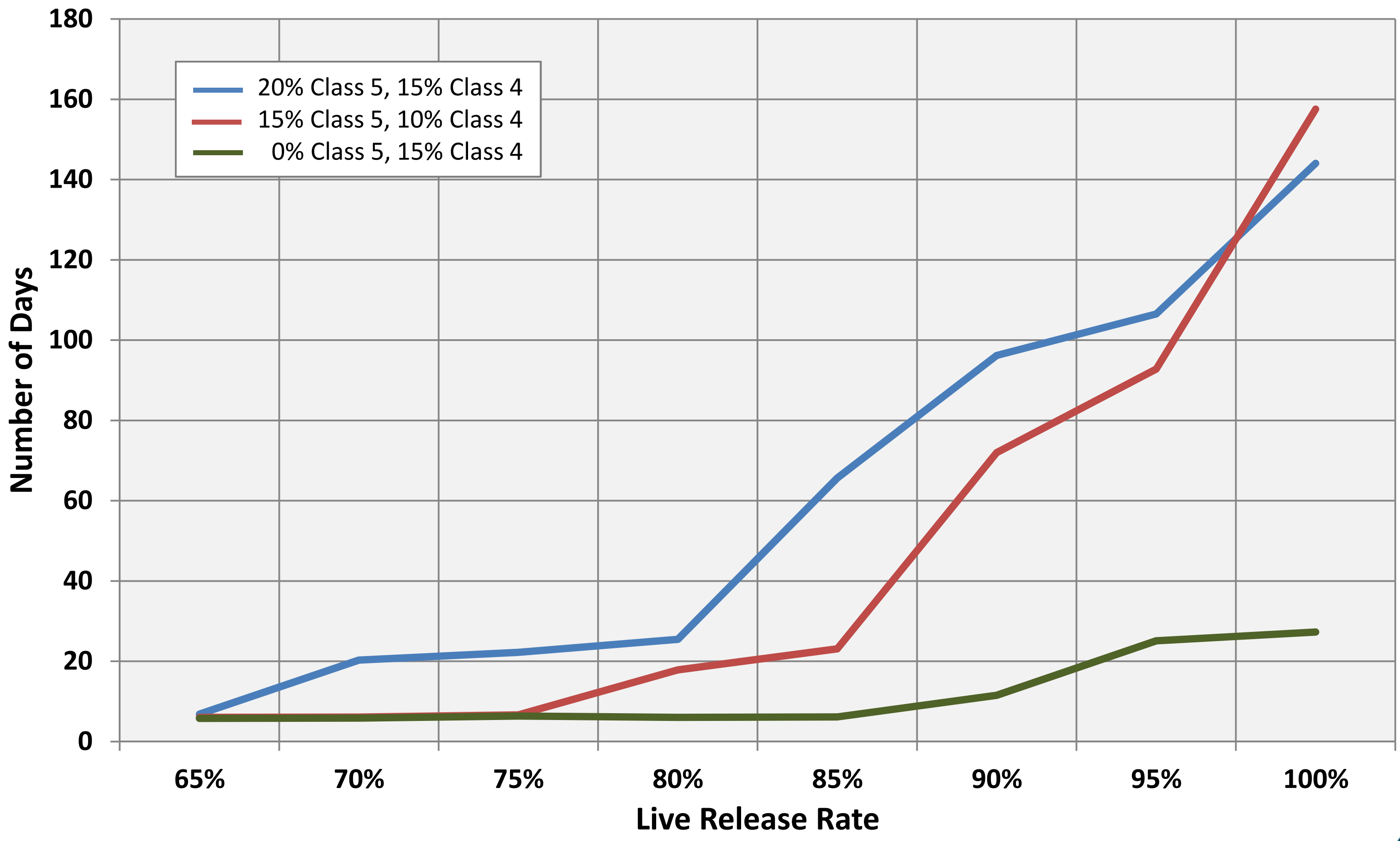
# Average LOS at Different LRR

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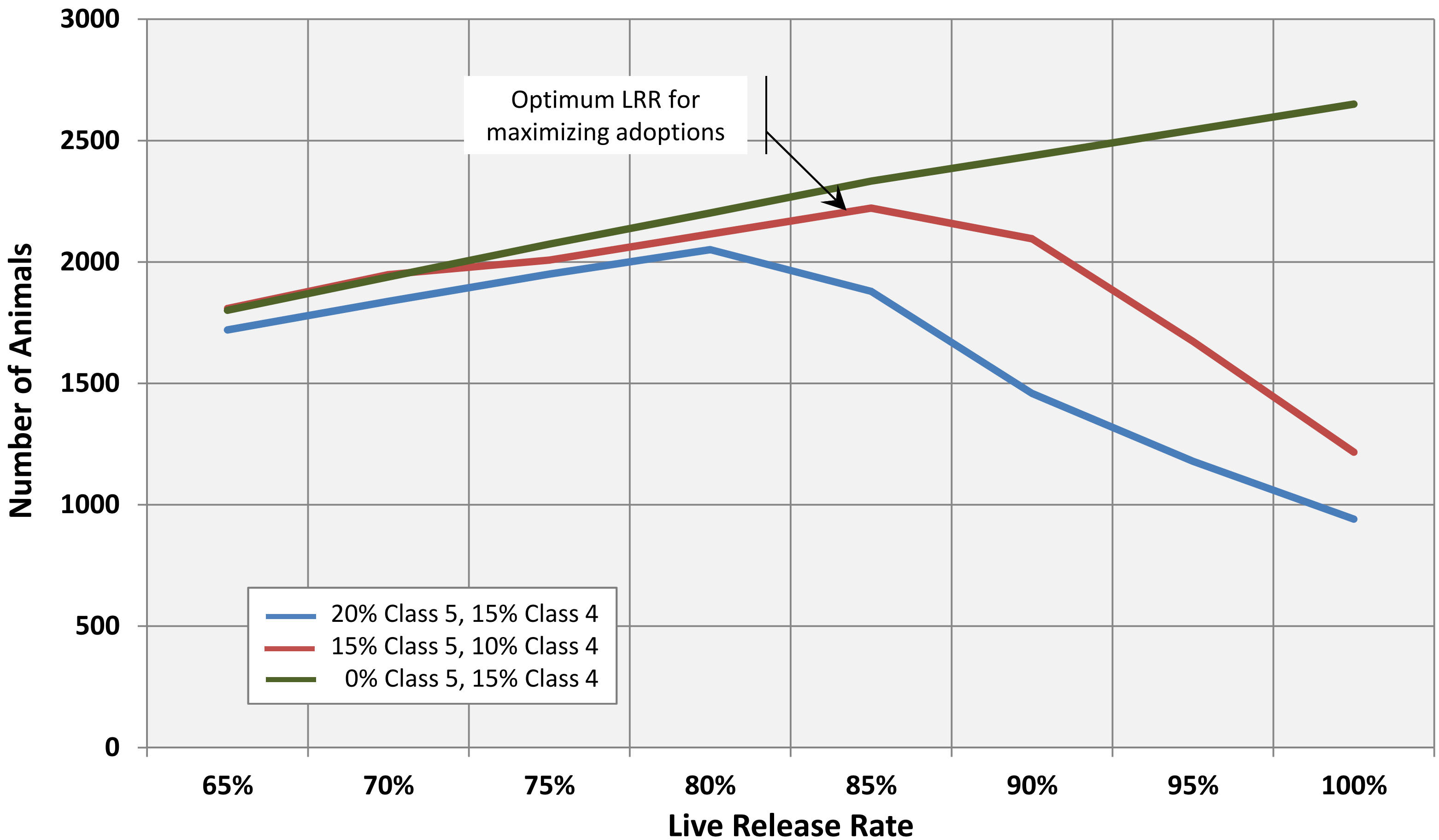
# Total Adoptions at Different LRR

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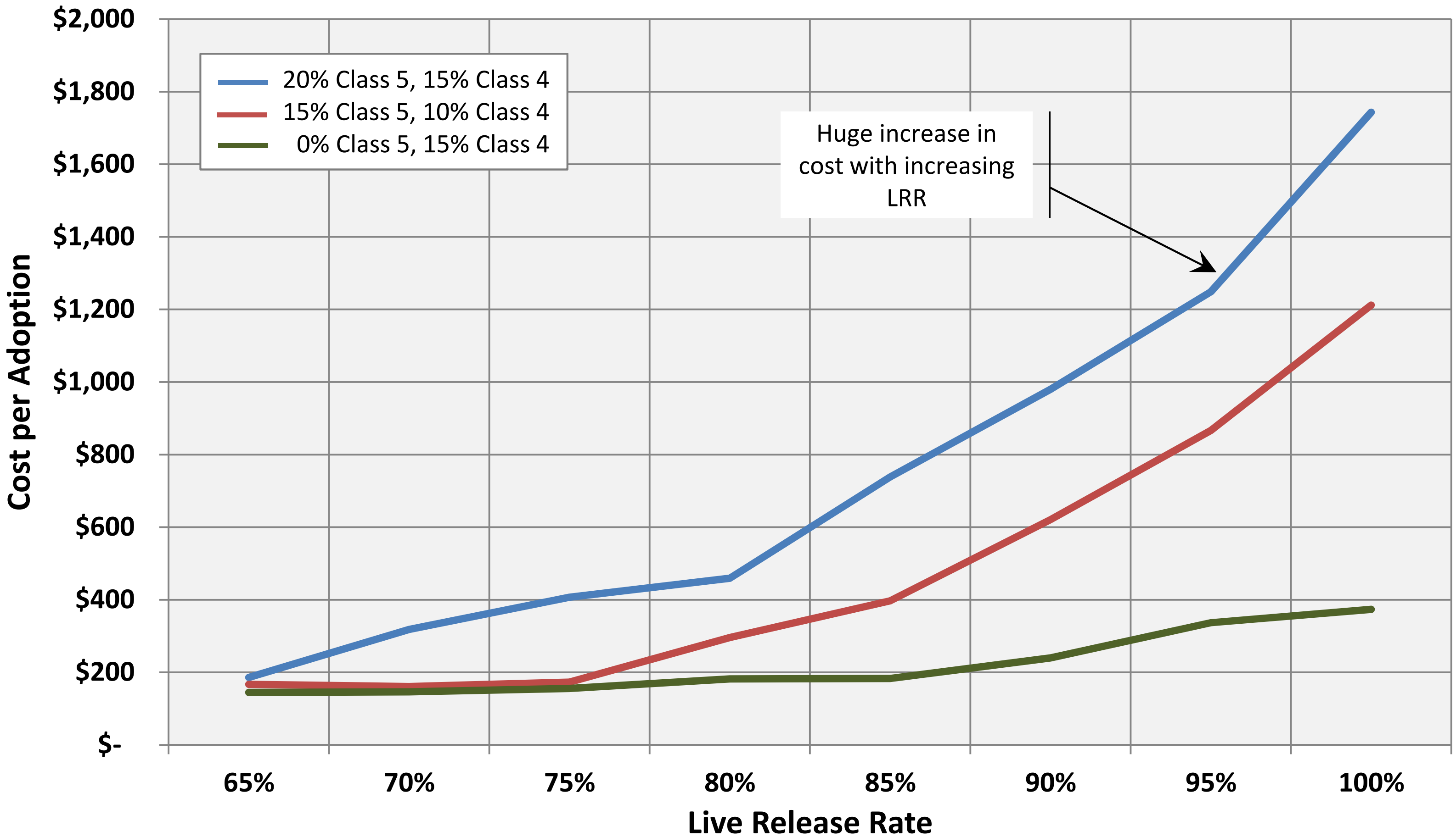
# Cost/Adoption at Different LRR

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# Key Points on Intake Population

- Shelter performance is highly dependent on intake population
  - Managed intake facilities can achieve much higher LRR than open admission facilities
- The cost to increase LRR is nearly exponential
  - Both monetarily and in overall animal welfare
- Each population of animals has an optimum LRR that will maximize the number of adoptions and intakes

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# Where Does this Leave Us?

- Live Release Rate is a critical metric, but we must understand its weaknesses, biases and limitation
  - Dependent on intake population
  - Loses sight of scale
  - Can work against animal welfare as defined by the Five Freedoms if used in isolation

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It’s a Community Problem

# MULTI-SHELTER IMPACT ANALYSIS

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# The Tale of Two Shelters

- Purrville has just opened up two identical shelters; they are exactly the same as the one opened in Wagsberg. The animal population has the same statistical parameters as well.
- Both shelters expect about 3000 animals
- This simulation will analyze the impact of intake and euthanasia policies on each of the shelters and the community as a whole. Two different cases highlighted below were analyzed

| | Case 1 | | Case 2 | |
|---|---|---|---|---|
| | No Time Limit | Municipal | No Time Limit | Municipal |
| Intake | Any if room | Any if room | Only Class 1 to 4, if room | Any if room |
| Euthanasia | None | Class 5 & 5s | None | Class 5s only |

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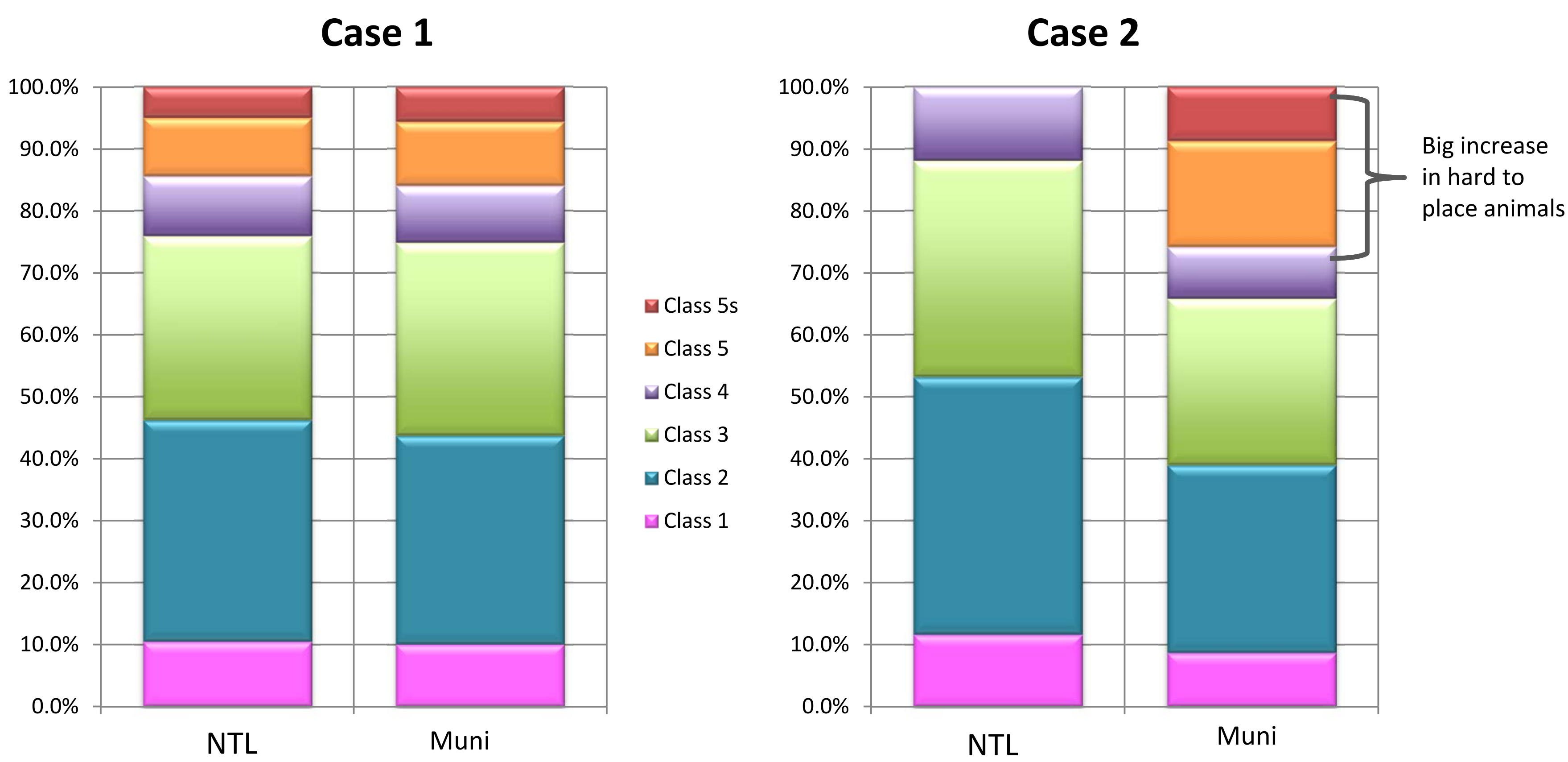
# Arrival Population Demographics




Implementing a selective intake policy (Only Classes 1 to 4) at No-Time-Limit Shelter pushes a higher percentage of hard to place (Class 5 & 5s) animals to Municipal Shelter that has an open admission policy

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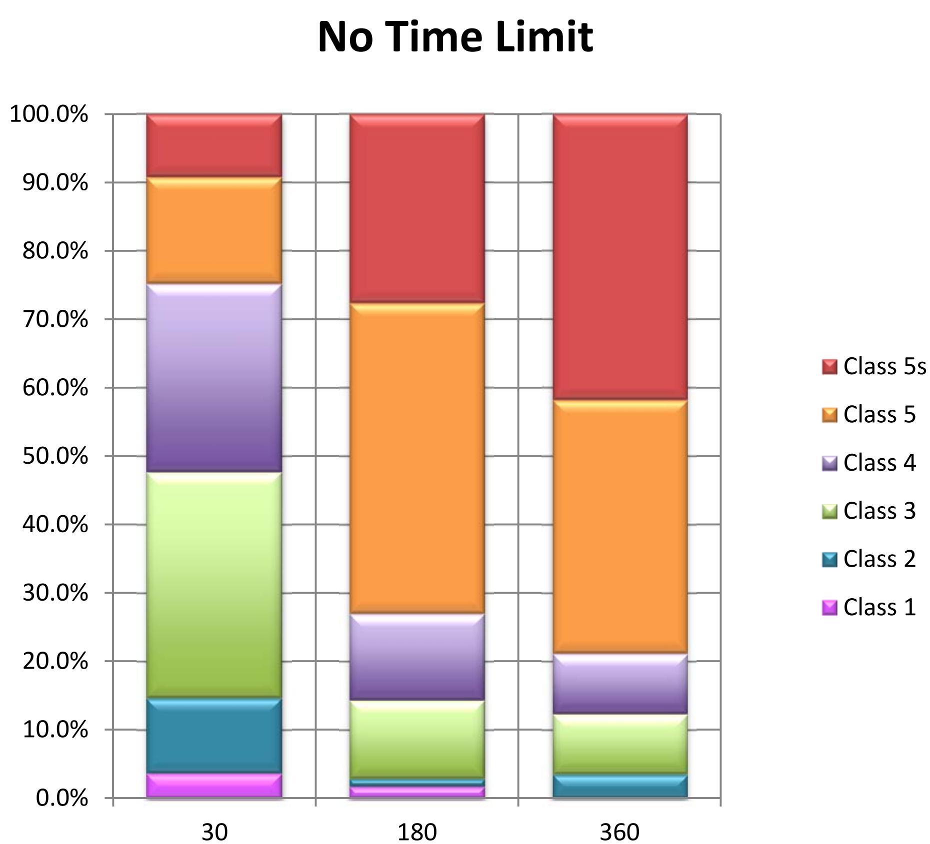
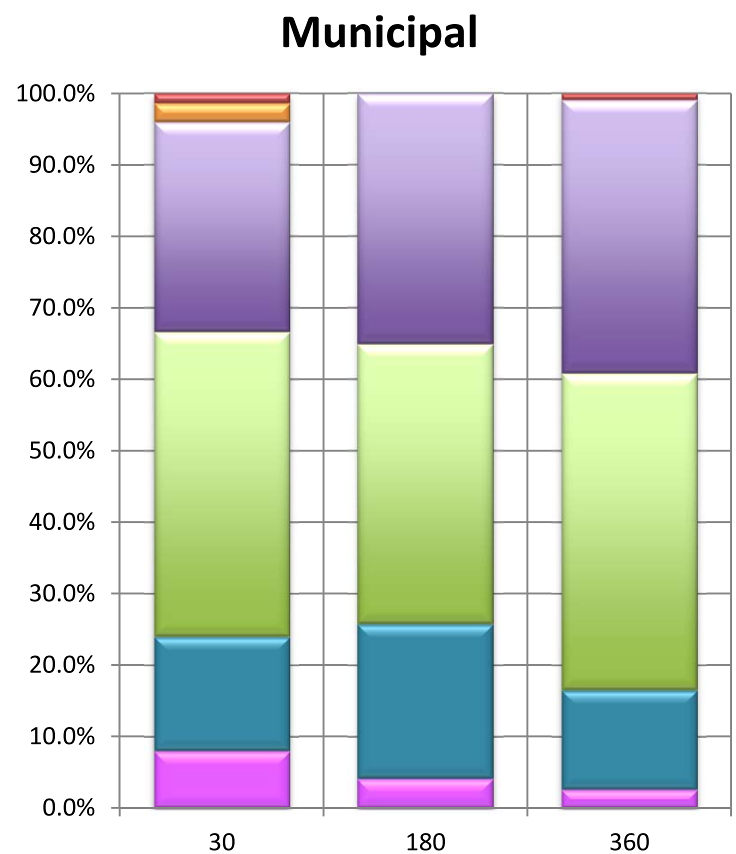
# Case 1: Shelter Inventory over Time

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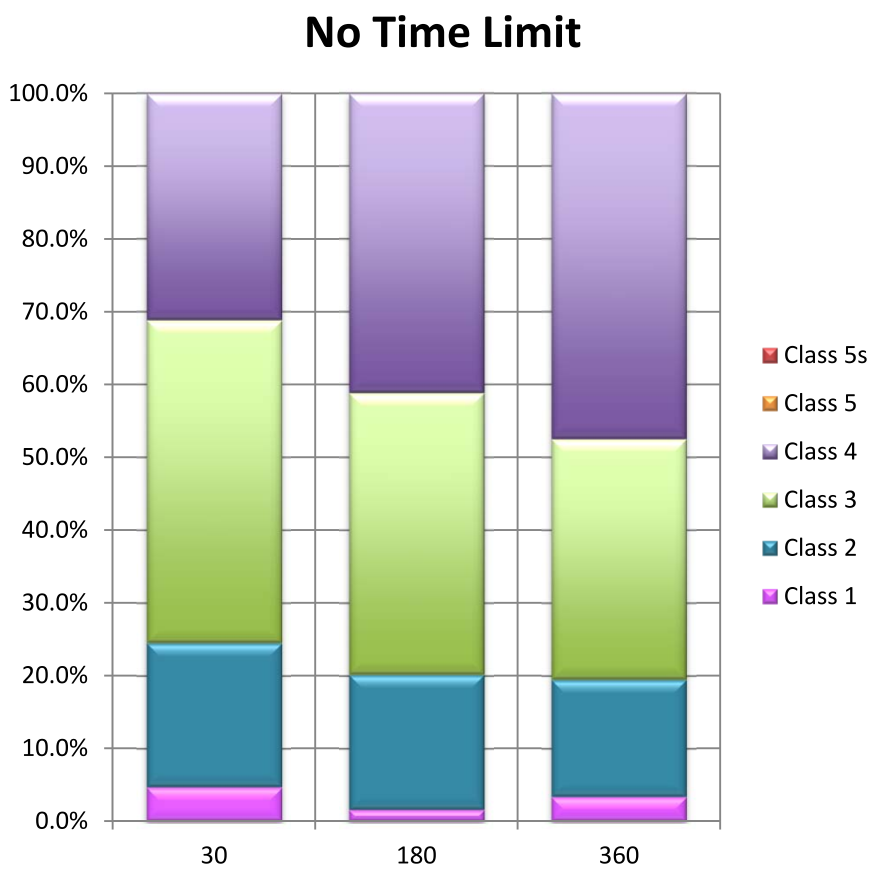
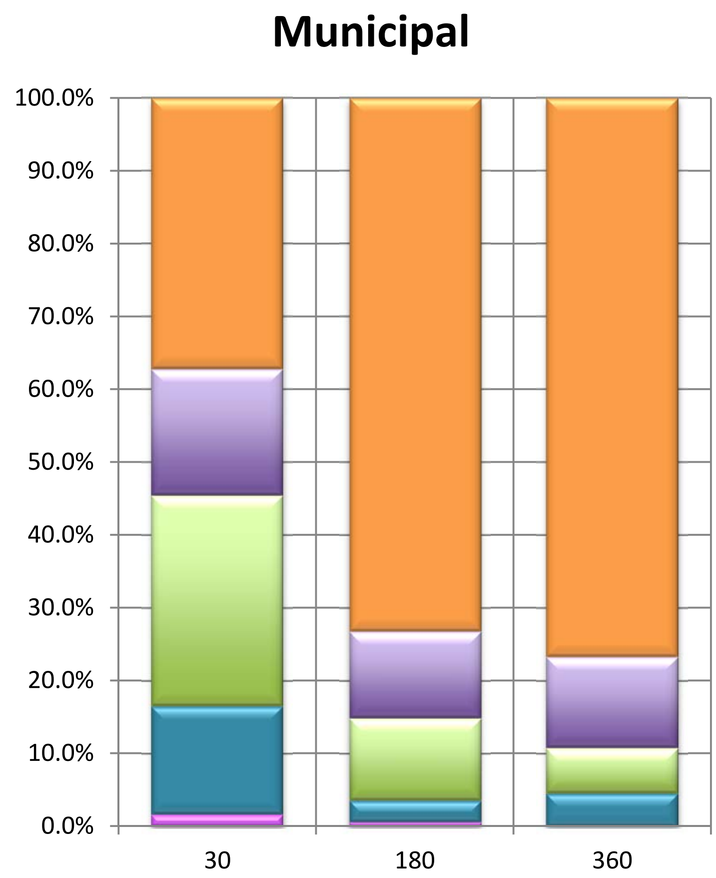
# Case 2: Shelter Inventory over Time

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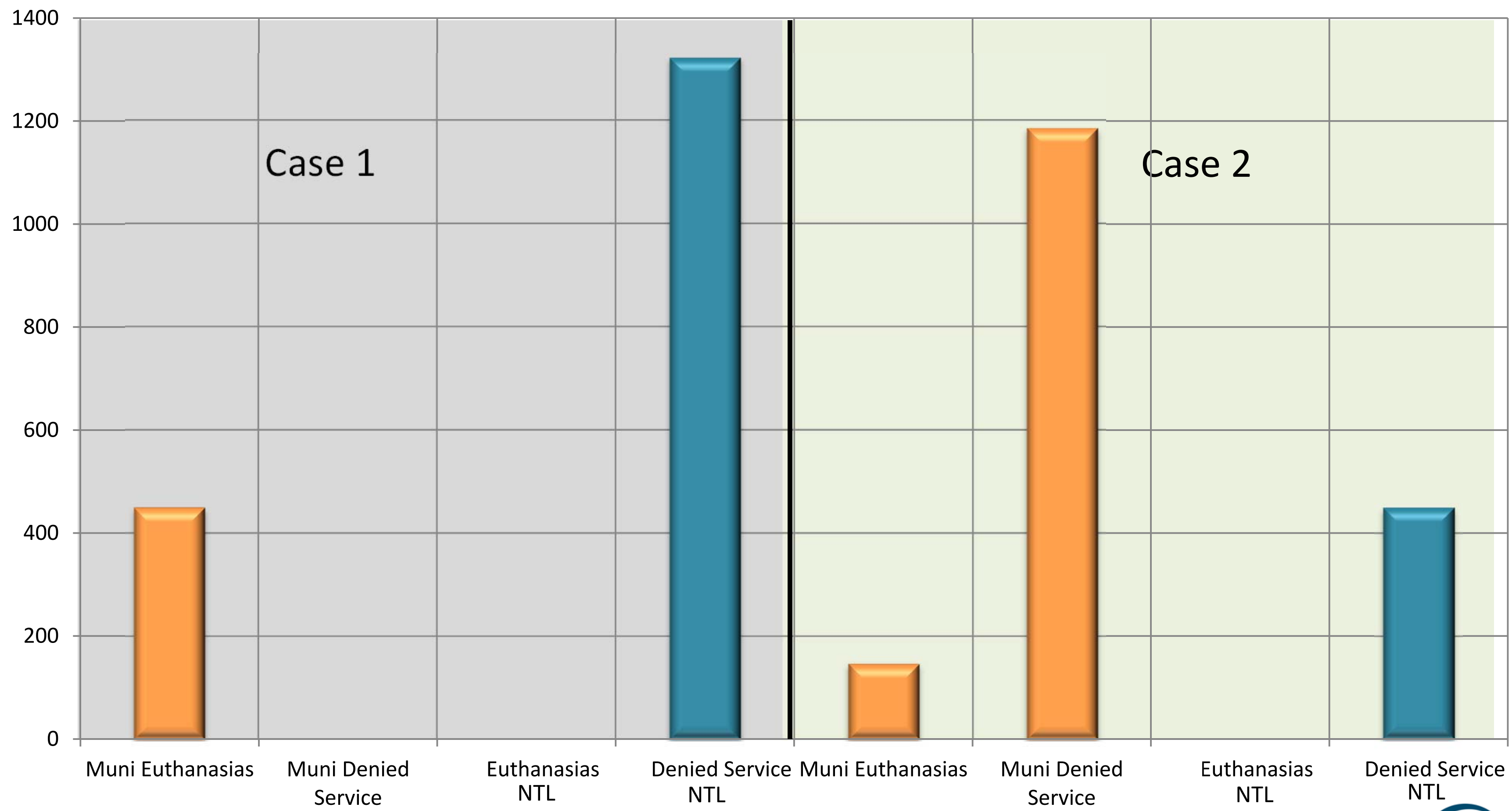
# Euthanasias & Denial of Service

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# Comparison of Results

| Metric | Municipal Shelter | | | | | No Time Limit Shelter | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Case 1 | Case 2 | Diff | | | Case 1 | Case 2 | Diff | |
| Intakes | 2866 | 1673 | (1193) | ↓ | | 1544 | 2858 | 1314 | ↑ |
| Rejected | 0 | 1185 | 1185 | ↓ | | 1322 | 450 | (872) | ↑ |
| Adoptions | 2301 | 1307 | (994) | ↓ | | 1377 | 2858 | 1481 | ↑ |
| Euthanasias | 450 | 147 | (303) | ↑ | | 0 | 0 | 0 | |
| Ave. Capacity | 63% | 101% | 38% | ↓ | | 101% | 72% | (29%) | ↑ |
| Ave. LOS | 20.4 | 122 | 102 | ↓ | | 171 | 23 | (149) | ↑ |
| % Long-term | 0% | 73% | 73% | ↓ | | 81% | 0% | (1) | ↑ |
| Annual Cost | 832,169 | 1,756,994 | 924,825 | ↓ | | 1,723,025 | 1,010,007 | (713,018) | ↑ |
| Adoption Rev. | 441,560 | 221,457 | (220,103) | ↓ | | 247,026 | 515,512 | 268,486 | ↑ |
| $/ Adoption | 362 | 1,344 | 983 | ↓ | | 1,251 | 353 | (898) | ↑ |
| $/Animal Served | 290 | 1,050 | 760 | ↓ | | 1,116 | 353 | (763) | ↑ |

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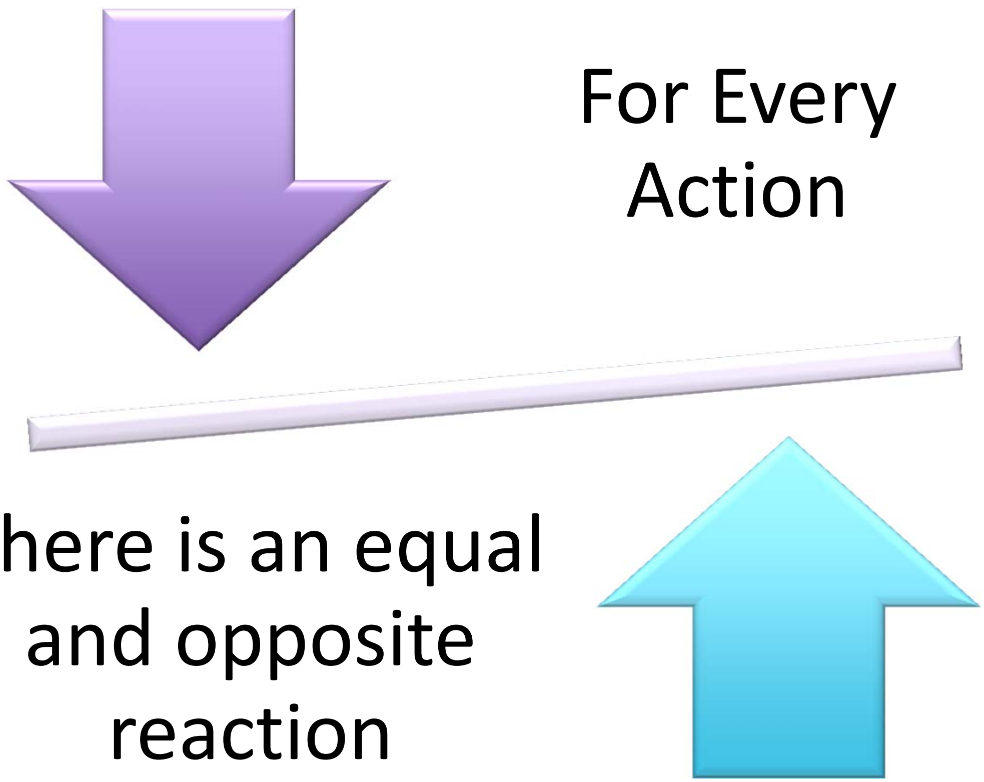
# Newton's 3rd Law

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Comparing expected outcome to real data

# WHAT DOES THE MODEL PREDICT

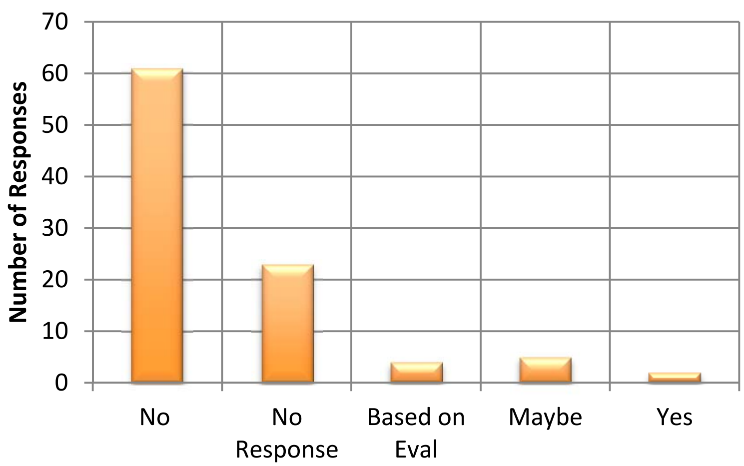
# Model Predication: Shelters are Full

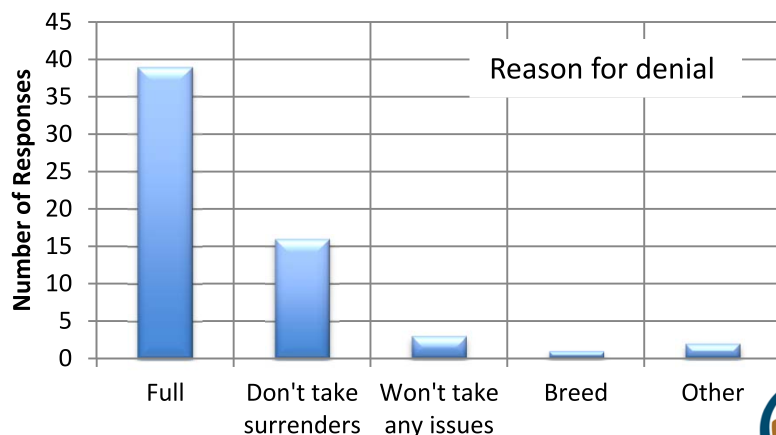
**Scenario to Evaluate Capacity in No Kill Shelters**

*Mr. Squish*

- Contacted 100 No-Kill shelters around the country
- 50 with Boxer Mix; 50 with Lab Mix

  "Hi, this is my dog, Mr. Squish. He is a nice dog, 3 years old, current on shots/heartworm/neutered. He is fighting with my other dog. It started 5-6 months ago and has gotten worse. He likes other people and hasn't fought with any other dogs, but isn't around other dogs much either. I really need a place for him to go so that my other dog can be happy again, he's 9, and I can't rehome him. Please let me know if you can take him into your shelter."

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# Model Prediction: Long LOS, High Costs

| Data from a Major Sanctuary* | | |
|---|---|---|
| | Model 90% LRR | Sanctuary |
| Average Length of Stay | 4 months | 22 months |
| Cost per Animal (Annual) | $17,500 | $19,376 |
| Inventory of Difficult Animals | 42% | 31% |
| Cost per Adoption | $1,750 | $9,754 |
| Euthanasia Rate | 10% | 13% |

** Reported to be 90% successful adoptions*

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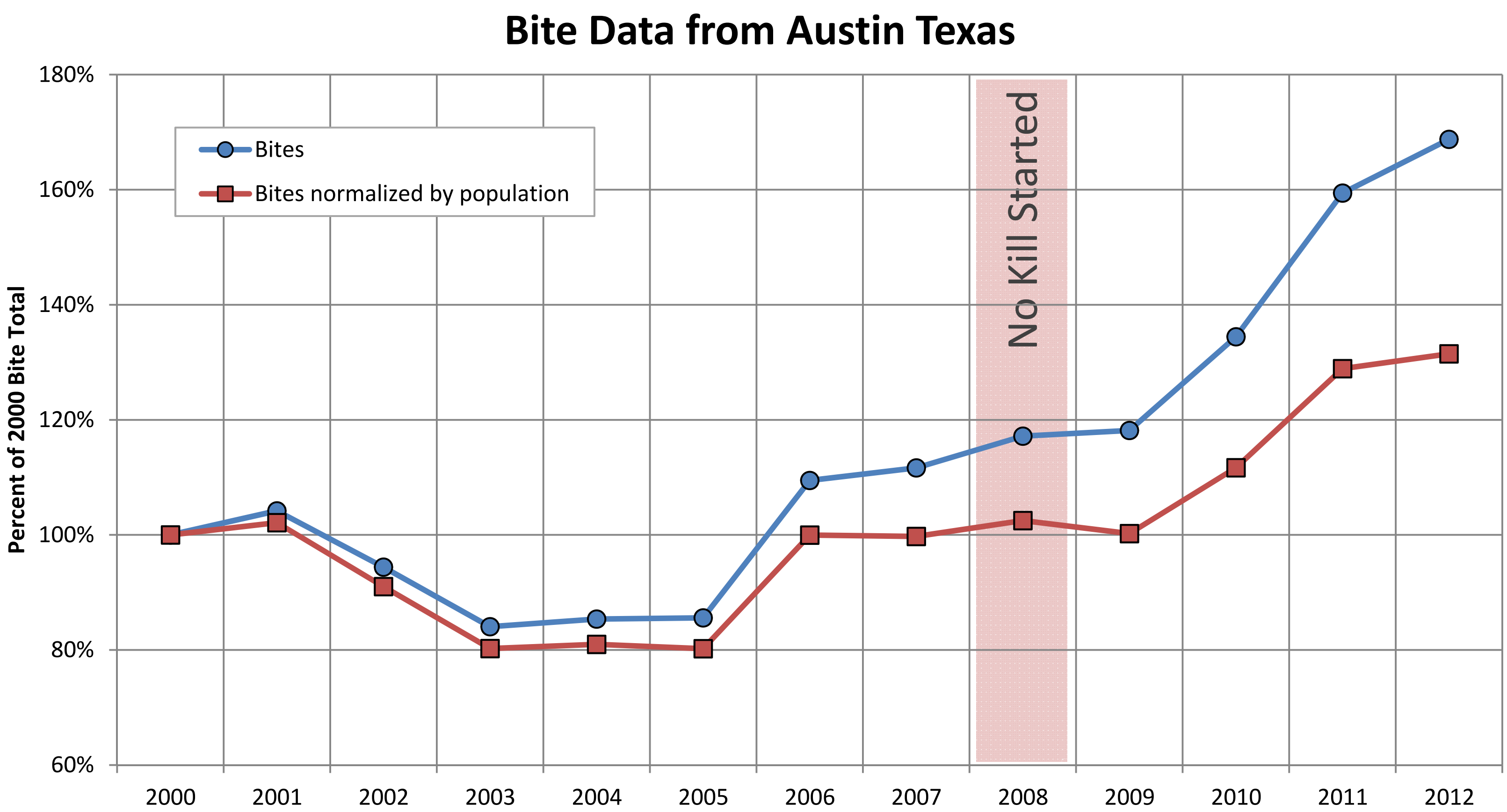
# Model Prediction: Increase in Unserved Animals




Inference: More unserved animals means more problematic animals in the community resulting in an increase in dog bites

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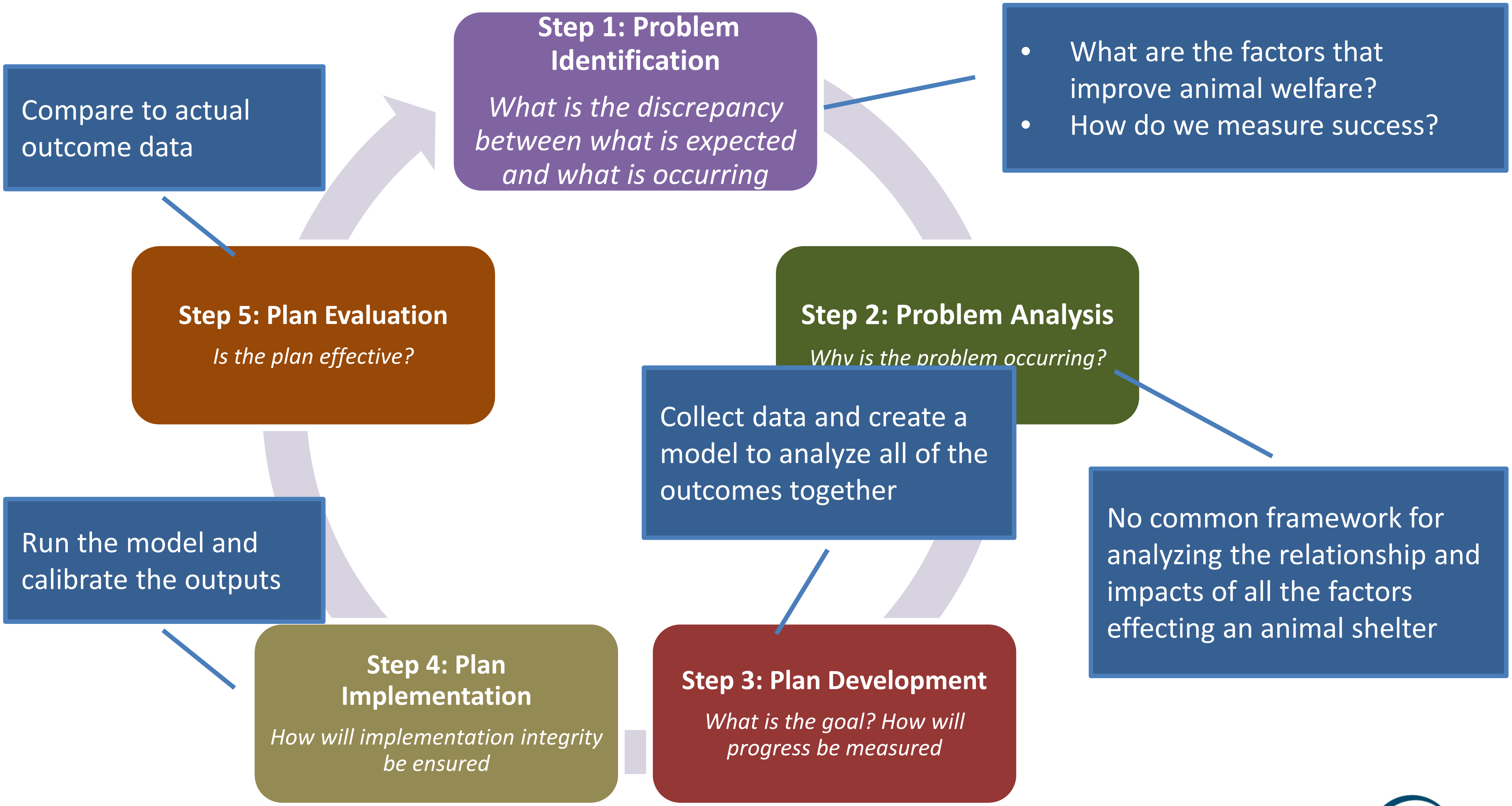
# Stochastic Modeling as Problem Solving

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# Summary

- LRR is  a critical metric, but is not a sufficient measure of success
  - You need counter balancing metrics like Length of Stay
- Increasing LRR from 85% to 95% causes a significant increase in LOS, cost,  and denial of service.
- The optimal LRR for a shelter is highly dependent on the intake population and is unique for each community and situation
- Your decisions greatly effect those around you
  - Changing your intake policy by limiting types of animals can have a very negative effect on other shelters in your community
- **Animal welfare is much more than LRR; we must measure our success on the sum total of all the factors that contribute to an animal's welfare**

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# Definition of Paradox

A paradox is a statement or concept that contains conflicting ideas. In logic, a paradox is a statement that contradicts itself;

for example, the statement "I never tell the truth" is a paradox because if the statement is true (T), it must be false (F) and if it is false (F), it must be true (T).

# Mission: Improving Animal Welfare

- We have to recognize the we live in a system/community
- What we do effects those around us
- An organization's mission, vision and values must be in the context of the community
- As we get better and better at what we do, we are faced with decisions and consequences that cannot be taken in isolation
- Simplifying the world to a single attribute will ultimately drive organizations away from their intended mission

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# The Live Release Rate Paradox

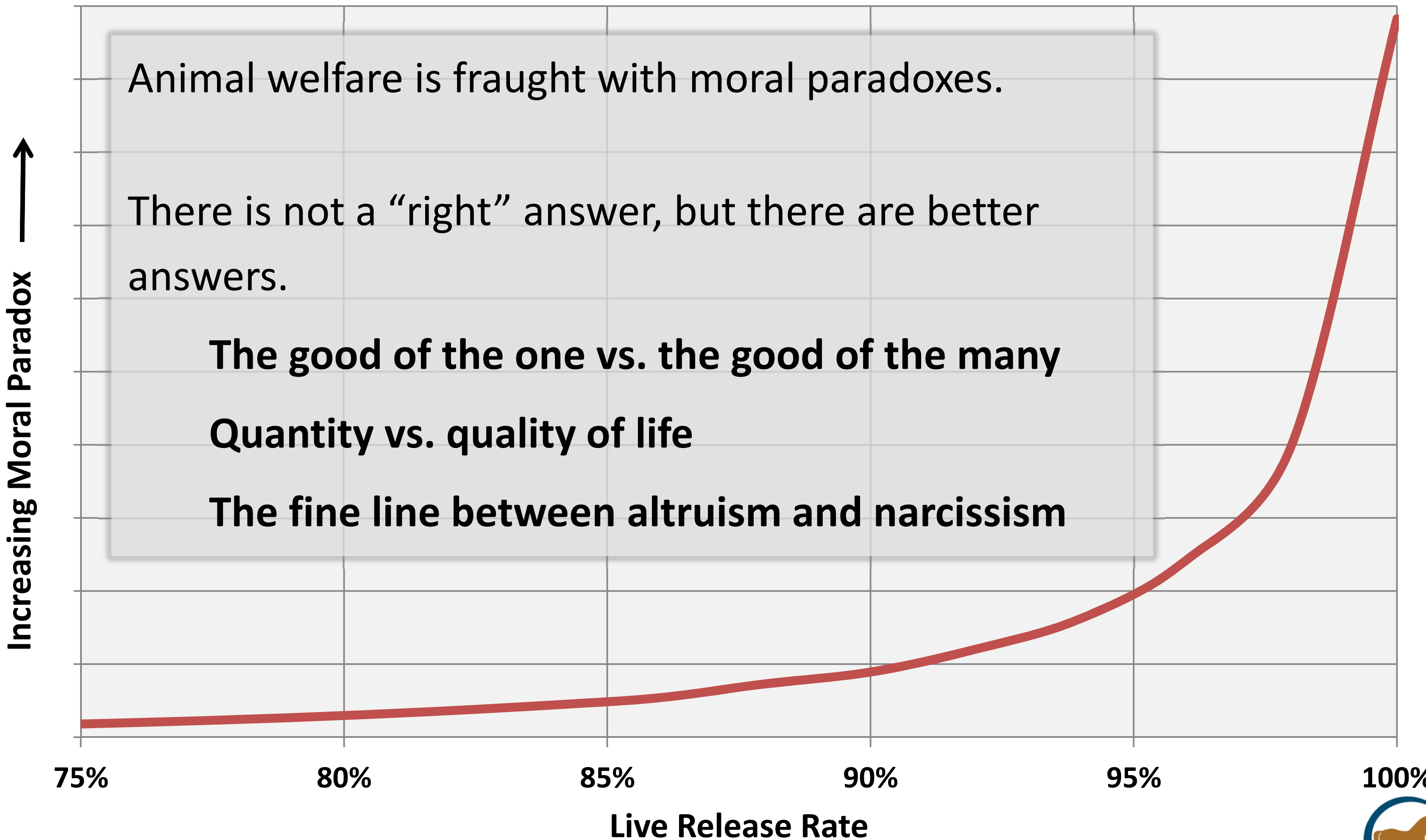
Animal welfare is fraught with moral paradoxes.

There is not a “right” answer, but there are better answers.

**The good of the one vs. the good of the many**

**Quantity vs. quality of life**

**The fine line between altruism and narcissism**

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# Questions?