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# Animal Shelter Intakes and Adoptions Analysis

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# Agenda

- Introduction
- Methodology
- Analysis
- Demo

# Introduction

- **6.5 million** dogs/cats enter animal shelters in the U.S. every year
- **1.5 million** of them are euthanized
- Local shelters are facing challenges to handle such amount of intakes due to limited resources

# Audience

Animal shelters and local rescues

# Shelter Top Challenges

1. Overcrowding
2. Constant high-volume of intakes
3. Mandatory holding periods (7-10 days)
4. Limited Resources
  - Space
  - Medical
  - Staff
  - Facilities

# Our Goals

- Understand factors of shelter animal intake and adoption
- Reduce Shelter Crowdedness by:
  - Relocate animals
  - Improve adoption rate

# Data Collection

- Cleaned Data

- [Austin Animal Center Shelter Intakes and Outcomes](#)(Kaggle)
- [Intakes Reason 2020](#) (Data.World)
- [Median Household Income by State \(2019\)](#)
- [Educational Attainment Rank by States 2021](#)
- [Licensed Breeder Nationwide 2021](#)

- Unprocessed Data

- [Petfinder API](#)
  - Adopted/not adopted dogs and cats in 2020



# Data Collection & Cleaning (Petfinder API)

- Jupyter Notebook
- Fetching From API
  - Rauth Python Package
  - 32000 dog records and 40000 cat records
- Attributes Extraction and Cleaning
  - Drop datas not needed (image url, video link)
  - Drop values with missing percentage > 80%



# Data Collection & Cleaning (Petfinder API)

```
def make_req(page, typ, status):
    url = url = f'https://api.petfinder.com/v2/animals?type={typ}&page={page}&limit={limit}'
    r = requests.get(url, headers=headers).json()
    return r

def get_all_data(typ, status='adoptable', upper_page_lim=0):
    try:
        url = f'https://api.petfinder.com/v2/animals?type={typ}&page={page}&limit={limit}'
        r = requests.get(url, headers=headers).json()
        total_pages = r['pagination']['total_pages']
    except:
        print('error occured...')
        print(r)
        return

    res = r['animals']
    if not upper_page_lim:
        print(f'there should be around {limit * total_pages} {typ}s...')
        for p in range(2, total_pages + 1):
            r = make_req(p, status)
            res.extend(r['animals'])
    else:
        print(f'there are around {limit * total_pages} {typ}s...')
        print(f'taking random {upper_page_lim} pages from the api...')
        for p in random.sample(range(2, total_pages + 1), upper_page_lim):
            r = make_req(p, typ, status)
            res.extend(r['animals'])
    return res
```

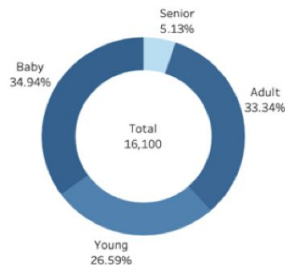
```
# Functions for flatten the nested dictionary
def flatten_attr(df, attr):
    for key in df[attr][0].keys():
        df[f'{attr}_{key}'] = df[attr].apply(lambda row : row[key])

def flatten_all_attrs(df, attr_lst):
    for attr in attr_lst:
        flatten_attr(df, attr)
    return df.drop(attr_lst, axis=1)
```

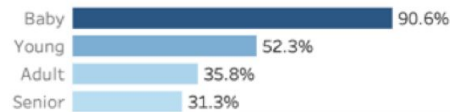
# Essential Features: Age

- Adopted Dog
  - Infant (34.94%)
  - Adult (33.34%)
- Adopted Cat
  - Infant (52.32%)
- Overall
  - Infant dogs/cats have the highest adoption rate

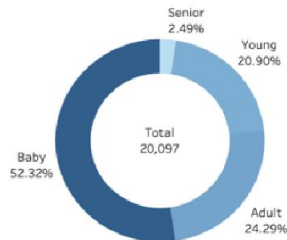
Adopted Dogs Age Distribution  
as of 12.31.2020



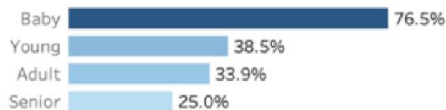
Adoption Rate: Dog Age  
as of 12.31.2020



Adopted Cats Age Distribution  
as of 12.31.2020



Adoption Rate: Cat Age  
as of 12.31.2020

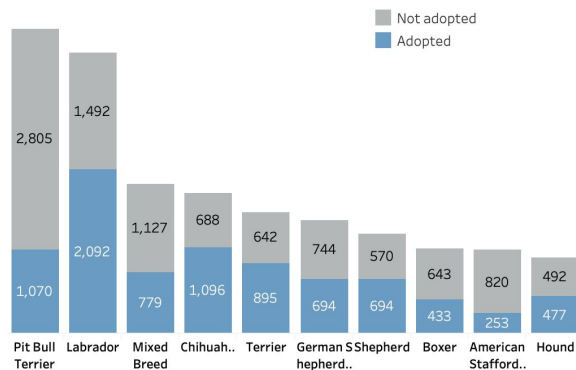


# Essential Features: Breed

- Dog Breeds

- Chihuahua: 61.4%
- Labrador: 58.4%

Dog Breeds Popularity Top 10  
as of 12.31.2020



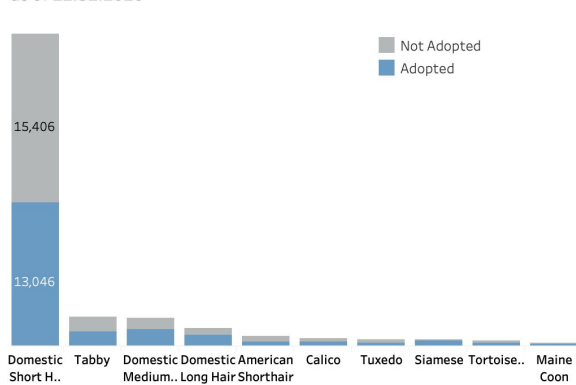
Adoption Rate: Top 5 Dog Breeds



- Cat Breeds

- Not a good indicator
- Majority is short haired
  - 28,452 records
  - ~70% of the cat dataset

Cat Breeds Popularity Top 10  
as of 12.31.2020



Adoption Rate: Top 5 Cat Breeds

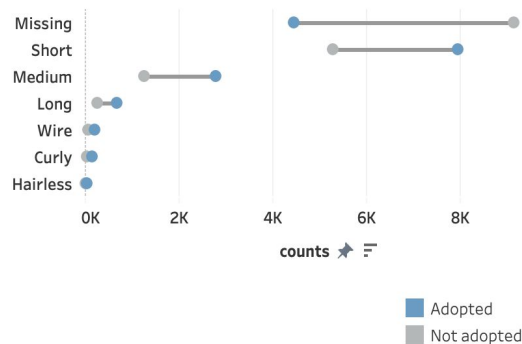


# Essential Features: Coat

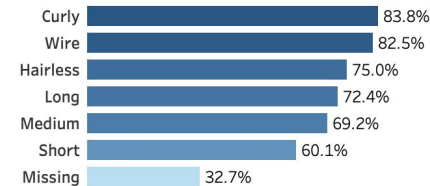
- All type of coats shows a high adoption rate > 59% except "Missing"
- Pets Not Adopted with Missing Coat
  - Dog: 9,131 (61.3%)
  - Cat: 11,931 (71.5%)

Dog Coat

as of 12.31.2020

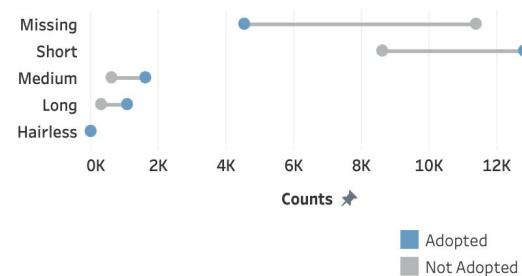


Adoption Rate: Dog Coat

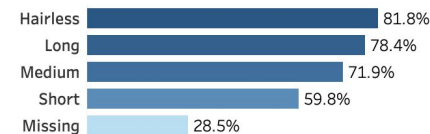


Cat Coat

as of 12.31.2020

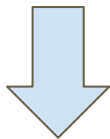


Adoption Rate: Cat Coat



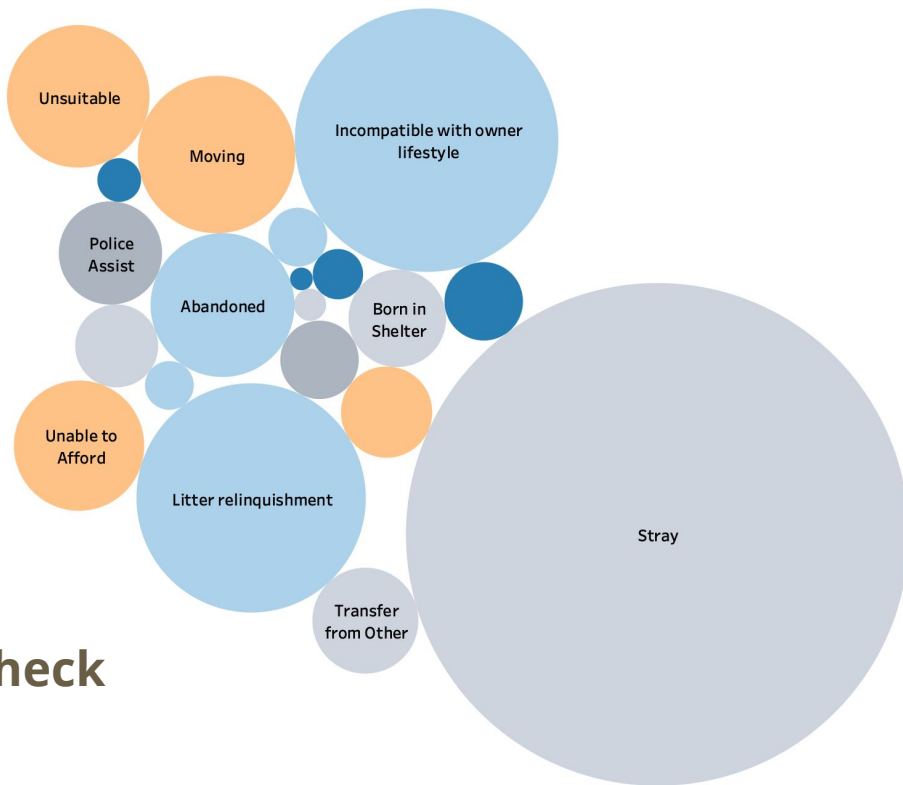
# Intake Reasons

- Gray: social reasons
- Orange: financial reasons
- Blue: other reasons  
(allergy, relationship split)



**Get stray animals spayed/neutered**  
**Adopter Background Information Check**

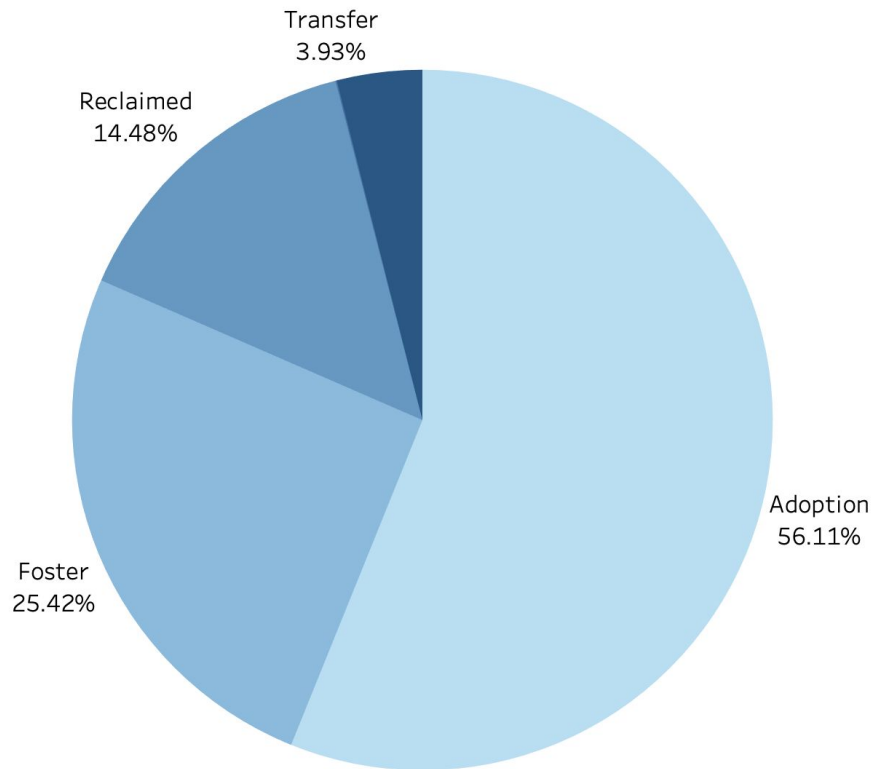
IntakeReason  
Total: 10,290



# Out Reasons

- Help animals to be reclaimed
- Transfer to other shelters to balance resources

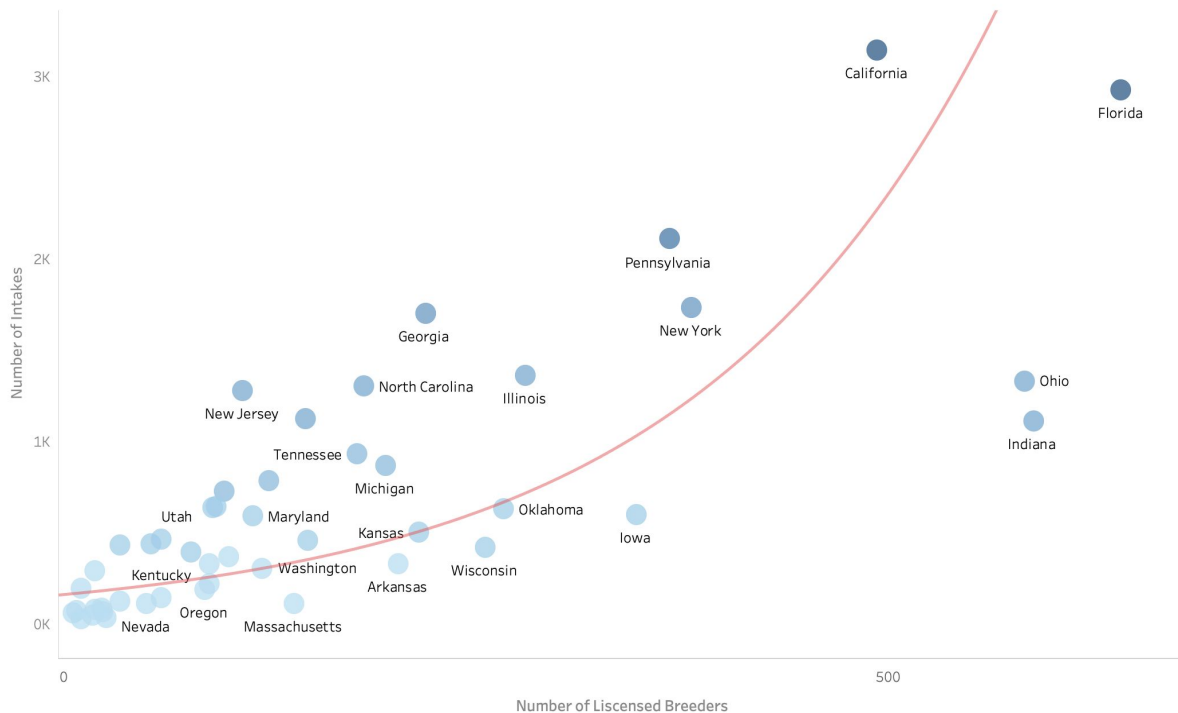
Out Reason  
Total: 10,290



# Intakes & Breeders

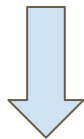
Intakes grow exponentially when number of licensed breeders increases.

Correlation Between Intakes and Breeders



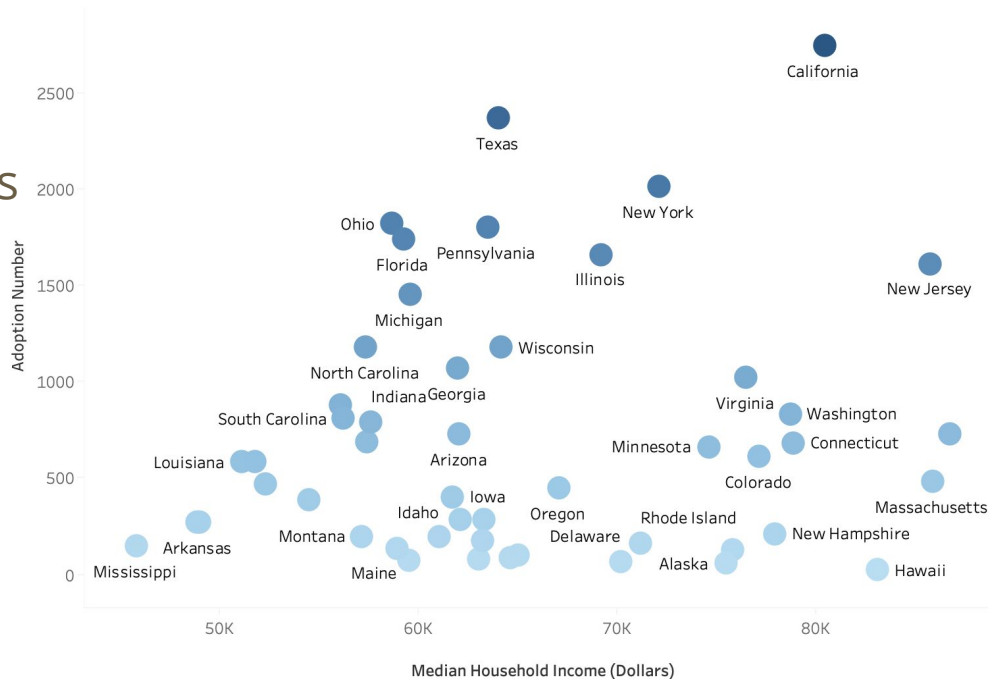
# Adoption & Income

- No obvious trend
- High income level indicates high adoption rate



Adopter's income level is a significant factor.

Correlation Between Adoption and Income





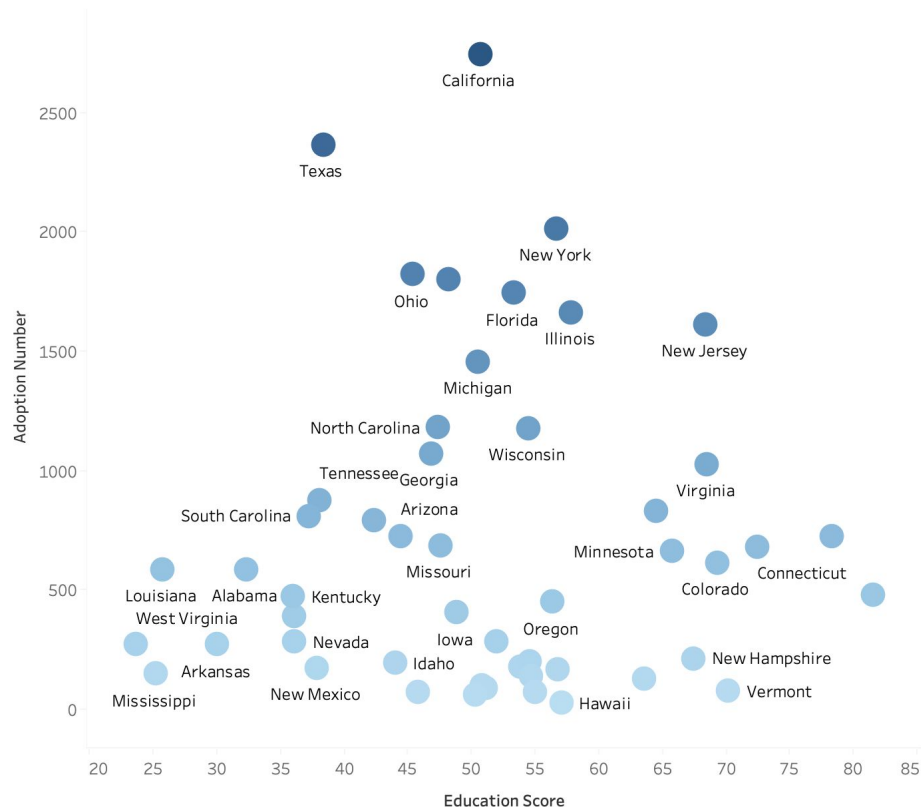
# Adoption & Education

- No obvious trend
- Medium education level indicates high adoption rate



Adopter's education level is not important as financial status

Correlation between Adoption and Education

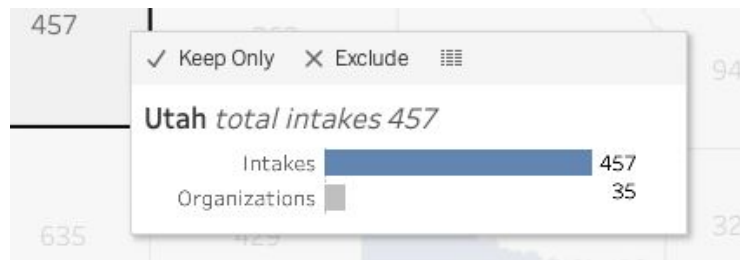
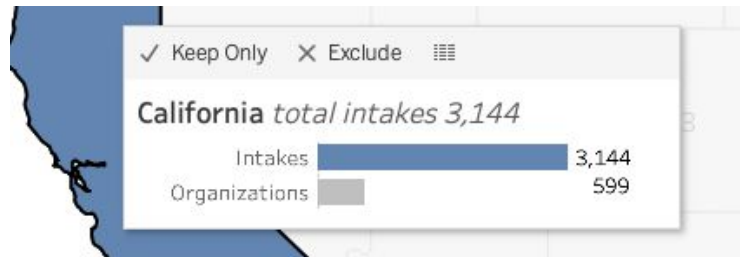
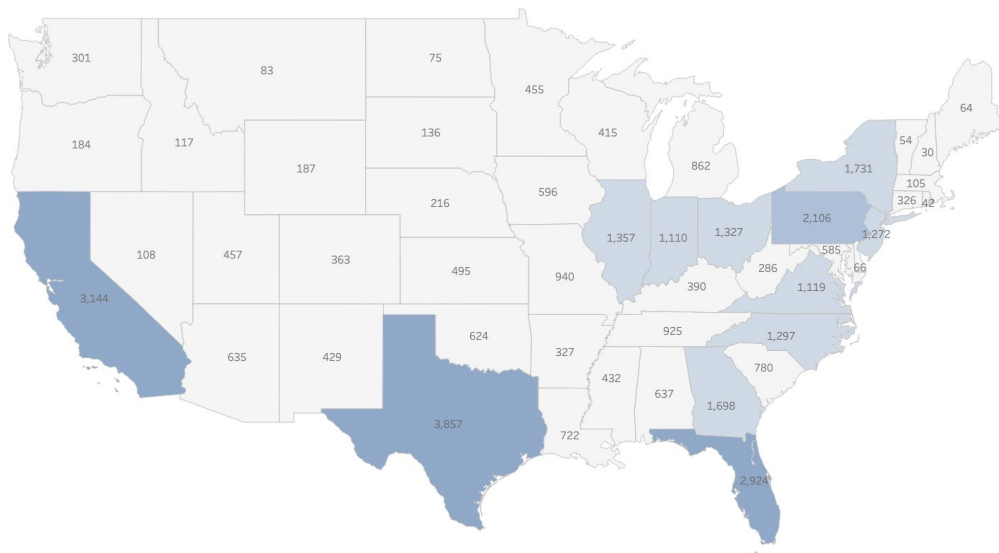


# Crowdedness: Total Intakes

## Dog and Cat Intakes

as of 12/31/2020

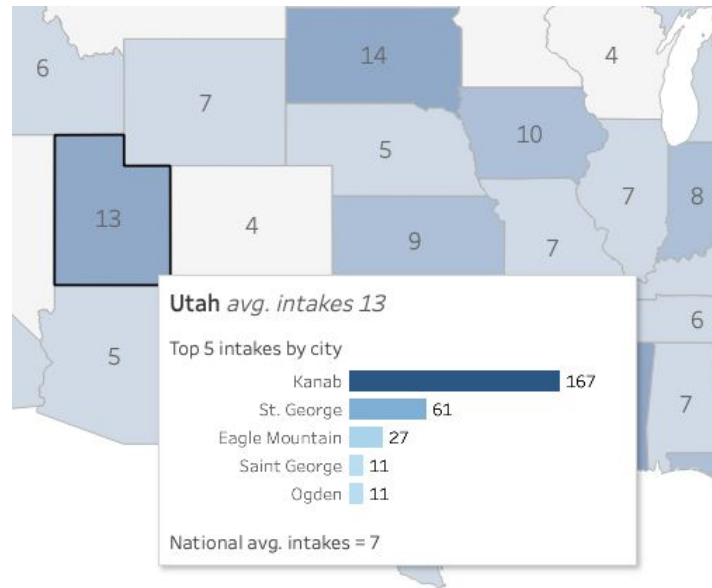
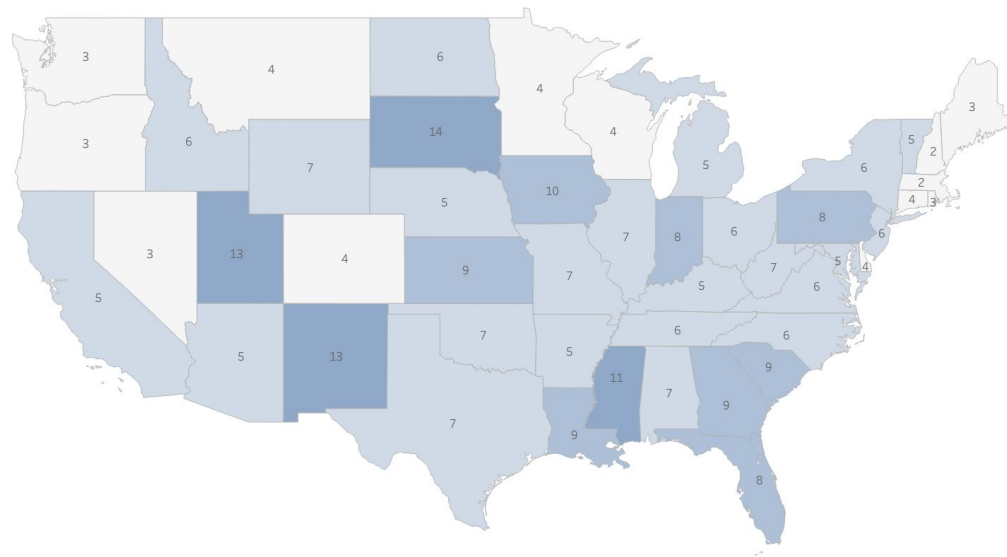
National Intakes  
3 3,857



### Dog and Cat Average Intakes

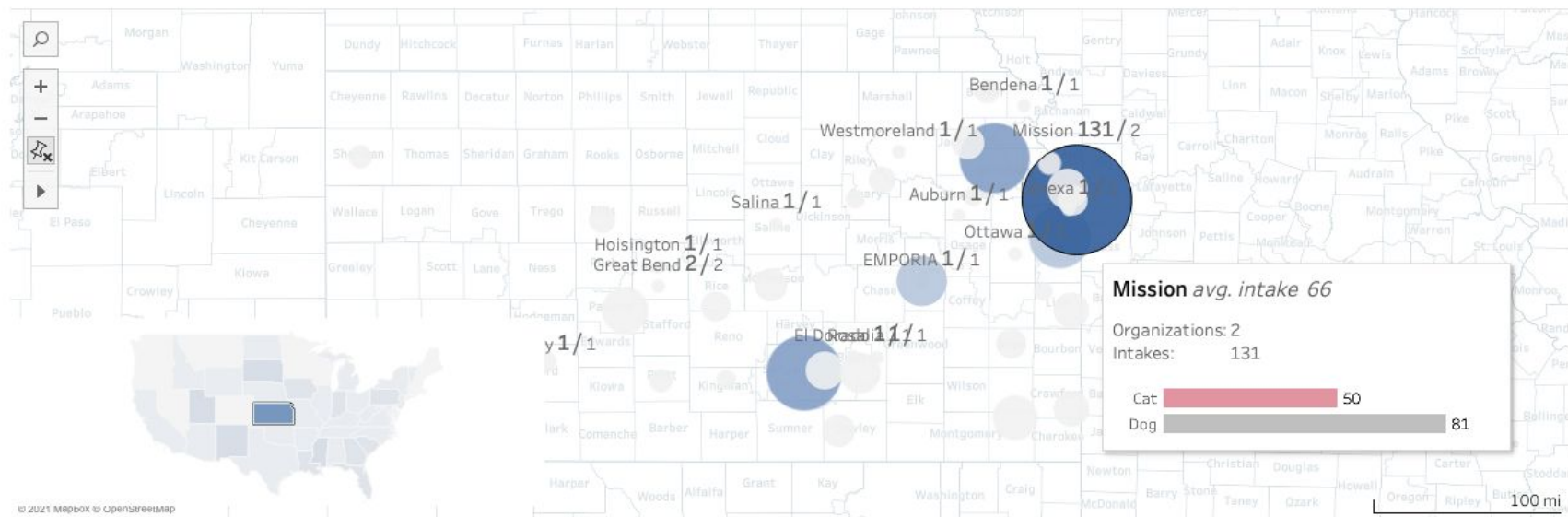
as of 12.31.2020

Avg Intake per Org



# Crowdedness: Distribution

Kansas Intake and Organization Distribution



Avg. Intake.. 1

# Seasonal Trend: National

National Intake Trend..



# Seasonal Trend: by State



# Recap: Adoption

- Top **3** reasons dog/cat **leave** a shelter: **adopted**, **fostered**, and **reclaimed**
- Top **3** features of the adopted dogs and cats: **age**, **coat** and **breed**
- **Correlation** between adoption and intake is **linear** among states
  - State with high intake rate also has high adoption rate

# Recap: Intake

- Top **2** reasons dog/cat **enter** a shelter: **stray** and **lifestyle**
- Total Intakes  $\neq$  Crowdedness
- December is a **national dumping season**
- The **unbalanced resources** and animal **distribution** could be one of the major reason causing overcrowding

**Transportation** might be one of the feasible solution to resolve the complex shelter **crowdedness**



**Demo**