Social vulnerability assessment of dog intake location data as a planning tool for community health program development: A case study in Athens-Clarke County, GA, 2014-2016.

Jessie Dyer, MSPH MA

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How can we determine which pet owners need the most help?

What is Social Vulnerability?

Social vulnerability refers to the community’s ability to “bounce back” or resilience

Originally used in disaster research as a predictor areas which may need support in preparing for hazards; or recovering from disaster.

Social Vulnerability Index

Overall Social Vulnerability

Reported measure:

Domain:
Socioeconomic Status
Household Composition & Disability
Minority Status & Language
Housing & Transportation

Example Human Factors:
Example: Income
Example: Age 65 or older
Example: Minority Status
Example: Crowded Housing
Overall Social Vulnerability

**Socioeconomic Status**
- Income
- Age 65 or older
- Minority status

**Household Composition & Disability**
- Generational view of dog role (i.e., companion vs. yard dog)
- Barriers to community outreach initiatives

**Minority Status & Language**
- Limited access to veterinary offices and pet supply stores

**Housing & Transportation**
- Crowded housing

Example Human Factors:
- Access to preventative vet care

Example Dog Factors:
- Generational view of dog role (i.e., companion vs. yard dog)
- Barriers to community outreach initiatives

Domain:
- Reported measure: Social Vulnerability Index
- Example Human Factors:
- Income
- Age 65 or older
- Minority status

Sample Data:
- Athens-Clarke County, GA (ACC)
  - 34.1% of ACC's population lived below the poverty line in 2017.
  - The national average is 13.4%

Study Site: ACC Animal Control

**Animals Intake:**
- Strays
- Owner surrendered
- Captured or Unknown (information not recorded)

**Animal Shelter**

**Dog Kennels:**
- 36 large
- 5 small (up to 150 lbs)
- 5 rabies quarantine

**Disposition:**
- Adopted
- Reclaimed by owner
- Euthanized or Other

Study used ACCAC dog intake data from January 1, 2014 - December 31, 2016.

ACC Animal Control

- Animal caretakers perform a basic health assessment upon intake
- Most dogs receive: DHPP vaccine and Bordetella vaccine
All other ACC Animal Control veterinary care was funded through a non-profit until very recently.

Health Categories
- Healthy
- Known health issue upon intake
- Visible health issues typically associated with physical neglect
- Behaviors typically associated with social neglect
- Visible health issues typically associated with vehicular trauma

Signs of Physical Neglect
- Includes the presence of preventable or treatable conditions.
- May be the result of short-term care deficits (such as flea infestations) or longer-term care deficits (such as collar embedding)

Signs of Social Neglect
- May include inappropriate reactions to other dogs if they don’t speak “dog”
- The subtle signaling of non-verbal communications may go unnoticed.

Includes the presence of undesirable responses to unfamiliar situations
Methods: Spatial Analysis

Hot spots are statistically significant positive clusters of dogs higher than the expected rate.

Some clusters may not be statistically significant.

Methods: Spatial Analysis

Cold spots are statistically significant positive clusters of dogs lower than the expected rate.

Social Vulnerability Index

Least vulnerable

Most vulnerable
Methods: Statistical Analysis

- one-way ANOVA
  - To assess the relationships between environmental conditions (overall vulnerability by census tracts SVI ranking) and categorical variables (i.e., age group, health category, final disposition, and reason for euthanasia)
  - Tukey test post-hoc analysis for one-way ANOVA results

Results: Overview

Animals intake:
- Strays (n=2,352; 67.9%),
- Owner surrendered (n=1,018; 29.4%),
- Captured (n=61; 1.8%), or
- Unknown (n=35; 1%)

Health categories were developed from the basic health assessment

Disposition:
- Adopted (n=1,026; 29.6%),
- Reclaimed by owner (n=795; 23%),
- Euthanized (n=382, 11%), or
- Other (n=28, 0.8%)

Athens-Clarke County Animal Control health or behavioral category of impounded dogs at time of intake, by year, 2014-2016.

| Health or behavioral category at time of intake* | 2014 | 2015 | 2016 | Total |
|-----------------------------------------------|------|------|------|-------|
| Healthy                                       | 804  | 814  | 666  | 2,284 |
| Known health issue upon intake                | 355  | 333  | 305  | 993   |
| Visible health issues typically associated with physical neglect | 228  | 212  | 189  | 529   |
| Behaviors typically associated with social neglect | 97   | 101  | 69   | 269   |
| Visible health issues typically associated with vehicular trauma | 14   | 21   | 11   | 46    |
| Total                                         | 1,498| 1,483| 1,240| 4,221 |

*Dogs may be in more than one category.
Physically Neglected Dogs
n=629

Socially Neglected Dogs
n=269

Juvenile dogs
n=1,879

Adult dogs
n=1,305

Dogs Euthanized due to Severe Health Issue or Behavioral Issue
n=381
### ANOVA analysis of Athens-Clarke County Animal Control dog intake characteristics for overall Social Vulnerability Index ranking, 2014-2016

#### Method of intake

| Characteristic | N   | Mean | SD  | One-way ANOVA results |
|----------------|-----|------|-----|------------------------|
| Owner surrender| 935 | 0.5844 | 0.2866 | F=5.65, p = 0.0044** |
| Stray          | 2,141 | 0.5821 | 0.2794 |
| Live trap      | 53  | 0.7053 | 0.2636 |

#### Age group

| Characteristic | N   | Mean | SD  | One-way ANOVA results |
|----------------|-----|------|-----|------------------------|
| Juvenile       | 1,711 | 0.6089 | 0.2810 | F=15, p = 0.0002** |
| Adult          | 1,191 | 0.5524 | 0.2780 |
| Senior         | 241  | 0.5643 | 0.2872 |

### ANOVA analysis of Athens-Clarke County Animal Control dog intake characteristics for overall Social Vulnerability Index ranking, 2014-2016

#### Health or behavioral category

| Characteristic                                                                 | N   | Mean | SD  | One-way ANOVA results |
|--------------------------------------------------------------------------------|-----|------|-----|------------------------|
| Behaviors typically associated with social neglect                            | 206 | 0.6328 | 0.2773 |
| Visible health issues typically associated with vehicular trauma              | 44  | 0.6100 | 0.2819 |
| Visible health issues typically associated with physical neglect              | 523 | 0.5839 | 0.2865 |
| Visible health issues typically associated with physical neglect and behaviors typically associated with social neglect | 51  | 0.6216 | 0.3014 |
| Known health issue upon intake                                               | 391 | 0.6502 | 0.2836 |
| Healthy                                                                      | 1,946 | 0.5735 | 0.2795 |

#### Final disposition

| Characteristic                                                                 | N   | Mean | SD  | One-way ANOVA results |
|--------------------------------------------------------------------------------|-----|------|-----|------------------------|
| Adopted                                                                        | 846 | 0.5828 | 0.2840 |
| Euthanized                                                                      | 381 | 0.6115 | 0.2836 |
| Transferred to animal rescue group                                             | 724 | 0.5908 | 0.2677 |
| Reclaimed by owner                                                             | 1,181 | 0.5959 | 0.2873 |
| Reason for euthanasis                                                          | F=13.29, p = 0.0004** |
| Fought with another dog on property                                            | 16  | 0.5754 | 0.2797 |
| Medical necessity                                                              | 131 | 0.6071 | 0.2784 |
| Reactivity                                                                      | 99  | 0.6184 | 0.2797 |
| Space                                                                           | 12  | 0.5274 | 0.3218 |
| Unknown                                                                         | 123 | 0.5464 | 0.2787 |
Post-hoc analysis of one-way ANOVA on Athens-Clarke County Animal Control dog intake characteristics by Tukey test, 2014-2016. Relationships are statistically significant if the p-value < 0.05

| Characteristics | Overall SVI* | Mean difference | 95% Confidence Interval |
|-----------------|-------------|----------------|-------------------------|
| Age group: Juvenile vs. Adult | | | |
| Health or behavioral category: Behaviors typically associated with social neglect | | | |
| Health or behavioral category: Known health issue upon intake | | | |
| Health or behavioral category: Visible health issues typically associated with physical neglect | | | |
| Final disposition: Euthanized due to reactivity | | | |
| Final disposition: Reclaimed by owner | | | |

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Post-hoc analysis of one-way ANOVA on Athens-Clarke County Animal Control dog intake characteristics by Tukey test, 2014-2016.

| Characteristics                                                                 | Mean difference | 95% Confidence Interval |
|---------------------------------------------------------------------------------|-----------------|-------------------------|
| Overall SVI*                                                                    |                 |                         |
| Age group: Juvenile vs. Adult                                                    | 0.057**         | 0.032 0.081             |
| Health or behavioral category: Behaviors typically associated with social neglect|                 |                         |
| Health or behavioral category: Known health issue upon intake                   | 0.049**         | -0.017 0.115            |
| Health or behavioral category: Visible health issues typically associated with physical neglect |                 |                         |
| Health or behavioral category: Healthy or whose health status was unknown        | 0.048**         | -0.066 0.162            |
| Final disposition: Euthanized due to reactivity vs. Final disposition: Reclaimed by owner |     | 0.061**        | 0.015 0.106 |

Relationships are statistically significant if the p-value < 0.05

Conclusion

The study found statistically significant hot spots of several dog characteristics clusters associated with greater social vulnerability.

Results support that humans and dogs that share physical and social environments are similarly vulnerable populations.

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