

Demographic Trends in Virginia

Animal Shelters: 2004-2011

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Abstract

Animal welfare advocates have worked tirelessly to address the companion animal overpopulation problem, but a lack of comprehensive data makes it difficult to evaluate its extent, dynamics, and progress being made. This study aims to contribute to the sparse research in the animal sheltering field by providing a recent measure of statewide trends in Virginia shelters. The research examines trends over an eight-year period from 2004-2011 as a whole and by shelter and species subgroups. It also explores whether animal shelters are reacting dynamically to changes in the environment, or resort to the same measures to address outcomes. Results indicate that conditions overall are improving for Virginia animals; intake fell significantly and adoption increased significantly. Euthanasia rates, however, fluctuated during the study period. Clear differences were observed for shelters based on their operating environment, suggesting that needs vary for different shelters. Additionally, large shelters and humane societies operate more consistently. This research can provide a baseline measurement of conditions at Virginia shelters for interventions and programs to be compared against.

Introduction

Despite the ostensible value that Americans place on their pets, an estimated five to seven million companion animals enter shelters each year and of those, three to four million are euthanized ("Pet Statistics," 2012). While these numbers are significant, it is generally considered that much improvement has been made since the 1970s, when the surplus was thought to have hit an all-time high with over 20 million animals being euthanized. The early 1970s marked a turning point in addressing this surplus; around this time, Phyllis Wright of the Humane Society of the United States launched a three-pronged approach to address shelter intake and subsequent euthanasia known as LES (Legislation, Education, and Sterilization) that would come to affect animal welfare policy through the 1990s (Clancy and Rowan, 2003). This campaign established sterilization programs, mandated licensing fees, and developed humane education programs. While considerable progress has been made in the past four decades, companion animal overpopulation remains a costly and controversial issue.

Animal shelters and welfare organizations put considerable resources into addressing the overpopulation issue—one estimate puts national animal shelter expenditure at one billion dollars (Rowan, 1992)—but the animal welfare field notoriously suffers from a lack of good data that accurately measures progress. This data is essential to understanding the level, dynamics and causes of overpopulation (Marsh, 2010). Early data collection efforts only focused on the number of animals being euthanized, without considering how many were taken in or reclaimed by their owner. Historical data are sparse and inaccurate, largely due to the lack of a standardized list of shelters operating across the country, as well as shelters' fear that the data would be used to criticize their organization (Clancy and Rowan, 2003).

This research project seeks to contribute to the sparse research pertaining to companion animal overpopulation by investigating recent statewide trends in animal shelter intake and outcomes to understand the dynamics of unwanted animals in Virginia. Analysis will be limited to cats and dogs, as these are the species that are most overpopulated, and thus are the main targets of overpopulation reduction programs. Additionally, most research to date has not distinguished between trends specific to shelter type, community type, and size, despite the fact that issues and policies affecting different categories of shelters likely vary substantially. This research isolates trends by subgroups so that problem areas can be identified and more effectively addressed. Further, it is important to address whether shelters respond to change in total animal intake by shifting the mix of potential outcomes, especially whether euthanasia falls on pace with intake.

Long-term studies generally show a considerable decline in animal shelter intake, and it is thought that euthanasia drops accordingly, while adoption operates more independently (Christiansen, 1998; Marsh, 2010). This would lead one to conclude that shelters maintain the status quo, resorting to the same procedures as used in the past, but just with fewer animals. In addition to exploring trends, this research also addresses how shelters respond to decreases in intake. Do they continue to operate as usual, or do they respond dynamically, reacting to environmental changes such as improvements in return to owner methods or better marketing for adoption?

Beginning in the 1990s, individual shelters increasingly recognized and responded to the need for comprehensive data through independent data collection efforts, but even today, there is little consensus as to how shelter data should be reported, making comparisons difficult. Maddie's Fund, a grant-giving and research organization that sponsors sterilization and adoption

efforts, has made significant contributions to the animal welfare field in recent years. In addition to rigorous evaluation of its programs' impacts and research regarding factors contributing to shelter intake and euthanasia, Maddie's Fund created the nation's first standardized, comparable database of trends from 474 shelters across the U.S. in 2011 ("Maddie's Fund," 2011). Though a major advancement in the field, the data originate from a nonrandom sample of shelters, lending to selection bias issues. According to Bartlett, Bartlett, Walshaw, & Halstead (2005), complete collections of shelter statistics at the regional level are rare in the United States; however, they emphasize that comprehensive surveys from large geographic areas are required to accurately report intake and outcomes. Organizations may draw animals from the same geographic area, making it impossible to estimate these metrics based on human population when only a sample of shelters provide information. High response rates typically come only with a government mandate to report these data.

Over the past two decades, a few states have passed laws requiring that shelters report annual statistics, including California, Colorado, Michigan, Utah, and Virginia. Shelters must follow a uniform reporting method decided by each state, making comparisons within states possible. Required statistics commonly include species, mode of intake (e.g. stray, seized, surrendered by owner), and mode of exit (e.g. returned to owner, adopted, euthanized). However, because states may choose to report measures differently, between-state comparisons remain difficult. For example, while Virginia breaks down intake data to measure reasons for intake, Michigan and Colorado do not (Michigan Department of Agriculture and Rural Development, 2013; Morris, Wolf, & Gies, 2011). Additionally, research on shelter trends often follows different methodologies for reporting intake and outcome measures, some reporting raw statistics, some standardizing based on human population, and still others reporting as a

percentage of the estimated owned animal population. Until uniform reporting measures are adopted on the national level, progress in this vein will remain difficult to evaluate.

Nonetheless, this paper will present a comprehensive portrait of one state, Virginia, over time, adopting the best research practices to date.

Literature Review

The State of Virginia is unique in that it consists of 95 counties and 39 independent cities, which function like a county. From 2004 to 2011, Virginia's human population growth rate outpaced the national rate at 8.3 percent versus 6.4 percent (U.S. Census Bureau, 2004-2011). The poverty rate in Virginia is lower than the national average and the state ranks eighth in the nation for percent of the population with a bachelor's degree or higher ("Poverty" & "Educational Attainment," 2013). Accurate data on the number of owned animals in Virginia is not available, but national estimates of the population of owned cats and dogs show fluctuation from approximately 130 million in 2002, up to 154 million in 2007, and dropping to 144 million in 2012 (American Veterinary Medical Association, 2002, 2007, 2012).

Although it is important to report statewide statistics to gain a general picture of progress being made, there are undoubtedly many different factors contributing to issues facing shelters based on their policies, operating capacity, and the community they operate in. Wenstrup (1999) found great variability in animal shelter demographics when analyzing data from 186 shelters around the country. The California Department of Human Services data show similar variability, suggesting a need for targeted interventions based on a community's particular issues (Marsh, 2010). There may be different underlying reasons contributing to a community's overpopulation problem; thus local statistics are critical in the planning process.

A lack of accurate, complete data measuring animal shelter trends and predictability has made it difficult for researchers to evaluate progress on the overpopulation issue (Bartlett et al., 2005; Lord et al., 2006; McDowell, Burns, & Lepczyk, 2011; Morris et al., 2011; Wenstrup, 2011; Zawistowski, Morris, Salman, & Ruch-Gallie, 1998), resulting in widely varying estimates. What follows are the best estimates-to-date of statewide and regional trends.

Intake

The few long-term studies of single shelter systems' and statewide longitudinal data extrapolated to the national level show a considerable decline in intake since the 1970s (Clancy and Rowan, 2003). Statewide data for New Jersey show a decrease of nearly 50,000 intakes from 1984-1997 (Clancy and Rowan, 2003). More recent estimates, however, are mixed. Morris et al. (2011) analyzed statewide animal shelter data in Colorado for the years 2000-2007 and found that statewide annual dog intake rate per 1,000 residents decreased by 11 percent during the study period, but increased by 20 percent for cats. When Morris et al. (2011) examined urban versus rural intake, they found no significant changes in total dog intake for both urban and rural subgroups, but urban counties experienced a 24 percent increase in the number of cat intakes.

A similar statewide demographic study of cats and dogs handled between 1996 and 2004 at Ohio animal care and control agencies revealed an overall decrease in intake of seven percent (Lord et al., 2006). When intake was examined by agency type, they found a significant decrease in mean intake rate per 1,000 individuals served for county dog warden agencies.

Euthanasia

It is widely believed that animal shelter euthanasia reached its peak in the early 1970s, just before animal welfare advocates first began to aggressively address overpopulation. It is estimated that 23.4 million animals were euthanized in the U.S. in 1970, down to about 4.2 million in 2007. Euthanasia dropped significantly on the national level until about 2000, when it began to level off (Clifton, 2008). This drop is thought to be due almost entirely to a decline in animal intake rates (Marsh, 2010).

The California Department of Health Services has collected statewide animal shelter data since 1970, providing the most comprehensive picture available of longitudinal trends (Marsh, 2010). Euthanasia in this state reached its peak in the early 1970s, when approximately 21 percent of the estimated owned animal population in California was killed. By 1996, however, only 4 percent of the state's owned cat and dog population was euthanized. Statewide data for New Jersey shelters show a decline in the euthanasia rate from 57 percent in 1984 to 46 percent in 1997 (Clancy and Rowan, 2003).

The notion that the decline has leveled off in the past decade is reasonable considering the results of recent studies. The Virginia Department of Agriculture and Consumer Services (VDACS) estimates that euthanasia rates for dogs (expressed as a percent of the estimated owned animal population) from 2000-2002 were 4.2, 3.8, and 3.9 percent, respectively (Bartlett et al., 2005). The rates for cats during the same period were 3.8, 3.4, and 4.1 percent, respectively, suggesting that rates were fluctuating during this time. In Colorado, Morris et al. (2011) found no change in the statewide dog euthanasia rate per 1,000 residents, but found that the cat euthanasia rate increased by 35.7 percent. Broken down by urban and rural subgroup, Morris et al. found that euthanasia rates remained unchanged in urban areas, but increased by 29 percent

for the rural subgroup. Meanwhile, the urban subgroup experienced a 72 percent increase in cat euthanasia, while the rural subgroup remained unchanged. In contrast, Lord et al. (2006) found a decrease in animal shelter euthanasia in Ohio of 65.3 percent in 1996 to 56.8 percent in 2004. They also found a substantial decrease in the euthanasia rate for county dog warden agencies of 20 percent, from 68 to 48 percent.

Using 2003 cross-sectional data from a Michigan statewide survey of shelters, Bartlett et al. (2005) found an average statewide euthanasia rate of 48.5 percent. Bartlett et al. (2005) also found that altered dogs and cats had lower rates of euthanasia than non-altered dogs and cats. Urban and rural Michigan shelters did not differ in their percentage of dogs and cats euthanized; however, Bartlett et al. (2005) found a great difference in euthanasia rates between governmental and privately owned facilities. Privately owned facilities euthanized 20 percent of dogs and 29 percent of cats, while government facilities euthanized 30 percent of dogs and 50 percent of cats. Larger shelters had significantly higher euthanasia rates, even after controlling for shelter type. Bartlett et al.'s (2005) final model for percent of dogs euthanized included type, size, size², and size controlling for type. Their final model for cats included type, size, size².

A California study assessing intake and euthanasia rates for California from 1970-1995 revealed a correlation of .98 between intake and euthanasia rates (Christiansen, 1998). This strong correlation was also seen in a 22-year study conducted in Hillsborough County, Florida (Marsh, 2010). However, the California study showed a nearly constant adoption rate, and little correlation between the adoption and euthanasia rate. States compiling complete shelter statistics found a similarly high correlation between intake and euthanasia rates, with a very low correlation between adoption and euthanasia rates.

Adoption

Longitudinal data on adoption trends at the regional and national level are more difficult to come by than that for euthanasia and intake. New Jersey data show an adoption rate of 21 percent in 1984, which increased to 39 percent by 1997 (Clancy and Rowan, 2003). Again, more recent studies show mixed results. Morris et al. (2011) found a decrease in Colorado dog adoptions and no change in cat adoptions. They found no change for dogs in the urban and rural subgroups, but there was a nine and 20 percent increase for cats in the urban and rural subgroups, respectively. In Ohio, Lord et al. (2006) found an increase in the adoption rate from 24.5 percent in 1996 to 33.6 percent in 2004. Bartlett et al. found an adoption rate in Michigan shelters of 26 percent in 2003.

Additional Outcome Measures

While some data exists for animals reclaimed by owner (hereinafter RBO), regional data on animals transferred in and out-of-state are far more limited. National estimates on percent of animals RBO include 15-20 percent of dogs and only two percent of cats ("Pet Statistics," 2012). Cats have considerably lower RBO rates because they are less likely to have identification and owners are less likely to look for them at shelters. Statewide studies in both New Jersey and Colorado show an increase in the percent RBO for dogs, but no change for cats (Clancy and Rowan, 2003; Morris et al., 2011). Michigan's RBO rates in 2003 were about 20 percent for dogs were RBO and 4 percent for cats (Bartlett et al., 2005).

Morris et al. (2011) were the only researchers to examine statewide transfer rates, finding a significant increase in Colorado's in-state transfer rates from 2000-2007.

The difficulties in comparing trends between states should be noted, as there are human demographic differences, as well as regional factors affecting animal shelters differently. As

well, data for these studies were collected differently; while research concerning Michigan and Colorado relied on administrative data, Ohio's data came from a voluntary survey, presenting selection bias issues.

Institutional Stability

Investigating whether Virginia's animal shelters change what they do with their animals requires an understanding of institutional stability and change. Kelly and Amburgey (1991) note that the main advantages of formal organizations are their ability to perform reliably and their accountability, which means that they can keep track of resource use and decisions leading to particular outcomes. This implies that many larger, more formal animal shelters may have more stable intake and outcome measures since they have developed formalized methods of handling animals. However, while formal organizations may offer these advantages, they have less ability to change if members seek to protect their interests by maintaining the status quo (Kelley and Amburgey, 1991). Inertia theory posits that older and larger institutions are more resistant to change because they have had time to formalize and standardize, and larger institutions have more formalized roles and control systems (Kelley and Amburgey, 1991).

While animal shelters differ from typical organizations in a number of ways, small shelters may be able to respond to changes in their environment more easily without formalized systems. However, these changes may only be temporary if the shelter cannot sustain them. While differences in stability between government-funded shelters and humane societies are less clear, government-funded shelters may be more unpredictable in their mix of outcomes due to policy or budget limitations. Government shelters are often required to have an open-door policy meaning they are obligated to admit every animal, while humane societies sometimes have a limited admission policy to limit euthanasia and maximize adoption (Ramos, n.d.). The

obligation to admit every animal decreases the predictability of government shelter outcomes, as the outcome is highly dependent on the number of animals in the shelter. Meanwhile, humane societies prioritize adoption and returning animals to their owner and can better ensure these outcomes by limiting the number of animals in the shelter.

This study contributes to the above literature by providing a recent statewide measure of annual animal shelter intake and outcomes, accounting for size, community type, and shelter type. It also investigates shelter stability in intake and outcomes. Virginia shelters serve as the study sample because Virginia is one of the few states that require annual reports from shelters, and no known previous research has rigorously evaluated statewide temporal shelter trends in this state.

Taking recent research into account, I predict the following:

Hypothesis 1: Statewide animal shelter intake decreased in Virginia during the study period.

Hypothesis 2: If intake in fact fell, euthanasia would have fallen in relative accordance with intake.

Hypothesis 3: Adoption remained relatively flat and independent of intake and euthanasia.

Hypothesis 4: Smaller shelters behave more unpredictably due to their ability to be more flexible in their response to the environment.

Hypothesis 5: Government-funded shelters operate more unpredictably due the increased likelihood of being required to have an open-door policy.

Data

Virginia Department of Agriculture and Consumer Services (hereinafter VDACS) requires that animal shelters report annual intake and outcome data for all live animals taken into custody. Virginia's data are publicly available and reports beginning in year 2004 can be found on the VDACS website (VDACS, 2004-2011). Measures are reported for each species and as a total. Animal shelters are classified into four groups: city, county, humane society, and rescue agency. This study relies on existing data from all Virginia animal shelters classified as city, county, or humane society that provided data for each year from 2004-2011, 2011 being the most recent year for which complete statistics are available. Rescue groups are excluded due to their transient nature, as well as the fact that many focus on a particular breed and do not provide general services to the public. The number of shelters reporting to VDACS varied from year to year; table one presents total respondents for each year. This presents a limitation in the analysis in that shelters that did not report their data could be inherently different than those that did; however, this possibility was explored by also running the analyses solely on shelters that reported for the entire eight years.

TABLE 1 ABOUT HERE

Dependent variables

Total intake: Total intake is the primary dependent variable used to measure intake. This variable is defined as the total cat and dog intake from all sources, including stray, surrendered by owner, transferred from in state, and other. Mean total intake for 2004, as seen in table two, was 1576 with a standard deviation of 1977, and mean total intake in 2011 was 1344 with a standard deviation of 1433. The low was in 2010 with 1293 and the high was in 2004. The two main modes of intake shelters typically deal with are stray and surrendered by owner.

Stray is defined by VDACS as "...all animals found running at large, found separated from the rightful owner, or found in a manner whereby an owner is not identified and the animal's status is unknown" (2011). Animals surrendered by owner are animals that have been surrendered or relinquished by the rightful owner.

TABLE 2 ABOUT HERE

Percent euthanized: Primary outcome variables are percent euthanized and percent adopted. These measures were calculated as a function of total outcomes as opposed to total intake, since some animals may still have been held in the shelter at year-end. Euthanized is defined as "...the number of animals in custody that were euthanized, regardless of the reason or whether the euthanasia was performed at the facility or a licensed veterinary establishment" (VDACS, 2011). Mean percent euthanasia ranged from 37 percent with a standard deviation of 31 percent in 2004 to 33 percent with a standard deviation of 28 percent in 2011, with a high of 39 percent in 2007 and a low in 2011.

Percent adopted: Adopted is defined by VDACS as the number of animals adopted to a new owner. Mean percent adopted increased slowly but steadily; values ranged from 26.5 percent with a standard deviation of 30 percent in 2004 to 30 percent with a standard deviation of 31 percent in 2011. The highest mean percent adopted was in 2011, and the low was in 2005.

Percent RBO: Percent RBO is defined as the percent of animals reclaimed by their rightful owner.

Percent transferred in state: This measure represents the proportion of animals transferred to another licensed Virginia shelter.

Percent transferred out of state: This statistic represents the percent of animals transferred to a shelter outside of Virginia.

Percent other: This is a composite measure that includes animals that have died in the facility, animals that were stolen or that escaped.

Figure 1 displays mean total intake, adoptions and euthanasia for the eight-year period. Intake looks to be decreasing, while euthanasia may be decreasing slightly, and adoption is relatively constant.

FIGURE 1 ABOUT HERE

Independent variables

Year: Year is the primary independent variable, ranging from 2004 to 2011. Each reporting year runs from January 1 to December 31.

Lagged dependent variable: To answer hypotheses four and five, I use the previous year's value on the intake and outcome measures to estimate the predictability of the current year's value.

Control variables

Shelter type: Agency type is a categorical independent variable; values include "city" "county" "humane society" and "mixed." City and county agencies are contracted by the local government to handle stray animals; some may choose to also handle unwanted animals. Additionally, some may only handle a certain species. Humane societies are private, nonprofit agencies that are generally established to deal with unwanted animals, though most also handle strays. The primary objective of most humane societies is to care for and find new homes for unwanted or stray animals. Some humane societies have contracts with the local government to provide animal care and control services; these agencies have been reclassified as "mixed." Table 3 presents the count and percentage distributions for shelter type, community type, and

shelter size over the eight-year period. About half of the observations come from county shelters.

TABLE 3 ABOUT HERE

Community type: Community type is another categorical variable with values of “rural” “mixed rural” “mixed urban” and “urban.” Shelters are coded into community type using the Isserman definition of counties because according to the Virginia Rural Health Plan, it is thought to best “describe the rural and urban characteristics of Virginia’s unique governmental entity of counties and cities” (“Virginia Rural Health Plan,” 2008). Based on the Isserman classification system (1999), rural counties are defined as having a population density of less than 500 people per square mile and 90 percent of the county’s population is in a rural area or the county has no urban area with a population of 10,000 or more. Urban counties are defined as having a population density of 500 people per square mile or more and 90 percent of the county’s population lives in urban areas, or the county’s population in urbanized areas is at least 50,000 or 90 percent of the county population. Mixed rural counties are defined as meeting neither the urban nor rural criteria and population density is less than 320 people per square mile, while mixed urban counties don’t meet urban or rural criteria but have a population density of at least 320 people per square mile. Shelters from rural counties make up the largest proportion of observations.

Shelter size: This is a dichotomous variable calculated by taking the median of a shelter’s average total intake over the eight-year period as the cut point. The median was estimated at 765; shelters below this were coded “small” and shelters above this were coded “large.” The distribution of small and large shelters is about even.

Methods

Part I: Trend

The overall methodology of this analysis is simple: to estimate how intake and outcome measures have changed in Virginia from 2004-2011, and to estimate the stability in intake and outcome measures. The analysis is divided into three sections: in section one I examine statewide trends, then I analyze trends with controls for agency type, community type, and size, and finally, I include interaction terms with community type, agency type, and size to determine whether values are falling or increasing for these variables over the study period. Size is not controlled for in the intake measure because the size variable was created by averaging total intake over the eight years. Initial values of intake and outcomes for the first year in the study period are presented to provide a baseline measurement of how many animals entered shelters and how shelters responded. Individual dummy variables for year are included in the statewide analysis without controls to measure year-to-year change. A squared term on year is used to examine nonlinear relationships. Simple linear regressions were also run on the primary three measures by species type to understand whether conditions differed between them, but the rest of the analysis aggregated measures for both species.

Ordinary least squares is used to examine whether change is occurring linearly over the eight-year period. Standard errors are clustered to account for the fact that multiple observations are coming from the same year. Relationships with a p-value of less than .05 are considered significant.

The three primary equations used to assess trend are expressed as follows:

$$y = \alpha + \beta_x + \varepsilon$$

where x represents year.

$$y = \alpha + \beta_x + \beta_z + \varepsilon$$

where x represents year and z represents a shelter characteristic control variable.

$$y = \alpha + \beta_x + \beta_z + \beta_i + \varepsilon$$

where x represents year, x represents a shelter characteristic control variable, and i represents the interaction of year and a shelter characteristic variable.

Section II: Shelter Stability

Section two addresses whether shelters are predictable in how many animals they receive and what they do with them. I examine the value for last year's impact on the current year's value using a lagged dependent variable. To answer hypothesis four, I examine the R-squared value for large versus small shelters, and to answer hypothesis five, I examine the R-squared value for city and county shelters versus humane societies. City and county shelters were aggregated for this part of the analysis as they are both government-funded. The equation used to estimate this relationship is as follows:

$$y = \alpha + \beta_{y-1} + \varepsilon$$

where y-1 represents a one-year lag of the intake or outcome measure.

Part III: Balanced versus unbalanced panel

Because there was such variability in the shelters reporting, the trend analysis was also run again using only the shelters that reported for the entire eight-year period. This was done to see whether the trends differed significantly between the two groups. The same methods were used as in part I, and results were compared against the results from part I. Using a balanced panel dropped the number of observations by about 50 percent.

VDACS does specify intake type, but only the total intake was used in this analysis in order to simplify results, as well as to focus on how shelters handle animals once they have them. Further research should specifically examine intake trends to better understand why animals are entering shelters. Additionally, although previous literature has calculated intake and outcome measures in a variety of ways, including on a per-capita basis or as a proportion of the total owned animals in the state, I have chosen not to standardize these measures to make results more easily interpretable. Because the analysis only spans eight years, Virginia's human population does not change much during this time and thus, incorporating it is not truly worthwhile. And estimates of the owned animal population are very inaccurate, which questions the validity of measures incorporating owned animals. The primary purpose of this research is to compare trends within a state, rather than between states or nationally.

Results

Part I: Trend

Intake

Table 4 displays intake and outcome trends by year. In 2004, Virginia animal shelters had an average intake of 1,531 animals. Total intake decreased significantly at about 28 animals per year. With shelter and community type controls, about 31 less animals were taken in per year, with an adjusted R-squared value of 0.28 versus an R-squared of virtually zero in the first model.

TABLE 4 ABOUT HERE

Shown in table 5 are the intake, euthanasia, and adoption trends by species. Surprisingly, both dog and cat intake decreased significantly at 15.5 and 12 less animals per year, respectively; however the decrease in dog intake was more significant. Examining year as a dummy variable reveals that the intake trend is not entirely linear; the largest year-to-year decreases in intake were from 2004 to 2005 with a decrease of 132 animals, and from 2009 to 2010 with a decrease of about 139 animals. Other year-to-year fluctuations were relatively small.

TABLE 6 ABOUT HERE

Table 6 presents interactions with shelter characteristic variables. Trend by shelter type and size showed that urban shelters started with the most intakes in 2004 at nearly 2,200 more animals than rural shelters, but experienced the greatest decline in intake at 86 less animals over the years. Mixed rural shelters experienced a higher initial intake rate than mixed urban shelters, but both experienced a decline similar to each other. Rural shelters did not experience a significant change in intake.

All shelter types had higher intake rates in 2004 than city shelters; mixed facilities had the highest at over 2,250 more intakes. However, no shelter types experienced significant decreases in intake.

Euthanasia

The initial euthanasia rate was in 2004 was 38 percent. Euthanasia rates did not change significantly in the linear regression with or without controls, but adding a squared term revealed a significant increase in the percent of animals euthanized of about 1.5 percent per year from 2004-2007, and then a decrease of about a quarter of a percent per year from about 2007 to 2011. Examining individual years tells a somewhat different story; euthanasia decreased within the first year of the study, then increased, and finally decreased considerably in the last two years of the

study. Intake and euthanasia are correlated at a somewhat lower rate than expected based on previous research; the average correlation for the eight-year period was 0.88. However, it seems that euthanasia rates mirror intake rates more closely when both are examined as dummy variables.

Separated by species, dog euthanasia decreased significantly at -0.8 percent per year. There was no change in cat euthanasia. Clearly, euthanasia conditions were different for each species, which likely explains why the aggregated trend is erratic.

Mixed rural shelters had the highest euthanasia rates in 2004, and this was the only community type to significantly decrease euthanasia rates by about 1.3 percent over the years. Urban shelters increased euthanasia rates significantly and mixed urban shelters experienced a marginally significant increase. In terms of shelter type, mixed facilities began with highest euthanasia rate in 2004 and were the only shelter type to significantly decrease euthanasia over the years by about -2.5 percent. This relationship is strongly significant. Large shelters started with considerably higher euthanasia rate of about 17 percent compared to small shelters, but there was no significant change for either.

Adoption

Overall, Virginia shelters adopted 27 percent of their animals in 2004. The percentage of animals adopted increased significantly at about 0.5 percent per year. With controls, the magnitude of the relationship decreased to about 0.25, but remained significant. Adding these controls yielded an adjusted R-squared value of 0.57, meaning that these factors influenced adoption more than they did intake or euthanasia. Although euthanasia increased significantly in the first half of the study period, it is a positive sign that adoption rates did not decrease in a reactionary fashion, implying that adoption operated somewhat independently of euthanasia.

The year-to-year trends model somewhat similarly; adoption rates increased except for slight decreases from 2004-2005 and from 2009-2010.

Another surprising finding was that adoption rates increased significantly for both species. Dog adoption rates increased at 0.3 percent per year and cat adoption rates increased at 0.8 percent per year.

Shelters in Mixed urban communities had the highest initial adoption rates, but urban facilities were the only ones to significantly increase adoption rates at about 1.5 percent over the years. Unsurprisingly, humane societies started with an adoption rate that was 64 percent higher than that of city shelters; however, the humane society adoption rate decreased significantly at -0.4 percent over the years. Meanwhile, adoption rates for both city shelters and mixed facilities increased significantly, increasing fastest for mixed facilities. Large shelters had significantly lower initial adoption rates, but increased their adoption rate by about 0.6 percent over the years. Small shelters had no change in adoptions.

RBO, Transfers, and Other

The magnitude of the increase in the percent of animals reclaimed by owner was unexpected; this outcome increased by 0.85 percent per year, with an initial average rate of 12 percent. With controls, the year coefficient increased to 1.05. Virginia shelters transferred 20 percent of animals in state in 2004, and in-state transfers decreased significantly at about -1.5 percent per year. Conversely, the percent transferred out increased by 0.4 percent per year. The initial out-of-state transfer rate was around two percent. The “other” outcome also had an initial value of two percent and remained constant throughout the study period.

Part II: Shelter Stability

TABLE 7 ABOUT HERE

Table 7 displays R-squared values for intake and outcome measures separated by shelter size and type. Small and large shelters differed most in the predictability of their intake rates. While 95 percent of the variance in a current year's intake could be explained by the previous year's intake at large shelters, only 65 percent of the variance can be explained by this in small shelters.

Smaller shelters also had less predictable euthanasia rates; 77 percent of the variance in the current year's euthanasia rate could be explained by last year's rate, while that statistic is 90 percent for large shelters.

Adoption predictability differed less between small and large shelters; the R-squared values were 89 and 93 percent, respectively. This is perhaps because there are likely other factors driving the adoption rate predictability that affect shelters of all sizes similarly. For example, previous literature has found that some adoption rates have remained relatively constant, suggesting that there is a cap on the number of adoptions a community can sustain (Morris et al., 2011).

In comparing predictability in city and county shelters versus humane societies, the R-squared values were surprisingly the same for intake and euthanasia, but only 65 percent of the variance in city and county shelter adoption rates could be explained by the previous year's rate, while 88 percent of the variance in humane society adoption rates could be explained by the previous year's rate. This suggests that intake and euthanasia rates are less driven by policy and they are more a function of what is going on in the environment, while adoption is a policy that humane societies strongly promote. Humane societies also had more predictable RBO rates,

providing further evidence that they operate more stably in outcomes that are highly policy driven.

Part III: Balanced versus unbalanced panel

TABLE 8 ABOUT HERE

Table 8 compares trend in intake and outcome variables for the original data versus a balanced panel. Some differences were observed in the intake and outcome regressions between the two panels. Intake decreased in both panels, but larger decreases were observed in the balanced panel and the relationship between year and intake was stronger. Perhaps the largest difference in results between the two panels was that the percent euthanized decreased significantly in the balanced panel at about one percent per year. Another notable difference was the percent transferred in-state for each panel; this measure decreased significantly in the unbalanced panel, but there was a non-significant increase in the balanced panel.

Limitations

There are a number of issues inherent to the data that limit the generalizability of this research. Because only a few states currently require shelters to report data and have been doing so for less than a decade, a general consensus is still being reached about how to best report it. Information reported also varies across states, making it difficult to compare some trends across states. For example, Virginia's shelter statistics likely include overestimates of total statewide animal intake as in-state transfers may be counted twice. However, maximum error due to this issue is estimated to be at 6.2 percent. The idea to calculate the intake error rate due to transfers was obtained from Morris et al. (2011).

Although Virginia requires annual reporting from all licensed facilities, there was still considerable variability in the number of shelters reporting from year to year. This could lead to selection bias issues. Although this limitation was addressed by running the analysis on a balanced panel, this dropped the sample size by about 50 percent calling into question how well these shelters represent Virginia's shelters on the whole.

Some of the numbers reported by shelters were surprising and a cause for concern. In particular, some shelters reported a 100 percent RBO rate. It is possible, and quite likely, that some shelters doctored numbers to have more favorable outcomes. Another issue is possible confusion on what constitutes an intake. It is known that some shelters will count an animal being dropped off to be spayed or neutered as an intake, and when the animal is picked up later that day it is recorded as a return-to-owner, thereby improving the outcome data (Weiss, 2010). This has far-reaching implications for many studies, particularly ones that examine the impact of spay and neuter on a shelter's intake.

Rescue groups were not included in this analysis, which could lead to an overestimation of statewide euthanasia rates and underestimation of adoption rates as rescue agencies typically have very low euthanasia rates and often have the resources to care for animals until they are adopted. Additionally, because reason for euthanasia is not accounted for in the data, shelters may have larger than desired euthanasia rates. Examples of euthanasia commonly performed at shelters that are not necessarily related to population concerns include owner-requested euthanasia, euthanasia for health reasons, and for aggressive behavior. Such nonadoptable animals may account for as much as 20 percent of shelter intake (Scarlett, Salman, New, & Kass, 1999). However, it is reasonable to assume that proportions of these types of euthanasia will be relatively similar across shelters.

There was a great deal of variability in shelter intake and outcomes, which made the linear estimation of trends difficult. Although this research provides good insight into Virginia shelters as a whole, these trends are not necessarily representative of a single shelter system.

Though time-consuming and costly to obtain, more detailed data would help better evaluate progress in companion animal overpopulation. Information that would prove very useful for this analysis would include the spay/neuter status of the animal upon entry. It would add a more direct measure of the effectiveness of the spay/neuter policies during this eight-year period. The approximate age of the animal would also prove useful.

Because some shelters are “limited admission,” meaning they can refuse to accept animals for any reason, some shelters may have inflated adoption rates because they likely do not accept more animals than they can adopt, meaning animals that were refused may have been dumped on side of road or killed, and there is no way of tracking this.

Despite these limitations, this research has the potential to prove useful to policymakers and the animal welfare field by both providing a current and comprehensive analysis of statewide shelter trends, emphasizing the need for consistent shelter data in order to evaluate progress in addressing the companion animal overpopulation problem.

Conclusion

Many of the results in this analysis are encouraging in regard to the state of animals in Virginia. Statewide intake decreased significantly during the study period, even as the state’s human population grew faster than the national growth rate. Contrary to recent research suggesting a decrease in dog intake but an increase in cat intake, Virginia data show a decrease for both species. One reason for the decline in intake could be that more people are choosing to

bring unwanted or stray animals to rescue groups, which grew considerably in number over the study period (VDACS, 2004-2011). However, because most rescue groups are generally very selective and small, it is not believed these groups would have had a significant impact on the trends. With increased education efforts and emphasis on the overpopulation problem, Virginians may also be becoming increasingly responsible pet owners.

While the euthanasia rate fluctuated during much of the study period, it decreased by more than four percent during the final two years. It would be of interest to examine whether this decrease continues in subsequent years. Perhaps increased efforts to promote adoption, as well as advances in methods of returning pets to their owners could be driving any decreases in euthanasia to a greater extent than in earlier years. The somewhat stagnant euthanasia rates during the middle of the study period could also suggest that a level of equilibrium is being reached in some communities. While some animal welfare advocates believe a “no kill” society is possible, Morris et al. (2011) suggest it is more likely that there will always be a certain level of euthanasia in a community due to animals with behavior or health issues, old age, or unwanted breeds that cannot be adopted. The community may be able to achieve a new state of equilibrium, but the cost to achieve this new state will likely be significantly larger than the benefit it provides. When broken down by species, the data show improving euthanasia rates for dogs, but no significant change for cats. Cats have surpassed dogs as the most popular pet to own in the U.S. (AVMA, 2002) but other studies have shown a subsequent increase in intake and euthanasia for cats in shelters (Morris et al., 2011; Lord et al., 2006). It is likely that the increase in cats’ popularity has increased the complexity of their management, leading to a stagnant euthanasia rate.

The increased adoption rate was perhaps the most encouraging finding; this is likely the result of increased marketing efforts to enhance public perceptions about adoption. The fact that large, mixed and more urban shelters were increasing adoption rates faster highlights the need to examine the issues facing small, rural shelters. It was particularly surprising that both dog and cat adoption rates were increasing, and that the coefficient for cats was more than double the size of that for dogs. This suggests that cats are continuing to increase in popularity as pets, and that perhaps marketing efforts have been successful in promoting shelters as the best place to find a pet cat.

Marked increases in RBO rates are encouraging, but a deeper investigation as to their validity is warranted. A total of 26 observations over the study period reported an RBO rate of 100 percent. Given the low national RBO rates, it is highly unlikely that any shelter could claim that all of its animals were RBO. Removing these observations reduces the coefficient by about half, but there is still a significant increase in RBO of about half a percent per year. This is not entirely unexpected due to the increased use of the Internet as a way to advertise lost and found animals, as well as the increased use of microchipping technology¹.

The shelter subgroup analysis makes apparent that small rural shelters are generally experiencing the greatest difficulty in animal overpopulation issues. Shelters in rural communities were the only ones to not significantly decrease intake rates, and also had no change in euthanasia or adoption. Further research should examine these shelters in more detail to better understand the reasons contributing to the stagnant rates. Somewhat unexpectedly, the relationship between community type and the dependent variable did not operate entirely linearly; in most cases mixed rural and mixed urban seemed to operate in reverse. A possible

¹ Microchips are small chips inserted under the skin of an animal that use Radio Frequency Identification technology. This allows animal shelters and veterinary clinics to scan the animals for owner contact information. It is increasingly becoming a standard for shelters to adopt all animals with a microchip.

reason for this is that many of Isserman's mixed urban counties are wealthy suburban areas that may not have more resources to address animal overpopulation, as well as less overpopulation to begin with ("Virginia Rural Health Plan," 2008). This community type also had the smallest number of observations.

Unsurprisingly, smaller shelters were more unpredictable in their intake and euthanasia rates. This could be because fluctuations in intake affect smaller shelters more than larger ones. Small shelters may have been able to adapt to changes in the environment, but due to resource limitations, those changes may have only been temporary. Small and large shelters did not differ much in adoption predictability, likely because adoption is something that a shelter has more internal control over based on its policies. This assumption was proven correct when examining the difference in the adjusted R-squared for government facilities versus humane societies. Many government shelters have strict capacity and budget limitations, meaning animals only have a limited amount of time to be adopted. Government shelters are at the mercy of how many animals come in, as well as demand for adoption in the community. Conversely, humane societies' primary goal is to promote adoption, and many will hold animals for weeks, months, or even years until they are adopted. That, combined with public perception that humane societies are usually better places to adopt from explains why they have more stability in adoptions. However, the fact that humane societies and government facilities did not differ in their intake predictability suggests that perhaps the agencies did not have significantly different admissions policies, or that the policies have not changed.

Only 81 shelters provided data for the entire eight-year period. Results were somewhat different between the two panels; the main differences were in the euthanasia rates and the transferred in state rates. The balanced panel contained a higher percentage of large shelters and

since the unbalanced panel showed larger shelters decreasing euthanasia rates marginally significantly, this could be accounting for the strongly significant decrease. Although the rolling cross-sectional data had this variability, I chose to focus my analysis on this data because the balanced panel contained too few observations to accurately represent the status of animal overpopulation issues in Virginia shelters.

It is likely that the animal sheltering community will continue to suffer from a lack of data to assess the needs and progress being made in their communities or regions. Animal shelters are generally understaffed and underfunded, with their primary goal being the care and adoption of animals. Many may not even have access to computer technology. And very few in the field likely read research. With so many pressing day-to-day issues to address, it can understandably be difficult for shelters to recognize the critical importance of collecting and analyzing data. Future efforts must focus on bridging the gap between researchers and those on the frontlines by making research more accessible and educating shelters on how to collect data and perform basic analyses. For interventions to reach maximum effectiveness, they must be grounded in hard data, rather than anecdotal evidence.

It is my hope that this study presents a clearer picture of animal shelter trends in Virginia and nationally, as well as provides baseline measurements for the effects of future programs to be evaluated against.

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Figure 1

Mean Total Intake, Adoptions, and Euthanasia for Virginia Animal Shelters, 2004-2011

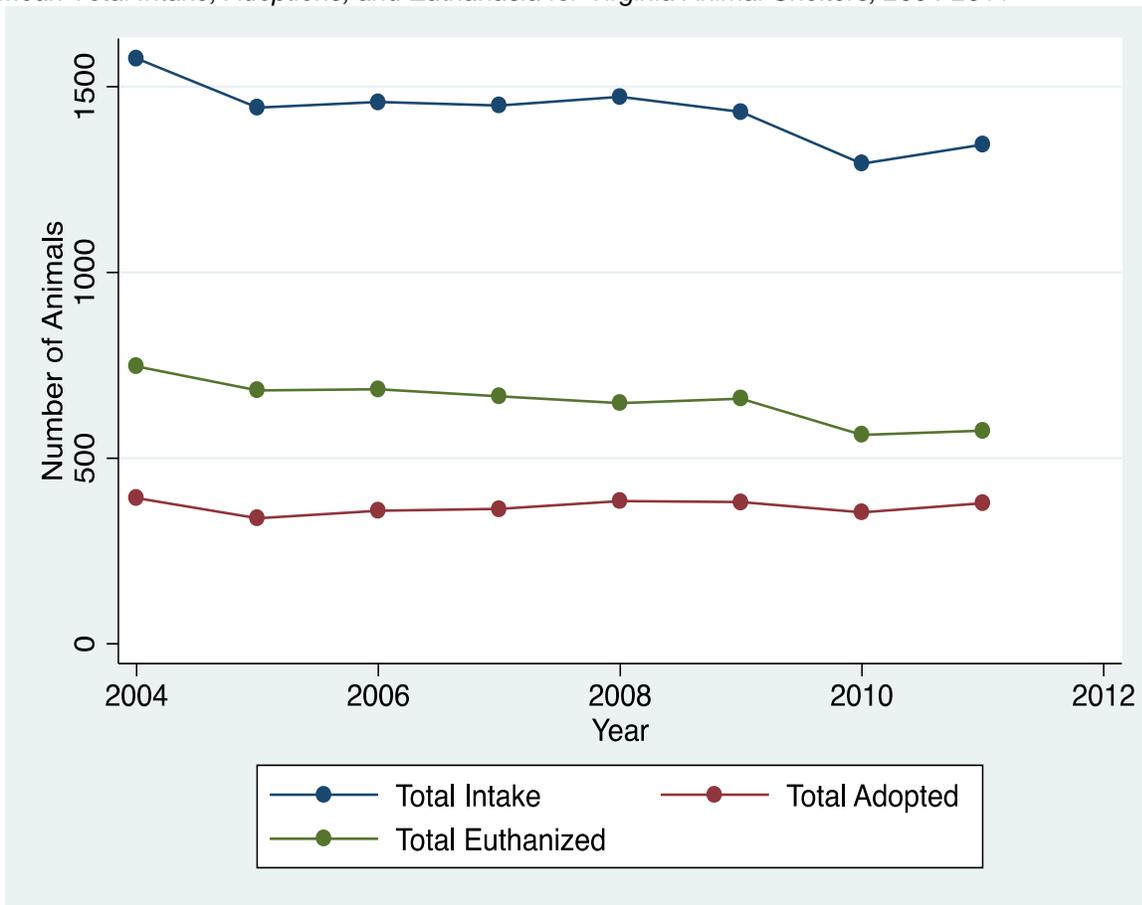


Table 1

Total Number of Agencies Reporting by Year

Year	Agencies
2004	138
2005	175
2006	167
2007	159
2008	162
2009	141
2010	161
2011	146
<i>Total</i>	1,249

Table 2

Summary Statistics for Distribution of Independent Variables

Variable	Observations	Percent of Total
Community type		
Rural	584	47
Mixed rural	249	20
Mixed urban	114	9
Urban	302	24
<i>Total</i>	1,249	100
Shelter type		
City	232	19
County	622	50
Humane society	270	21
Mixed	125	10
<i>Total</i>	1,249	100
Shelter size		
Small	617	49
Large	632	51
<i>Total</i>	1,249	100

Table 3

Average Total Intake and Outcomes for Virginia Shelters: 2004 and 2011

Variable	2004 (#)	2004 (%)	2011 (#)	2011 (%)
Intake	1576 (1977)		1344 (1433)	
Euthanized	747 (1068)	37 (29)	574 (831)	33 (28)
Adopted	393 (604)	27 (30)	378 (549)	30 (31)
Reclaimed by Owner	240 (745)	12 (13)	169 (276)	18 (24)
Transferred In State	142 (253)	21 (32)	164 (274)	12 (16)
Transferred Out of State	33 (126)	2 (10)	40 (150)	4 (13)
Died in Facility/Other	33 (87)	2 (4)	22 (159)	2 (4)

Standard deviations in parentheses

Table 4

Intake and Outcome Trends for Virginia Animal Shelters: With and Without Controls

Variables	Total Intake		Percent Euthanized		Percent Adopted		Percent RBO		Percent Transferred In State		Percent Transferred Out of State		Percent Other	
	Controls		Controls		Controls		Controls		Controls		Controls		Controls	
Mixed rural	1,035.53***		-2.80**		-1.05		5.32**		2.82+		-4.41***		0.13	
	(49.59)		(0.73)		(0.88)		(1.13)		(1.49)		(0.74)		(0.56)	
Mixed urban	651.74***		-11.10***		7.88***		12.25**		-1.87		-6.34***		-1.51**	
	(91.23)		(1.50)		(1.20)		(2.69)		(1.72)		(0.58)		(0.35)	
Urban	1,870.97***		-6.23***		10.87***		10.67***		-4.74*		-10.36***		-0.06	
	(114.43)		(1.00)		(1.23)		(1.09)		(1.38)		(0.91)		(0.84)	
County	1,071.97***		6.77**		8.50***		-1.28		-6.01+		-5.82***		-1.81*	
	(98.84)		(1.57)		(1.29)		(2.85)		(2.82)		(0.48)		(0.57)	
Humane society	243.16*		-30.54***		60.12***		-19.31**		-17.97**		9.25***		-1.24	
	(88.25)		(1.73)		(1.33)		(3.97)		(4.76)		(0.75)		(0.82)	
Mixed facility	2,036.33***		2.54		21.62***		-7.41*		-14.65**		-0.96+		-0.94	
	(128.69)		(1.95)		(0.91)		(2.23)		(3.04)		(0.41)		(0.61)	
Shelter size			13.04***		0.19		-9.80**		-5.09		2.40**		-0.67	
			(1.42)		(0.58)		(2.04)		(3.18)		(0.52)		(0.63)	
Year	-28.42**	-30.91**	-0.39	-0.39	0.56***	0.26**	0.85***	1.05***	-1.47**	-1.34**	0.39**	0.33**	0.01	0.02
	(7.60)	(6.58)	(0.24)	(0.24)	(0.07)	(0.07)	(0.08)	(0.08)	(0.34)	(0.27)	(0.08)	(0.06)	(0.09)	(0.09)
Constant	1,531.09***	31.19	37.69***	37.14***	26.20***	4.60**	12.02***	17.06**	19.89***	31.13***	2.16***	6.10***	2.16***	3.83**
	(31.21)	(119.23)	(0.93)	(2.03)	(0.24)	(0.98)	(0.35)	(3.33)	(1.59)	(4.59)	(0.38)	(0.68)	(0.33)	(0.73)
Observations	1,249	1,249	1,249	1,249	1,249	1,249	1,249	1,249	1,249	1,249	1,249	1,249	1,249	1,249
R-squared	0.00	0.29	0.00	0.37	0.00	0.57	0.01	0.25	0.02	0.11	0.01	0.26	0.00	0.02
Adj. R-squared		0.28		0.36		0.57		0.25		0.11		0.25		0.01

Robust standard errors in parentheses

*** p<0.001, ** p<0.01, * p<0.05, + p<0.10

Table 5

Intake and Outcome Trends for Virginia Animal Shelters by Species Subgroup

Variable	Total Intake		Percent Euthanized		Percent Adopted	
	Dogs	Cats	Dogs	Cats	Dogs	Cats
Year	-15.56** (4.09)	-12.04* (4.04)	-0.78*** (0.12)	0.32 (0.36)	0.34** (0.09)	0.78*** (0.07)
Constant	826.15*** (20.11)	770.81*** (13.24)	30.73*** (0.53)	47.15*** (1.42)	26.73*** (0.45)	27.84*** (0.34)
Observations	1,232	1,149	1,225	1,152	1,225	1,152
R-squared	0.00	0.00	0.00	0.00	0.00	0.00

Robust standard errors in parentheses

*** p<0.001, ** p<0.01, * p<0.05, + p<0.10

Table 6
Intake and Outcome Trends with Shelter Characteristic Interactions

Variables	Total Intake		Percent Euthanized			Percent Adopted		
	Community Type Interaction	Shelter Type Interaction	Community Type Interaction	Shelter Type Interaction	Size Interaction	Community Type Interaction	Shelter Type Interaction	Size Interaction
Mixed rural	1,196.70*** (64.56)	1,033.36*** (49.86)	0.26 (1.05)	-2.83** (0.72)	-2.81** (0.72)	-2.73 (2.16)	-1.06 (0.89)	-1.05 (0.88)
Mixed urban	805.37*** (56.39)	651.55*** (92.00)	-14.71*** (2.12)	-11.05*** (1.49)	-11.06*** (1.49)	8.15* (2.75)	7.83*** (1.19)	7.86*** (1.19)
Urban	2,182.67*** (149.61)	1,871.00*** (113.40)	-7.84*** (0.93)	-6.11*** (1.05)	-6.23*** (1.03)	6.39*** (0.90)	10.74*** (1.24)	10.87*** (1.21)
year	4.26 (6.82)	-8.24 (29.59)	-0.43 (0.30)	0.25 (0.65)	0.17 (0.48)	-0.14 (0.12)	0.71* (0.22)	-0.05 (0.14)
Mixed ruralxyear	-46.24** (11.44)		-0.86* (0.35)			0.48 (0.48)		
Mixed urbanxyear	-43.75** (8.90)		1.07+ (0.46)			-0.11 (0.50)		
Urbanxyear	-90.26* (28.10)		0.46* (0.17)			1.31*** (0.08)		
County	1,075.78*** (97.31)	1,107.80*** (92.44)	6.67** (1.56)	8.72** (1.82)	6.67** (1.58)	8.47*** (1.32)	10.40*** (1.10)	8.56*** (1.29)
Humane society	247.14* (86.03)	404.67*** (66.29)	-30.64*** (1.70)	-29.64*** (2.26)	-30.71*** (1.73)	60.08*** (1.33)	63.87*** (1.57)	60.22*** (1.37)
Mixed facility	2,045.62*** (124.95)	2,256.31*** (201.60)	2.36 (1.96)	12.29*** (2.00)	2.38 (1.90)	21.48*** (0.89)	18.61*** (1.23)	21.71*** (0.92)
Countyxyear		-12.34 (31.52)		-0.59 (0.55)			-0.60 (0.37)	
Humane societyxyear		-47.51+ (22.51)		-0.31 (0.68)			-1.11* (0.37)	
Mixed facilityxyear		-65.73 (53.22)		-2.87*** (0.46)			0.84** (0.21)	
Shelter size			13.00*** (1.41)	13.00*** (1.40)	16.87*** (1.67)	0.20 (0.58)	0.17 (0.59)	-1.92* (0.79)
Shelter sizexyear					-1.10+ (0.47)			0.61** (0.17)
Constant	-95.60 (103.50)	-40.65 (101.93)	37.41*** (2.08)	35.04*** (2.25)	35.34*** (2.17)	6.02** (1.33)	3.25** (0.91)	5.60*** (0.77)
Observations	1,249	1,249	1,249	1,249	1,249	1,249	1,249	1,249
Adj. R-squared	0.28	0.28	0.36	0.36	0.36	0.57	0.57	0.57

Robust standard errors in parentheses

*** p<0.001, ** p<0.01, * p<0.05, + p<0.10

Table 7

R-squared values for lagged dependent variable

Variable	Shelter Size		Shelter Type	
	Small	Large	Gov't	Private
Total Intake	0.65	0.95	0.95	0.97
Percent Euthanized	0.77	0.90	0.76	0.76
Percent Adopted	0.89	0.93	0.65	0.88
Percent RBO	0.62	0.91	0.60	0.94
Percent Transferred In State	0.60	0.80	0.63	0.68
Percent Transferred Out of State	0.82	0.86	0.34	0.86
Percent Other	0.01	0.29	0.01	0.21
Observations	475	530	680	220

Table 8

Comparison of Intake and Outcome Trends in Original versus Balanced Panel

Variable	Total Intake		Percent Euthanized		Percent Adopted		Percent RBO		Percent Transferred In State		Percent Transferred Out of State		Percent Other	
	Original	Balanced	Original	Balanced	Original	Balanced	Original	Balanced	Original	Balanced	Original	Balanced	Original	Balanced
Year	-28.42** (7.60)	-56.50*** (3.68)	-0.39 (0.24)	-1.18*** (0.14)	0.56*** (0.07)	0.25** (0.06)	0.85*** (0.08)	0.47*** (0.07)	-1.47** (0.34)	0.17 (0.11)	0.39** (0.08)	0.39*** (0.04)	0.01 (0.09)	-0.10* (0.03)
Constant	1,531.09*** (31.21)	2,010.64*** (10.45)	37.69*** (0.93)	43.40*** (0.63)	26.20*** (0.24)	31.35*** (0.27)	12.02*** (0.35)	12.02*** (0.28)	19.89*** (1.59)	9.85*** (0.51)	2.16*** (0.38)	1.23*** (0.15)	2.16*** (0.33)	2.15*** (0.20)
Observations	1,249	648	1,249	648	1,249	648	1,249	648	1,249	648	1,249	648	1,249	648
R-squared	0.00	0.01	0.00	0.01	0.00	0.00	0.01	0.01	0.02	0.00	0.01	0.01	0.00	0.00

Robust standard errors in parentheses

*** p<0.001, ** p<0.01, * p<0.05, + p<0.10