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Have You Seen the Poop Fairy?

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ABSTRACT

This research seeks to understand the effectiveness of the There is no Poop Fairy campaign through a public survey of dog owners. The There Is No Poop Fairy campaign was initiated in Albuquerque, New Mexico, in 2014, with the goal of getting dog owners to pick up and properly dispose of their dogs' waste. The Rio Grande is contaminated with *E. coli* bacteria that originates in part from dog waste, which is carried to the river through storm water. Levels of *E. coli* in the Rio Grande have decreased dramatically within the past few years, coincident with the campaign. The main purpose of the study is to better understand whether or not the There Is No Poop Fairy Campaign may have contributed to the decrease in *E. coli* by surveying dog owners who live in the focus area of the campaign about their exposure to the campaign information and any subsequent changes in behavior. The research also investigates other issues such as dog owners' feelings of responsibility in picking up their dogs' waste (i.e., is it up to them or somebody else?) and the acceptability in leaving dog poop behind in public spaces (e.g., parks and open space settings). This is a nonprobability survey and will be conducted using convenience sampling methods.

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1.0 Introduction

1.1 Background

The southwestern United States has an arid environment where drought is common and water scarcity is an issue (Brookshire, Gupta, & Matthews, 2013). With water in short supply, states such as New Mexico grapple with issues related to water quantity and quality. One major water source in New Mexico is the Rio Grande, which runs through the urbanized city of Albuquerque in Bernalillo County. In addition to being an important water source for drinking, agriculture, businesses, industry, and recreation, the Rio Grande and its associated river forest (i.e., the bosque) are considered key cultural components of life in Albuquerque. Thus, keeping them healthy is a priority for residents and officials alike. One effort by Bernalillo County to keep the Rio Grande clean and healthy is the *There Is No Poop Fairy* campaign.

The *There Is No Poop Fairy* campaign originated in Greeneville County, South Carolina, in 2011. The campaign's mascot and slogan were used with permission by Bernalillo County, New Mexico, beginning in 2014 (Bernalillo County, 2014). Bernalillo County's goal with the campaign was to inform dog owners about the impact of their dogs' waste on the environment, specifically water contamination and subsequent transmission of bacteria and disease. In Bernalillo County, uncollected dog waste is an issue because it can be transported by storm water into the Rio Grande. Historically, the Rio Grande has contained a high average concentration of the bacterium *Escherichia coli (E.coli*) (AMAFCA, 2016; Bernalillo County, 2014, 2016, 2017; City Of Albuquerque, 2016), 21.9% of which has been shown to come from dog waste (Parson Water & Infrastructure / The City of Albuquerque, 2005). The remaining 78.1% of E.coli comes from birds, humans, non-avian

wildlife, felines, and unknown sources (Parson Water & Infrastructure / The City of Albuquerque, 2005). Figure 1 shows the breakdown by percentage of the sources of *E. coli* contamination in the Rio Grande. Of the sources of *E.coli*, dogs were targeted for control of their waste because they contribute a relatively large percentage and they represent the only source that is relatively easily controlled by humans; i.e., the other known contributors are wild or feral animals.

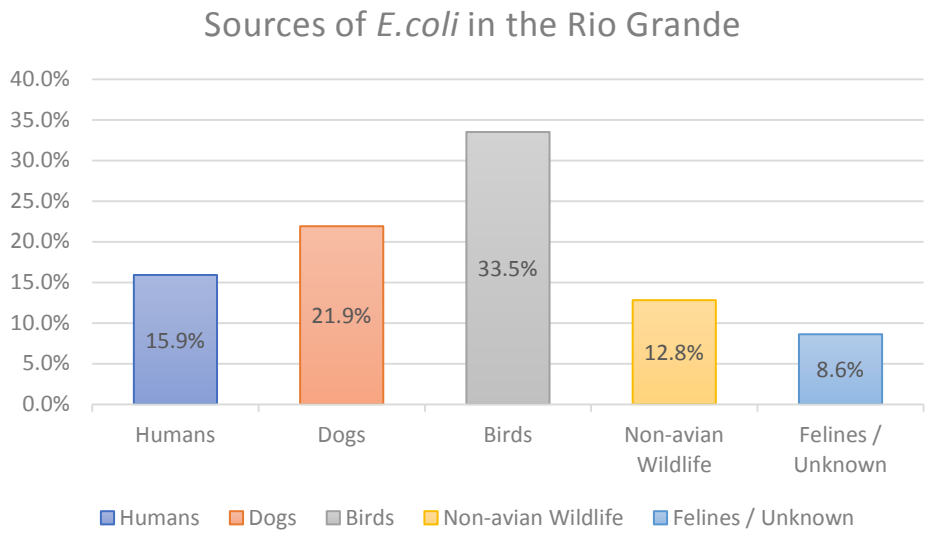

Figure 1: **Sources of E. coli found in the Rio Grande (Parson Water & Infrastructure / City of Albuquerque, 2005)**

Recent studies conducted by the Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA) found a significant decrease in the *E.coli* concentration along the segment of the Rio Grande that runs through the Albuquerque Metropolitan area: from 2,489 most probable number (MPN) in 2015 to 145 MPN in 2016, representing a decrease of 94% (Albuquerque Metropolitan Arroyo Flood Control Authority, 2016). Further, for the middle Rio Grande reach starting at Tijeras Arroyo to the Alameda Bridge (a river segment similar

to the one studied by AMAFCA), the New Mexico Environment Department's (NMED's) 303 (D) list has *E.coli* listed as an impairment in 2014-2016, but not for 2016-2018 (New Mexico Environment Department, 2018). These findings have led county officials to ask whether the *There Is No Poop Fairy* campaign may have contributed to improvements in water quality.

1.2 Objectives of this Research

This research is primarily focused on Albuquerque, the major urban center that is located within Bernalillo County. The state of New Mexico has one of the highest levels of pet ownership in the nation, holding 2nd place in the year 2013 (Gerew, 2013), making Albuquerque a great community in which to study the effects of the *There Is No Poop Fairy* campaign. The research includes a community survey that uses a convenience sample, with the goal of better understanding the reach and success of the campaign. It also examines dog ownership practices, dog owner's feelings of responsibility in picking up their dogs' waste, and other related topics.

2.0 Literature Review

With a presumably large number of dogs and dog owners in Bernalillo County, it is important to manage their behavior and its impact on the environment and society. According to Carter (2016, p.2), “dogs are increasingly recognized as having both a private and a public life, where their needs ought to be recognized beyond the private realm and in the public realm”. The *There Is No Poop Fairy campaign* is an example of managing the relationship between dogs and the public realm.

Pet dogs provide companionship, encourage physical activity, and influence the use and perception of public space. Each of these subjects is covered in the subsections that follow, along with related topics such as how dog ownership effects the accumulation of social capital and the factors that influence dog owner behavior and policy related to dog ownership.

2.1 Social Capital

Putnam defines social capital as the “connections among individuals - social networks and the norms of reciprocity and trustworthiness that arise from them” (Putnam, 2001a, p.19). These social networks have internal and external effects, and the effects can be positive or negative. Social capital is key for maintaining “mutual obligation” or “reciprocity” in society (Putnam, 2001a, p.20). Reciprocity has two forms: generalized and specific. Generalized reciprocity is when an individual does something without expecting anything immediate in return, and specific reciprocity is when people engage in exchange of favors (i.e., help me clean my yard and then I will help you clean yours) (Putnam, 1993).

Putnam classifies social capital as either bonding or bridging. Bonding social capital strengthens ties within existing social networks. Bridging social capital strengthens external

connections among existing social networks. Further, networks of social capital can be formal (e.g., workplace, PTA, bowling club) or informal (e.g., waving to someone while out on a walk).

Both formal and informal networks and the norms of reciprocity are important in building social capital, which can have benefits for both the individuals within the networks and those outside of them (Putnam, 2001a). Considering dog ownership in this context, dog owners may be viewed as part of an informal network through which social capital can be built by small, informal acts of reciprocity (Putnam, 1993, 2001b), such as nodding to a passing dog owner who is also out walking their dog or helping to keep dog waste clean-up stations stocked with plastic bags. Along these lines, Wood et al. (2005) showed that pet ownership increased the likelihood of getting to know one's neighbor and promoted mutual favors among neighbors. In fact, many participants of their study reported having met their neighbors because of their pet. Also, pet owners in the study were 57% more likely than non-pet owners to participate in civic engagement, which is another indicator of social capital (Wood, Giles-Corti, & Bulsara, 2005).

A follow up study by one of the same authors involved a survey of 2,692 dog owners in the USA and Australia (Wood et al., 2017). The results reinforced the previous findings by demonstrating a higher level of social capital among pet owners than among non-pet owners. The survey asked questions that measured "general helpfulness, friendliness, trust, reciprocity, civic engagement, and neighborhood networks" (Wood et al., 2017, p.443).

Each indicator of social capital was measured on a four-point Likert-type scale; the results were then translated into measurements of social capital. The level of social capital may have been higher among dog-owners compared to pet-owners in general due to dog

walking activities and time spent in public spaces. Also, the presence of dog owners walking their dogs around the neighborhood was found to promote feelings of safety and surveillance among neighborhood residents (Wood et al., 2017), suggesting that dog walking can have a positive effect on those outside the informal dog owner network.

Social capital generation through dog ownership was further explored by Jackson (2010), who found that social capital can be built when dog owners take their dogs to spend time in public spaces such as parks and dog parks, or simply walk their dogs around the neighborhood. While out at these public places, there is an increased chance of social interactions, and these interactions promote strong social ties, as the owners may have similar lifestyles (Jackson, 2010). Although Jackson (2010) asserts that pet ownership is a contributor to social capital, the author calls for further research on the topic.

Social capital and institutional enforcement provide two different ways of keeping social order, and social capital can promote enforcement of "informal contracts" (Putnam, 2001b, p.8), such as picking up after one's dog. Dog-related policies are difficult to enforce and responsible dog ownership practices rely heavily on self-governance (Borthwick, 2009). Informal networks, such as dog owners, have a way of policing themselves through reciprocity and altruism (Putnam, 1993, 2001b). In the case of dog ownership, owners cleaning up after their dogs benefits all users of the public space (keeps the space clean), the long-term expectation (and benefit derived from cleaning) being that all dog owners participate in cleaning up their dogs' waste. Reciprocity and altruism work largely in favor of the continued allowance of dogs in public areas. In other words, dog owners clean up because they expect other dog owners to do the same and they want to maintain their

standing in the eyes of dog owners and non-dog owners so that they are welcome in public spaces with their dogs.

The type of social capital that is built through dog ownership depends on the characteristics of the dog ownership practices. Degeling et al. (2016, p.193) argued that “dog care can be practiced in ways that may generate positive as well as negative dimensions of social capital”. Aggressive dogs with distracted owners in public spaces can cause feelings of danger and discomfort, and this can cause conflict among dog-owners and other patrons of public spaces (Degeling et al,2016). Other undesirable behavior includes loud dogs that disrupt the neighborhood, dogs escaping from their homes, or a yard littered with dog feces, and these practices can lead to a decrease in social capital (Degeling et al., 2016).

2.2 Health Benefits of Dog Ownership

A study focused on dog ownership, neighborhood characteristics, sense of community, and socio-demographic characteristics examined the effects of dog ownership and dog walking on older populations in Calgary, Canada (Toohey et al., 2013). Owning a dog was shown to increase physical activity and promote a sense of community. Further, dog owners were found to be more likely than non-dog owners to participate in physical activity such as walking. Plus, not only did the dog walkers go on more walks, but they walked for longer periods of time. These results are in line with those of Ioja et al. (2011), who found that dog walkers walked to a park in their study area more frequently than non-dog walkers. However, McCormack et al. (2011) found that dog walkers who went to off-leash dog parks were less likely to participate in physical activity once they got to the off leash park than owners who went to regular parks with no off leash areas.

Beyond the physical benefits, dog walking and dog ownership can also provide mental health benefits. Degeling & Rock (2013) found that dog ownership facilitated the exchange of favors among neighbors and family members concerning dog care, which promoted emotional well-being among all those involved. The health benefits of dog ownership were also transferred to the dog owner's non-dog owning family, friends, and neighbors when they were caring for the dog because they were more likely to go out for a walk than on a typical night without a dog. Further, dog owners who were surveyed reported that having a dog encouraged spending time with family, as they walked or played with the dog together. However, Degeling & Rock (2013) also found that these beneficial effects can decline as a dog ages and can no longer participate in physical activity, to the point that dog ownership discourages physical activity. Dog size also influences the level of activity among dog owners: owners with smaller dogs were less likely to walk their dogs than those with large-sized breeds (Rhodes & Lim, 2016).

The physical layout of a neighborhood can impact the time spent walking as well: those who lived in curvilinear layouts were found to be more likely to spend more time walking than those who lived in neighborhoods with a grid pattern (Toohey et al., 2013). Also, McCormack et al. (2011) found that living within 1.6km (0.62 miles) of an off-leash dog park contributed to higher frequency of weekly dog walking.

2.3 Dogs and Community

Urbanik & Morgan (2013) presented a case study in which a Kansas City community campaigned for an off-leash dog park in the neighborhood. At the time of the study only one off-leash dog park had been established in Kansas City. The dog park ultimately had a positive effect on the neighborhood because the high use rate provided a secondary benefit of

being an informal “neighborhood watch” (Urbanik & Morgan, 2013, p.296) program. The success of the dog park inspired residents in another part of the city to unite and propose a new dog park. Six hundred and seventy-six community members signed a petition for the second dog park. Architects joined in on the movement by completing an ecologically friendly design for the newly proposed dog park. Community members cited “health of dogs, sense of community, and human-dog relationships”(Urbanik & Morgan, 2013, p.298) as the primary benefits of having a dog park. In spite of the positive effects that off-leash dog parks can have, many other Kansas City residents, along with the city council, opposed the building of a new off leash dog park in their neighborhood and blocked the plan. Sanitation reasons and a stated desire for tax dollars to be spent on humans and not on pets were some of the major points of opposition for building the dog park (Urbanik & Morgan, 2013).

The “Burnley dog war” (Pemberton, 2017, p.239) provides another example of the conflict that can occur within communities over the presence dogs in public spaces. In the late 1970’s and early 1980’s, the town of Burnley in Lancashire, England, was divided over the presence of dogs at public parks. The so-called “war” began when a ban was placed on dog walkers in public parks, which led to a seven-year conflict among dog-owners, non-dog-owners, and Burnley’s local government. One of the major reasons for the ban was the presence of dog feces in public parks. Burnley residents viewed dog waste as natural until they realized it was a threat to public health. Toxocariasis was presented as a threat to children’s health by what Pemberton calls “sensationalist media coverage”(Pemberton, 2017, p.245) in a documentary titled *The Case Against Dogs*. Because of the documentary and its coverage in the news, many park goers feared toxocariasis, which is spread through dog feces. Other residents favored the presence of dogs because the dogs facilitated interactions

among park goers and there was a perception of less crime when dog walkers were present. Several dog enthusiasts were jailed for walking their dogs at parks during the ban. The town eventually lifted the ban because of the realization that the parks the ban was meant to save were still degraded even without the presence of dogs. Although the "war" started as a public health issue, dog waste was ultimately used as a scapegoat to address the decline in Burnley due to industrial practices. The dog waste represented a decline in public spaces and was targeted as the cause for the fading public spaces in Burnley. There would not be a policy for dog waste cleanup in Britain until 1996, over 10 years after the end of the "war" (Pemberton, 2017).

Gomez et al. (2013) conducted a case study and survey related to Colonial Greenway dog park in Norfolk, Virginia, to understand the uses and benefits of dog parks. The study revealed that Colonial Greenway dog park users used the park for three main reasons: (1) exercise for their dogs, (2) socialization for their dogs, and (3) sense of community/bonding with other park users. The authors concluded that the benefits felt at Colonial Greenway park were due in part to the heavy involvement of the community during the design of the park, and responsible dog owners managing their dogs' behavior and waste in a responsible manner (Gómez, 2013).

2.4 Policy Related to Dogs and Their Owners

Dogs are considered to be the private property of humans and are governed as such (Borthwick, 2009; M. Rock, 2013). The dog's classification of private changes to public when its behavior has effects on the public (e.g., barking as a nuisance) (Carter, 2016). Language in public policy concerning dogs is often aimed at the regulation of the owner, and policies rely heavily on self-enforcement (Borthwick, 2009; Carter, 2016; Degeling et al.,

2016; M. Rock, 2013; M. J. Rock, Graham, Massolo, & McCormack, 2016; Rohlf, Bennett, Toukhsati, & Coleman, 2010). Though policies are written pertaining to animals and humans, they typically favor the welfare of humans (Borthwick, 2009). Borthwick (2009) found that, when examining historical governance of pets and their owners, the focus has shifted from regulating the animal's behavior to regulating the human's behavior.

Carter (2016) used interviews and the analysis of domestic animal management plans to determine the effectiveness of current animal management practices in the State of Victoria, Australia. The study sorts management practices of dogs and their owners into two primary categories: education and enforcement activities. Findings indicated that when conducting public education, the governing body should prioritize the content of the education and not the frequency of its administration to determine success (Carter, 2016). Further, the educational content should be simple and to the point to maximize its impact in the community (Carter, 2016). Regarding enforcement activities, they were found to be more complex because unwanted behavior such as dog barking is difficult to classify as a nuisance due to its subjectivity; some neighbors may have a higher tolerance for rowdy dogs than others. Carter (2016) explained that effective control of a dog's behavior (e.g., keeping a dog from roaming at large) is in some cases unachievable (given physical capacity of the owner, training of the dog, etc.) and therefore "inherently unenforceable"(Carter, 2016, p.10) . However, if the policies regarding the nuisances above are successfully enforced, this can result in a "more harmonious neighborhood" (Carter, 2016, p.13).

Rohlf et al. (2010) sought to understand the reasons why dog owners comply with common dog ownership practices, such as dog socialization. Their study included an online survey of 1,016 dog owners to "measure dog ownership attitudes and behaviors". The

primary behaviors of responsible dog-owners that were discussed in the survey included confinement, registration, microchipping, de-sexing, socialization and obedience training. The study showed that most dog owners believed these to be the best practices for responsible dog ownership, although not all dog owners followed. Social pressure from friends and family, the perceived difficulty, and the dog/owner bond were strong predictors of engagement in responsible dog ownership practices (Rohlf et al., 2010).

Rock (2013) examined the *Responsible Pet Ownership* bylaw that was enacted in Calgary, Canada, in 2006. Rock (2013) suggested that the bylaws governing pets are similar to smoking bans in that they are enacted for public health, use signage as a means of enforcement, rely on dominant social values, and are often self-policed. The three main foci of the bylaw are maintaining dogs on leashes, cleaning up dog waste in public areas, and the registering and licensing of dogs. Rock (2013) observed a split among dog-owners and non-dog-owners when it came to leashing; most of those who were in favor of the leash law were non-dog owners. The divide among citizens makes it difficult for governing bodies to establish policy concerning dogs. This divide can be problematic as policy ultimately effects "the social status of pets, and quite literally, their place in urbanized societies" (M. Rock, 2013, p.208).

A later study Rock et al. (2016) examined the effects of off-leash policy on public health. The authors performed a longitudinal study (2011-2012) in four different parks in Calgary, Canada. Overall, they noticed no significant change in waste cleanup habits due to the off-leash policy but asserted that physical and social environments do play a role in dog-owner behavior.

2.5 Public Spaces and Dog Waste

Hygiene related to dog waste is a big concern among non-dog owners and dog owners alike and is a central component of dog-related policy. A study in the Netherlands that surveyed 152 households about the dog/owner relationship and examined the household dogs' feces and fur for parasitic diseases demonstrated a presence of zoonotic parasites in healthy domesticated dogs (Overgaauw et al., 2009). *Toxocara* eggs and *Giardia* cysts were both present in the fur and feces of the dogs in the study. The researchers also found that a high percentage of the households demonstrated risky dog/owner hygiene practices, such as owners allowing dogs to sleep in bed with them or lick their faces, which facilitate the spread of zoonotic parasites. Despite the health risks associated with dog feces, many owners (39%) in the study reported never picking up their dog's feces (Overgaauw et al., 2009).

Owners often turn a blind eye to their dogs defecating in public spaces. Gross et al. (2017) found that people have different methods they use to deal with (or not) their dog's waste in a public space. They also discussed the conflict between a person's self-reported practices and actual practices, stating "people claim that they do something (buy organic food, adhere to an ecologically aware lifestyle, etc.) but actually frequently relapse into ingrained patterns or habits" (Gross et al., 2017, p.144).

The reasons for leaving dog poop behind can be practical, such as not having a trash bin nearby, though having people witness dogs pooping in the park can put social pressure on dog owners to pick up after their dogs (Gross et al., 2017). However, when owners do not pick up after their dogs, they have been shown to use one of two primary strategies to avoid the responsibility for doing so: active non-knowledge and passive non-knowledge. Some active strategies may include looking away while the dog does its business or looking at

one's phone. Some passive strategies include "forgetfulness or indifference to poop by conveniently putting it out of mind" (Gross et al., 2017, p.153).

Derges et al. (2012) examined the factors that influence perception of a public space by interviewing 60 residents in various parts of London (Derges, Lynch, Clow, Petticrew, & Draper, 2012)**.** All respondents referenced dog feces as influencing their perception of a space, and many associated the presence of dog waste with incivility (Derges et al., 2012). Derges et al. (2012) suggested that the feelings of incivility brought on by dog feces are linked to the state and its waste management practices. In other words, the state has a crucial role when it comes to the management of dog waste in the form of policy enforcement and creation of public awareness through education. Some participants in the study believed that the presence of dog waste demarcated the parts of the city that were neglected by the state (Derges et al., 2012).

Jason and Zolik (1981) examined the effectiveness of two primary techniques used to reduce the amount of dog waste left behind by dog owners in public spaces. The two techniques studied were building a fence to prevent dogs from entering the area and educating the owners about how to clean up after their dogs, i.e., the methods and tools that should be used. The education method proved to be more successful, with 82% of owners who underwent training reporting that they subsequently picked up after their dogs, resulting in an 85% reduction of dog feces in the study area. This finding demonstrates that providing the public with education and information on this topic can be an effective way to modify behavior.

3.0 Methods

3.1 Subjects for Study

Since this study attempts to understand the effectiveness of the *There Is No Poop Fairy* campaign and its influence on dog owners' behavior, we conducted a survey of people who lived in Bernalillo County, owned a dog, and were at least 18 years of age at the time of the survey. We surveyed 502 members of the community. The research was approved by the University of New Mexico (UNM) Institutional Review Board (IRB).

A form explaining the purpose of the study was provided to each potential participant, who was asked to read the form before proceeding with the survey. Subjects were required to provide consent before participating. Participants were provided with a clipboard that included the survey and the informed consent form. Providing participants with clipboards rather than having them fill out their survey on a common table ensured a level of privacy when answering questions. However, given the public nature of the site locations (discussed below), complete privacy could not be guaranteed.

3.2 Survey Design

Based on the literature related to this thesis topic, the survey was designed to collect data from participants on the following issues:

- Attitudes toward and perceptions of dog poop in public spaces,
- Attitudes towards various dog ownership practices,
- Reported behavior related to various dog ownership practices,
- Feelings related to acceptability of not picking up dog poop in public and private spaces,
- Beliefs about responsibility for picking up dog poop,

- Leash habits in public spaces and owner's awareness of dog's behavior when off leash,
- Visibility or reach of the *There Is No Poop Fairy* campaign,
- Concern or awareness related to the environment.

The survey began with questions that asked about the participant's number of dogs in the household, the number of times per week the owner walks the dog(s), and the frequency with which the owner picks up their dog's poop. We were also interested in gauging how important it is to community members that dog owners clean up after their dogs, and if they have ever picked up after a dog that was not theirs. We then asked participants about the *There Is No Poop Fairy* campaign sign, if they had seen it and where, and if it had any effect on their behavior. Questions on clean-up responsibility and acceptability related to dog poop followed, and the survey ended with questions related to environmental concern and demographics.

The survey was reviewed by members of the Bernalillo County Stormwater Team, AMAFCA, and several faculty members from UNM. After revisions, we pre-tested the survey instrument on 25 community members. During each pre-test, the researcher sat with the pre-test participant and asked them to think aloud as they took the survey. An interview about the survey and the participant's experience taking it followed each pre-test event. We addressed all issues, such as poorly worded questions, and did another round of reviews and pre-testing to finalize the survey. The finalized survey instrument is shown in Appendix A.

3.3 Survey Administration and Participant Recruitment

The survey was administered at various sites throughout Bernalillo County, primarily in the Albuquerque Metropolitan area. The locations were a mixture of open space access

points, public parks, and higher education campuses. In three instances the survey was administered at public events, two of which were related to environmental awareness. The third was a 5k run in which runners were encouraged to participate with their dogs.

The administration of the survey included purposive and convenience sampling techniques. Convenience sampling is used when resources are limited, and when a random sample is impractical due to time and budgetary constraints. Convenience sampling allows the surveyor to pick a location and time that is feasible for administration (Etikan, Musa, & Alkassim, 2016). Since the survey required certain criteria for participation (18 years of age, dog-owner, resides in Bernalillo County) this project also has elements of purposive sampling. Purposive sampling seeks to survey a specific population with certain attributes that are relevant to the research question (Etikan et al., 2016).

The survey was administered at a table, which was set up at each site. The items that were given to participants in exchange for taking a survey were displayed on the table, along with a banner/table cloth containing the selection criteria (age, dog ownership status, and residency in Bernalillo County). Figure 2 shows an example of what the survey table looked like at one of the events where the survey was administered.

***Figure 2*: Table set up at Valle De Oro Urban Wildlife Refuge**

The give-away items included items such as doggie litter clean-up bags with carrying cases and the "poop emoji" foam toy, which is a popular icon used in text messages and social media. Other give away items included windshield ice scrapers, rulers, and hand sanitizer. The give-away items encouraged a "social exchange" (Dillman, Smyth, & Christian, 2014, p.42), which is used to promote a willingness to participate and a higher response rate. Participants who are at the table responding and receiving an exchange item will be seen by bystanders; this may also attract new participants as "knowing that others have completed a survey can encourage people to participate"(Dillman, Smyth, & Christian, 2014, p.30).

3.4 Data Analysis

The survey results were organized and analyzed using two softwares. Excel was used to record data and to create most of the graphics displaying the data. The open-source

statistics software “R” was also used for analysis and sorting of data and for creating two of the more advanced displays of data (Figures 13 and 17, which will be discussed later), which involved creation of ordinal logistic regression models. The ordinal logistic regression was achieved by first creating cumulative link models, which measure the strength of the relationship between the dependent variable (pick up frequency) and the independent variables (having seen the sign and environmental awareness). This is done in R by using the cumulative link model (clm) function found in the ordinal stats package.

First we prepared the ordered response variable pick_up_freq (pick up frequency) with the following command:

```
y <- factor(data$pick_up_freq, ordered=TRUE)
```

Then we prepared the predictor variables; having seen the sign and environmental concern. The variable seen_sign was analyzed as a binary variable, and was assigned to an x-value using the following input:

```
x_sign <- factor(data$seen_sign)
```

We then assigned environmental concern to an x-value as a binary variable. The question was asked in the form of a likert scale response from (1) not at all concerned to (5) extremely concerned. We converted this to a binary variable by collapsing the response choices from (1) not at all concerned to (4) moderately concerned into one group, and those who answered (5) extremely concerned into another with the following command:

```
x_env <- factor(data$eviron_concern >= 5)
```

We then fit the model only using whether or not they have seen the sign , where x=having seen the sign and y= pick up frequency with the following command:

```
fit_seen_sign <- clm(y~x_sign, data=covariates)
```

The relationship was shown to have statistical significance with a p value of p= 0.0018 which is considered to be statistically significant. The same process was followed for environmental concern and its effect on pick up frequency, this relationship was also significant with a p value of p=3.32e-08 which is statistically significant.

The process for creating the bar charts can be seen in appendix B.

4.0 Results and Discussion

4.1 Number of Dogs per Household

Almost 50% of respondents had one dog in their household at the time of the survey, almost a third of respondents reported having two dogs, and having three or more dogs was far less common. Only 0.4% of households owned either seven or eight dogs. A complete breakdown of number of dogs per household among respondents can be found in Figure 3 below.

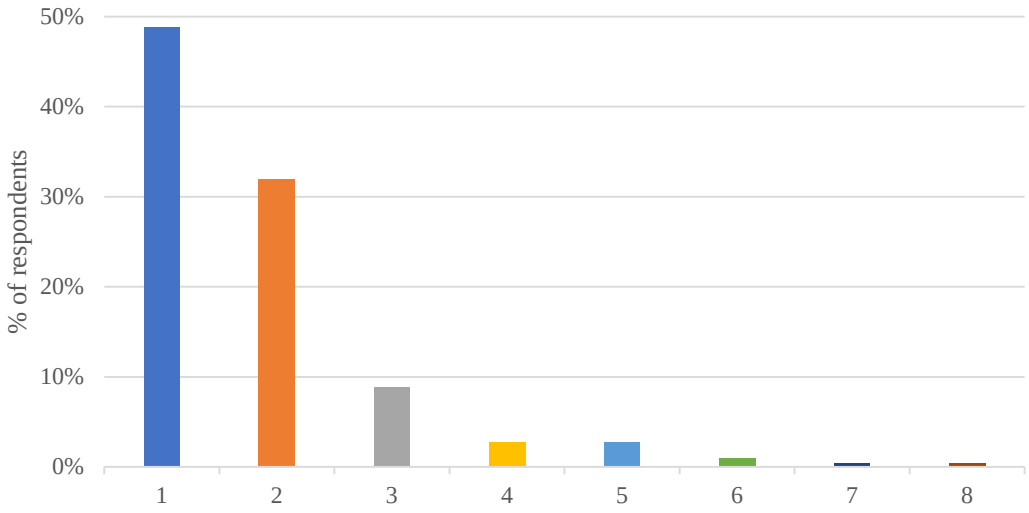

***Figure 3*: Number of dogs in household, by % of respondents**

4.2 Dog Walking Frequency and Reasons for Walking

Overall respondents were fairly active with a low number reporting that they never walked their dog. Thirty-eight percent of respondents reported walking their dog one to three times per week, 22% reported walking their dog four to six times per week, 12% said they walked their dog seven to nine times per week, and 17% walked their dog ten or more times

per week. Just under 10% of respondents reported that they did not walk their dog. A breakdown of walking frequency among respondents is shown in Figure 4.

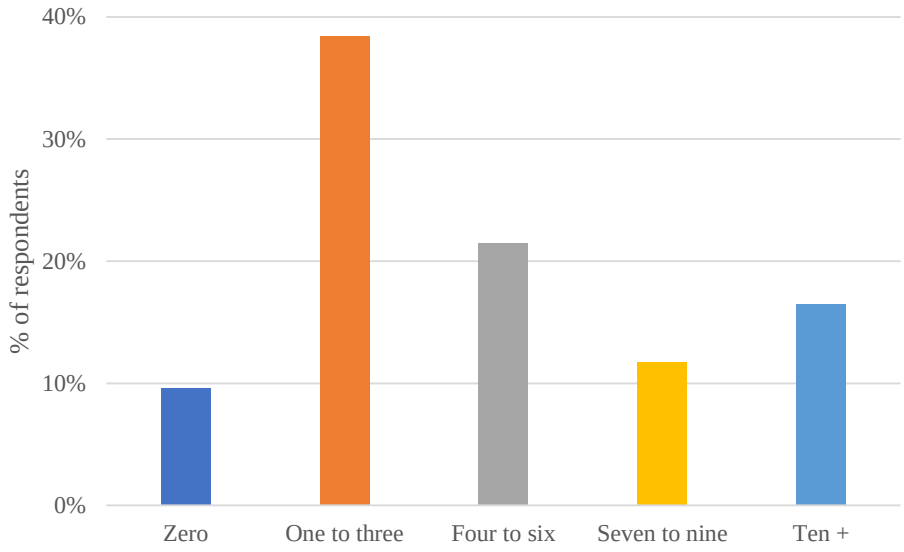

***Figure 4*: Walking frequency, by % of respondents**

Survey respondents could choose among nine options for the reason/s why they walked their dog. The instructions asked respondents to pick "all that apply" so in some cases all options were selected. The top responses were "exercise for my dog" (just under 80%), "exercise for me" (54%), and "to get fresh air" (just under 50%). The breakdown for all responses concerning reasons for dog walking is shown in Figure 5. Research has shown that dog ownership can promote an increase of physical activity (Toohey et al., 2013), which is supported by the results of this study (e.g., over half of respondent walk their dog anywhere from 4-6 times per week to ten times or more a week). The results as to why owners walk their dogs are also in line with the findings of Gomez (2013) who found that exercise for the dog was the top reason for walking.

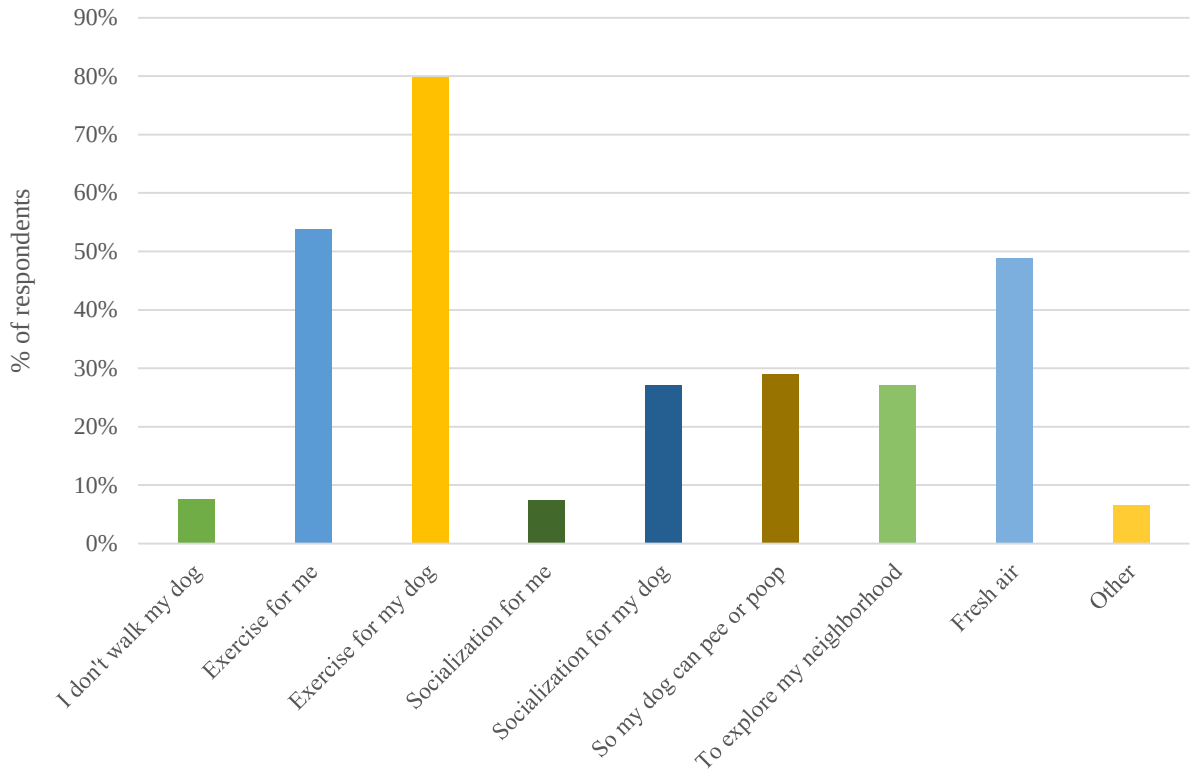

***Figure 5*: Reasons why owners walk their dogs, by % of respondents**

4.3 Clean-up Habits

We asked about the frequency with which dog owners picked up after their dog when it poops in a public space. Respondents were asked to select one choice on a 5-point Likert-type scale from 1 (never) to 5 (always). Most of the sample (72%) reported always picking up after their dog when it pooped in a public space, 14% said that they "often" picked up their dog's poop, 7% reported that they "sometimes" picked up, 1% reported that they "rarely" picked up, and 2% reported never picking up after their dog. Self-reported pick up frequency is shown in Figure 6. The high self-reported pick up frequency results are similar to those reported by Rock et. al. (2016), where 86% of respondents said that they always picked up after their dog in a public space. Although a low number of respondents in our

study reported never picking up after their dog, it only takes a small amount of dog waste to change the perception of a public area, usually in a negative light (Derges et al., 2012).

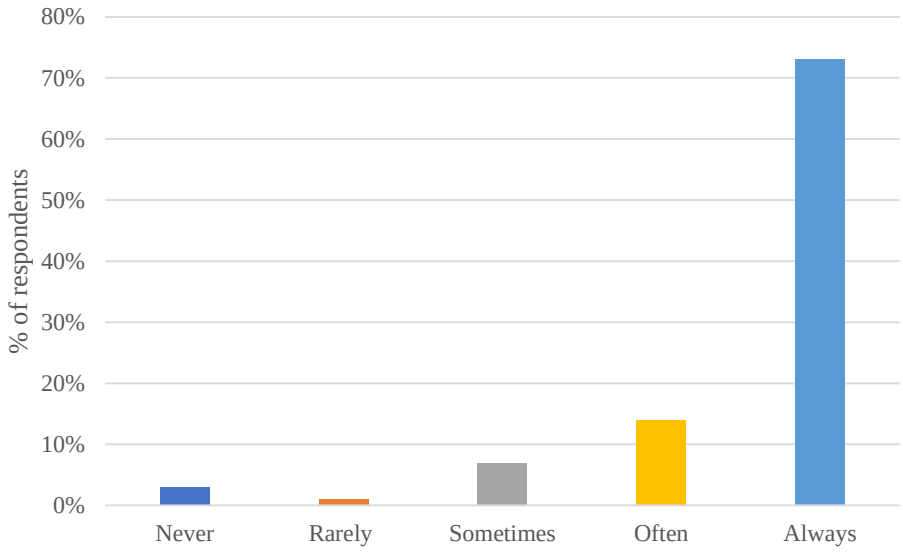

***Figure 6*: Frequency of picking up dog poop when in a public space, by percentage of respondents**

When respondents were asked if they picked up waste from dogs that were not their own, Figure 7 shows that 64% of the sample population reported some frequency of pick up other than “never”. A total of 40% selected “always”, “often”, or “sometimes”. We then asked respondents to report the location(s) in which they were picking up dog waste that was not from their own dog. The top three responses were “around my neighborhood” (31%), “public parks” (28%), and “my home or yard” (26%).

The fact that 40% of respondents at least sometimes picked up poop from strangers’ dogs is evidence of social capital. Dog owners may see themselves as an informal group and take it upon themselves to enforce dog waste cleanup , even when it is not their dogs’ poop. This supports the idea that dog owners are a community built on reciprocity (Putnam, 1993, 2001a, 2001b; Wood et al., 2005, 2017) and the notion that one irresponsible dog owner can

make all dog owners look bad. The top two locations for picking up other dogs' waste – around the neighborhood and public parks – are both public spaces. This result pertaining to the location of where dog owners are cleaning up after others' dogs also supports the idea of social capital, reciprocity, and altruism (Putnam, 1993, 2001a, 2001b) among dog owners.

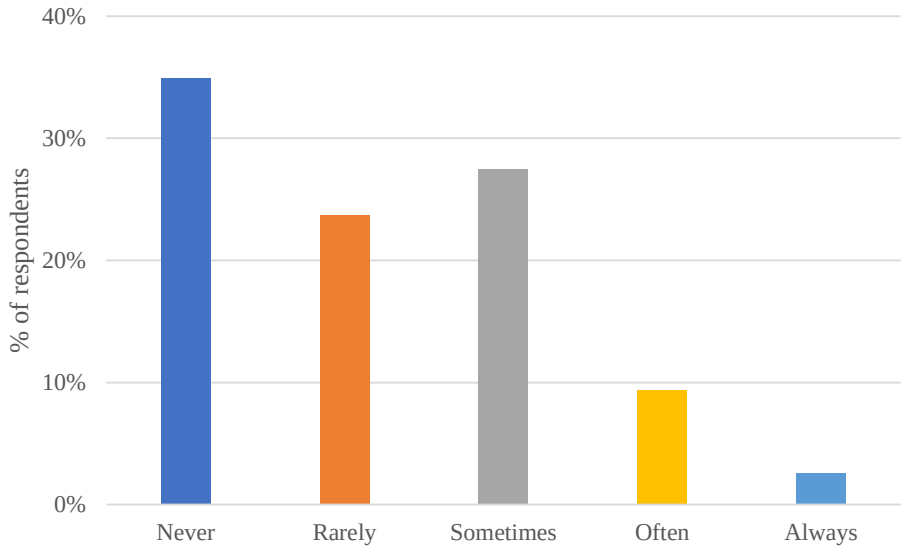

***Figure 7*: Frequency of picking up poop from other people's dogs, by % of respondents**

4.4 Leash Habits

We asked dog owners about their leash habits when walking their dogs in a public space. Dogs are typically required to be leashed in public spaces unless they are in a designated off-leash area. It was important to examine the frequency with which participating dog owners allowed their dogs off leash in public areas because, as previously discussed, the literature suggests that the public perceives off-leash dogs as major contributors to dog feces in public spaces and as a threat to public safety (M. Rock, 2013; M. J. Rock et al., 2016). Adhering to leash laws is seen as a sign of responsible dog ownership and is an example of

another self-enforced policy (Borthwick, 2009; Carter, 2016; Degeling et al., 2016; M. Rock, 2013; M. J. Rock et al., 2016; Rohlf et al., 2010) .

As shown in Figure 8, over 60% of the study participants reported keeping their dog on a leash the whole time they are in public spaces. We also asked respondents about their awareness of their dog's behavior when off leash, and the results are shown in Figure 9. The data show that most dog owners reported always being aware of when their dog poops (off leash) or that they do not allow their dog to be off leash in public spaces. This demonstrates that most respondents practice several dog ownership practices that are seen as "responsible", such as waste cleanup, leashing in public spaces, and weekly walking (Degeling et al., 2016).

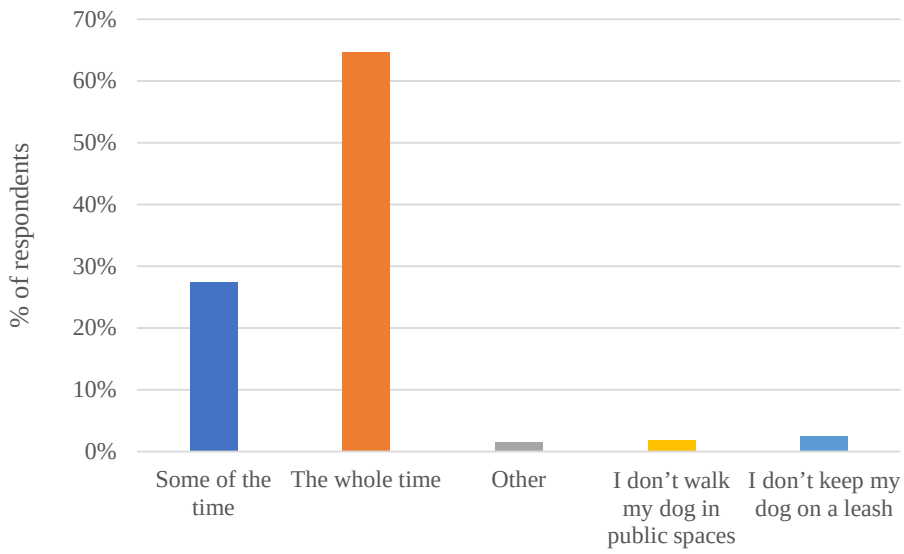

***Figure 8*: Frequency of leashing dog while in public spaces, by % of respondents**

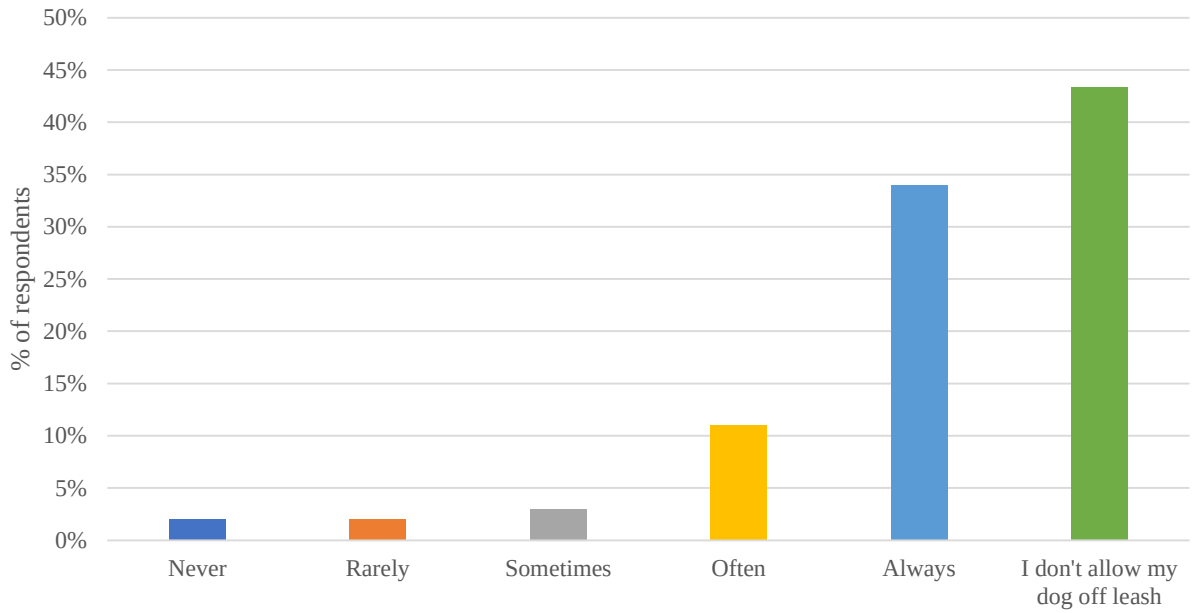

***Figure 9*: Responses to the question: "When my dog is off leash, I am aware of what it is doing and would know if it pooped."**

4.5 Reach of the There Is No Poop Fairy Campaign

Over two-thirds (69%) of respondents reported having seen a *There Is No Poop Fairy* sign, as shown in Figure 10, indicating that the campaign has been fairly successful in reaching many residents across the study area. We also asked survey respondents to indicate where they had seen the sign, and they were allowed to choose multiple locations. As shown in Figure 11, the top four locations where respondents had seen a *There Is No Poop Fairy* sign were in a neighbor's yard (36%), a public park (35%), open space areas (21%), and dog parks (19%). It is interesting to note that dog owners' neighborhoods were found to be the location where the most *There Is No Poop Fairy* signs were seen and where the most poop from other people's dogs is picked up by respondents.

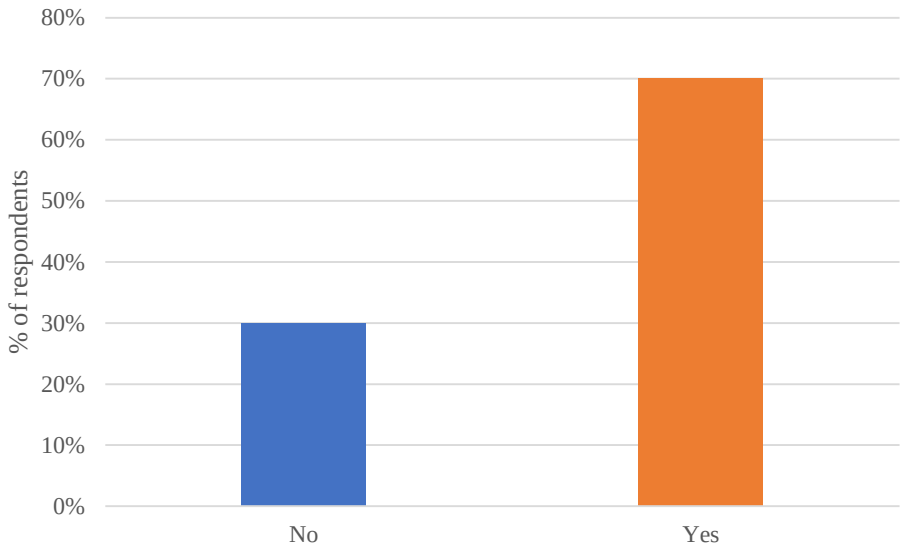

***Figure 3*: Responses to whether or not respondents had seen a "There Is No Poop Fairy" sign, by % of respondents**

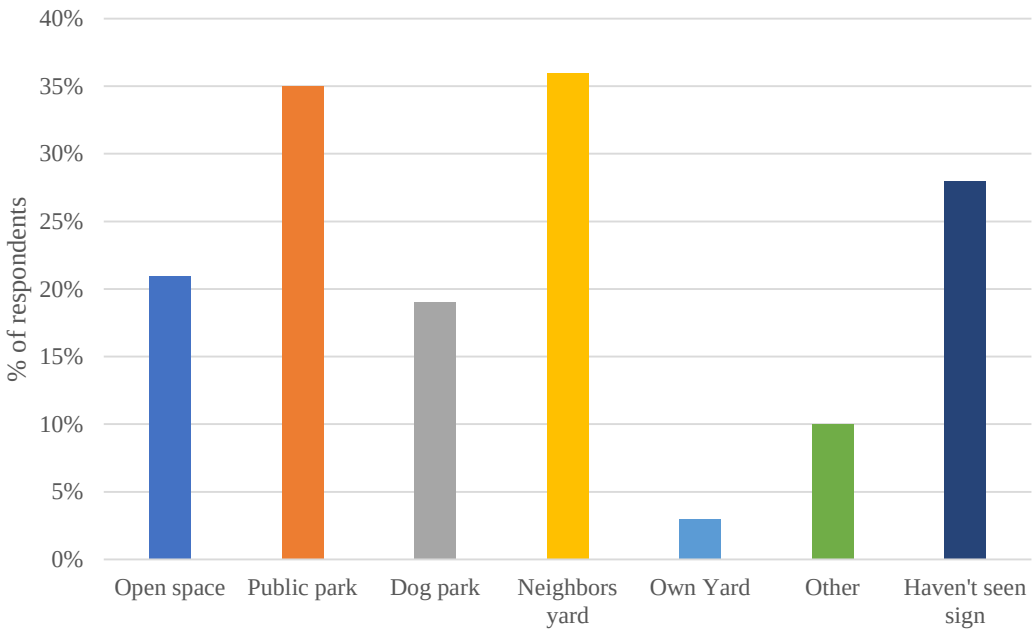

***Figure 4*: Location(s) where respondents reported seeing a "There Is No Poop Fairy" sign, by % of respondents**

We noted that 30% of respondents said they had not seen the sign in Figure 10, while 28% said they had not seen it in Figure 11. To try to understand this discrepancy, we further analyzed the data for differences in the characteristics of respondents who reported seeing the sign as compared to those who had not seen it. We compared walking frequency, dog waste clean up frequency, gender, age, and location of where the survey was taken between the two groups (those who had seen the sign and those who had not seen the sign). The complete breakdown of results can be seen below in Tables 1 through 5.

When it comes to walking frequency (number of times per week) both samples had a similar progression from lowest frequency (one to three times per week) to highest frequency (ten plus times per week). The breakdown can be seen below in Table 1.

Table 1: ***Walking frequency for those who have and have not seen the sign***

Walking frequency (times per week)	**Not seen sign**	**Seen sign**
One to three	46%	35%
Four to six	19%	23%
Seven to nine	9%	13%
Ten plus	9%	7%

Gender did not appear to have much variation between the two groups, as shown in Table 2.

Table 2: ***Gender of those who have and have not seen the sign***

Gender	**Not seen sign**	**Seen sign**
Male	33%	35%
Female	62%	62%

Pick up frequency was also similar between the two groups, as shown in Table 3. Most respondents in both groups reported always picking up after their dogs when they pooped in a public space, with 77% of those who have seen the sign reporting that they

always pick up after their dog, and 66% of those who have not seen the sign reporting that they always pick up after their dog. Further analysis of pick up frequency as it relates to having seen the sign is described in the next section.

Table 3: ***Pick up frequency of those who have and have not seen the sign***

Pick up frequency	Not seen	Seen sign
1-Never	5%	2%
2-Rarely	2%	1%
3-Sometimes	12%	5%
4-Often	14%	14%
5-Always	66%	77%

Most of the respondents who had seen the sign fall into two age categories: 25-44 years and 45-64 years, each of which account for 33% of the population that had seen the sign. Eighteen to 24 years is the age category with the highest proportion of the sample that has not seen the sign (43%). Table 4 shows the breakdown of results related to age.

Table 4: ***Age of respondents who have and have not seen the sign***

Age	Not seen sign	Seen sign
18-24 years	43%	28%
25-44 years	29%	33%
45-64 years	19%	33%
65+ years	5%	4%

Most of the sample was surveyed at UNM. Thus, UNM was the location with the highest proportion of the sample that have and have not seen the sign, at 39% and 44 % respectively. Table 5 shows a breakdown of results related to survey location. See Table 5 for breakdown of all locations.

Table 5: ***Location of survey administration for those who have and have not seen the sign***

Location	Not seen sign	Seen sign
Bandelier Elementary	3%	13%
Bachechi Open Space	0%	3%
Central New Mexico Community College	26%	15%
Doggie Dash & Dawdle	19%	21%
Hyder Park	0%	2%
University of New Mexico	44%	39%
Valle De Oro National Wildlife Refuge	7%	9%

The results of this additional analysis suggest that those who walk their dogs infrequently and those in the 18-24 year age group have less exposure to the *There Is No Poop Fairy* sign. Outreach to younger populations could help to promote further success of the campaign. Since there was a notably higher percentage of respondents surveyed at CNM who had not seen the sign, sign placement at CNM could also be valuable. Since our survey did not include university or college campuses as a location option for seeing the sign (see Figure 11), it is unknown if signs are being placed in these locations and/or if people are seeing them.

4.6 Influence of Campaign

We also collected data on self-reported changes in behavior caused by seeing the *There Is No Poop Fairy* sign. When asked if seeing the *There Is No Poop Fairy* sign caused a change in pick up frequency, 37% of respondents reported that seeing the sign caused an increase in the frequency with which they picked up after their own dog as shown in Figure 12 below. The fact that a sizable portion of the sample changed its behavior due to the campaign demonstrates that the *There Is No Poop Fairy* campaign was a success. Eighteen percent reported no change in behavior because they already always picked up after their

dog. Over a quarter of the sample reported having not seen the sign, suggesting that there is still potential for increasing the campaign's positive effects.

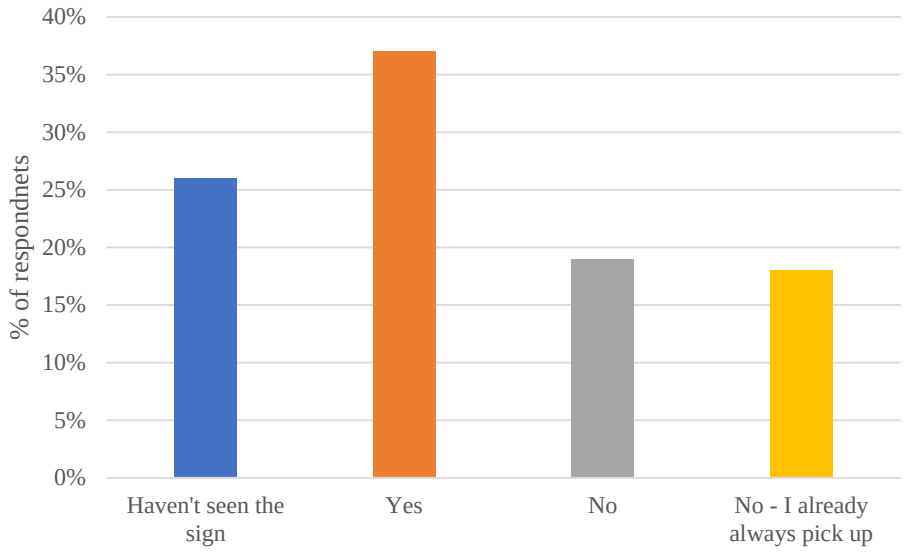

***Figure 5*: Self-reporting on whether or not seeing a There Is No Poop Fairy sign changed frequency of dog waste pick up, by % of respondents**

A further analysis of the data using R revealed that those who have seen the *There Is No Poop Fairy* sign reported a higher frequency of always picking up their dog's poop in public spaces than those who have not seen the sign. Those who have not seen the sign reported higher frequencies than those who had seen the sign of often, sometimes, rarely, and never picking up their dog's poop. The impact on dog waste pick up of having seen the *There Is No Poop Fairy* sign is shown in Figure 13, below.

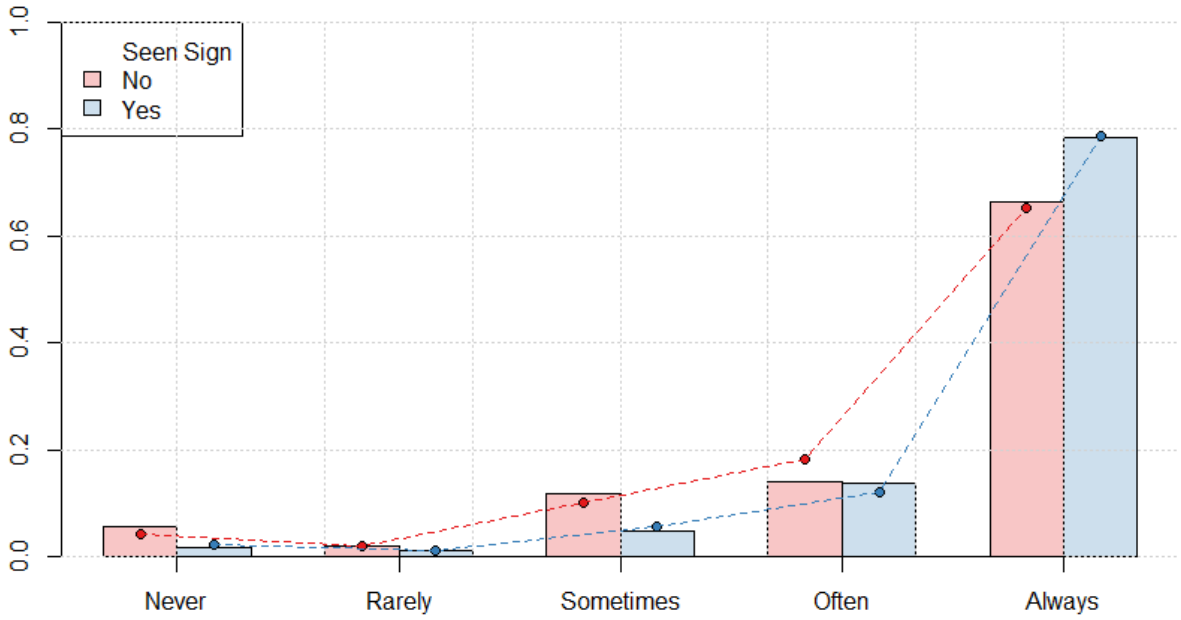

***Figure 6*: Impact on dog waste pick up of seeing the There Is No Poop Fairy sign; frequency of pick up by proportion of respondents**

4.7 Responsibility

We asked respondents for their opinions about the responsibility of the County, City, neighborhood associations, and dog owners for cleaning up dog waste in public spaces. The responsibility question used a Likert-type scale, with response options from 1 (not at all responsible) to 4 (completely responsible) for each entity. Most respondents indicated that dog owners were completely responsible for cleaning up after their dogs in public spaces. It was surprising that over 40% of respondents felt that the County, City, and neighborhood associations were “somewhat responsible” for cleaning up dog waste, and that an average of

about 10% of respondents felt that these entities were “mostly” or “completely” responsible for cleanup. These results are shown below in Figure 14.

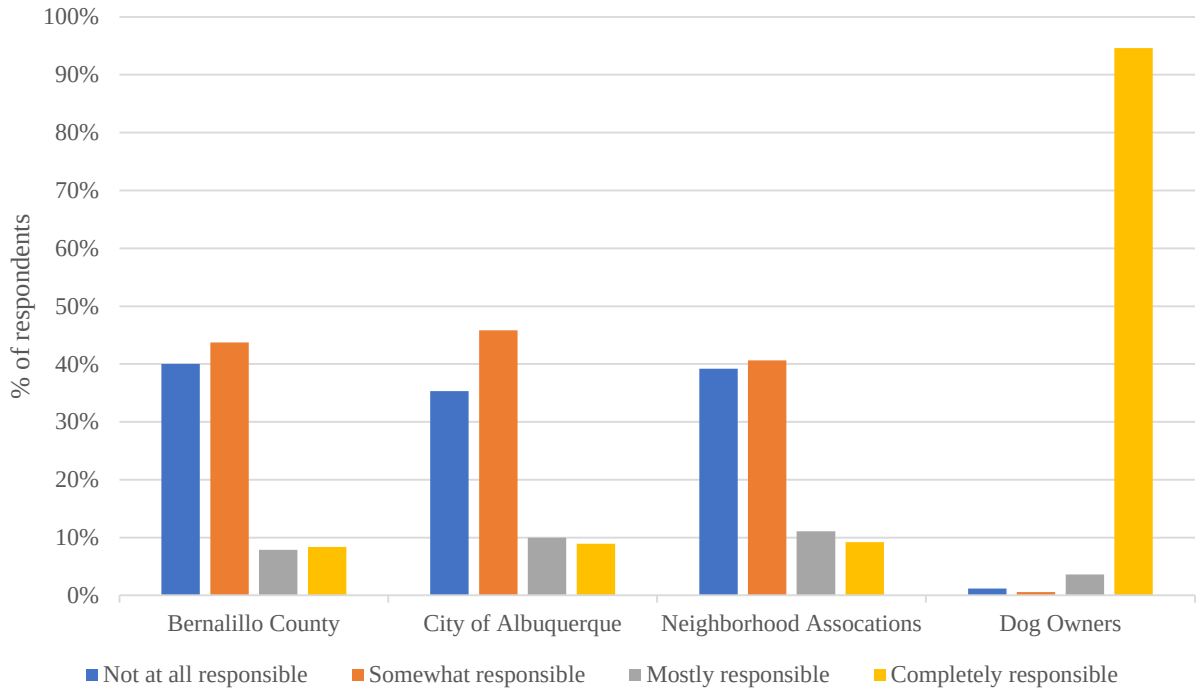

***Figure 7*: Responsibility of dog waste left behind in public spaces, 4-point scale**

4.8 Acceptability

Respondents were asked to indicate how acceptable they felt it was to leave dog waste behind in various areas (open space, public parks, dog parks, around their neighborhood, and in their home or yard). The response options used a Likert-type scale from 1 (totally acceptable) to 4 (not at all acceptable). As shown in Figure 15, most respondents felt it was “totally unacceptable” for dog owners to leave dog poop behind in all spaces, except for in the dog owners’ home or yard. There was clearly a difference in thinking about acceptability when it came to public versus private spaces. Public spaces such as parks and neighborhoods rated lowest for acceptability. Compared to other public spaces, open space

rated highest in acceptability, possibly due to the misconception of dog poop being natural (Pemberton, 2017). Public parks may have had the highest level of unacceptability due to the varied uses of public parks. A much higher number of respondents felt that it is perfectly acceptable to leave dog poop behind in their home or yards compared to the other locations. This result may indicate that people believe the need to pick up dog waste is more about protecting other public space users (i.e., altruism; not wanting someone else to step in dog poop) than about protecting the environment, since stormwater runoff can equally affect public and private spaces. There may be a lack of knowledge about the risk of disease transferred by dog waste, as discussed by Overgaauw et al. (2009). Also, as noted in the literature, policy mostly addresses behavior of a dog in the public sphere rather than in private spaces (Borthwick, 2009; Carter, 2016; Degeling et al., 2016; M. Rock, 2013; M. J. Rock et al., 2016; Rohlf et al., 2010).

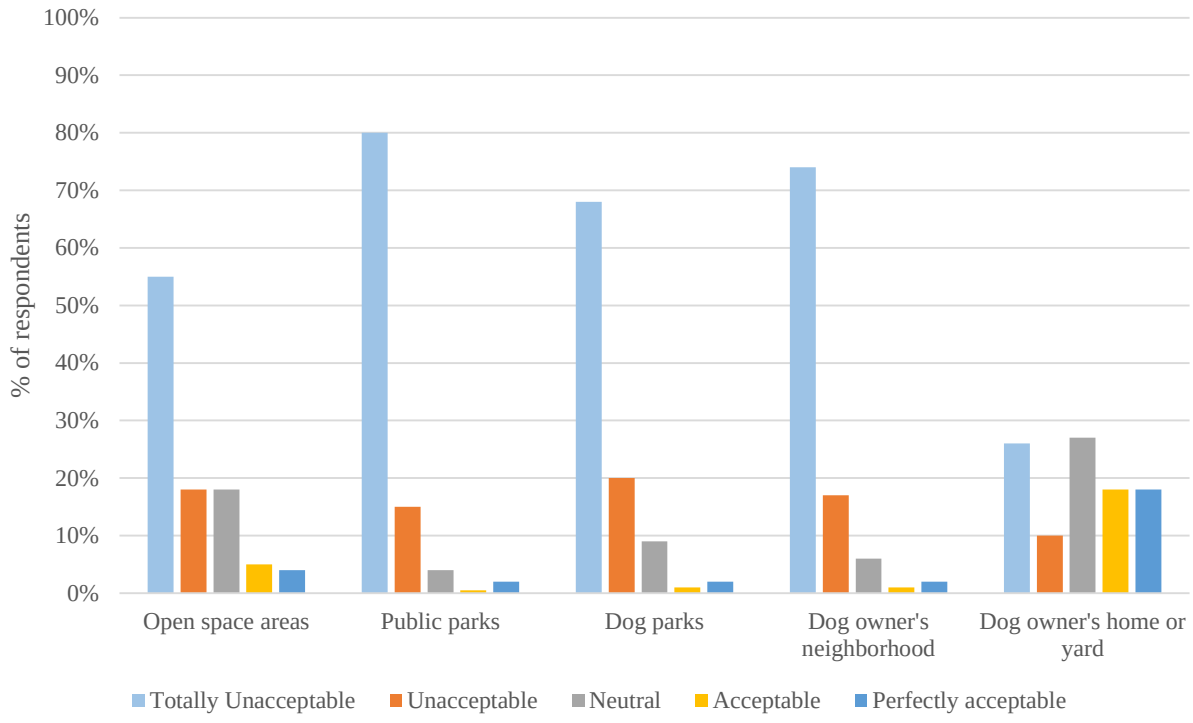

***Figure 15*: Acceptability of dog poop in public spaces and the dog owner's home/yard, 5-point scale**

4.9 Dog Waste and the Environment

Respondents reported their levels of concern for environmental pollution on a Likert-type scale from 1 (not at all concerned) to 5 (extremely concerned). As shown in Figure 16, nearly half (48%) of the respondents indicated that they were "extremely concerned" about environmental pollution. Over 80% of respondents were at least "moderately" concerned. The fact that the sample indicated a high level of concern for environmental pollution may at least partly explain the success of the *There Is No Poop Fairy* campaign, as discussed for Figure 16 below.

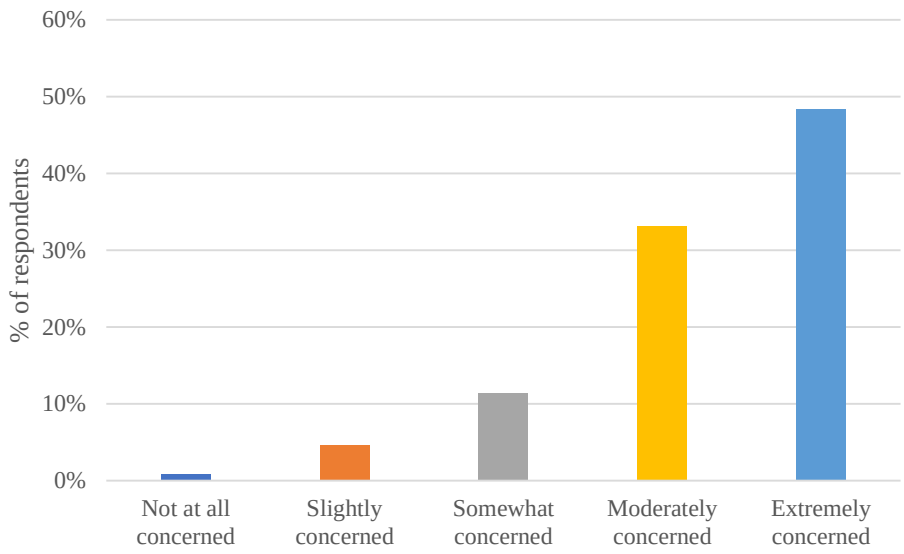

***Figure 16*: Level of environmental concern for environmental pollution, 5-point scale**

Further analysis using R examined the effect of environmental concern on pick up frequency. Results show that those who reported extreme environmental concern were more likely to report always picking up after their dog in a public space. Those reporting the lower levels of concern had higher frequencies for picking up often, sometimes, rarely, and never. The relationship is shown below in Figure 17.

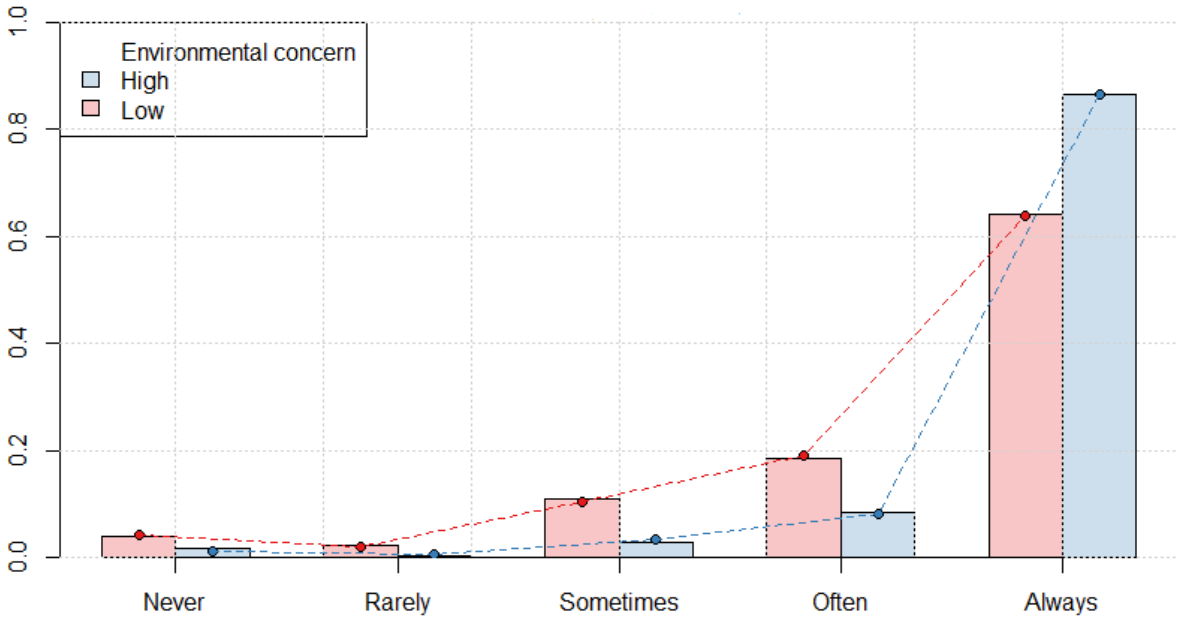

***Figure 17*: Effect of level of environmental concern on pick-up frequency; frequency of pick up by proportion of respondents**

Next, we asked dog owners to indicate their level of agreement with the following statement: “Dog poop has a negative effect on storm water and water quality in the Rio Grande”. The response options were based on a modified Likert-type scale, which included 1 to indicate “I don’t know”, and 2 through 5 to indicate strong disagreement to strong agreement. As shown in Figure 18, most respondents strongly agreed with the statement (45%), 30% agreed with the statement, and 17% reported “I don’t know”. Fewer than 4% of respondents selected each of the disagreement options. Education on the effects of dog waste on storm water and water quality in the Rio Grande could be useful in future campaigns done by Bernalillo County to address the approximately 24% of respondents who either did not

know or did not believe that dog waste can have a negative effect on water quality. Also, it is interesting to compare this 24% of respondents with the approximately 63% of respondents who found it “acceptable” or “perfectly acceptable” or were “neutral” regarding dog owners not cleaning up dog waste in their own yard. Clearly, there are additional education needs in this area.

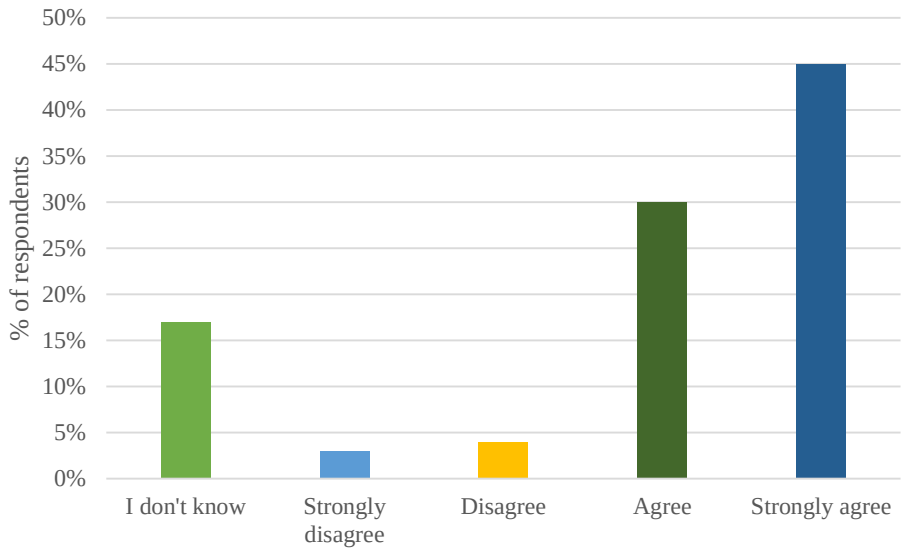

***Figure 18*: Level of agreement of the following statement: “Dog poop has a negative effect on storm water and water quality in the Rio Grande”, 5-point scale**

4.10 Demographic Information

The last few questions of the survey asked about basic demographic information. Most survey respondents had at least some college education. This result likely occurred because several of the locations for survey administration were institutions of higher learning. Figure 19 below shows a complete breakdown of respondents’ education levels.

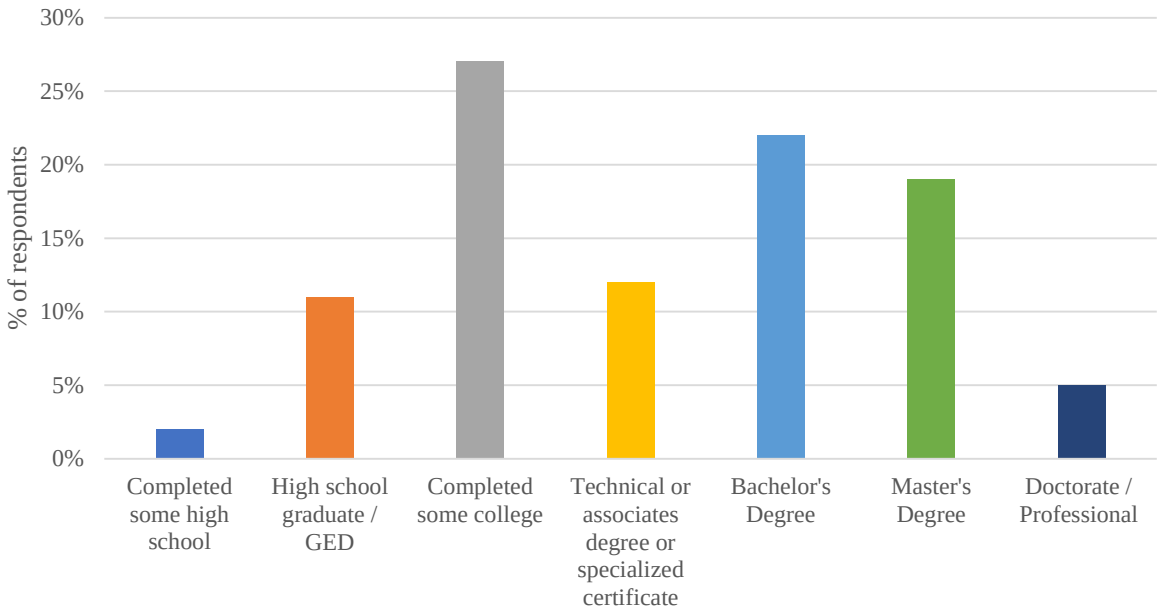

***Figure 19*: Education levels, by % of respondents**

When compared to Bernalillo County, the sample is more educated than the overall population. A complete breakdown of how the two compare can be seen below in Figure 20.

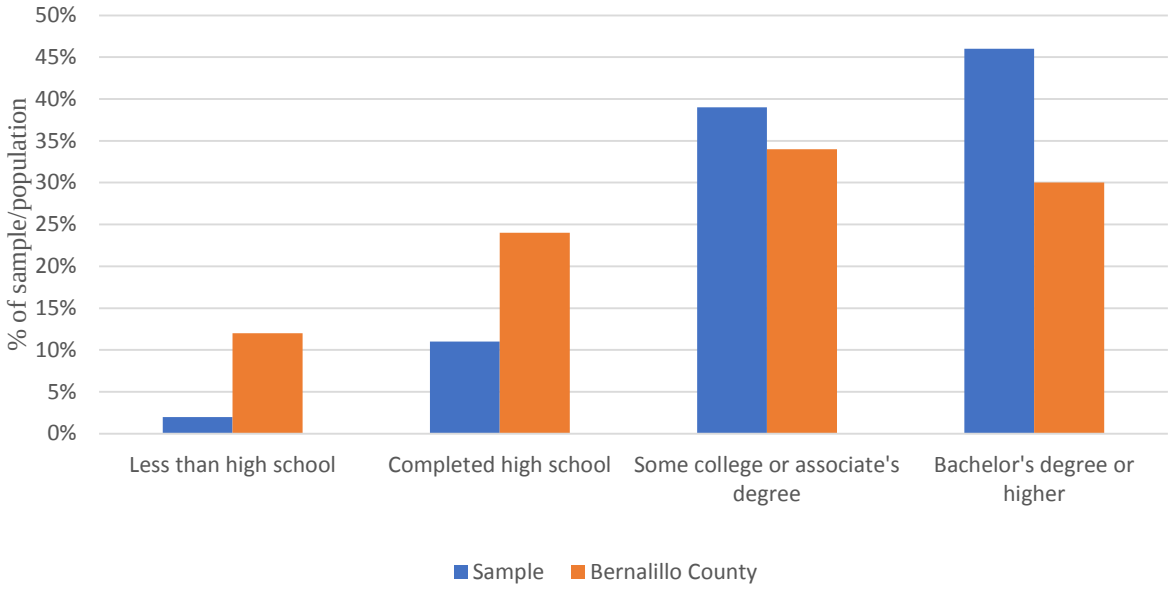

***Figure 20*: Education level of survey sample data compared with Bernalillo County data (2013-2017 American Community Survey (ACS) Estimates)**

About a third of respondents fell into each of the first two age groups (18-24 years and 25-44 years), while there were slightly fewer in the 45-64 year age group, and less than 5% in the 65+ years category. The age data are displayed in Figure 21. Females made up 61% of the sample.

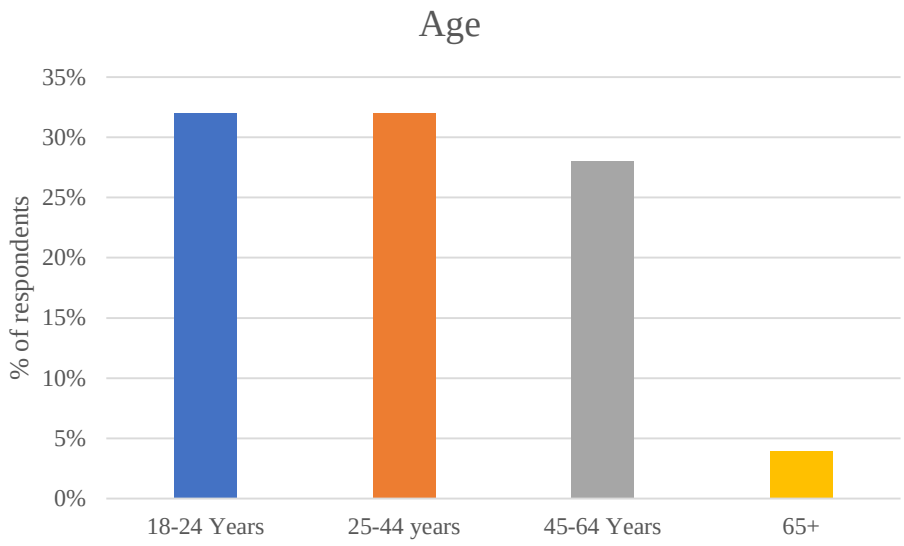

***Figure 21*: Age categories, by % of respondents**

4.11 Was the Campaign Successful?

This study had numerous limitations, as discussed in the next section. However, one could argue that the data offer numerous ways to gauge the success of the poop fairy campaign:

Reach: 69% of dog owners who took the survey have seen a *There Is No Poop Fairy* sign. This suggests that a large portion of other local dog owners may have also seen the sign.

Influence: Dog owners reported a change in behavior after seeing the sign (an increase in pick up frequency), though we acknowledge that self-reported data is imperfect.

Statistically significant relationships: The demonstrated positive relationship between having seen the sign and pick up frequency is statistically significant, indicating that seeing the sign has an impact on self-reported pick up frequency.

Environmental change: The reclassification of impairment of the Rio Grande for *E. coli* during the timeframe of the campaign suggests that the campaign may have had a positive influence on pollution levels.

4.12 Limitations

Most respondents were recruited from higher education campuses, specifically, the University of New Mexico and Central New Mexico Community College. This may have contributed to the high levels of education found in the sample.

The Doggie Dash and Dawdle is a 5k run/walk in which dog owners are encouraged to bring their dogs to participate. The sample at this event may have had high rates of self-reported weekly dog walking and may have contributed to an overrepresentation of active dog owners.

Other events included the VDO Build Your Refuge Day, and the 20th anniversary of Bachechi Open Space. Although a small portion of the sample came from these events, they may have contributed to a sample that is highly environmentally concerned.

As discussed by Dillman et al., 2014 there may be biases when respondents are filling out a survey. Respondents may be responding in such a way to appease “perceived societal norms” pg.7 and may answer questions in such a way to better align themselves with the norms of the survey administrator. The survey administrator for the *Have You Seen The Poop Fairy?* project was directed to mitigate discussion until after respondents completed the survey as to limit influence over their answer choices.

Sample does not represent less educated persons or elderly 65+ years of age. It could be that dog owners with those characteristics vary in pick up frequency and other dog care habits.

As discussed by Ortega and De La Rocha (2018), people typically pay more attention to things that are important to them (i.e. dog waste in public spaces); this is known as selective attention. Selective attention is used as the brain can only take in so much new information, thus only selecting the information that is deemed important by the observer. People also tend to ignore new information that conflicts with their existing behavior patterns and world view. For example, those who already always pick up after their dogs my more easily notice a sign like the *There Is No Poop Fairy* sign which reinforces their beliefs; this is otherwise known as a confirmation bias. Similarly, those who do not pick up after their dogs may not notice *There Is No Poop Fairy* signs as it does not fit into their worldview; or simply is not on their radar.

5.0 Conclusions

This thesis aims to understand the success of the *There Is No Poop Fairy* campaign through a review of the literature and a survey of local dog owners. The literature included several aspects of dog ownership including physical and mental health benefits of owning a dog, adherence to responsible ownership practices (dog walking, dog waste cleanup in public spaces, dog leashing in public spaces), and policies related to dogs and dog ownership. The survey was developed based on the findings reported in the literature. With a series of 20 questions, the survey attempted to measure the reach and influence of the *There Is No Poop Fairy* campaign, environmental awareness, and public opinion on the effect dog waste has on stormwater and water quality in the Rio Grande. This study contributes significantly to the existing body of literature by measuring the success of the *There Is No Poop Fairy* campaign (a voluntary public health campaign) and is one of the first to do so.

We built upon the existing literature describing dog owners as an informal network for building social capital, suggesting that social capital may explain part of the effectiveness of the campaign. Campaign participation was voluntary and heavily relied on the network of dog-owners for its success. This is evident in the fact that most signs were seen in a neighbor's yard or other public spaces. We also found that the dog owners were fairly active and walked their dogs several times per week. As discussed in the literature and results, dog owners may be getting physical activity done as a secondary effect of walking their dogs.

Bernalillo County tapped into this informal network of dog owners using environmental protection, reciprocity, and altruism as motivators to clean up dog waste. As discussed by Putnam (1993), reciprocity and altruism are greater motivators than institutional enforcement. By activating the informal network of dog owners and encouraging the spread

of the *There Is No Poop Fairy* campaign, Bernalillo County attempted to unite the community on a common issue: dog waste. Our study may be one of the first to examine pick up rates of other peoples dogs, as we were unable to find any literature exploring this topic. Our findings of dog owners picking up after dogs that were not theirs reinforces the idea of dog ownership as a driver of social capital.

The short and simple message provided by the *There Is No Poop Fairy* campaign may have also contributed to its success. As stated by Carter (2016), campaigns with a short and simple message are more likely to have a lasting effect on the targeted behavior and population. As demonstrated in the results, high environmental awareness also likely contributed to the campaign's success. This study also contributes to the measurement of effectiveness of policy used to govern pets and their owners which Carter (2016) states is rarely studied.

The responses to the responsibility question demonstrate that dog owners are aware that they are responsible for dog waste in public spaces. The data tell us that targeting responsible dog owners has potential to have the greatest improvement i.e.: they already believe themselves to be responsible and only need to have behavior reinforced.

There is still work to be done when considering dog waste in private spaces; owners may not be aware of the risks of disease or that storm water can carry pollution from private and public spaces alike. As shown in the results of the survey, many respondents felt it to be totally acceptable to leave dog waste in their home or yard; especially when compared to public spaces. Tailored education campaigns can help dog-owners better understand these issues.

Regarding future research to potentially expand the success of the *There Is No Poop Fairy* campaign, zip codes for respondents who indicated that they had not seen the *There Is No Poop Fairy* sign could be examined to target those areas for signage and further education about health and environmental risks caused by dog waste in public and private spaces.

We also recommend an observational study in which off-leash and dog waste cleanup habits are observed and recorded. The results of the observation can be compared to the *Have You Seen the Poop Fairy?* Study. With the comparison of the data, the researcher can determine if self-reported behavior is congruent with actual behavior. Depending on the results, state entities can determine if more public outreach is needed and where to focus said outreach. If dog owners are not picking up after their dogs in public spaces, then the *There Is No Poop Fairy* campaign can still be used to educate dog owners to reinforce healthy clean up habits. If dog owners are picking up after their dogs, then perhaps a shift into education about dog waste at home is needed.

To help tailor the educational messages, the survey contained three open-ended questions that may contain valuable information. The first question asked dog owners whether or not they thought picking up dog poop in public spaces was important and why. The second question asked respondents about reasons why dog owners may leave dog poop behind in public spaces, and the third question asked owners why the campaign sign did or did not affect their behavior. Further analysis of these questions is needed to help determine factors that can strengthen the *There Is No Poop Fairy* campaign and promote higher pick up rates among dog owners.

6.0 Appendices

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Appendix A: Final Survey Instrument

Have you seen the Poop Fairy?

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This survey was created by researchers at the University of New Mexico and is funded by the National Science Foundation.

1. **How many dogs are in your household?**

   ☐ Dog(s)

2. **On average, how many times per week do you walk your dog(s)?** *Check one.*

   - ○ 0
   - ○ 1-3
   - ○ 4-6
   - ○ 7-9
   - ○ 10+

3. **What are the primary reasons you walk your dog?** *Check all that apply.*

   - ○ I don't walk my dog
   - ○ Exercise for me
   - ○ Exercise for my dog
   - ○ So I can socialize
   - ○ So my dog can socialize
   - ○ So my dog can pee or poop
   - ○ To explore my neighborhood
   - ○ To get fresh air
   - ○ Other _____

4. **Where does your dog commonly poop?** *Check all that apply.*

   - ○ Open space (e.g., hiking trails, Bosque)
   - ○ Public parks
   - ○ Dog parks
   - ○ Around my neighborhood
   - ○ My home or yard

5. How often do you pick up after your dog when it poops in a public space such as the Bosque, forests, public parks, dog parks, or around your neighborhood? *Please circle the appropriate number.*

1 Never	2 Rarely	3 Sometimes	4 Often	5 Always
1	2	3	4	5

6. Do you think it is important for dog owners to pick up their dogs' poop in public spaces? Why or why not? *Please write a short answer below.*

7. What are some barriers that dog owners face in picking up after their dog when it poops in a public space? *Please write a short answer below.*

8. Please circle the numbered response that best applies to you: *I pick up dog poop from other people's dogs.*

1 Never	2 Rarely	3 Sometimes	4 Often	5 Always
1	2	3	4	5

9. **If you have picked up dog poop from other people's dogs, where was it located?** *Check all that apply.*

- ○ I haven't picked up poop from other people's dogs
- ○ Open space (hiking trails, Bosque)
- ○ Public parks
- ○ Dog parks
- ○ Around my neighborhood
- ○ My home or yard

10. **Please check the response that best applies to you:** *When I walk my dog in a public space...*

- ○ I keep my dog on a leash the whole time
- ○ I keep my dog on a leash some of the time
- ○ I don't keep my dog on a leash
- ○ I don't walk my dog in public spaces
- ○ Other: _____

11. **Please circle the numbered response that best applies to you:** *I can see what my dog is doing when it is off leash in a public space and I would know if it pooped.*

1 Never	2 Rarely	3 Some-times	4 Often	5 Always	6 I don't allow my dog off leash in public spaces
1	2	3	4	5	6

12. Have you seen a *There is No Poop Fairy* sign? *Check one.*

- ○ Yes
- ○ No

13. Where did you see the *There is No Poop Fairy* sign? *Check all that apply.*

- ○ I haven't seen the sign
- ○ Open space (hiking trails, Bosque)
- ○ Public park
- ○ Dog park
- ○ In or near my neighborhood
- ○ I have one at my home
- ○ Other: _____

14. Has seeing the sign caused you to pick up your dog's poop more often? *Check one.*

- ○ I haven't seen the sign
- ○ Yes
- ○ No

15. If you answered yes or no to question 14, please explain why the sign has or hasn't caused you to pick up your dog's poop more often. *Please write a short answer below.*

16. Whose responsibility is it to clean up dog poop in public spaces such as the Bosque, public parks, dog parks, or around your neighborhood?
Please circle the appropriate number for each group/ entity.

	1 Not at all responsible	2 Somewhat responsible	3 Mostly responsible	4 Completely responsible
Bernalillo County	1	2	3	4
The City of Albuquerque	1	2	3	4
Neighbor-hood Associations	1	2	3	4
Dog Owners	1	2	3	4

This portion is intentionally left blank.

17. Please indicate how acceptable you feel it is for dog owners to leave dog poop behind in the following areas:
Please circle the appropriate number for each area.

	1 Totally unacceptable	2 Unacceptable	3 Neutral	4 Acceptable	5 Perfectly acceptable
Open space areas (Hiking trails, Bosque)	1	2	3	4	5
Public parks	1	2	3	4	5
Dog parks	1	2	3	4	5
Around their neighborhood	1	2	3	4	5
Their home or yard	1	2	3	4	5

18. Please circle the numbered response that best describes your level of concern for environmental pollution.

1 Not at all concerned	2 Slightly concerned	3 Somewhat concerned	4 Moderately concerned	5 Extremely concerned
1	2	3	4	5

19. Please circle the numbered response that best describes your level of agreement with the following statement: *Dog poop has a negative effect on storm water and water quality in the Rio Grande.*

1 I don't know	2 Strongly disagree	3 Disagree	4 Agree	5 Strongly agree
1	2	3	4	5

20. Do you have any concerns about dog or pet waste that have not been discussed here? If so, please describe them below.

About you and your household:

Please answer the following questions about you and your household so that we can understand how similar you are to other respondents and residents of Bernalillo County.

21. What zip code do you reside in?

22. What is your age?

- 18-24 years
- 25-44 years
- 45-64 years
- 65+ years

23. What is your gender? *Check one.*

- Male
- Female
- Other

24. What is your highest level of education completed? *Check one.*

- Completed some high school
- High school graduate / GED
- Completed some college
- Technical or Associate's degree or Specialized Certificate
- Bachelor's degree (BA, AB, BS)
- Master's degree (MA, MS, MBA)
- Doctorate / Professional degree (PhD, JD, EdD, MD, DDS)

Thank you for taking this survey!

For more information, please visit:
bernco.gov/poopfairy


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Appendix B: Process for creating bar plots in R

Below is the step by step process in R used to create the bar plots for figures 13 and 17.

```
> #Seen sign
> par(mar=c(5,4,5,2))
> bob <- brewer.pal(3, 'Set1')
> bars <- t(apply(table(x_sign, y), 1, function(x) x/sum(x)))
> barplot(bars, main='How often do you pick up after your dog when
+ it poops in a public space such as the Bosque,
+ forests, public parks, dog parks, or around your
+ neighborhood?', xlab="", ylab='Proportion',
+         ylim=c(0,1), col=adjustcolor(brewer.pal(3, 'Set1')[1:2], alpha.f=0.25),
+         legend = c('Seen Sign', rownames(bars)), font.main=3, beside=TRUE,
+         xaxt='n', args.legend=list(x='topleft', border=c('white', 'black', 'black'), fill=c(NA, adju
stcolor(bob, alpha.f=0.25))))
> grid()
> axis(1, seq(2, 14, by=3), c('Never', 'Rarely', 'Sometimes', 'Often', 'Always'))
> pars <- fit_seen_sign$coefficients
> x0 <- c(1, 4, 7, 10, 13) + .5
> x1 <- c(2, 5, 8, 11, 14) + .5
> gamma0 <- c(0, 1/(1+exp(-pars[1:4])), 1)
> points(x0, diff(gamma0), pch=21, bg=brewer.pal(3, 'Set1')[1])
> lines(x0, diff(gamma0), lty=2, col=brewer.pal(3, 'Set1')[1])
> gamma1 <- c(0, 1/(1+exp(-pars[1:4]+pars[5])), 1)
> points(x1, diff(gamma1), pch=21, bg=brewer.pal(3, 'Set1')[2])
> lines(x1, diff(gamma1), lty=2, col=brewer.pal(3, 'Set1')[2])
>
>
> #Environmental concern
> par(mar=c(5,4,5,2))
> bob <- brewer.pal(3, 'Set1')
> bars <- t(apply(table(x_env, y), 1, function(x) x/sum(x)))
> barplot(bars, main='How often do you pick up after your dog when
+         it poops in a public space such as the Bosque,
+         forests, public parks, dog parks, or around your
+         neighborhood?', xlab="", ylab='Proportion',
+         ylim=c(0,1), col=adjustcolor(brewer.pal(3, 'Set1')[1:2], alpha.f=0.25),
+         legend = c('Environmental concern', 'High', 'Low'), font.main=3, beside=TRUE,
+         xaxt='n', args.legend=list(x='topleft', border=c('white', 'black', 'black'), fill=c(NA, adju
stcolor(bob[c(2,1)], alpha.f=0.25))))
> grid()
> axis(1, seq(2, 14, by=3), c('Never', 'Rarely', 'Sometimes', 'Often', 'Always'))
> pars <- fit_env$coefficients
> x0 <- c(1, 4, 7, 10, 13) + .5
```

```
> x1 <- c(2, 5, 8, 11, 14) + .5
> gamma0 <- c(0, 1/(1+exp(-pars[1:4])), 1)
> points(x0, diff(gamma0), pch=21, bg=brewer.pal(3, 'Set1')[1])
> lines(x0, diff(gamma0), lty=2, col=brewer.pal(3, 'Set1')[1])
> gamma1 <- c(0, 1/(1+exp(-pars[1:4]+pars[5])), 1)
> points(x1, diff(gamma1), pch=21, bg=brewer.pal(3, 'Set1')[2])
> lines(x1, diff(gamma1), lty=2, col=brewer.pal(3, 'Set1')[2])
>
```

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