



Voluntary Public Campaigns to Benefit the Environment: Assessing the Effectiveness of the *There Is No Poop Fairy* Campaign

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Caroline E. Scruggs¹ , Sergio Lozoya¹, Kellin N. Rumsey¹,
Kali Bronson², and Patrick Chavez³

Abstract

The *There Is No Poop Fairy* campaign began in Albuquerque, New Mexico, in 2014 to encourage dog owners to pick up their dogs' waste so that it does not contaminate the Rio Grande through stormwater runoff. This research aimed to understand the success of the campaign using a survey of local dog owners. Results suggest that the campaign was successful based on its reach and influence on self-reported pickup frequency and showed that those who were aware of the campaign reported higher frequencies of dog waste pickup, greater environmental concern, and greater awareness about the effects of dog waste on stormwater quality.

Keywords

citizen participation, education, environment, governance, natural resources, public health

Abstract

La campaña *There Is No Poop Fairy* comenzó en Albuquerque, Nuevo México, en 2014 para alentar a los dueños de perros a recoger los desechos de sus perros para que no contamine el Río Grande a través de la escorrentía de aguas pluviales. Esta investigación tenía como objetivo entender el éxito de la campaña utilizando una encuesta de los dueños de perros locales. Los resultados sugieren que la campaña tuvo éxito en base a su alcance e influencia en la frecuencia de recogida auto informadas y mostraron que aquellos que estaban al tanto de la campaña reportaron mayores frecuencias de recogida de residuos caninas, mayor preocupación ambiental y mayor conciencia sobre los efectos de los desechos de perros en la calidad de las aguas pluviales.

Keywords

participación ciudadana, educación, medio ambiente, gobernación, recursos naturales, salud pública

Abstract

无粪便精灵”运动始于2014年新墨西哥州的阿尔伯克基地区，鼓励狗主人捡起他们的狗的粪便，以免它们通过雨水径流污染格兰德河。这项研究旨在通过进行对当地犬只主人的调查来了解该运动是否成功。结果表明，该运动基于自我报告的捡拾频率的影响力和社会影响而获得成功，并且研究报告表明那些了解该运动的人，捡拾狗粪的频率更高，对环境的关注更高，狗粪对雨水质量的影响的认知也更高。

Keywords

公民参与；教育；环境；治理；自然资源；公共卫生

Introduction

Background

In the arid southwestern United States, drought and maintenance of adequate water quality and quantity for human and ecosystem needs are ongoing concerns (Brookshire, Gupta, and Matthews 2012). The City of Albuquerque, in Bernalillo County, New Mexico, relies on the Rio Grande as a major water source for drinking, agriculture, business, industry, and recreation. As a strategy for keeping it clean and healthy,

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¹The University of New Mexico, Albuquerque, NM, USA

²Bernalillo County Natural Resource Services, Albuquerque, NM, USA

³Albuquerque Metropolitan Arroyo Flood Control Authority, Albuquerque, NM, USA

Corresponding Author:

Caroline E. Scruggs, Community and Regional Planning Department, School of Architecture and Planning, University of New Mexico, 2401 Central Ave., NE, MSC04 2530, Albuquerque, NM 87131-0001, USA.
Email: cscruggs@unm.edu

Bernalillo County initiated the *There Is No Poop Fairy* campaign in 2014 (Bernalillo County, n.d.). Other entities in the Middle Rio Grande, including the Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA), the City of Albuquerque, and the Stormwater Quality Team, have joined the County in adopting the campaign.

The *There Is No Poop Fairy* campaign originated in 2011 in Greenville County, South Carolina. Since then, the campaign's mascot and slogan have been used with permission by a growing number of communities across the United States (Kraker 2019). The *There Is No Poop Fairy* campaign uses a short and simple message in an attempt to motivate dog owners to pick up after their dogs. Bernalillo County's goal with the campaign was to inform dog owners about the impact of their dogs' waste on the environment, specifically that uncollected dog waste can be transported by storm water into the Rio Grande where it causes water contamination and subsequent transmission of bacteria and disease.

The campaign message is primarily spread via a sign, approximately twenty-four by thirty inches in size, that is staked into the ground in public and private spaces throughout the community. The front side of the sign includes the campaign's message: "There is no poop fairy! Scoop the poop; grab it; bag it; toss it in the trash." It also displays websites where people can find more information (www.cabq.gov and www.keeptheriogrande.org). The back side of the sign provides answers to the question: "Why scoop the poop?" It explains that by law, dog owners are responsible for cleaning up their dog's waste, pet waste can spread diseases, and dog poop left on the ground can be carried by stormwater to pollute the Rio Grande. The sign is shown in Figure S1 in Supplemental Materials.

The County distributes 600 to 700 *There Is No Poop Fairy* campaign signs per year. Some are installed by county departments in parks and medians where dog waste is a particular problem, while others are requested by residents. To reinforce the message about picking up pet waste, the County, City, Stormwater Quality Team, and AMAFCA have parallel programming, such as educational cards that are distributed at community events, hung on doors in neighborhoods where the County receives complaints about dog waste, and sent home with new pets from animal shelters (see examples, Figure S2 in Supplemental Materials, http://www.keeptheriogrand.org/wp-content/uploads/2018/07/Poop-Fairy-Rack-Card_FINAL-04262018.pdf, http://www.keeptheriogrand.org/wp-content/uploads/2018/07/New-Pet-Rack-Card_FINAL-04262018.pdf, and www.Keeptheriogrande.org). Some community events target adults (e.g., a 5K run with pets), while others target children and youth (e.g., classroom projects, field trips, and a moveable kiosk that is loaned to libraries) with the expectation that students will help to educate the adults in their lives. The County places educational messages in neighborhood association newsletters approximately once per year and is currently expanding its messaging to social media platforms. Also, the City and

AMAFCA erect pet waste stations, which include a supply of pet waste bags and a trash can, along trails and in parks. Additional stations are erected for residents who request and agree to sponsor them. Although none of the entities involved have studied the efficacy of providing free pet waste bags, the County and Stormwater Quality Team provide free dog waste bag dispensers and bags at community events, and free bags are provided at many open spaces, parks, and community centers.

Historically, concentrations of the bacterium *Escherichia coli* (*E.coli*) in the Rio Grande have been high (Bernalillo County 2016, 2017; City of Albuquerque 2016), with 21.9 percent coming from dog waste (Parsons Water & Infrastructure 2005). The remaining 78.1 percent of the *E.coli* comes from birds, humans, non-avian wildlife, felines, and unknown sources (Parsons Water & Infrastructure 2005) (see Figure S3). Of the *E.coli* sources, dogs were targeted for control of their waste because they contribute a relatively large percentage and represent the only non-human source that is controllable (i.e., the other main contributors are wild or feral animals).

Recent studies conducted by the AMAFCA found a substantial decrease in the *E.coli* concentrations 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 (AMAFCA 2016). Furthermore, for a river segment similar to that studied by AMAFCA, the New Mexico Environment Department's (NMED) 303(d) report listed *E.coli* as an impairment in the Middle Rio Grande in 2014–2016, but it was removed as an impairment in the 2016–2018 303(d) report (NMED 2018). Since the *There Is No Poop Fairy* campaign was launched in 2014 and required a couple years to fully mobilize and form needed partnerships, and no explanations exist for decreases in other sources of *E. coli*, these observations have led county officials to ask whether the campaign may have contributed to improvements in water quality. Aside from what is described above, the authors are unaware of separate interventions by others in the Albuquerque metropolitan area to provide additional trash cans, dog waste pickup bags, or other materials or information that could represent potential sources of intervention contamination.

Objectives of This Research

The effectiveness of policy used to govern pets and their owners is rarely studied (Carter 2016), and rigorous research has not been conducted to understand the effectiveness of interventions that encourage dog waste cleanup (Atenstaedt and Jones 2011). To the authors' knowledge, scholars have yet to examine the effectiveness of the *There Is No Poop Fairy* campaign in motivating residents to clean up after their dogs. We conducted a community survey with the goal of better understanding the effectiveness of the *There Is No Poop Fairy* campaign. The survey also

examined dog-ownership practices, dog owners' feelings of responsibility for picking up their dogs' waste, and related topics. Our focus was on the major urban center of Albuquerque, New Mexico, located within Bernalillo County, because the *There Is No Poop Fairy* campaign was introduced fairly recently, there was a documented decrease in *E. coli* concentrations in the Rio Grande since the campaign was initiated, and dog ownership in the state is common (39.4% of New Mexican households owned at least one dog in 2016 compared with the national average of 38.4%; American Veterinary Medical Association 2018).

Research Questions

Our primary research questions dealt with campaign effectiveness: Was the Poop Fairy campaign visible to the community and did it influence dog owners' self-reported pickup frequency of dog waste? Did respondents understand that not picking up dog waste could negatively influence water quality in the Rio Grande? We asked a number of supplemental questions that allowed for comparison of our study respondents with others in the literature and delved deeper into questions of responsibility for dog waste pickup. We asked questions regarding how often participants walked their dogs and why; placement of these simple questions at the survey's start also served to ease participants into answering questions before coming to the possibly more provocative questions about dog waste. In addition, we asked questions about responsibility for dog waste pickup (to understand who people thought should be picking up the waste if not them), leashing of dogs (to see if a dog being on or off leash influenced respondents' thinking about responsibility for pickup), and acceptability of leaving dog waste behind.

We formed the following hypotheses related to our primary research questions. Based on the County's observation of a decrease in *E. coli* in the river and our own observations of numerous campaign signs around the city, we hypothesized that the campaign was visible to the community and effective in motivating dog owners to pick up after their dogs. Regarding the campaign's effectiveness in helping residents understand the connection between not picking up dog waste and deterioration of water quality, we hypothesized that it was not effective based on our own experience in seeing the campaign signs, which are usually positioned such that most people would see the side with the image of the fairy and not the reasons to pick up.

Previous Research that Informed Our Study

Pet dogs play an important role in society: they provide companionship, encourage physical activity, influence the use and perception of public spaces, and affect the accumulation of social capital. We examined these topics, along with the

factors that influence dog-owner behavior and policy related to dog ownership, to guide our research and the design of our survey.

Dogs and 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, 19).

Both formal and informal networks are important in building social capital, which can have benefits for 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 cleanup stations stocked with plastic bags.

Degeling et al. (2016) found that dog ownership facilitated the exchange of favors among neighbors and family members concerning dog care, which promoted well-being among all those involved. Similarly, Wood, Giles-Corti, and Bulsara (2005) showed that pet ownership increased the likelihood of getting to know one's neighbor and the exchange of favors. Also, pet owners were more likely than non-pet owners to participate in civic engagement, which is an indicator of social capital (Wood, Giles-Corti, and Bulsara 2005). Additional research on dog owners in the United States and Australia showed a higher level of social capital among pet owners compared with non-pet owners, and found that the presence of dog walkers in a neighborhood promoted feelings of safety and surveillance among neighborhood residents (Urbanik and Morgan 2013; Wood et al. 2017), suggesting that dog walking can have a positive effect on those outside the informal dog-owner network. Furthermore, social capital can be built when dog owners take their dogs to spend time in public spaces because there is an increased chance of social interactions, which can promote strong social ties (Jackson 2010) and an increased sense of community (Toohey et al. 2013). However, Graham and Glover (2014) found that the benefits of such social interactions were not equally distributed among participants. A dog owner's opportunity for social benefit was influenced in part by others' perceptions of their dog's breed and behavior and how the owner managed the dog's behavior (Graham and Glover 2014).

Social capital and institutional enforcement provide two different means of maintaining social order (Putnam 2001b). Social capital promotes enforcement of "informal contracts" (Putnam 2001b, 8), such as picking up after one's dog, and informal networks have a way of policing themselves through reciprocity and altruism (Putnam 1993, 2001b). In the case of dog owners, cleaning up after their dogs benefits all users of a public space, with the expectation that all dog

owners participate in cleaning up their own dog's waste. Reciprocity and altruism work in favor of the continued allowance of dogs in public areas: 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. Graham and Glover (2014) described how dog owners who did not conform to a set of expectations around responsible dog ownership were ostracized by other users of dog parks.

The type of social capital that is built through dog ownership depends on the characteristics of the dog-ownership practices. Degeling et al. (2016, 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. Other undesirable behavior, including excessive or loud barking, dogs escaping from their homes, or a yard littered with dog feces, can also lead to a decrease in social capital (Degeling et al. 2016).

Dog Parks and Dogs in Public Parks

While dogs and dog walking can bring benefits to individuals and society, dog waste is a topic that can create divisions within a community. Research has shown dog waste to be a critical issue in community debates on creation of dog parks and the acceptability of dogs in public parks. For example, a Kansas City community campaigned for an off-leash neighborhood dog park, but other residents and the city council blocked the plan, identifying sanitation issues as a major reason for opposition (Urbanik and Morgan 2013). As another example, a "dog war" in Burnley in Lancashire, England, began when dog walking was banned in public parks, in part because dog owners were said to not be cleaning up after their dogs (Pemberton 2017, 239). Toxocariasis, which is spread through dog feces, was presented by the media as a threat to children's health, causing fear among many park goers, though other residents objected to the ban because they felt that dog walking facilitated community interactions and reduced crime (Pemberton 2017). A case study of the Colonial Greenway dog park in Norfolk, Virginia, provided a positive example, with the authors concluding that a main reason for the park's success was dog owners managing their dogs' behavior and waste in a responsible manner (Gómez 2013).

Dog Waste in Private and Public Spaces

Hygiene related to dog waste is a central component of dog-related policy. Research has demonstrated the presence of zoonotic parasites in healthy domesticated dogs and that many owners do not pick up their dog's waste (Overgaauw et al. 2009). Dog owners often turn a blind eye to their dogs

defecating in public spaces, and differences can exist between a person's self-reported practices and actual practices related to picking up dog waste (Gross and Horta 2016). When owners do not pick up after their dogs, they have been shown to use one of two primary avoidance strategies: active non-knowledge (e.g., looking away while the dog defecates or looking at one's phone) or passive non-knowledge (e.g., "forgetfulness or indifference to poop") (Gross and Horta 2016, 153). Although the reasons for leaving dog waste behind can also be practical, such as not having a trash bin nearby, having witnesses to dogs defecating in public spaces can put social pressure on dog owners to pick up after their dogs (Gross and Horta 2016).

The fact that witnesses make dog owners more likely to pick up after their dogs is consistent with theories about how social norms affect pro-environmental behavior. Based on a review of the literature, Farrow, Grolleau, and Ibanez (2017, 3) state that "social norms appear to have a significant effect on a range of pro-environmental behaviors" for reasons including wanting to gain or maintain social approval or fit in. Thus, interventions relying on social norms can be effective in changing behavior. Especially relevant to dog waste pickup, people might "take the behavior of others as an indication of what is most effective, or they might expect reciprocity in exchange for their own conformity" (Farrow, Grolleau, and Ibanez 2017, 1). The responsibility of owners to pick up their dog's waste can be viewed as an unwritten rule or expectation that one must follow to avoid disapproval by other park or public space users. However, conditions for conformity may exist, such as having a witness to the dog defecating or availability of bags to use for cleanup. Furthermore, social norms do not necessarily apply to actions that are solely in the interest of the individual, that is, they usually rely on external enforcement of public action (Farrow, Grolleau, and Ibanez 2017).

In a study of factors influencing perception of public spaces, London residents referenced the presence of dog feces as influencing their perceptions, and many associated its presence with incivility. Some participants believed that the presence of dog waste demarcated parts of the city that were neglected by the state (Derges et al. 2012). The authors suggested that the feelings of incivility brought on by dog feces are linked to the state and its management of dog waste in the form of policy enforcement and creation of public awareness through educational programming.

Interventions for Pro-environmental Behavior

Jason and Zolik (1981) examined the effectiveness of two techniques designed to reduce the amount of dog waste left behind by dog owners in public spaces: (1) building a fence to prevent dogs from entering the area and (2) educating the owners about how to clean up after their dogs, that is, the methods and tools that should be used. The education method proved to be more successful, with 82 percent of owners who

underwent the training reporting that they subsequently picked up after their dogs, resulting in an 85 percent reduction of dog feces in the study area. The authors concluded that providing the public with education and information on this topic can be an effective way to modify behavior.

However, other research on interventions for pro-environmental behavior has concluded that education alone is not always sufficient to motivate behavior change because many other factors may be at play in addition to a lack of information. Abrahamse (2019) reviewed the literature on drivers of behavior and effectiveness of pro-environmental behavior change interventions and concluded that it is critical to understand factors such as people's values, beliefs, and motivations when framing a particular topic and advocating for behavior change. For example, beyond education about the topic, individuals' values and attitudes appear to be key to decreasing energy use and increasing sustainable food consumption, and people's habits and perceived ability to actually use different forms of transport affect their decisions about moving to more sustainable transportation options. While general information on a topic will likely result in no changes to behavior (or only among motivated people), a higher degree of success is possible when the information is framed with a specific focus and/or appeals to people's values or beliefs. Social modeling of behavior and social norms is seen as a generally effective contributor to behavior change as well (Abrahamse 2019).

Policy Related to Dogs and Their Owners

Dogs are considered to be the private property of humans and are governed as such (Borthwick 2009; Rock 2013). Over time, focus has shifted from regulating animal behavior to regulating human behavior, and policies rely heavily on self-enforcement (Borthwick 2009; Carter 2016; Degeling et al. 2016; Rock 2013; Rock et al. 2016; Rohlf et al. 2010). Rock (2013) suggested that bylaws governing pets are similar to smoking bans in that they are enacted to protect public health, use signage as a means of enforcement, rely on dominant social values, and are often self-policed.

A study by Carter (2016) sorted domestic animal management practices into two primary categories: education and enforcement. For effective public education, findings suggested that messaging should prioritize content over frequency of administration, and the educational content should be simple and concise to maximize long-term impact. Determining effectiveness of enforcement activities was more complicated because unwanted behavior such as dog barking can be difficult to classify as a nuisance due to people's differing tolerances (Carter 2016).

A study of responsible pet ownership bylaws showed a split among dog owners and non-dog owners when it came to leashing, with most of those in favor of leashing being non-dog owners (Rock 2013). The divide among residents on such issues makes it challenging for governing bodies to

establish dog-related policies because policy ultimately effects "the social status of pets, and quite literally, their place in urbanized societies" (Rock 2013, 208). A follow-up study examined the effectiveness of off-leash policies by performing a longitudinal study in four parks. Overall, the authors found no significant change in waste cleanup habits due to leashing policies, but emphasized that physical and social environments play a role in dog-owner behavior (Rock et al. 2016).

Method

We conducted a survey from September 2018 through January 2019 to better understand the effectiveness of Bernalillo County's *There Is No Poop Fairy* campaign and its influence on dog-owner behavior. Details are described below.

Subjects for Study

We required that survey participants were Bernalillo County residents, dog owners, and at least eighteen years of age. Potential participants were provided with a consent form explaining the purpose of the study and risks of participation, and they were asked to read the form and provide consent before proceeding with the survey. The survey research was approved by the University of New Mexico (UNM) Institutional Review Board (IRB).

Survey Design

Based on our research questions, the literature, and relevant local data, the survey was designed to collect various types of information from participants. The survey began with questions that asked about the participant's number of dogs in the household and the number of times per week the owner walked the dog(s) and why. These questions allowed us to compare our respondents with those from other studies and provided an easy entry into the survey. Questions related to our primary research questions were included throughout the survey, including questions about the frequency with which the owner picked up their dog's waste, if they have ever picked up after others' dogs, if they had seen the *There Is No Poop Fairy* campaign sign and where, and whether the sign had any effect on their pick-up frequency. We also asked whether participants believed that not picking up dog waste negatively affected the Rio Grande, and about their concern for environmental pollution in general. Other questions addressed attitudes toward dog waste in public spaces, various dog-ownership practices, acceptability of not picking up dog waste in public and private spaces, responsibility for picking up dog waste, and leash habits in public spaces. The survey concluded with a series of demographic questions.

Given the convenience nature of our survey, we designed it to be as quick and easy as possible for someone to complete.

Our survey question types included two fill-in-the-blank, four open-ended, and eleven multiple choice (with seven allowing for selection of a single answer category and four allowing for selection of multiple answer categories). We also used seven Likert-type scale questions, which are often used in public health and policy surveys, where respondents are asked to choose the response that best aligns with their beliefs or the frequency of their actions. For these questions, we usually used an ordered continuum of five responses. The design of the scale response anchors is consistent with those developed by Vagias (2006).

The survey was refined through feedback from UNM faculty and professional community members with expertise in survey design and stormwater pollution, followed by two rounds of pre-testing on eligible participants from the community. A total of twenty-five community members participated in pre-testing. During each pre-test, the researcher sat with the participant and asked them to think aloud as they took the survey. An interview about the survey and the participant's experience completing it followed each pre-test event. Feedback from the pre-testing was used to determine if questions were being interpreted as intended, the time required to take the survey, and if there were any problems with vocabulary, content, and structure (Dillman, Smyth, and Christian 2014; Thacher et al. 2011). The finalized survey instrument is shown in Figure S4. The survey was also translated into Spanish, although all survey respondents opted for the English version.

Survey Administration and Participant Recruitment

The survey administration used convenience and purposive sampling techniques (Etikan, Musa, and Alkassim 2016). It was administered at various sites throughout Bernalillo County, primarily in the Albuquerque metropolitan area, including 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 Valle de Oro Build Your Refuge Day and the 20th anniversary of the Bachechi Open Space), and the third was the Doggie Dash and Dawdle 5K run/walk in which runners were encouraged to participate with their dogs.

The survey was administered at a table, which was set up at each site and covered with a banner/tablecloth that displayed the survey participation criteria (see Figure S5). Participants were provided with the survey and a clipboard, which allowed for some privacy.

In exchange for taking the survey, each participant was offered one of several items. Example give-away items included windshield ice scrapers, rulers, hand sanitizer, doggie litter cleanup bags with carrying cases, and the "poop emoji" foam toy, which is a popular icon used in social media. The give-away items encouraged "social exchange"

to promote a higher response rate (Dillman, Smyth, and Christian 2014, 42).

Data Analysis

Regarding organization and analysis of the survey data, Excel was used to record and maintain the data and the open-source statistical software "R" was used to formulate all figures and tables. R was also used to conduct a variety of statistical tests for determining the relationship between categorical variables. In particular, we use Fisher's exact test a number of times, which is ideal for comparing two-category variables. In addition, we conducted several analyses using proportional log-odds cumulative link models, also called ordinal logistic regression (Bender and Grouven 1997). Ordinal logistic regression is designed for modeling a response variable that is ordinal in nature, like the Likert-type scale data found in this survey. All models were fit in R, using the "clm" function from the "ordinal" package.

Results and Discussion

Our survey had 502 respondents. About a third of respondents fell into each of two age groups (18–24 years and 25–44 years), while there were slightly fewer in the 45 to 64 year age group, and less than 5 percent in the 65+ years category. Females made up 61 percent of the sample. Most survey respondents had at least some college education, likely because several of the locations for survey administration were institutions of higher learning; the sample was more highly educated than the overall population of Bernalillo County (see Table S1 for a summary of demographic information).

Frequency of and Reasons for Dog Walking

Almost 50 percent of respondents had one dog in their household, 32 percent reported having two dogs, and having three or more dogs was far less common. Overall, respondents were fairly active with weekly dog walks: 38 percent of respondents walked one to three times, 22 percent walked four to six times, 12 percent walked their dog seven to nine times, 17 percent walked ten or more times, and about 10 percent never walked (see Table S2).

Survey respondents were instructed to choose "all that apply" from the nine options for reason/s why they walked their dog. The top responses were "exercise for my dog," "exercise for me," and "to get fresh air" (see Figure S6). Research has shown that dog ownership can promote physical activity (Toohey et al. 2013), which is supported by the results of this study (e.g., over half of respondents walked their dog at least four to six times per week). The findings regarding why owners walk their dogs are also in line with those of Gómez (2013), where exercise for the dog was the top reason for walking.

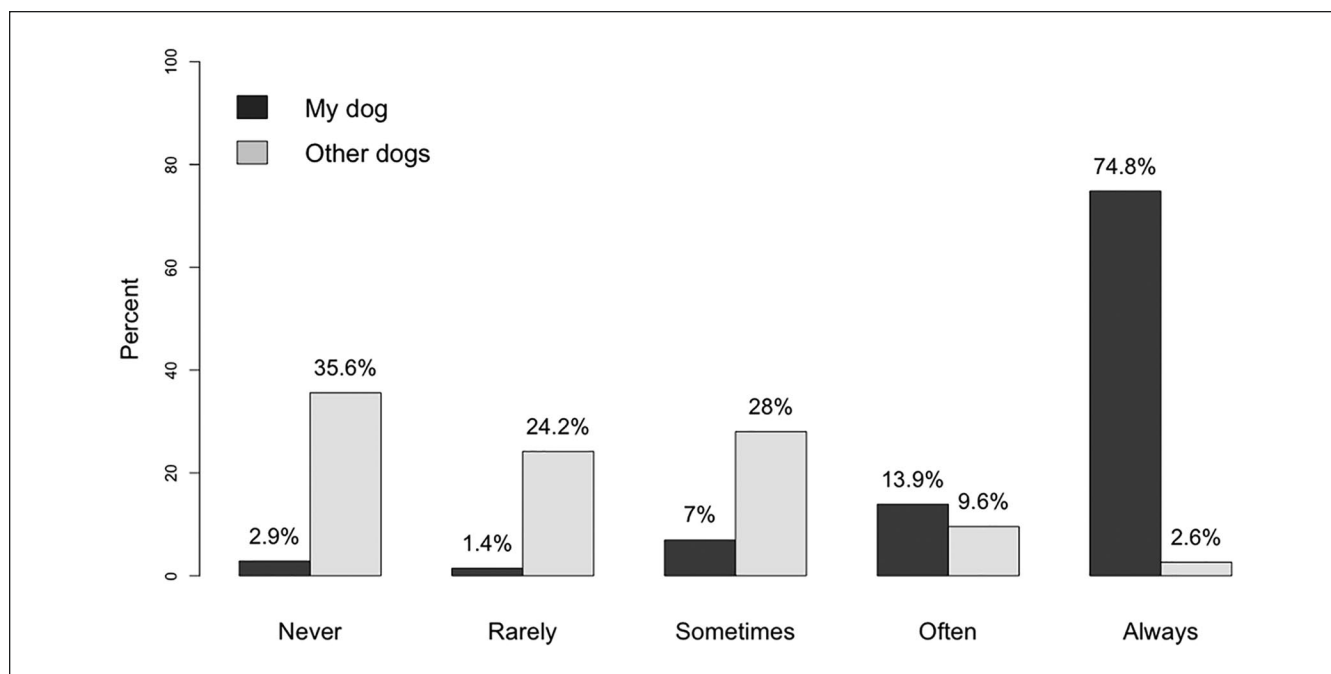


Figure 1. Frequency of picking up dog waste when in a public space, by percentage of respondents.

Cleanup Habits

We asked about the frequency with which dog owners picked up after their dog when it defecated in a public space. Respondents were asked to select the option on a five-point Likert-type scale from 1 (*never*) to 5 (*always*) that best described their pick-up frequency. As shown in Figure 1, most respondents reported always picking up after their dog when it defecated in a public space, 14 percent said that they “often” picked up, and options indicating less frequent pickup were less common. The high self-reported pickup frequency results are similar to those reported by Rock et al. (2016). Although few respondents in our study reported never picking up after their dog, it only takes a small amount of dog waste to change people’s perception of a public space (Derges et al. 2012). When asked about barriers to picking up dog waste, overwhelmingly the most popular answers were not having a dog waste pickup bag, followed by absence of trash receptacles. Figure S7 shows a full break down of responses.

When respondents were asked if they picked up waste from dogs that were not their own, Figure 1 also shows that 64 percent of the sample population reported some frequency of pickup other than “never.” In fact, a total of 40 percent selected “always,” “often,” or “sometimes.” In addition, we 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 percent of respondents at least sometimes picked up other dogs’ waste could be evidence of social capital. These dog owners might see themselves as an

informal group and take it upon themselves to enforce dog waste cleanup, even when it is not their dogs’ waste. This supports the idea that dog owners are a community built on reciprocity (Putnam 1993, 2001a, 2001b; Toohey and Rock 2015; Wood, Giles-Corti, and Bulsara 2005; Wood et al. 2017). The fact that the top two locations for cleaning up after others’ dogs are public spaces also suggests the existence of social capital, reciprocity, and altruism (Putnam 1993, 2001a, 2001b) among dog owners. Alternatively, dog waste littering public spaces has been shown to be a contentious issue within communities (Pemberton 2017; Urbanik and Morgan 2013), and one irresponsible dog owner can make all dog owners look bad. Thus, it is possible that some residents are picking up after others’ dogs to preserve the public space as a shared resource where they are welcome with their dogs.

Leash Habits

We asked dog owners about their leash habits when walking their dogs in public spaces. Dogs are typically required to be leashed in public spaces unless it is 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 given that the public perceives off-leash dogs as major contributors to dog waste in public spaces and a threat to public safety (Rock 2013; Rock et al. 2016).

Most study participants who walked their dogs in public spaces reported keeping their dog on a leash the whole time or some of the time (68% and 30%, respectively) when they are in public spaces (see Table S2). We also asked respondents

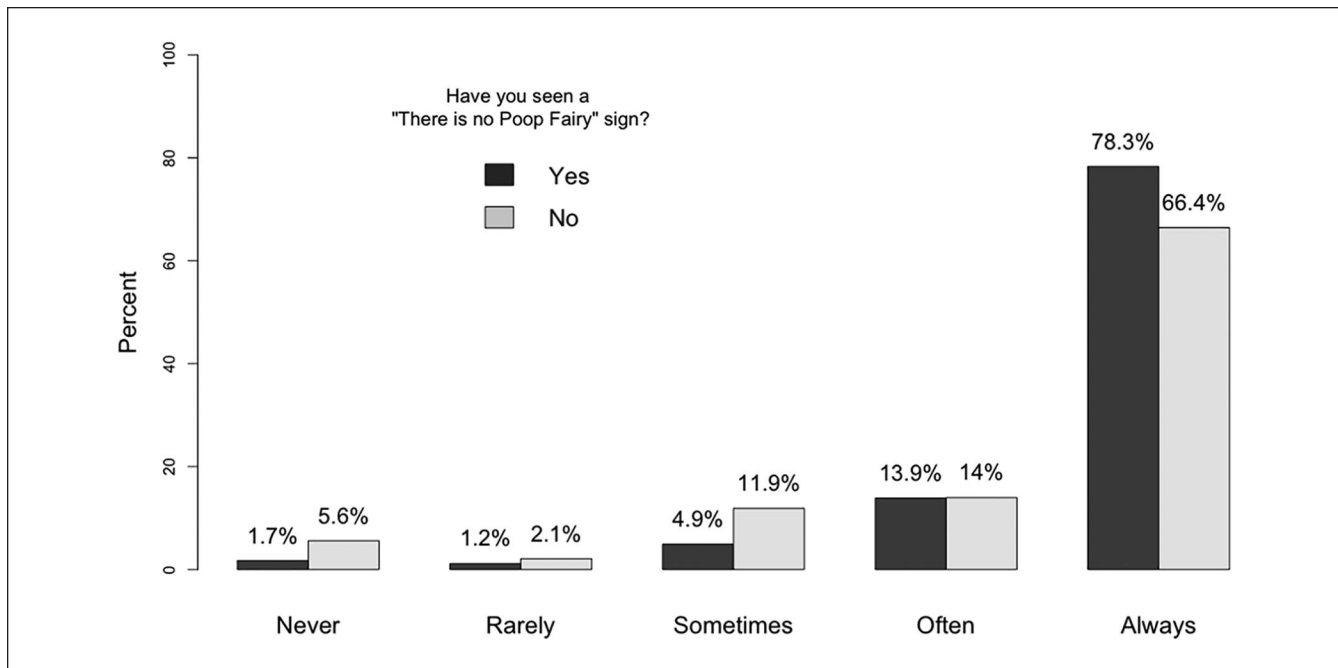


Figure 2. Response to the question: “How often do you pick up after your dog when it poops in a public space?”

about their awareness of their dog’s behavior when off leash, and most dog owners reported always being aware of when their dog defecated (off leash) or that they do not allow their dog to be off leash in public spaces (see Table S2). Our findings demonstrate 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).

Reach of the *There Is No Poop Fairy* Campaign

Seventy percent of respondents reported having seen a *There Is No Poop Fairy* sign, suggesting that the campaign has been fairly successful in reaching residents across the study area. Although we acknowledge potential biases in the survey data (discussed later), a 95 percent confidence interval (Clopper and Pearson 1934; Hollander and Wolfe 1973) suggests that between 65.7 and 73.9 percent of Bernalillo county residents have seen a *There Is No Poop Fairy* sign. Not surprisingly, there was a relationship between seeing the sign and the frequency of dog walks ($p = .088$; χ^2 test): 75.2 percent of the participants who reported walking their dog at least four times a week saw the sign, compared with 63.8 percent of participants who walked their dog less than four times a week. We also asked survey respondents to indicate where they had seen the sign, and they were allowed to choose multiple locations. The top four locations were in a neighbor’s yard (36%), a public park (35%), open space areas (21%), and dog parks (19%) (see Figure S8). 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 also where respondents said they picked up the most dog waste from dogs that were not their own.

Influence of the Campaign

For respondents who reported seeing a *There Is No Poop Fairy* sign, we collected data on self-reported changes in behavior: 50 percent of respondents reported that seeing the sign caused an increase in the frequency with which they picked up after their dog, 34 percent said that seeing the sign did not change their behavior because they already always picked up after their dog, and 16 percent reported no change in behavior (this includes the people who reported not walking their dogs) (see Figure S9). A sizable portion of the sample reported changes in their self-reported pickup frequency after seeing a sign, providing some evidence to suggest that the *There Is No Poop Fairy* campaign was effective in increasing self-reported pickup frequency. More detail about why the sign did or did not influence pickup frequency can be found in Figure S10. The top three reasons that respondents indicated for causing them to pick up more often were that the sign provides a reminder, it increases education and awareness, and it helps them understand that it’s their responsibility.

Further analysis of the data revealed that those who had seen the *There Is No Poop Fairy* sign reported a higher frequency of always picking up after their dogs in public spaces than those who had not seen the sign. Those who had not seen the sign reported higher frequencies of often, sometimes, rarely, and never picking up their dog’s waste as compared with those who had seen the sign. The impact on dog waste pickup of having seen the *There Is No Poop Fairy* sign

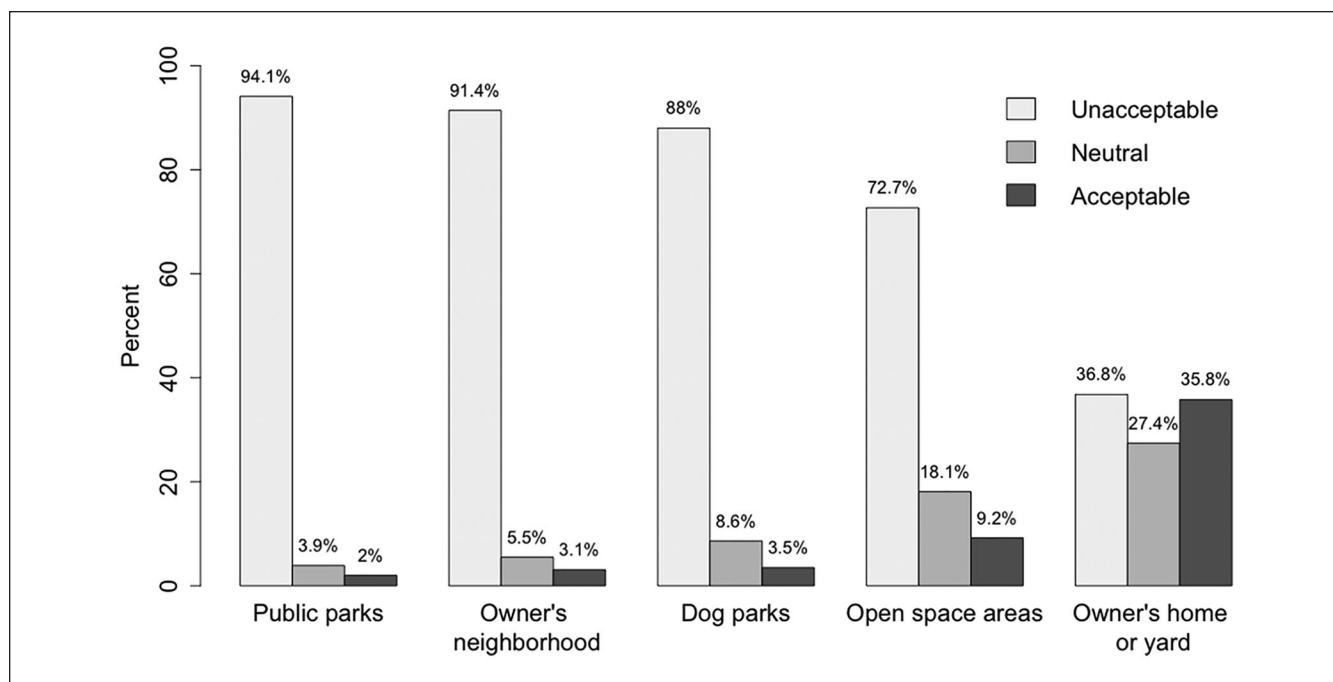


Figure 3. Response to the question: “How acceptable is it for a dog owner to leave poop behind in each of the following areas?”

Note: *Unacceptable* indicates a response of “totally unacceptable” or “unacceptable” and *Acceptable* indicates a response of “acceptable” or “perfectly acceptable.”

is shown in Figure 2. A similar result was observed for picking up other dogs’ waste, where those who had seen the sign reported higher frequencies of picking up, and those who had not seen the sign were more likely to report that they never picked up other dogs’ waste (Figure S11).

To support these findings more formally, the relationship between seeing a sign and pickup frequency was modeled with *ordinal logistic regression*. Our model indicates that individuals who saw the sign were more likely to pick up after their dog, with an estimated *odds ratio* of 1.97 (a value of 1 indicates no relationship) and a *p* value of .0018. After controlling for demographic factors including age, gender, and education level, the effect is reduced, but remains meaningful with an estimated odds ratio of 1.72 and a *p* value of .0195. Similar results were obtained for the frequency with which individuals picked up other dogs’ waste, with an estimated odds ratio of 1.86 and a *p* value of .0023.

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 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. Surprisingly, over 40 percent of respondents felt that the County, City, and neighborhood

associations were “somewhat responsible” for cleaning up dog waste, and almost 10 percent of respondents on average felt that these entities were “mostly” or “completely” responsible for cleanup (see Figure S12).

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 unacceptable*) to 5 (*perfectly acceptable*). As shown in Figure 3, most respondents felt it was “totally unacceptable” for dog owners to leave dog waste behind in all spaces, except for in the dog owners’ home or yard, indicating a clear difference in thinking about acceptability when it came to public versus private spaces. Public spaces such as parks and neighborhoods had the highest levels of unacceptability; public parks may have ranked highest due to their numerous and varied uses. Compared with other public spaces, open space was rated lowest for unacceptability, possibly due to the misconception that dog waste is natural and therefore harmless (Pemberton 2017). The fact that many more respondents found it perfectly acceptable to leave dog waste behind in their yards compared with the other locations is in line with the literature on social norms, which usually rely on visibility and external enforcement to influence a behavior such as waste pickup in public spaces. The results also might indicate that people believe the need to pick up

Table 1. Agreement with Statements Based on Having Seen (or Not) a Poop Fairy Sign.

	Has seen Poop Fairy sign (N = 351)		Has not seen Poop Fairy sign (N = 151)		p value ^a
	# responses	% yes	# responses	% yes	
I pick up my own dog's poop^b	346	92	143	80	.0003
I pick up other dogs' poop^b	346	14	147	8	.0969
I am concerned about the environment^c	344	87	149	75	.0022
Dog poop has a negative effect on water quality^d	344	81	149	65	.0002

^aSmall *p* values indicate statistical evidence of a relationship between "yes" responses and "seen sign" (using Fisher's exact test).

^bThose reporting "always" or "often."

^cThose reporting being "moderately" or "extremely" concerned.

^dThose reporting that they "agree" or "strongly agree" with the statement: "Dog poop has a negative effect on storm water and water quality in the Rio Grande."

dog waste is more about protecting other public space users (i.e., altruism; not wanting someone else to step in dog waste) than about protecting the environment, as stormwater runoff can equally affect public and private spaces. There might be a lack of knowledge about the risk of diseases spread by dog waste (Overgaauw et al. 2009), and policy mostly addresses behavior of dogs in the public sphere rather than in private spaces (Borthwick 2009; Carter 2016; Degeling et al. 2016; Rock 2013; Rock et al. 2016; Rohlf et al. 2010).

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 S13. Nearly half (49%) of the respondents indicated that they were "extremely" concerned about environmental pollution, with 83 percent of respondents indicating that they were at least "moderately" concerned. We modeled the pick-up frequency using environmental concern as a predictor, partitioning into low (moderately concerned and below) and high (extremely concerned), which lead to an estimated odds ratio of 3.14 and a *p* value of 5×10^{-6} , after controlling for demographic variables. This demonstrates that those reporting high environmental concern were more likely to report always or usually picking up after their dog in a public space, which is in line with research on support for other environmentally beneficial behaviors (e.g., U.S. Environmental Protection Agency [USEPA] 2012).

Surprisingly, we also found a relationship between environmental concern and awareness of the *There Is No Poop Fairy* campaign (see Table 1). It seems unlikely that observing a campaign sign would have a causal effect on one's concern for the environment. One explanation for this relationship is that environmentally concerned individuals are more likely to notice the campaign signs. Alternatively, there may be an unobserved confounding variable such as time spent outdoors, which can help explain this result.

Finally, this may be partially related to self-reporting bias, as discussed later.

In a similar vein, those who saw a campaign sign were more likely to agree with the 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: a response of 1 indicated *I don't know*, and 2 through 5 indicated *strong disagreement* to *strong agreement*. As shown in Figure S14, 46 percent respondents strongly agreed with the statement, 31 percent agreed with the statement, and 17 percent reported "I don't know." The effect of seeing a *There Is No Poop Fairy* sign was found to be meaningful, with an estimated odds ratio of 2.11 and a *p* value of .00013 after controlling for age and education. In addition to the explanations discussed above, it is possible that the campaign signs were at least partially effective as an educational tool about the negative impacts of dog waste on water quality. On the contrary, almost 36 percent of survey respondents did not believe that it is important to pick up dog waste in their own home or yard, indicating that they do not understand the link between dog waste and water quality. Of the 24 percent of respondents who either did not know or did not believe that dog waste can have a negative effect on water quality, 50 percent indicated that it was acceptable for dog owners to not clean up waste in their own yards, compared with just 31 percent of those who believed dog waste to have a negative effect on water quality (Fisher's exact test *p* value: .0019). Clearly, there are additional education needs on this topic, especially in future campaigns done by Bernalillo County to address the approximately 24 percent of respondents who either did not know or did not believe that dog waste can have a negative effect on water quality.

Summarizing: Who Is Picking up and Campaign Success

Tables S3 to S5 and Figure S15 discuss the percentages of respondents who "often" or "always" pick up after their dogs

based on demographic, dog-ownership-related, and environment-related variables. Regarding demographic variables, it appears that increased age and education are associated with higher pickup frequencies. Generally, pickup frequency also increased with the number of dog walks per week. A high number of weekly dog walks could lead to more positive interactions with others in the community, which has been shown to increase neighborhood social cohesion (Toohey and Rock 2011). There was a clear association between increased environmental concern and pickup frequency, and those who believed that dog poop had a negative effect on water quality had the highest pickup frequencies.

Almost 70 percent of participants reported seeing the *There Is No Poop Fairy* sign, and 50 percent reported that seeing the sign caused them to increase their pick-up frequency of their dog's waste. Table 1 shows how those who have seen the sign compare with those who have not in terms of pickup frequency, concern for the environment, and belief that dog waste affects water quality in the Rio Grande. Those who have seen the sign have higher frequencies of reported dog waste pickup, greater concern for the environment, and a greater awareness about the effects of dog waste on storm-water quality.

Study Limitations

We acknowledge numerous limitations regarding our sample and sampling approach. Regarding the locations where we set up our survey table, many respondents were recruited from higher education campuses, specifically, UNM and Central New Mexico Community College, likely contributing to the relatively high levels of education found in the sample compared with Bernalillo County as a whole. Furthermore, participants recruited at the Doggie Dash and Dawdle were more active compared with the rest of the sample: these participants reported walking their dogs at least once a week 94.7 percent of the time compared with 89.4 percent for the participants recruited at other events (Fisher's exact test p value: .1235). Similarly, participants who were recruited at the Valle de Oro Build Your Refuge Day and the Bachechi Open Space 20th Anniversary events were more likely to be concerned about the environment, with 62.7 percent of these participants describing themselves as "extremely concerned" compared with 47.7 percent of those recruited at other events (Fisher's exact test p value: .0760). Less educated persons and those over sixty-five years of age were underrepresented in our sample, and it is possible that dog owners with these characteristics have different pickup frequencies and/or other dog care habits as compared with those who are better represented in our sample.

Regarding individual responses, Dillman, Smyth, and Christian (2014, 7) discussed the potential for bias when survey respondents answer questions in such a way as to appease "perceived societal norms" or try to align themselves with the norms of the survey administrator. To minimize the

potential for such bias, the survey administrator saved any discussion with participants until after their completion of the survey, although the success of this strategy in eliminating bias was unknown. Also, people use selective attention to focus or emphasize new information that aligns with their previous decisions, which introduces confirmation bias (Prat-Ortega and de la Rocha 2018). For example, those who always pick up after their dogs might be more likely than those who do not to notice a *There Is No Poop Fairy* sign because it reinforces their behavior or worldview.

Conclusion

This study aimed to better understand the visibility of the *There Is No Poop Fairy* campaign, its influence on dog owners' self-reported pickup frequency of dog waste, and whether dog owners understood that not picking up dog waste could negatively affect water quality in the Rio Grande. Using relevant community-specific data and literature related to various aspects of dog ownership, we developed a survey to measure the campaign's visibility and influence along with attitudes toward various dog-ownership practices. From the literature, it is clear that the siting and existence of dog parks and the allowance of dogs in public spaces are important and contentious community issues, largely because of dog waste that is not picked up. Furthermore, dog waste can influence a person's perception of a place and affect their quality of life. This paper is the first to study an intervention aimed at motivating dog owners to pick up after their dogs and offers suggestions for communities that are striving to balance the needs and desires of pet owners and non-pet owners in public spaces. In this way, the research will contribute to the literatures related to dog ownership and policy in public spaces, and the results will be of particular interest to planners in other communities who are interested in the *There Is No Poop Fairy* or similar campaigns aimed at motivating owners to pick up dog waste. More broadly, the study will contribute to the literature on interventions for pro-environmental behavior and will be relevant to planners and policy makers in informing other public health and community-based initiatives and interventions.

Despite our study's numerous limitations, the data discussed herein suggest that the *There Is No Poop Fairy* campaign was successful based on its reach (almost 70% of respondents had seen the sign) and its influence on self-reported pickup frequency (50% of dog owners reported increased pickup frequency of dog waste after seeing the sign). While the campaign serves to educate residents about the importance of dog waste pickup, the influences of social capital and social norms likely aid the campaign's success. Our findings suggest that social capital may explain part of the campaign's effectiveness: campaign participation was voluntary and heavily relied on the informal network of dog owners for its success, and most signs were seen in a neighbor's yard or public spaces. We also found that our respondents were

fairly active and walked their dogs frequently, which might be evidence of a fairly strong, though informal, network of dog owners in the study area. The campaign might have tapped into this informal network of dog owners to clean up dog waste using environmental protection, reciprocity, and altruism as motivators, rather than institutional enforcement. By activating this informal network and encouraging the spread of the *There Is No Poop Fairy* campaign, Bernalillo County was arguably successful in uniting the community on a common issue: dog waste. Social norms might have played a role in motivating dog waste pickup in public spaces as well, with the campaign advocating for a behavior that most local residents reportedly observe. Our study may be one of the first to examine pickup frequency of waste from others' dogs. Our findings on this topic reinforce the idea of dog ownership as a driver of social capital and social modeling of behavior as a potential contributor toward collective behavior change.

The short and simple message used by the *There Is No Poop Fairy* campaign may have contributed to its success, although it is possible that an important aspect of the message—that dog waste is important to pick up in both public and private spaces—is being lost in the aim for simplicity. Thus, there is still work to be done in educating owners about the fact that storm water can carry pollutants from private and public spaces alike. As our findings suggest that environmental concern contributed to the campaign's success, a greater emphasis could be placed on the message that picking up dog waste benefits the environment.

Regarding future research to expand the success of the *There Is No Poop Fairy* campaign, zip codes of respondents who indicated that they had not seen the *There Is No Poop Fairy* sign could be targeted for sign placement and further education about health and environmental risks associated with dog waste in public and private spaces. We also recommend an observational study within the same study area where off-leash and dog waste cleanup behaviors are observed and recorded for comparison with the self-reported data from our study to determine if self-reported behavior is congruent with actual behavior. To better understand whether the campaign affects behavior, natural experiments could be designed to compare dog waste in areas (e.g., counties, zip codes, or neighborhoods) with and without the Poop Fairy intervention. Alternatively, an intervention could include evaluation of a baseline level of dog waste in several public spaces in communities where the Poop Fairy campaign has not been introduced. Next, the campaign would be introduced, and after some time, the baseline would be reevaluated to determine if change had occurred. Also, parks or other public spaces could be studied to determine whether the campaign's effectiveness improves when dog waste cleanup bags and/or ample trash cans are made available. For any of these future studies, researchers could consider collecting data during multiple seasons to better understand whether and how weather conditions might influence the frequency of dog waste pickup. Results from these additional studies could help the county

and other entities identify content for future public outreach and educational programming.

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ORCID iD

Caroline E. Scruggs  <https://orcid.org/0000-0003-2840-0068>

Supplemental Material

Supplemental material for this article is available online.

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Author Biographies

Caroline E. Scruggs is an associate professor in the Community and Regional Planning Department and the associate dean for research in the School of Architecture and Planning at the University of New Mexico. Her areas of research and teaching

include water resources and scarcity in arid lands, chemical policy, environmental governance, and stakeholder perspectives on health and environment issues.

Sergio Lozoya was a graduate research assistant in the Community and Regional Planning Department at the University of New Mexico at the time this study was conducted. He is now a planner in the Urban Design and Development Division of the City of Albuquerque's Planning Department where he works on zoning, master plan development, and framework plans associated with planned development zone districts. His work and interests include community planning efforts, graphic design, and planning research.

Kellin N. Rumsey was a PhD candidate in Statistics at the University of New Mexico when this study was conducted. He is now a postdoctoral researcher at Los Alamos National Laboratories where he works on statistical inference for exascale climate models.

Kali Bronson is the Stormwater Program Compliance Manager for Bernalillo County and currently manages the county's MS4 stormwater program. She is a hydrologist with experience and interests in watershed planning, stormwater management, water quality monitoring, and environmental investigations, monitoring, and restoration.

Patrick Chavez is a stormwater quality engineer and leads the stormwater management program at the Albuquerque Metropolitan Arroyo Flood Control Authority. He is responsible for overall programmatic compliance with the watershed-based permit that allows for discharge to the Rio Grande. His work and interests also include planning, designing, constructing, and collecting data from water quality treatment trains in urbanized areas.