



Phone-call reminders narrow the intention-action gap by increasing follow-through for a residential tree giveaway program

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ABSTRACT

Residents' participation is key to the success of urban tree planting programs, yet a gap between resident intentions and participation actions may limit the benefits provided by such programs. Philadelphia Parks and Recreation (Pennsylvania, US) has conducted tree giveaway events for residents since 2012 with the goal of increasing tree canopy. But some residents who register for giveaway events do not follow through and attend the event, creating logistical and planning difficulties that increase program costs. We tested whether phone call reminders could narrow the intention-action gap and increase the likelihood that registered residents attend a yard tree giveaway event. A total of 251 people registered for a spring 2018 giveaway event. Registered participants were randomly assigned to receive either a standard set of email and paper reminders representing normal program operations (126 participants), or to receive up to two phone call reminder attempts in addition to the standard reminders (125 participants). The follow-through (attendance) rate among registered participants who received phone calls was compared to those who did not receive phone calls. The phone calls increased attendance by 16 percentage points, a statistically significant increase. Based on this effect size and time spent making phone calls, staff spent an average of 12.4 min making phone calls per additional attendee. This study demonstrates the feasibility of using an experimental approach to facilitate evidence-based decisions in an urban tree planting context. Further research is needed to evaluate the impacts of communication strategies on resident behavior in tree planting and distribution programs.

1. Introduction

Resident attitudes and behaviors play a role in multiple components of urban tree planting and distribution programs, particularly programs focused on private residential land (Clark et al., 1997; Mincey et al., 2013). Program participation, tree installation, and maintenance of young and mature trees all involve resident actions that can affect program outcomes. For example, resident experiences and perceptions of municipal forestry programs in Detroit, MI prevented wider participation in a street tree planting program (Carmichael and McDonough, 2018), and a lack of maintenance by residents of trees requested in a yard tree giveaway program was connected to higher tree mortality rates in Sacramento, CA (Roman et al., 2014). Despite the role of behavior in urban forestry programs and burgeoning scholarship about urban environmental stewardship networks (Connolly et al., 2014), more evidence is needed on the role of resident behavior in program

outcomes and the effectiveness of different strategies to encourage stewardship.

Evidence from other fields, such as personal finance, health care, and education, suggests that low-cost strategies that focus on behavioral barriers can improve program outcomes (Benartzi et al., 2017). In this study, we used a randomized evaluation design to test the effectiveness of phone call reminders to encourage attendance at a tree giveaway event. Testing low-cost interventions aimed at behavioral barriers is increasingly common in the public sector (Congdon and Shankar, 2018). In addition to estimating the effect of phone call reminders for tree distribution programs, this paper demonstrates how field experiments can be used to understand behavior in urban greening programs.

The components of tree planting and distribution programs relate to desired program outcomes, such as high rates of participation, planting, and tree survival (Fig. 1). Residents may opt-in or opt-out of planting

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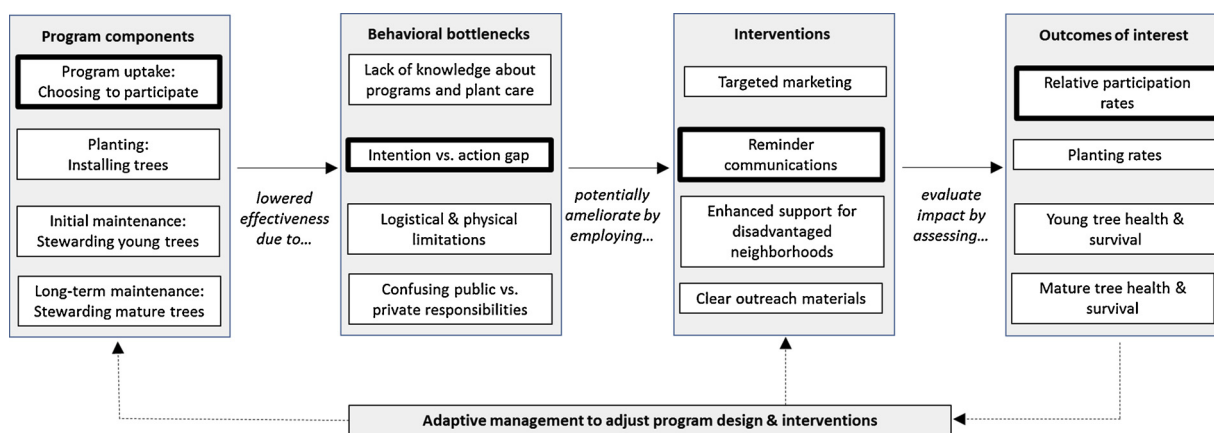


Fig. 1. Components of tree planting and distribution programs. Boxes in bold indicate components targeted in this study for evaluation.

initiatives based on their values and lived experiences (Locke et al., 2015; Carmichael and McDonough, 2018; Dawes et al., 2018), which can lead to inequities in program implementation (Locke and Grove, 2016). Interventions aimed at encouraging specific actions, such as targeted outreach strategies and neighborhood partnerships, can improve planting and tree care (Nguyen et al., 2017; de Guzman et al., 2018). Unfortunately, participating residents may not adhere to recommended tree care practices, including such essential steps as planting and watering for tree giveaway programs (Roman et al., 2014). Varying knowledge and attitudes among residents, as well as logistical and physical challenges, can result in tree care that falls short of best practices (Roman et al., 2014, 2015; Conway, 2016; Carmichael and McDonough, 2018; Almas and Conway, 2018). Trees that are not planted or are lost to mortality after planting represent sunk program costs (Nguyen et al., 2017) and fail to provide environmental benefits (Ko et al., 2016).

Many of these challenges can be considered examples of an intention-action or attitudes-action gap, whereby individuals express knowledge of or interest in environmental issues, but do not display pro-environmental behavior (Newton and Meyer, 2013). People may not follow through on their intentions for reasons that can be mitigated by phone call reminders. Reminders may be effective if they bring attention to the future benefits of taking action (Karlan et al., 2016). Reminders may increase the likelihood the people take the desired action by aiding in planning or serving as an implementation prompt (Rogers et al., 2015), and asking people to predict whether they will follow through may itself increase the chance of follow-through (Greenwald et al., 1987).

The effectiveness of phone call reminders has been demonstrated primarily in the context of health care services. For example, phone call reminders can increase attendance at appointments by 12%–17% (Sawyer et al., 2002; Lee and McCormick, 2003; Roberts et al., 2007). Any type of phone reminder tends to increase medical appointment attendance, although manually conducted calls are more effective than pre-recorded calls (Hasvold and Wootton, 2011).

Evaluating the effectiveness of communication efforts can inform adaptive management in urban forestry programs – an important component of managing urban forests as sustainable, resilient socio-ecological systems (Clark et al., 1997; Chaffin et al., 2016). We present a randomized evaluation focused on closing the intention-action gap within one specific step for tree giveaway programs (Fig. 1): residents who register for a giveaway event to receive a tree, but subsequently do not come to claim their tree. We estimated the effect of reminder phone calls on the follow-through rate (i.e., the proportion of registered individuals who attend the event) and examined the cost of conducting phone call reminders in this context.

2. Methods

2.1. Study area and background

TreePhilly is a yard tree giveaway program operated by Philadelphia Parks and Recreation (PPR) in Philadelphia, Pennsylvania (US). Philadelphia is a city of approximately 1.5 million people (U.S. Census, 2018) in the northeastern United States, in a region that was nearly entirely forested prior to European settlement (Stroud, 2015). As of 2008, urban tree cover in the city was 20% (O'Neil-Dunne, 2011), with a municipal goal to reach 30% in each neighborhood by 2025 (City of Philadelphia, 2009).

The TreePhilly program began in 2012 and was created to help meet municipal tree cover goals, especially because most plantable space in the city is on private land (Nguyen et al., 2017). The program organizes periodic events to distribute free trees to be planted in residential yards. The events are widely advertised and residents register in advance to pick up a particular species. Since 2015 an average of approximately two-thirds of participants registered for spring events have both attended the event and received their tree.

No-shows of registered participants can create logistical and planning difficulties for TreePhilly event organizers. Higher follow-through rates can help organizers more accurately predict the number and species of trees they will need for an event and reduce the chance that they will have to transport unclaimed trees. Communications to registered participants typically consist of an emailed registration confirmation, a mailed letter that includes an event ticket, a mailed post-card reminder, and an email reminder. Staff have also occasionally tried phone call reminders in low-canopy, low-income neighborhoods.

2.2. Evaluation design

A spring 2018 tree giveaway event occurred on Saturday, April 14, 2018, with registration limited to 300 people. Residents who intended to attend the giveaway event registered online between March 12, 2018 and April 8, 2018. Registrants provided basic contact information, including mailing address, the address where the tree would be planted, email address, telephone number, and an indication of whether they had previously attended a TreePhilly giveaway event in the past five years.

We used a block-randomized design to estimate the effect of phone call reminders (the treatment) on attendance at a giveaway event among registered participants. After the registration period closed, TreePhilly staff cleaned the registered participant list of duplicates and errors. A total of 251 unique registrations were included in the study. Registered individuals were grouped into blocks based on the week each individual registered (weeks 1–4 of the registration period) and whether they had participated in a previous TreePhilly giveaway event

(participated or did not participate/don't know). Individuals were randomized within block to either the treatment or control condition, with a total of 126 individuals assigned to control and 125 to treatment.

For consistency, all registered participants received the standard set of communication materials (mail and email reminders). Participants assigned to the treatment condition also received phone call reminders from TreePhilly staff two or three days prior to the event, whereas participants assigned to the control condition only received the standard communication.

2.3. Phone call protocols

TreePhilly staff made up to two phone call attempts to all assigned individuals on the evenings of April 11, 12, and 13 between the hours of 5:00 and 8:00 pm. If on the first call attempt the caller talked to either the registered individual or someone else in the household, then the caller would follow a general call script (see supplemental materials) to provide a reminder about basic event details (i.e., date, time, location) and information as needed for resident questions regarding transportation, tree species, and planting. No further calls to that individual would be made. If the caller did not reach someone, the caller instead left a voicemail (if possible) and a second call attempt was made the next evening following the same protocol. Two TreePhilly staff members made 205 phone call attempts over three evenings. The callers logged the duration and result of the call: no answer, voicemail, talked to registered individual, talked to someone else (Table 1).

2.4. Recording attendance at the giveaway event

Event attendance was recorded by TreePhilly staff. Staff matched attendees to the list of registered individuals by either matching the paper ticket if provided by the participant, or by matching their name and address to the registered list upon receipt of a tree. Registered individuals who notified TreePhilly that they would not attend (i.e., cancellations) were coded as not attending, and were kept in the study. Cancellations occurred when registered individuals called TreePhilly in advance of the event (or left a voicemail on the day of the event) or in a few cases among treatment group individuals during the reminder phone call. In total 15 individuals cancelled, nine from the treatment group and six from the control group.

2.5. Data analyses

We estimated an average treatment effect (ATE) of receiving reminder phone calls in addition to the standard reminder communication. The binary outcome variable (attended or not) was regressed against treatment assignment and blocking variables using ordinary least squares with heteroscedasticity-consistent standard errors. The

Table 1
Phone calls for individuals in the treatment group.

Call result	First call attempt	Second call attempt	Total calls
Total – all results¹	125	81	206
No answer ²	6	4	10
Left voicemail	76	62	138
Talked to registered individual	38	13	51
Talked to someone other than registered individual	5	2	7

¹ Five registered individuals assigned to receive reminders had the same contact information as another registered individual and were not contacted separately.

² One call during the first attempt was a wrong number (and was not followed up with a second attempt); one call during the second attempt hung up without providing any information.

primary regression equation is:

$$Attend_i = \alpha + \beta Treat_i + \delta Block_i + \mu_i, \tag{1}$$

where $Treat_i$ is a binary indicator of assignment to the treatment group for individual i , β represents the ATE, and $Block_i$ is a vector of block-group fixed effects for registration timing and prior participation. Because some participants in the treatment group received calls that resulted in either no answer or voicemails, which could be interpreted as not receiving treatment, the ATE represents an effect of being assigned to the treatment group (i.e., an intention-to-treat effect).

We also use an instrumental variable (IV) specification to estimate the effect on follow-through of receiving a reminder call where the registered individual actually spoke to the caller. The IV method uses random treatment assignment to predict whether a participant actually receives treatment; in our case, assignment to the phone call condition is random, but hearing a voicemail or talking to the caller may not be random. The IV method can identify the causal effect of receiving treatment (hearing a voicemail or talking to the caller) on the outcome of interest (event attendance), or the Compliers Average Causal Effect (CACE) (Sovey and Green, 2011). We define receipt of treatment in two ways: a strong version where receiving treatment is defined as talking with the registered individual, and a mild version where receiving treatment is defined as leaving a voicemail or talking to any person (the registered individual or someone else in the household).

The IV specification replaces the treatment indicator with an indicator of receipt of treatment ($Receipt_i$) as the primary independent variable of interest, and predicts $Receipt_i$ with a first stage regression on treatment assignment and blocking variables. The second-stage regression is,

$$Attend_i = \alpha + \beta_{IV} Receipt_i + \delta Block_i + \mu_i,$$

where β_{IV} represents the CACE (see Gerber and Green (2012, ch. 5) for more detail on IV methods).

Models were estimated using R version 3.4.3 (R Core Team, 2017) with the *sandwich* (Zeileis, 2004) and *AER* packages (Kleiberg and Zeileis, 2008). (See supplemental materials for data and analysis code.)

3. Results

3.1. Treatment effect estimates

Within the phone call reminder (treatment) condition, 69.6% of registered individuals attended the giveaway event, compared to 53.2% of individuals in the control condition. This represents an estimated ATE of a 16 percentage point difference in the attendance rate. Regressions results indicate that the effect of phone call reminders on attendance was unlikely due to chance (95% CI: 0.04, 0.28); we reject the null hypothesis of no effect of reminders at better than 1% confidence level (Table 2, first column).

The phone call logs for the 125 individuals in the treatment group recorded whether the caller talked to the registered individual (49 individuals), a different person (6 individuals), left a voicemail (63 individuals), or received no answer (7 individuals). If receipt of treatment is defined as receiving a voicemail or talking to any person (the weak version), the CACE of phone call reminders is 17.3 percentage points; if receipt of treatment is defined only as talking to the registered individual (the strong version), the CACE is 41.6 percentage points (Table 2, second and third columns).

The large range of estimates of the effect of actually receiving a phone call reminder is due to the fact that the two definitions of receipt of treatment make very different assumptions about who actually received the reminder. The CACE under the strong definition may be an upper-bound estimate; many individuals in the treatment group received voicemails, yet the strong definition of receipt of treatment assumes that these calls did not constitute a reminder. If voicemails or talking to someone else actually affects attendance, then this boost

Table 2Regression estimates of phone call reminder treatment effects (*dep. var.* = *attended event*; N = 251).

	Average Treatment Effect ¹ effect of assignment to the treatment group	Compliers Average Causal Effect ² effect of receipt of a phone call	
		Receipt = voicemail or talking to any person	Receipt = talk to intended person only
Coefficient estimate	0.163**	0.169**	0.400**
(Heteroskedasticity-consistent standard error)	(0.06)	(0.063)	(0.153)

Block fixed effects are included as regressors in all models.

** indicates p-value < 0.01.

¹ Estimate of β from the regression of eqn. 1: $Attend_i = \alpha + \beta Treat_i + \delta Block_i + \mu_i$.² Estimates of β_{IV} from the second-stage of the instrumental variables regression of eqn. 2: $Attend_i = \alpha + \beta_{IV} Receipt_i + \delta Block_i + \mu_i$.

would be attributed only to those calls talking to the intended person and overestimate the treatment effect (Gerber and Green, 2012, 157). The smaller CACE estimate under the mild definition of receipt of treatment is close to the average treatment effect because only a few individuals had the calls result in no answer. This smaller CACE estimate could be a lower bound if some of the voicemails or calls talking to someone other than the registered person did not actually convey any reminder information to the intended person.

3.2. Cost effectiveness

Phone call logs also recorded the start and end time of each phone call session for the two staff members making phone calls. Staff spent a total of 252 min making phone calls over the three evenings. The estimated ATE of 0.16 implies that the phone calls resulted in an additional 20 registered participants attending the giveaway event who would not have attended without the reminders. This implies a cost of approximately 12.4 min of staff time per additional attendee. Staff time in this calculation includes only time spent making phone calls, and does not include staff and administrative time planning, preparing call scripts, and rehearsing.

4. Discussion

Reminder phone calls increased attendance at the spring 2018 TreePhilly giveaway event by 16 percentage points. Prior research using phone call reminders to increase attendance for health care services report similar effectiveness (12%–17%; Sawyer et al., 2002; Lee and McCormick, 2003; Roberts et al., 2007). It is possible that the phone calls served as reminders to people who otherwise would have forgotten to attend the event, or served as a commitment mechanism for participants who had an intention to attend but may not have followed through without the phone call reinforcing the commitment.

An open question is whether phone call reminders are effective even when calls do not result in speaking with the intended individual (e.g., a voicemail). A limitation of the current study is that we cannot isolate the effect of different call results on follow-through. Given that many calls resulted in voicemails, understanding whether these messages are effective reminders could save staff time making follow-up calls.

Future research could consider tests of different types and combinations of reminders. For example, pairing types of reminders – such as emails and text messages – may boost follow-through and cost effectiveness of phone-call reminders for blood donation appointments (Germain and Godin, 2016). Future research could also test this approach in other cities and programs where the local context may alter the efficacy of phone call reminders. Our study was limited by taking place in only one program, and by examining only the follow-through rate, and not the planting and maintenance behavior of participants after receipt of their trees. Future research involving a monitoring component could help determine whether increased follow-through yields increases in the number of trees that are planted by residents and

survive.

The evaluation method presented here offers potential for understanding other components of urban tree programs (Fig. 1). Program interventions could be designed to target other behavioral barriers or program outcomes. Communications and outreach methods could be evaluated for their effects on planting and young tree care, or on achieving equitable participation patterns. More resource-intensive interventions may be necessary to overcome barriers like logistical and physical limitations. Testing and learning using an experimental approach can help develop concrete recommendations and facilitate evidence-based decisions.

All research designs have their advantages and disadvantages. Ecosystem science can be described as a table supported by four “ways of knowing”: comparisons, long-term studies, theory or models, and experiments (Carpenter, 1998; Grove et al., 2013). Our evaluation of phone call reminders relies on an experimental approach. This allows for observation of a direct response to an investigator-initiated intervention and strengthens causal claims, but results may lack generalizability to other contexts. Urban forestry has a stronger tradition of experimentation related to biophysical factors, such as planting stock and soil amendments (Costello et al., 2004; Layman et al., 2016). Experiments focusing on resident behavior are uncommon but can play a substantial role in supporting local stakeholders and understanding the human component of urban forest systems.

5. Conclusions

Our goal was to understand the effectiveness of phone-call reminders on follow-through rates of registrants to a free tree giveaway event in Philadelphia. We found that the phone call treatment group was, on average, 16 percentage points more likely to attend the event than registrants assigned to the control group. However, the outreach calls also required staff time to complete. We estimated that 12.4 min of staff time were needed per additional attendee.

This study demonstrates the effectiveness of a relatively easy-to-reproduce experiment designed to narrow the intention-action gap in urban tree distribution programs. It remains unknown how effective this and other types of interventions would be in other locales. Given the popularity of tree giveaway programs, testing similar interventions may be fruitful to support adaptive management. Urban forestry research and practice may benefit from broadening the proverbial toolbox to include experimentally-derived evidence about human behavior.

CRedit authorship contribution statement

Michael S. Hand: Methodology, Formal analysis, Software, Data curation, Writing - original draft, Writing - review & editing. **Lara A. Roman:** Conceptualization, Methodology, Writing - original draft, Writing - review & editing. **Dexter Henry Locke:** Conceptualization, Writing - original draft, Writing - review & editing, Validation, Software. **Erica Smith Fichman:** Data curation, Supervision, Writing -

review & editing.

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.ufug.2019.126425>.

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