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Nudging Early Reduces Administrative Burden: Three Field Experiments to Improve Code Enforcement

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ABSTRACT

In the past decade, public sector organizations around the world have worked to simplify administrative processes as a way to improve user experience and compliance. Academic evidence on administrative burden supports this approach and there is a strong body of research showing that learning costs, compliance costs and psychological costs help to explain why residents do not always take-up programs for which they are eligible. This article considers the role of these types of costs in a different set of resident-state interactions: compliance with regulations. We present the results of three large field experiments aimed at improving resident compliance with municipal housing codes using targeted behavioral interventions. We find that contacting property owners earlier, redesigning first notices, and proactively communicating with previous violators, can significantly improve compliance by 14.7 percent, 3.3 percent, and 9.2 percent respectively, with costs savings ranging from 6–15 percent of a city’s annual enforcement budget. Our results counterintuitively suggest that sometimes adding steps to an administrative process can reduce the costs associated with the resident-state interaction.

INTRODUCTION

The past two decades have seen an emergence of rigorous behavioral experimentation in government (e.g. John, Smith, & Stoker, 2009; Thaler & Sunstein, 2008). Some of the early success stories focused either on shifts in policy — such as defaulting people into more savings (Madrian, 2012) and organ donation programs (Johnson & Goldstein, 2003) — , or politics — such as nudging people to vote (Gerber, Green, & Larimer, 2008; Gerber & Rogers, 2009). Yet over the years, “nudges” (Thaler & Sunstein, 2008) have also been adopted with increasing popularity as a tool of public management. The growing literature on administrative burden has shown that learning costs (e.g., building an understanding of who is eligible), compliance costs (e.g., providing proof of documentation), and psychological costs (e.g., overcoming stigma associated with programs) all impact the likelihood that a resident will take up a program for which they are eligible, even if it is in their interest to do so (Moynihan, Herd & Harvey, 2014). In this paper, we argue that similar types of costs may also explain why both carrots and sticks do not always effectively ensure compliance with government regulation. We focus on one specific policy area: housing code enforcement. Targeted behavioral interventions can simultaneously tackle both learning and compliance costs, while also addressing some of the systematic cognitive biases that create psychological costs for compliance. Yet, as we show below, reducing learning and compliance costs does not always mean reducing overall administrative steps. Rather, we show that sometimes an additional step in the administrative process can reduce learning and compliance costs, and therefore reduce overall burden for the resident. In practice, adding early and well-targeted steps to an administrative process may shift part of the burden away from the resident and onto the government, improving overall compliance.

We test this argument using three large field experiments in three local government agencies in the U.S., all responsible for housing code enforcement. Housing-related strategy is an area of high interest for public officials, but may be a particularly challenging policy area for behavioral nudges. This is because the causes and consequences of blighted properties are often linked to systemic inequities and poverty – institutional constraints that are not typically addressable through low-cost nudges. However, our studies show that there is room for low-cost behavioral interventions; even in a world of large, systemic causes for housing code violations, the administrative processes of staying in compliance can also have a bearing on whether a given property owner fixes up their property quickly. In New Orleans, the introduction of a new courtesy letter improved compliance by the first inspection by 14.7 percent; in Louisville, modified citation and violation letters increased compliance by the third inspection by 3.3 percent and fine payment by 12.0 percent; and in Chattanooga, preemptive postcards sent to properties with a previous violation boosted compliance by 9.2 percent. As a result, the number of properties that continued onto court hearings from persistent code violations decreased, realizing significant cost savings for both property owners and local governments. We estimate these savings to range from 6 to 15 percent of annual city enforcement budgets. These findings show promise that behavioral interventions can reduce costs associated with compliance in ways that meaningfully improve state-resident interactions.

CONCEPTUAL FRAMEWORK

Compliance Theory and Administrative Burden

Our understanding of why individuals comply with government rules has been shifting dramatically over the past decades. Traditional models of decision-making see individuals

rationally weighing the benefits of compliance against the costs of noncompliance (Becker, 1968; Becker & Stigler, 1974; Peltzman, 1975). In political science and economics, this has been studied extensively in environmental regulation (Hatcher et al., 2000; Winter & May, 2001; Winter & May, 2002; May, 2004; May, 2005) and tax compliance (Blumenthal et al., 2001; Casey & Scholz, 1991; Alm et al., 1995; Cowell, 2004). In law and criminology, the focus has long been on deterrence, where punishment, the threat of punishment, and likelihood of enforcement are at the center of compliance decisions (Grasmick & Green, 1980; Meier and Morgan, 1982; Sherman, 1993; Paternoster & Simpson, 1996; Kuperan & Sutinen, 1998; Sutinen & Kuperan, 1999). More recently, scholars have explored the effect of combining the “carrot” and “stick” in various degrees to increase compliance, while also incorporating other emotional and normative factors beyond a simple cost-benefit calculation in their models. Emotional responses, social norms, as well as personal values and beliefs, are now seen as central to compliance (Coricelli et al., 2014; Cowell, 2004; Dari-Mattiacci & De Geest, 2010; De Geest & Dari-Mattiacci, 2013; Mendoza & Wielhouwer, 2015). This more nuanced understanding of compliance lends itself to a series of questions about what might make someone comply with the law, when direct carrots (incentives) and sticks (fines) haven’t worked.

A parallel and important literature on administrative burden provides a lens for answering this question by shedding light on how residents interact with government more broadly (e.g. Remler, Rachlin, & Glied, 2001; Malherbet, & Pellizzari, 2004; Currie, 2006; Hernanz, Orbach, 2006; Heinrich, 2016). Moynihan, Herd, and Harvey (2014), for example, argue that the administrative burdens residents face comprise of learning costs, psychological costs, and compliance costs, and the difficulty in overcoming these burdens impacts how well a government can deliver services. For example, for individuals applying to a program or services,

there are costs to completing forms, or providing documentation of status. Lack of transparency displayed through dense or vague instructions regarding what is required of residents may limit the ability of residents to adhere to government requirements, and in turn, imposes additional costs on government to get residents to comply with the rules.

There is empirical evidence that reducing learning and compliance costs does, in fact, alter resident behavior. States that simplified reporting procedures and required less frequent recertification in SNAP saw an increase in successful claimants (Kabbani & Wilde, 2003; Hanratty, 2006; Ratcliffe, McKernan & Finegold, 2007). Federal programs that used a single form for multiple programs or provided easy access to applications increased take-up in those programs (Kopczuk & Pop-Eleches, 2007; Leininger et al., 2011; Schwabish, 2012). The provision of in-person assistance in completing applications and auto-enrollment into programs based on administrative data significantly increased take-up (Aizer, 2003; Schanzenbach, 2009; Dorn, Hill & Hogan, 2009; Bettinger et al., 2012; Herd et al., 2013; Bhargava and Manoli, 2015).

Although this administrative burden literature often focuses on why marginalized groups don't take up programs for which they are eligible (e.g., Heinrich, 2015; Nisar, 2017), we argue that the same framework could be used to understand why and when residents follow government regulations, even outside of program take-up. Put simply, we argue that there is at least a subset of residents who *want* to follow the rules (that is, comply with a given regulation), but are often hindered by burdensome administrative processes, making it difficult for them to comply. The direct implication of this argument is that reductions in learning, compliance, and psychological costs should increase law-abiding behavior without the need to change the underlying incentives or punishments. We argue that the three types of costs in the Moynihan, Herd and Harvey (2014) framework can be tackled in tandem using insights from behavioral

science: an improved interaction between government and resident is neither a carrot nor a stick, but can simultaneously reduce learning and compliance costs, while also directly addressing some of the psychological barriers involved in compliance.

Importantly, we think of compliance not as one decision, but as a series of decisions that provide a series of potential interaction points between a government and its residents. Yet, as we will show below, a reduction in administrative burden need not reflect a reduction in the number of interaction points. Rather, *adding* decision nodes or steps can meaningfully impact overall compliance if they effectively reduce learning and compliance costs. We hypothesize that an additional step in the form of earlier nudges will be effective, because an earlier nudge gives individuals more time to internalize the ask. The additional time may help individuals make a reasonable plan to fix up their property, go through the various steps required for compliance, or ask for resources and support. An earlier nudge of this nature would probably not change any deep-rooted financial challenges associated with blight. However, we expect that there is a distribution of “types” of property owners, some of whom are not fixing up their properties due to lack of time or attention (but who wish to), and some of whom are not fixing up their properties due to more deep-rooted financial constraints. We expect that an earlier nudge is particularly effective for the exact “type” of property owner that a nudge could plausibly move: the one whose primary constraints are cognitive or temporal.

Compliance with Housing Regulations

Complying with housing codes and regulations is a particularly important challenge for local governments and residents alike. A vacant or abandoned property not only decreases the property’s own value, but also significantly reduces the prices of other homes in the surrounding area (Schilling & Pinzón, 2016). Recent research demonstrates the strong relationship between

housing conditions and public health (de Leon & Schilling, 2017), as well as crime and the risk of assault (Branas, Rubin, & Guo, 2012). More directly, vacant properties also represent losses in tax revenues for local government from \$5,000 to \$35,000 per property per year (Schilling & Pinzón, 2016), leading to severe public finance crises in places like Flint and Detroit, Michigan (Abbey-Lambertz, 2016); this issue has only become more urgent with the increase in natural disasters. As such, it is no surprise that cities spend immense resources trying to pressure, cajole, or force property owners to fix up their properties. Specifically, to monitor and enforce compliance with local property codes, local governments identify blighted properties, send out notifications to property owners of code violations, and inspect properties multiple times until the property meets city standards or, if not, begin trial proceedings. In order to comply, property owners need to take action that is often important, but not urgent (e.g. fix a roof, mow the lawn, fumigate the property), and the time and resources associated with such actions vary drastically. Often the costs are upfront and the benefits (in both housing value and lack of fines) *may* appear at an undefined point in the future. Much of behavioral science targets exactly this type of decision-making; decisions where present bias may explain why it is so difficult for people to internalize future costs into their decision-making. Indeed, as Schilling and Pinzon (2016) argue effectively, the challenge with housing code enforcement is created over time through neglect or damaging actions, and thus, reversing it is fundamentally a behavioral problem, where taking action — and taking action early — can have meaningful impact.

A Behavioral Lens for Code Enforcement

Below, we outline a public manager's response to housing code violations, drawing on the growing behavioral public administration literature (Jilke, Tummers, & Kelman, 2015; Grimmelikhuijsen, Jilke, Olsen, & Tummers, 2016). In this framework, each of the steps in the

enforcement process represents a decision node that could be leveraged to increase efficiency and cost-effectiveness. Figure 1 outlines many of these nodes for a typical local government. For the purposes of this study, we target three such decision nodes with a behavioral lens using three separate field experiments, to be able to clearly and rigorously measure causal impact.

The process of enforcing housing codes is a series of actions taken by multiple city departments (see Figure 1). In order for a property to be considered as potentially in violation, a resident (or another member of city staff) must either report the case to the city, often via a 311 call¹ or an inspector must proactively canvas a neighborhood to uncover a violation.

Traditionally, an inspector must inspect the property and determine if there is a violation; a back-office employee must determine the name and address of the registered owner and send them a notice; a second (and third and sometimes fourth) inspection must then be completed to ensure that the violation was fixed; an employee sends notice of a fine, places liens on the property, and starts court proceedings if a violation isn't fixed; and the property owner is ordered to pay fines and address the violation at the court hearing.

At each stage in the process, there may be multiple reasons why an individual resident does not comply. Many of these reasons directly relate back to the administrative burdens framework by Moynihan, Herd, and Harvey (2014) referenced above. Learning costs, compliance costs, and psychological costs all present barriers at key moments in this process. Learning and compliance costs may be present at various stages in the process. For example, knowing whether you are in violation may not be obvious and finding out what is and isn't covered in a city's code involves significant time and attention costs. Compliance itself, once a violation has been identified, often involves direct financial costs. Yet we posit that

¹ A 311 service request is a non-emergency phone number that residents in many cities can call to find information about services, make complaints, or report problems like graffiti or road damage.

psychological barriers are especially salient in these micro-decisions within the broader process. They may include, for example, cognitive load (Sweller, 1988), which prevents individuals from obtaining important information from existing notifications, such as the types of violations and the next inspection date, necessary for their property to pass inspection. This may be especially important for those who are also experiencing financial stressors since the emerging literature on cognitive processing in states of resource scarcity shows that people make different - often worse - decisions when facing financial scarcity than they would do otherwise (Mullainathan & Shafir, 2014). Social norms may present another type of psychological barrier since failure to comply with municipal property codes is a visible behavior. There are ample examples in the literature of people taking cues on how to behave from their neighbors (for example, Allcott 2011, and Agarwal et al., 2018). People may also be prone to hyperbolic discounting (Laibson, 1997) and are likely to delay fixing their properties in favor of other priorities, without an additional nudge.

Code Compliance Process

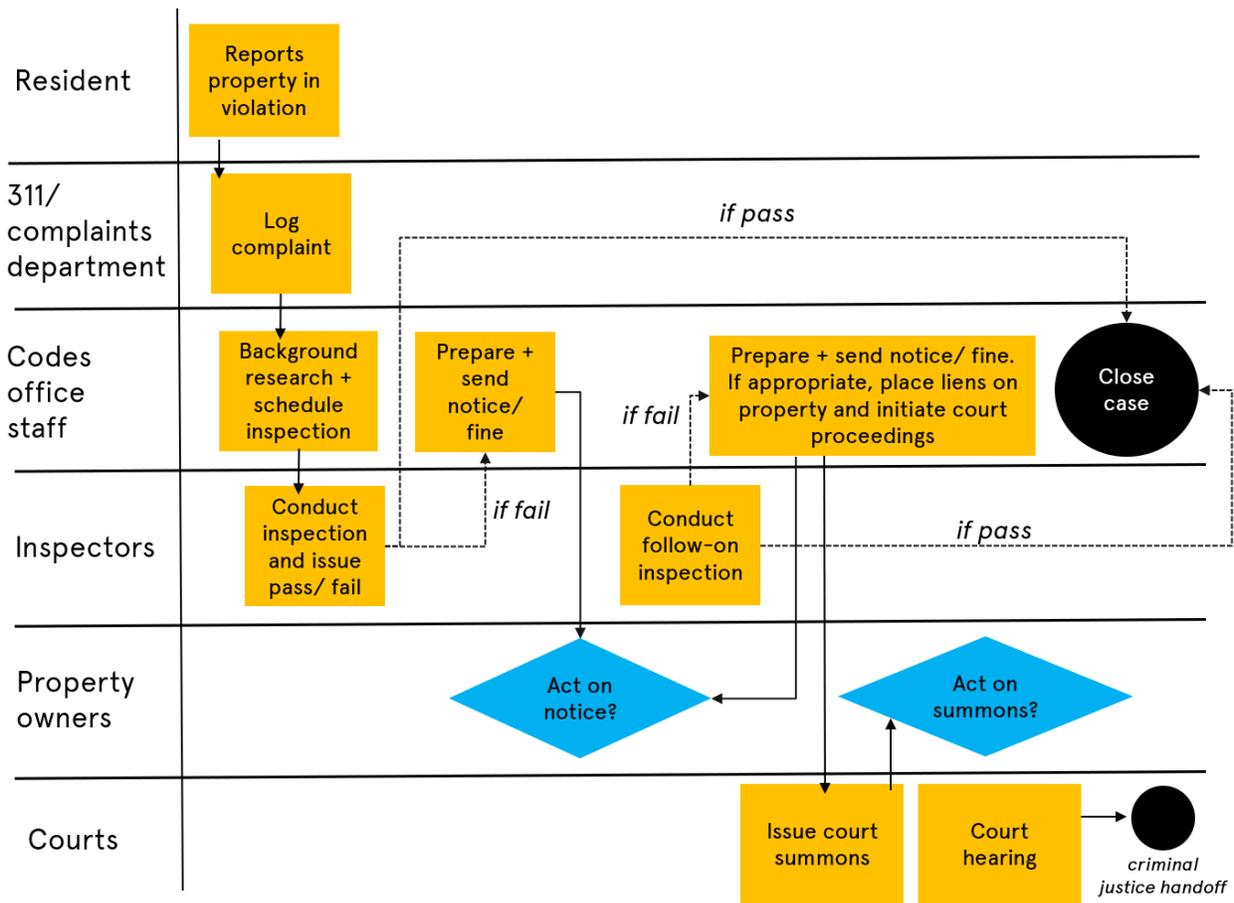


Figure 1: A Hypothetical City’s Response to Code Enforcement by Decision Nodes.

These predictable behavioral responses by individuals lead to major challenges in the aggregate for the code enforcement agency. When faced with these types of major challenges, incremental tweaks have often been viewed as inconsequential. Yet, as city governments rethink their overall approach to blight, there may be returns on investment to focusing on government processes that reduce administrative burdens on residents. The behavioral public administration literature suggests that there is room to iteratively test improvements to existing processes, in ways that increase voluntary compliance with housing codes, so as to free up resources for the more difficult cases. We argue that by breaking up the broader challenge into the individual

micro-behaviors or micro-decisions that shape compliance and create compliance costs, governments can target individual decision nodes where an incremental shift in policy could have a disproportionately large impact. Specifically, if learning and compliance costs can be reduced at early stages in the process through improved interaction between local government and the property owner, there are benefits both for the property owner and the city.

STUDIES

Below we present three experiments as proofs of concept for three of these decision nodes in different cities facing similar challenges. The experiments were conducted in New Orleans, Louisiana; Louisville, Kentucky; and Chattanooga, Tennessee. These experiments were identified as part of a program of work in each city to introduce applied behavioral insights and low cost randomized controlled trials. As such, the experiments and their locations were selected pragmatically based on where our partners were and what issues they were interested in addressing.

The letter designs used in these cities draw on a number of behavioral tools, such as simplicity or a call-to-action, reciprocity, time pressure, personalization, and loss aversion, to simultaneously reduce learning costs and compliance costs for residents. Each intervention is explained in depth below. Academically, it would certainly be interesting to disentangle in future experiments the relative weight of each nudge, and a limitation of these experiments is that they do not do this. As the primary purpose of our engagement with these cities was not academic, we chose to combine these mechanisms and test the “biggest bang for the city’s buck” in order to test whether any movement on compliance is possible. This was a deliberate, though limiting, choice as, from the perspective of the public administrators we were working with,

understanding the precise mechanism mattered less than understanding whether such an approach could improve outcomes (especially when adding additional mechanisms was zero cost). Of course, having gained an answer to this initial question, these administrators would also be interested in future information on whether more weight in some areas might yield further improvements.

The specific design of each study and results are discussed below. We present each of the studies separately because administrative data varies across cities, both in terms of how data is collected and what variables are collected. When possible, we have attempted to streamline the outcome we are measuring to assist in comparative analysis.

METHODS AND RESULTS

Note that for each study the regression equations and balance tables are included in Appendix C.

Study 1: New Orleans

Setting

This experiment was conducted in collaboration with the City of New Orleans. New Orleans has made blight reduction a central component of its broader strategic goals, especially after Hurricane Katrina caused damage to over 430,000 properties (White, 2015). Currently, there are a little over 5,000² properties with violations in a given year, almost 3,000 of which result in court hearings. The city estimated that early compliance saves the city \$402 per property in city resources. In New Orleans, as in many U.S. cities, inspectors are primarily sent to inspect homes after a 311 call from a resident. Inspectors have up to 30 days to inspect a property after a

² These estimates are based on data between September 2016 and September 2017 on New Orleans' open data platform, Blight Status: <https://blightstatus.nola.gov>.

call (with average time in our sample being 29.69 days, SD = 10.68). Property owners are then given another 30 days to submit evidence of compliance before a second inspection. If there is no improvement by second inspection, a court hearing is scheduled in another 30 days, where the time and resourcing costs to the city increase substantially. Traditionally, the property owner receives no warning or notice that a complaint has been made. The first time the government interacts with the property is at first inspection, where — according to earlier administrative data — approximately 80 percent of properties are found to be in violation, with approximately 35 percent of these properties having three or fewer violations.

The purpose of the trial was to test whether adding an additional earlier communication — in the form of a behaviorally-informed courtesy³ letter — would speed up the process by which code violations were corrected, leading to either fewer violations by the time of first inspection or meaningful progress towards fixing the property. Both of these actions were considered a success by the department, as the main cost to the Department occurs in preparation for a hearing. Somewhat counterintuitively, we hypothesized that a reduction in administrative burden could occur by *adding* a step in the administrative process, rather than removing it. Specifically, by directly reducing learning costs with an early warning system, and increasing the amount of time homeowners had to respond to a perceived violation, we hypothesized that this courtesy letter would allow the marginal resident to comply earlier, thus reducing the need for the more severe and burdensome multiple inspections and trial processes. The letter itself (see Appendix A), which had no legal standing, was designed based on previous behavioral science evidence of what works.

³ We use the word “courtesy” to describe the letters to separate them from any notice of violation that has legal standing. By design, these letters were sent before a government employee could inspect the property and therefore could only report on what the 311 caller had stated, and notify that an inspection was to occur.

We know, for example, that individuals are more likely to comply with a request if they receive clear, brief instructions on what is expected of them (Schlangenotto & Kundisch, 2016; BI Team, 2015). As such, the letter made the call to action as salient as possible, and provided simplified information on what to do next. Research also shows that deadlines (Inman & McAlister, 1994a) — even if self-imposed (Ariely & Wertenbroch, 2002) — can be powerful tools against inertia. By informing property owners that an inspector is coming soon to examine their properties for code violations, the letter created a sense of urgency, improving the likelihood that owners will fix violations before the first inspection. Finally, drawing on the vast literature on the impact of personalization (Sanders & Kirkman, 2019; BIT, 2015; Haynes et al. 2013), the letters used full names for both the sender (government agency) and the recipient (property owner) and provided detailed, individualized information on the house itself, based on the 311 call information. This personalization makes the content feel more relevant and provides a tangible link between the sender and the recipient. Moreover, prior studies show that personalizing a message in this way is an effective method to encourage someone to take action (BI Team, 2015).

Trial Design

This study was conducted as a randomized controlled trial, with randomization at the level of the property, covering all complaints for 1,153⁴ properties between December 2014 and June 2015. Preliminary data analyses revealed that approximately 500 property complaints are received each month through 311 calls, that approximately 20% of those initial calls have no violations upon first inspection, and that approximately 35% of the calls with violations have 3

⁴ With this sample size, we were powered to detect an effect size of approximately 8 percent points.

or fewer violations. We used this data to calculate breakeven rates – the compliance rate that would ensure that resource savings (in title searches, mailings, and hearing costs) would cover any additional costs associated with the implementation of the program. Accounting for the cost of the intervention and the foregone revenue from people who comply early on, the breakeven compliance rate for the pre-inspection letter is 3% (or 16 total properties). The breakeven compliance rate is 1% if only labor and variable costs are included.

The randomization occurred as follows: as 311 calls were routed to the Department of Code Enforcement to schedule inspections, approximately half of the relevant homes received a letter outlining that a complaint had been made, and clarifying what details — if any — were given on the call. Due to feasibility constraints, the randomization itself occurred by randomly assigning cases either to the treatment or the control group based on the last digit of the case ID. The randomization occurred automatically through a SQL script to minimize the potential for human error. We tested the SQL script by sending test letters to ourselves to ensure the code was working as intended. By chance, there happened to be more case IDs with odd final digits within this sample⁵. As such, there is a slight difference in the number of cases that were “treated” compared to the number of cases that were in the “control”, but not the characteristics of those cases. That is, there is no imbalance in terms of covariates: as we describe below, the randomization process seems to have effectively created two balanced samples for treatment and control groups.

Inspectors did not know who was in the control group or the treatment group. Outcome data were collected at first inspection and at hearing, and is therefore a snapshot of inspections that had already occurred up to that point. As such, there are some cases that were randomized

⁵ Case IDs are sequential but apply to all cases within the agency’s purview, so the case ID numbers that were relevant to this study were orthogonal to any outcome, but not necessarily sequential.

into a treatment or control group for which we do not have outcome data — the results of the first inspection — because the inspection had not yet occurred at time of data collection. This should be statistically similar across treatment and control groups and should not bias our sample in any way. We confirm that the results look similar when we correct for missing outcome data using inverse probability weighting.

The main outcome of interest was a binary variable indicating whether an owner begins to fix his/her property before the first inspection. Following city policy on what constitutes a success, a property is coded as “1” if at first inspection, the inspector lists the property as either “work in progress” (the owner has addressed some but not all code violations) or “no violation” (the property no longer has code violations). It is likely that some of the properties that are inspected and have been found to have no violation never had a violation to begin with. This should be the same across treatment and control groups. “Works in progress” statuses only account for 4 percent of cases of first inspection.

Results

Table 8 in Appendix C shows basic summary statistics by treatment and control group for pre-treatment characteristics as well as balanced assignment.

Table 1 presents our main findings. Column 1 presents a simple regression with no controls. Columns 2 and 3 add controls. Specifically, Column 2 introduces controls that may be correlated with the likelihood of compliance: alleged complaints and delayed time between complaints and inspections. Column 3 adds month fixed effects because the type of complaint and the ability to fix a property is highly dependent on the weather in ways that are not fully captured in “alleged complaints.” For example, there is a high season for complaints and code

violations in many cities in the early spring.

Table 1: Effect of courtesy letter on compliance.

VARIABLES	Compliance 1	Compliance 2	Compliance 3
Treatment	0.0530*	0.0652**	0.0623**
	(0.0294)	(0.0289)	(0.0290)
Alleged		-0.0729***	-0.0735***
		(0.0125)	(0.0125)
Delay		-0.00301**	-0.00352**
		(0.00135)	(0.00138)
Constant	0.424***	0.664***	0.768***
	(0.0199)	(0.0514)	(0.0720)
Observations	1,153	1,153	1,153
R-squared	0.003	0.037	0.045
Month FE			YES

Note: This table presents regressions on the likelihood of complying with code enforcement by first inspection. Compliance is defined as either no violation or clear work in progress towards fixing a violation. Control variables “alleged” refers to the number of alleged complaints from the 311 call and “delayed” refers to the time lag in days between the 311 complaint and inspection. Column 3 includes month fixed effects.

Robust standard errors in parentheses.

**** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.*

The results suggest that the courtesy letter significantly increased the likelihood that a property would be found in compliance by first inspection by 14.7 percent.⁶ The city’s estimate for the full cost (including labor costs) of sending out letters was \$1 per letter; thus, this trial provided a significant return on investment for the city. Specifically, we estimate that New Orleans would save approximately \$36,000⁷ each year by starting the process earlier, and may

⁶ The likelihood of compliance probability was obtained by dividing the treatment group coefficient under compliance model 3 (0.0623) by the control group coefficient (0.424) and multiplying the result by 100.

⁷ This estimate was calculated by applying the treatment effect of 14.7% compliance to the control sample size of 616, multiplying it by the \$402 cost for late compliance, and subtracting the \$616 cost of sending out courtesy letters: $616 \times 14.7\% = 91 \times \$402 = \$36,582 - \$616 = \sim \$36,000$.

meaningfully impact the relationship between residents and city officials as the intervention allows for earlier responsiveness and clearer communication.

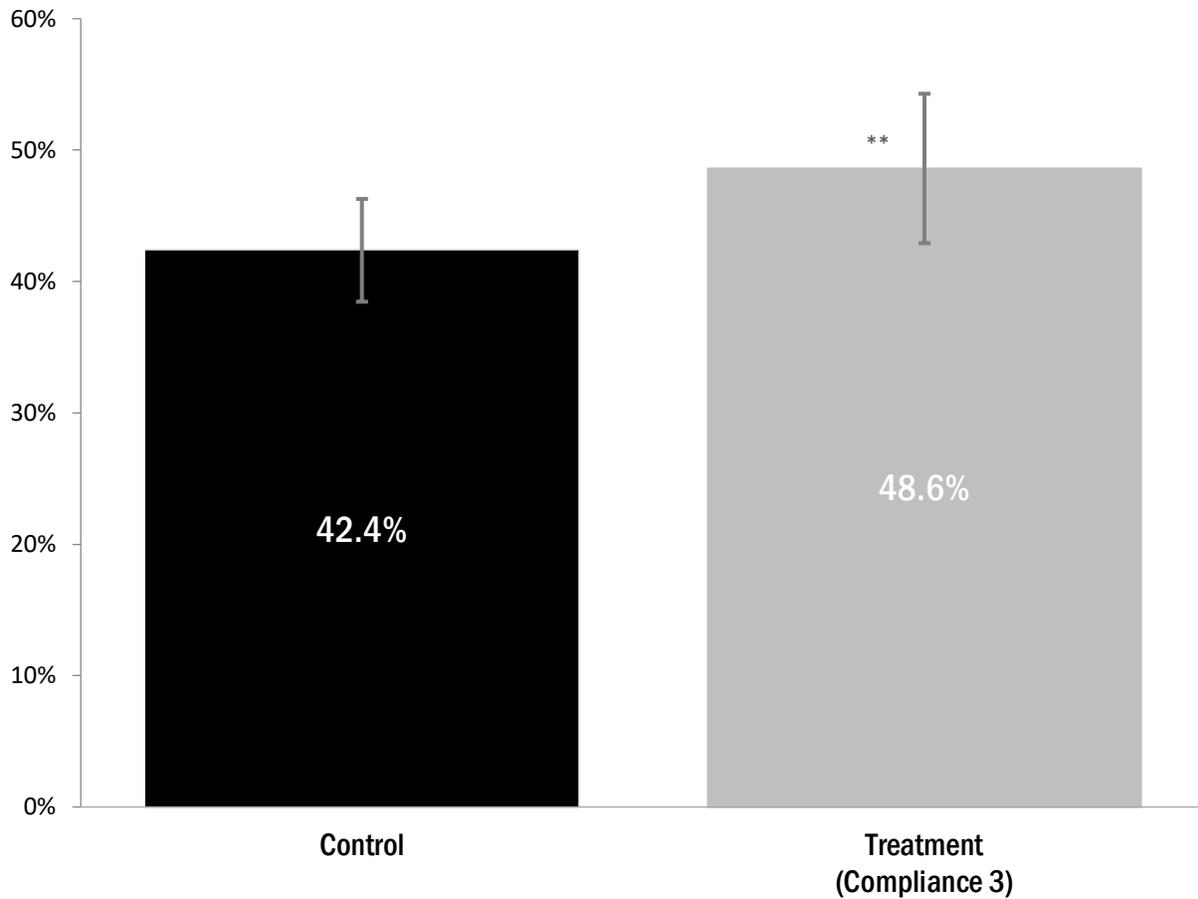


Figure 2: Effect of Courtesy Letter on Compliance.

Note: This bar graph illustrates the 6.23 percentage point difference between the control and the treatment groups for the regression model, Compliance 3, as shown in Table 1.

Study 2: Louisville

Setting

This trial in Louisville, Kentucky, focused on a subsequent node in the inspection process. Specifically, the goal of this trial was to improve the compliance rate between inspections, by altering the official notice of violation sent after first inspection. In 2014, there were more than 10,000 cases in Louisville where a property failed its first inspection

(approximately 59 percent of all cases) and was found to be in violation of the city's property code. Previous administrative data showed that, of the properties that fail first inspection, 65.2 percent are still not brought into compliance by the follow-up inspection. This could be due the time frame between inspections or because of the type of violation that required a more significant investment. Indeed, the baseline data suggested that a property would receive a median of four additional inspections after the second inspection before they are in compliance. The purpose of this trial therefore was to measure whether changes to the citation and violation notices, using insights from behavioral science, would improve compliance in subsequent inspections.

Modified versions of the citation and violation notices were used as the treatment letter (see Appendix A). Specifically, they were vastly simplified compared to the control, using evidence that mere simplification can be an effective way of increasing compliance, by reducing learning costs. (Sanders et al. 2019; Haynes et al., 2013; Bhargava & Manoli, 2015). For example, while the control citation letter begins with the phrase: "A citation in the amount listed above has been assessed against the owner of the above-mentioned property for the existence of violation(s) of the codified ordinances in Chapter 155 and/or Chapter 156 and/or Chapter 32 of the Louisville Metro Code of Ordinances. The facts constituting the offense are listed on the attached page(s)...," the equivalent treatment letter begins with "I inspected your property at <address> on <date and time> and found that it is in violation of Louisville Metro's property maintenance regulations. You must now do two things..." This simplification process also included a clear call-to-action (Schlangenotto & Kundisch, 2016; BI Team, 2015) by specified deadlines (Inman & McAlister, 1994a), that provided detailed information on the due dates for property owners to pay their fine and correct their violation(s).

Trial Design

This trial was also conducted as a randomized controlled trial, with randomization at the property level. The experiment occurred from December 4, 2015 to November 1, 2016, involving 12,729⁸ properties. Treatment allocation was automated and happened in real-time: a unique identifier linked to the address (either an odd or even number) determined whether or not a property would receive the treatment or control letters. We confirmed that there were no historical discrepancies between odd and even numbers in terms of key factors and outcomes and tested this treatment allocation method prior to employing this process.

The two outcomes of interest were compliance at the second- and third inspection. Compliance, in this case, is defined as “passing the inspection” (according to existing city administrative data), which translates into having no more violations.

Results

Table 9 in Appendix C below shows the summary statistics for this sample and confirm balance.

Tables 2 and 3 below show the main outcome of interest. Table 2 shows the results for the second inspection (that is, the first follow-up inspection), where columns 2 and 3 add controls. We do not see any impact of the treatment letter on whether property owners are able to comply by second inspection. In fact, much of the variation in who manages to comply in time seems to depend on month and inspector fixed effects. This seems less surprising given that the month is very much correlated with the type of violation we expect to see and that inspectors

⁸ With this sample, we were powered to detect an effect size of approximately 2.4 percentage points.

may have some unacknowledged discretion in what they consider “passing” a follow-up inspection of a property they have already inspected (especially because there is no separate category in this city for showing “work in progress” as in other cities). Indeed, it seems that inspector fixed effects are pulling out much of the variation in reported compliance.

Table 2: Effect of treatment letters on compliance by second inspection.

VARIABLES	Compliance 1	Compliance 2	Compliance 3	Compliance 4
Treatment	0.0108 (0.00810)	0.00869 (0.00726)	0.00885 (0.00725)	0.000462 (0.000456)
Vacant		-0.321*** (0.00645)	-0.318*** (0.00657)	-0.000774* (0.000396)
Number of Violations		-0.0207*** (0.000755)	-0.0204*** (0.000769)	-2.09e-05 (2.44e-05)
Constant	0.271*** (0.00573)	0.488*** (0.00759)	0.602*** (0.0470)	-0.000556 (0.000582)
Observations	12,186	12,038	12,038	8,764
R-squared	0.000	0.199	0.202	0.002
Month FE			YES	YES
Inspector FE				YES

Note: This table presents regressions on the likelihood of complying with code enforcement by second inspection. Control variable “vacant” is a binary variable indicating vacancy status of the property and “number of violations” refers to the number of violations per property found in the first inspection. Columns 3 and 4 add month and inspector fixed effects.

*Robust standard errors in parentheses
*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.*

Table 3 presents the same results for the third inspection. Here, there is a statistically significant but small impact of the treatment notice, compared to the control. Specifically, receiving the treatment notice improves compliance by approximately 3.3 percent by third inspection. Given that previous data also confirmed that very few properties were able to get in

compliance by a follow-up inspection, these results suggest that delaying the second inspection may be an appropriate way to save more inspection resources for the city, when in combination with improved language in citations and violation notices. That is, in line with our initial hypothesis, *time* to comply was a significant barrier in increasing compliance with code violations. Still, even with this incremental shift, cost savings on the resourcing side would be an estimated \$12,083.37 per year⁹ if the treatment letters were also sent to the control group.

Table 3: Effect of treatment letters on compliance by third inspection.

VARIABLES	Compliance 1	Compliance 2	Compliance 3	Compliance 4
Treatment	0.0198* (0.0106)	0.0166** (0.00845)	0.0157* (0.00824)	0.0156* (0.00915)
Vacant		-0.508*** (0.00915)	-0.473*** (0.00941)	-0.248*** (0.00958)
Number of Violations		-0.0289*** (0.00106)	-0.0254*** (0.00104)	-0.0126*** (0.000845)
Constant	0.473*** (0.00758)	0.785*** (0.00800)	0.769*** (0.0440)	0.329*** (0.0510)
Observations	8,810	8,687	8,687	5,414
R-squared	0.000	0.379	0.411	0.172
Month FE			YES	YES
Inspector FE				YES

Note: This table presents regressions on the likelihood of complying with code enforcement by third inspection. Control variable “vacant” is a binary variable indicating vacancy status of the property and “number of violations” refers to the number of violations per property found in the first inspection. Columns 3 and 4 add month and inspector fixed effects.

*Robust standard errors in parentheses
*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.*

⁹ This figure does not include the benefit of additional fine collection because fine collections is considered as revenue brought forward rather than true revenues. This figure only includes savings for inspections but does not include any additional savings to the City from not needing to take property owners to court.

In Louisville, the same department also had access to fine collection data related to code enforcement. Tables 4 and 5 below shows the impact of the letters on fine collection, both in terms of the likelihood of payment and the amount paid. We define the likelihood of making a payment as the likelihood that a property owner paid any fine (e.g. Civil Penalty, Interest charge, Lien filing fee, Administrative fee) in full during our study period. The amount paid outcomes exclude partial payments, as the data does not reveal the payment amount for those fines.

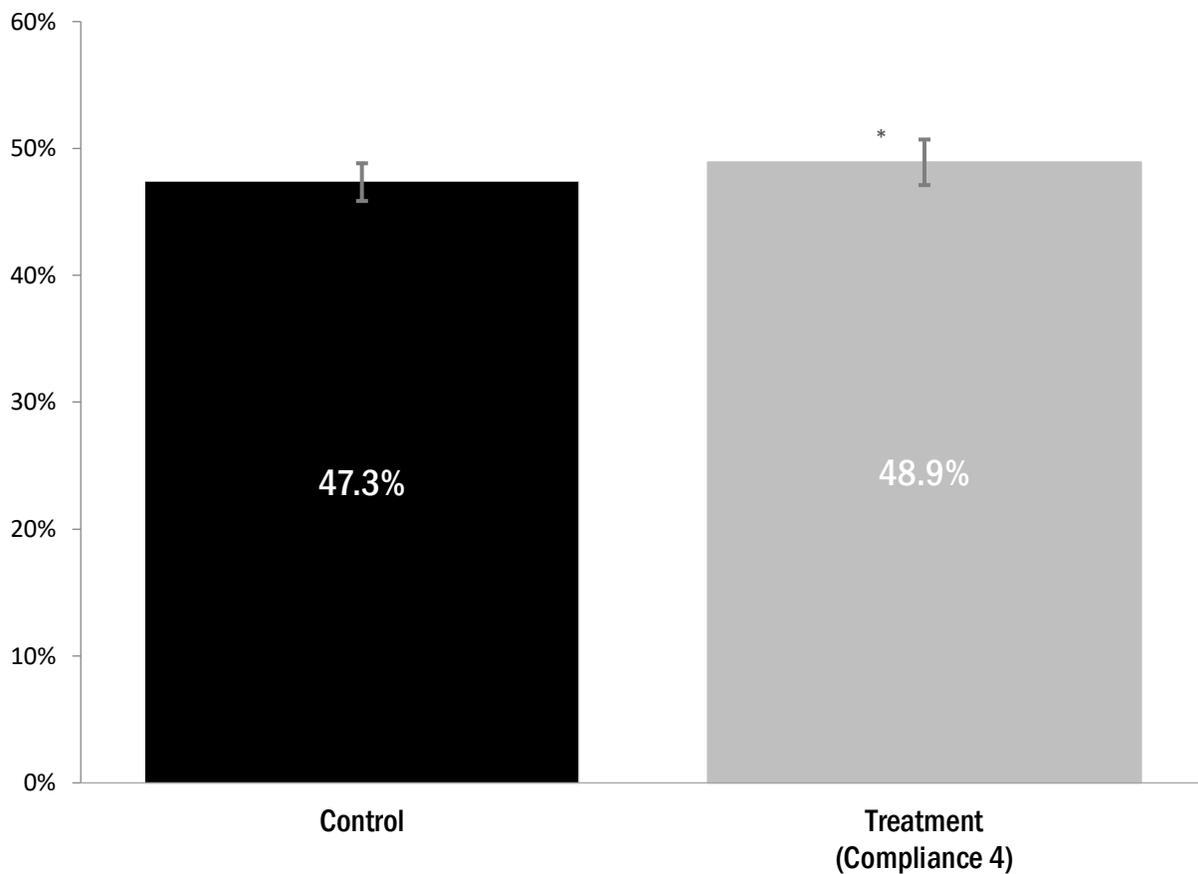


Figure 3: Effect of Treatment Letters on Compliance by Third Inspection.

Note: This bar graph illustrates the 1.56 percentage point difference between the control and the treatment group for the regression model, Compliance 4, as shown in Table 3.

Table 4: Effect of treatment letters on payment likelihood.

VARIABLES	Payment 1	Payment 2	Payment 3	Payment 4
Treatment	0.0263** (0.0126)	0.0187 (0.0130)	0.0185 (0.0130)	0.0219* (0.0132)
Vacant		-0.113*** (0.0166)	-0.112*** (0.0167)	-0.0910*** (0.0181)
Number of Violations		-0.0125*** (0.00132)	-0.0125*** (0.00135)	-0.0120*** (0.00138)
Constant	0.182*** (0.00874)	0.343*** (0.0178)	0.347*** (0.0879)	0.392*** (0.0992)
Observations	3,947	3,363	3,363	3,080
R-squared	0.001	0.051	0.052	0.043
Month FE			YES	YES
Inspector FE				YES

Note: This table presents regressions on the likelihood of paying fines related to code enforcement. Control variable “vacant” is a binary variable indicating vacancy status of the property and “number of violations” refers to the number of violations per property found in the first inspection. Columns 3 and 4 add month and inspector fixed effects.

*Robust standard errors in parentheses
*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.*

As is clear, the new letters had a significant effect on payments, where treatment letters increased the likelihood that a property owner paid a fine in full by 12.0 percent (Table 4). In addition, property owners receiving treatment letters paid, on average, \$23.63 more than those receiving control letters, which increases revenue by approximately 24 percent (Table 5). This suggests that had the treatment letters also been sent to the control group, the Department would have received approximately \$73,000 during the trial period. We do not include the dollar value of this additional revenue in the cost savings calculations above because we cannot determine whether this is revenue brought forward (that would have been paid eventually) or if this is truly additional revenue. However, given that after a certain period of non-payment, a city begins to

work with an independent collection agency (who receives a percentage of the fine collected), there is a clear interest for the city to have residents pay their fines earlier.

Table 5: Effect of treatment letters on amount paid.

VARIABLES	Amount Paid 1	Amount Paid 2	Amount Paid 3	Amount Paid 4
Treatment	19.14**	19.92**	21.29**	23.63**
	(7.719)	(8.908)	(8.958)	(9.669)
Vacant		-38.41***	-40.99***	-48.42***
		(11.04)	(11.11)	(13.11)
Number of Violations		1.292	0.707	-0.0122
		(1.045)	(1.063)	(1.084)
Constant	62.63***	85.32***	79.42**	99.03**
	(4.619)	(9.469)	(35.01)	(41.15)
Observations	3,947	3,363	3,363	3,080
R-squared	0.002	0.006	0.012	0.014
Month FE			YES	YES
Inspector FE				YES

Note: This table presents regressions on the amount of fines paid related to code enforcement. Control variable “vacant” is a binary variable indicating vacancy status of the property and “number of violations” refers to the number of violations per property found in the first inspection. Columns 3 and 4 add month and inspector fixed effects.

Robust standard errors in parentheses

**** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.*

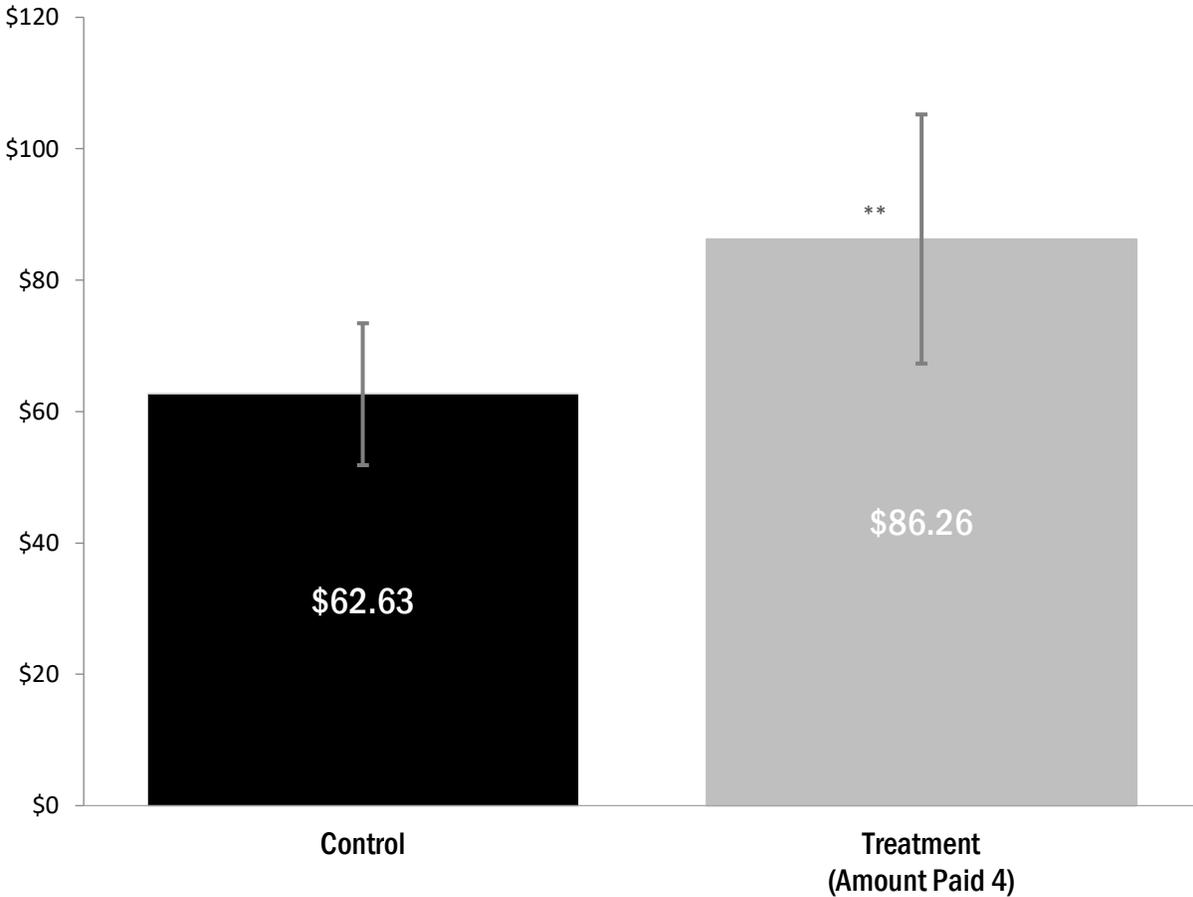


Figure 4: Effect of Treatment Letters on Amount Paid.

Note: This bar graph illustrates the \$23.63 statistical difference between the control and the treatment groups for the regression model, Amount Paid 4, as shown in Table 5.

Study 3: Chattanooga

Setting

The third study tackled a different node in the inspection process, considering whether proactive communication with previous violators could reduce future code violations. The reasoning was simple: if a city can predict who may violate code in the future, early proactive communication may be appropriate. For practical and ethical reasons, the city decided to target any property owner who had violations in the previous year (January 2015 through February 2016), a strong predictor of future violations. The goal of the trial was to measure whether an

early message would reduce violations during the subsequent “high season.” – that is, the season where most violations occur, months March through July.

The postcard itself (see Appendix A) included a series of behaviorally-informed techniques, including principles of personalization (Haynes et al., 2013; Sanders and Kirkman, 2019; BI Team, 2015)¹⁰ and indirect reciprocity (Yoeli et al., 2013) to encourage voluntary compliance. Regarding personalization, the postcard included the name and phone number of a member of the code enforcement team who was willing to speak with participants and connect them to available resources to fix their homes. This level of personalization helped to develop a more personal connection with code enforcement. Regarding indirect reciprocity, the postcard also contained a list of available resources and tips that the city had put together to help people avoid violations, as previous studies suggest that individuals are motivated to comply with a requested action and return the favor when others initiate the exchange by doing something small for them.

Trial Design

This randomized controlled trial involved a one-time behaviorally-informed postcard sent to 3,016¹¹ properties, with an additional 2,902 properties in the control group. This includes all properties that had been found to have a violation between January 2015 and February 2016. The randomization was clustered at the owner level and stratified by whether or not the owner had multiple properties with violations during the eligibility period. For owners in the treatment group with multiple violating properties (38 percent of total sample), half of the properties were

¹⁰ While the quality of the data did not allow use of first names of property owners, the letter was sent from an individual at Neighborhood Services.

¹¹ A conservative power calculation led to a minimum detectable effect size of 4 percentage points.

randomly selected to be referenced in a postcard.

The main outcome of interest was whether a violation occurred in any property owned by a given property owner between March 18th and July 31st of 2016, the four-month period that matches “high season,” according to previous data. That is, acknowledging that there may be spillovers amongst properties owned by the same person, we measure the likelihood of a violation for any property under a specific owner. The average owner owns 1.2 properties in our sample. To be clear, a property would only be listed in violation if there had been an inspection during this period and a violation was found. We expect the rate of inspections and their outcomes to be independent of treatment allocation and so under a null hypothesis, should be equal across treatment and control groups.

Results

Table 10 in Appendix C presents summary statistics on the target population and balance of assignment between treatment and control.

Table 6 shows the impact of sending a postcard on the likelihood that a given property owner has a violation in the subsequent high season. Column 1 presents a simple regression with no controls. Column 2 adds controls for characteristics that seem to be highly predictive of compliance, and column 3 adds fixed effects for the type of violation the property owner had initially. While much of the variation in compliance seems to be due to the type of violation a property owner had, as we might expect, the point estimate across regression is relatively stable. As such, there is suggestive evidence that the proactive postcard can reduce the likelihood of a violation by 9.2 percent.

Table 6: Effect of postcards on future violations.

VARIABLES	Violation 1	Violation 2	Violation 3
Treatment	-0.0168 (0.0120)	-0.0183 (0.0116)	-0.0191* (0.0114)
One Property		-0.0385*** (0.0130)	-0.0305** (0.0127)
Days Since Violation		-0.000584*** (5.31e-05)	-0.000641*** (5.19e-05)
Constant	0.207*** (0.00824)	0.369*** (0.0191)	0.215*** (0.0418)
Observations	5,918	5,918	5,918
R-squared	0.000	0.025	0.047
Violation Type FE			YES

Note: This table presents regressions on the likelihood of future violations of code enforcement for property owners who had a previous violation. Control variable “one property” is a binary variable indicating whether the property owner has more than one property and “days since violation” refers to the number of days since the last violation. Column 4 adds violation type fixed effects.

*Robust standard errors in parentheses
*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.*

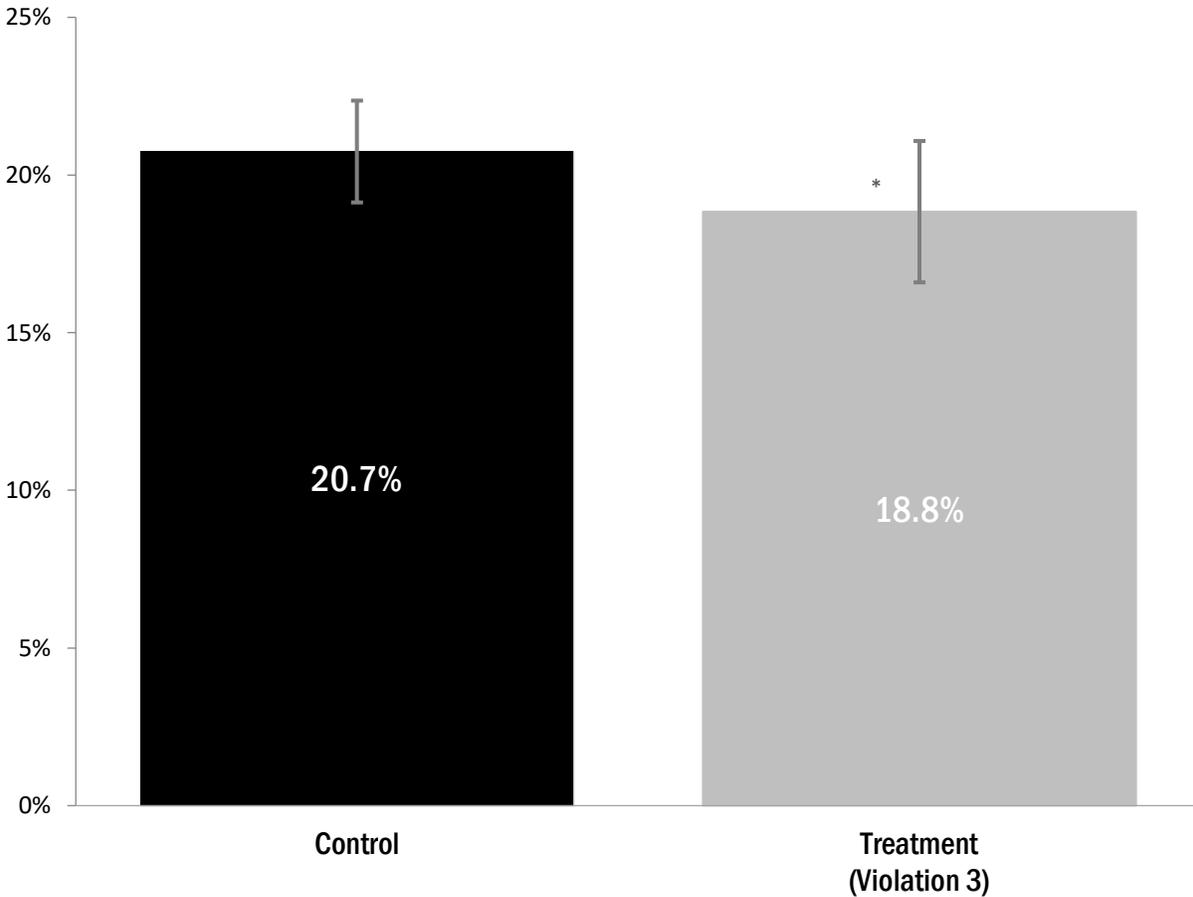


Figure 5: Effect of Postcards on Future Violations.

Note: This bar graph illustrates the 1.91 percentage point difference between the control and the treatment group for the regression model, Violation 3, as shown in Table 6.

DISCUSSION

Housing policy is a multifaceted challenge and improving compliance with code violations is a small part of the solution. However, these experiments demonstrate that local governments can easily and successfully reduce administrative burden, account for the cognitive biases of their residents, and improve overall compliance, even in a policy area as complicated as housing. We find that in New Orleans, earlier notification through the introduction of a new courtesy letter reducing learning costs and improved compliance by the first inspection by 14.7

percent; in Louisville, simplified citation and violation letters reduced compliance costs and increased compliance by the third inspection by 3.3 percent and payments by 12.0 percent; and in Chattanooga, preemptive postcards also aimed at reducing compliance costs sent to properties with previous violation(s) boosted compliance by 9.2 percent. In each case, previous learnings from behavioral science aimed to reduce psychological costs that lead to inaction.

Perhaps counterintuitively, these studies show that acting early – even if that means adding steps to the administrative process from the perspective of the government – can still reduce administrative burden for resident if it reduces learning and compliance costs. That is, we show that in reducing administrative burden for residents, governments may need to do more - not less - to help residents understand and comply with regulation. Effectively, these studies explore behaviorally-informed strategies to shift the administrative burden in the Moynihan et al. (2014) framework away from residents and onto government agencies. And while we do not argue that this is a substitute for larger reforms, employing rigorously tested behavioral nudges in public administration may allow for more decision nodes to be “unblocked” quickly, as broader discussions on reform move forward. For example, future studies could focus on the hearing process, consider new ways to improve 311 data collection, or consider how inspection visibility has neighborhood effects beyond the house being inspected.

Aside from leaving key touchpoints untested, there are a number of questions these studies do not address. For example, these trials do not tackle the behavior of inspectors themselves — where they choose to inspect, who they give a discretionary extension to, and how their decision-making may change over time. In other cities outside our sample that use “proactive inspections” as their main blight reduction strategy (that is, where inspectors decide which homes to inspect independently of complaints), behavioral interventions pertaining to the

inspectors may be more appropriate in driving both efficiency and equity. Furthermore, these studies do not tell us about *who* these low-cost¹² interventions influence. Last, these studies do not address the peer or neighborhood effects of code enforcement, even though the process of home improvement is a highly visible activity. Indeed, as these trials were designed with individual-level randomization, if a resident is more likely to fix up their own property because they see a neighbor fixing up theirs, our results are underestimates of the true impact of these types of interventions. Future studies could explicitly test the spillover effects of a blight nudge on neighbors.

Our estimates suggest that, if a mid-sized city implemented all three interventions in their administrative process, they could reasonably expect annual cost savings of between \$111,000 and \$311,000, or, in a mid-sized city, about 6 to 15 percent of the department’s relevant operating budget (see Appendix B for calculations). The large range in cost savings depends on assumptions about whether each decision node would effectively nudge the same person, or new people at each stage. That is, it is possible that only a certain type of person or property can be nudged, and so each intervention may nudge the same group of people; a group whose violations may never have escalated into the costliest forms of blight. This makes it hard to estimate whether these interventions would work additively. Moreover, we cannot estimate the external validity of these trials. While it is promising that we have some results from multiple cities all facing similar challenges, whether the magnitudes of the effects are city-specific cannot be determined from these studies. We strongly suggest that these interventions be replicated both in other settings and before they are rolled out in new cities by practitioners. It is noteworthy, however, that there is value in testing incremental tweaks that target the marginal “nudgeable”

¹² The most expensive intervention was in Chattanooga, TN, where the cost of the postcards to the treatment group totaled approximately \$1,200.

resident even if the magnitude of the effect is unclear a priori. By relieving some inspector pressure on the “easier” cases where voluntary compliance is possible, more time and resources can be allotted to the more “difficult” cases, leading to more efficient allocation of resources in local government. This may include more department attention on vacant properties or properties where the owner is hard to reach.

Importantly, cost savings for the cities were achieved very quickly through utilization of inexpensive interventions, which did not require a major investment by the city government in terms of time, risk, or resources. Indeed, each trial was completed in under a year with minimal disruption to current operations. As such, each of the trials also operates as a proof of concept that iterative rapid-cycle empirical experimental methods can be effective in public administration. They also operate as proofs of concept that compliance can be improved, even when reducing administrative costs does not equate with reducing administrative steps in the process.

More broadly, using principles of behavioral economics to improve the inner workings of government is both an important and new field where there is still much to learn. Beyond the results of the three field experiments themselves, this paper responds to the call for more experimental evidence in real government settings (Grimmelikhuijsen et al., 2016; James, Jilke, & Van Ryzin, 2017a, 2017b; Sebastian Jilke, Van de Walle, & Kim, 2015) and provides a useful operational framework for scholars and public managers working to improve government performance and processes. By providing examples of what’s possible in real-world governmental settings, we also hope that these types of RCTs can seamlessly be integrated into existing operations, making rapid and iterative testing the de facto approach to rolling out new policies.

REFERENCES

- Abbey-Lambertz, K. (2016, February 13). These are the cities with the most abandoned houses. Retrieved October 26, 2017, from https://www.huffingtonpost.com/entry/cities-with-most-abandoned-houses-flint_us_56be4e9ae4b0c3c5505171e7
- Adres, E., Vashdi, D. R., & Zalmanovitch, Y. (2016). Globalization and the retreat of citizen participation in collective action: A challenge for public administration. *Public Administration Review*, 76(1), 142–152.
- Agarwal, S., Mikhed, V., & Scholnick, B. (2018). Does the relative income of peers cause financial distress? Evidence from lottery winners and neighboring bankruptcies.
- Aizer, A. (2003). Low take-up in Medicaid: Does outreach matter and for whom? *The American Economic Review*, 93(2), 238–241.
- Allcott, H. (2011). Social norms and energy conservation. *Journal of Public Economics*, 95(9-10), 1082–1095.
- Alm, J., Sanchez, I., & De Juan, A. (1995). Economic and noneconomic factors in tax compliance. *Kyklos: Jahrbuch Des Instituts Fur Geschichte Der Medizin an Der Universitat Leipzig*, 48(1), 1–18.
- Arceneaux, K., & Butler, D. M. (2016). How not to increase participation in local government: The advantages of experiments when testing policy interventions. *Public Administration Review*, 76(1), 131–139.
- Ariely, D., & Wertenbroch, K. (2002). Procrastination, deadlines, and performance: Self-control by precommitment. *Psychological Science*, 13(3), 219–224.
- Badger, E. (2015, May 20). How cities are starting to turn back decades of creeping urban blight. *The Washington Post*. Retrieved from <https://www.washingtonpost.com/news/wonk/wp/2015/05/20/how-cities-are-starting-to-turn-back-decades-of-creeping-urban-blight/>
- Baekgaard, M., & Serritzlew, S. (2016). Interpreting performance information: Motivated reasoning or unbiased comprehension. *Public Administration Review*, 76(1), 73–82.
- Becker, G. S. (1968). Crime and punishment: An economic approach. *The Journal of Political Economy*, 76(2), 169–217.
- Becker, G. S., & Stigler, G. J. (1974). Law enforcement, malfeasance, and compensation of enforcers. *The Journal of Legal Studies*, 3(1), 1–18.
- Behavioural Insights Team (Great Britain) (2015). Update report 2013-2015. Behavioural Insights Limited.
- Bettinger, E. P., Long, B. T., Oreopoulos, P., & Sanbonmatsu, L. (2012). The role of application assistance and information in college decisions: Results from the H&R Block FAFSA experiment. *The Quarterly Journal of Economics*, 127(3), 1205–1242.
- Bhargava, S., & Manoli, D. (2015). Psychological frictions and the incomplete take-up of social benefits: Evidence from an IRS field experiment. *The American Economic Review*, 105(11), 3489–3529.
- Blumenthal, M., Christian, C., Slemrod, J., & Smith, M. G. (2001). Do normative appeals affect tax compliance? Evidence from a controlled experiment in Minnesota. *National Tax Journal*, 125-138.
- Bouwman, R., & Grimmelikhuijsen, S. (2016). Experimental public administration from 1992 to 2014. *International Journal of Public Sector Management*, 29(2), 110–131.
- Branas, C. C., Rubin, D., & Guo, W. (2012). Vacant properties and violence in neighborhoods.

- ISRN Public Health, 2012, 1–23.
- Casey, J. T., & Scholz, J. T. (1991). Beyond deterrence: Behavioral decision theory and tax compliance. *Law & Society Review*, 25(4), 821.
- Coricelli, G., Rusconi, E., & Villeval, M. C. (2014). Tax evasion and emotions: An empirical test of re-integrative shaming theory. *Journal of Economic Psychology*, 40, 49–61.
- Cowell, F. (2004). Carrots and sticks in enforcement. In H. J. Aaron & J. Slemrod (Eds.), *The crisis in tax administration*, Washington, D.C.: Brookings Institution Press.
- Currie, J., & Gruber, J. (1996). Health insurance eligibility, utilization of Medical care, and child health. *Quarterly Journal of Economics* 111, 431-66.
- Currie, J. (2006). The take-up of social benefits. In *Public Policy and the Income Distribution*, eds. Alan J. Auerbach, David Card, and John M. Quigley, 80-148. New York: Russell Sage.
- Dari-Mattiacci, G., & De Geest, G. (2010). Carrots, sticks, and the multiplication effect. *Journal of Law, Economics, & Organization*, 26(2), 365–384.
- De Geest, Gerrit and Dari-Mattiacci, Giuseppe (2013), ‘The rise of carrots and the decline of sticks,’ 80(1) *University of Chicago Law Review*, 341–392
- De Leon, E., & Schilling, J. (2017). Urban blight and public health: Addressing the impact of substandard housing, abandoned buildings, and vacant lots. Urban Institute. Available at https://www.urban.org/sites/default/files/publication/89491/2017.04.03_urban_blight_and_public_health_vprn_report_finalized.pdf.
- Dorn, S., Hill I., & Hogan, S. (2009). *The secrets of Massachusetts’ success: Why 97 percent of state residents have health coverage*. Washington, DC: Urban Institute.
- Gerber, A. S., Green, D. P., & Larimer, C. W. (2008). Social pressure and voter turnout: Evidence from a large-scale field experiment. *The American Political Science Review*, 102(01), 33–48.
- Gerber, A. S., & Rogers, T. (2009). Descriptive social norms and motivation to vote: Everybody’s voting and so should you. *The Journal of Politics*, 71(1), 178–191.
- Grasmick, H. G., & Green, D. E. (1980). Legal punishment, social disapproval and internalization as inhibitors of illegal behavior. *The Journal of Criminal Law and Criminology* (1973-), 71(3), 325.
- Grimmelikhuisen, S., Gilke, S., Olsen, A. L., & Tummers, L. (2016). Behavioral public administration: Combining insights from public administration and psychology. *Public Administration Review*, 77(1), 45–56.
- Hanratty, M. J. (2006). Has the Food Stamp program become more accessible? Impacts of recent changes in reporting requirements and asset eligibility limits. *Journal of Policy Analysis and Management* 25(3), 603–621.
- Hatcher, A., Jaffry, S., Thebaud, O., & Bennett, E. (2000). Normative and social influences affecting compliance with fishery regulations. *Land Economics*, 76(3), 448.
- Haynes, L. C., Green, D. P., Gallagher, R., John, P., & Torgerson, D. J. (2013). Collection of delinquent fines: an adaptive randomized trial to assess the effectiveness of alternative text messages. *Journal of Policy Analysis and Management*: , 32(4), 718–730.
- Heinrich, Carolyn J. The bite of administrative burden: a theoretical and empirical investigation. *Journal of Public Administration Research and Theory* 26.3 (2015): 403–420.
- Herd, P., DeLeire, T., Harvey, H., & Moynihan, D. P. (2013). Shifting administrative burden to the State: The case of Medicaid take-up. *Public Administration Review*, 73(s1), S69–S81.
- Hernanz, V., Malherbet F., & Pellizari, M. (2004). Take-up of welfare benefits in OECD countries: A review of the evidence, vol. 17. Paris: OECD.

- Hvidman, U., & Andersen, S. C. (2016). Perceptions of public and private performance: Evidence from a survey experiment. *Public Administration Review*, 76(1), 111–120.
- Inman, J. J., & McAlister, L. (1994a). Do coupon expiration dates affect consumer behavior? *JMR, Journal of Marketing Research*, 423–428.
- Inman, J. J., & McAlister, L. (1994b). Do coupon expiration dates affect consumer behavior? *JMR, Journal of Marketing Research*, 31(3), 423–428.
- James, O., Jilke, S., Petersen, C., & Van de Walle, S. (2016). Citizens' blame of politicians for public service failure: Experimental evidence about blame reduction through delegation and contracting. *Public Administration Review*, 76(1), 83–93.
- James, O., Jilke, S. R., & Van Ryzin, G. G. (2017a). Conclusions – Towards an experimental public management. In *Experiments in Public Management Research*, 495–508.
- James, O., Jilke, S. R., & Van Ryzin, G. G. (2017b). *Experiments in public management research: Challenges and contributions*. Cambridge University Press.
- Jilke, S., Tummers, L., & Kelman, S. (2015). Behavioral public administration. *Academy of Management Proceedings*, 2015(1), 14952–14952.
- Jilke, S., Van de Walle, S., & Kim, S. (2015). Generating usable knowledge through an experimental approach to public administration. *Public Administration Review*, 76(1), 69–72.
- John, P., Smith, G., & Stoker, G. (2009). Nudge nudge, think think: two strategies for changing civic behaviour. *The Political Quarterly*, 80(3), 361–370.
- Johnson, E. J., & Goldstein, D. (2003). Medicine. Do defaults save lives? *Science*, 302(5649), 1338–1339.
- Kabbani, N. S., & Wilde, P. E. (2003). Short recertification periods in the U.S. Food Stamp program. *The Journal of Human Resources*, 38, 1112.
- Kopczuk, W., & Pop-Eleches, C. (2005). Electronic filing, tax preparers, and participation in the Earned Income Tax Credit. *Journal of Public Economics* 91, 1351–1367.
- Kuperan, K., & Sutinen, J. G. (1998). Blue water crime: Deterrence, legitimacy, and compliance in fisheries. *Law & Society Review*, 32(2), 309.
- Laibson, D. (1997). Golden Eggs and Hyperbolic Discounting. *The Quarterly Journal of Economics*, 112(2), 443–478.
- Leininger, L., Friedsam D., Voskuil K., & DeLeire, T. (2011). The target efficiency of online Medicaid/CHIP Enrollment: An evaluation of Wisconsin's ACCESS internet portal. Princeton, NJ: Robert Wood Johnson Foundation State Health Access Reform Evaluation.
- Madrian, B. C. (2012). Matching contributions and savings outcomes: A behavioral economics perspective. In *Matching Contributions for Pensions*, 289–309.
- Margetts, H. Z. (2011). Experiments for public management research. *Public Management Review*, 13(2), 189–208.
- Marvel, J. D., & Girth, A. M. (2016). Citizen attributions of blame in third-party governance. *Public Administration Review*, 76(1), 96–108.
- May, P. J. (2004). Compliance motivations: Affirmative and negative Bases. *Law & Society Review*, 38(1), 41–68.
- May, P. J. (2005). Regulation and compliance motivations: Examining different approaches. *Public Administration Review*, 65(1), 31–44.
- Meier, K. J., & Morgan, D. R. (1982). Citizen compliance with public policy: the National maximum speed law. *Political Research Quarterly*, 35(2), 258–273.
- Mendoza, J. P., & Wielhouwer, J. L. (2015). Only the carrot, not the stick: incorporating trust into the enforcement of regulation. *PloS one*, 10(2), e0117212.

- Moynihan, D., Herd, P., & Harvey, H. (2014). Administrative burden: Learning, psychological, and compliance costs in citizen-state interactions. *Journal of Public Administration Research and Theory*, 25(1), 43–69.
- Mullainathan, S., & Shafir, E. (2014). *Scarcity: The new science of having less and how it defines our lives*. New York: Picador.
- Nisar, Muhammad A. Children of a lesser god: Administrative burden and social equity in citizen–state interactions. *Journal of Public Administration Research and Theory* 28.1 (2017): 104-119.
- Orbach, B. (2006). Unwelcome benefits: Why welfare beneficiaries reject government aid. *Law and inequality: A journal of theory and practice* 24(1), 107–155.
- Paternoster, R., & Simpson, S. (1996). Sanction threats and appeals to morality: Testing a rational choice model of corporate crime. *Law & Society Review*, 30(3), 549.
- Peltzman, S. (1975). The effects of automobile safety regulation. *The Journal of Political Economy*, 83(4), 677–725.
- Ratcliffe, C., McKernan SM., & Finegold, K. (2007). *The effect of state Food Stamp and TANF policies on Food Stamp program participation*. Washington, DC: Urban Institute.
- Remler, D., Rachlin J., & Glied, S. (2001). What can the take-up of other programs teach us about how to improve take-up of health insurance programs? National Bureau of Economic Research Working Paper No. 8185.
- Riccucci, N. M., Van Ryzin, G. G., & Li, H. (2016). Representative bureaucracy and the willingness to coproduce: An experimental study. *Public Administration Review*, 76(1), 121–130.
- Rushe, D. (2014, May 27). Clearing Detroit’s blight will cost city almost \$2bn, taskforce report finds. *The Guardian*. Retrieved from <http://www.theguardian.com/world/2014/may/27/detroit-blight-remove-vacant-structures-buildings-report>
- Sanders, M., & Kirkman, E. (2019). I’ve booked you a place, good luck: A field experiment applying behavioral science to improve attendance at high impact recruitment events. *Journal of Behavioral Public Administration*, 2(1).
- Sanders, M., Kirkman, E., Chande, R., Luca, M., Linos, E., Soon, X-Z.. (2019). Using text reminders to increase attendance and attainment: Evidence from a field experiment. <http://dx.doi.org/10.2139/ssrn.3349116>.
- Schanzenbach, D.W. (2009). *Experimental estimates of the barriers to Food Stamp enrollment*. Madison, WI: Institute for Research on Poverty.
- Schilling, J., & Pinzón, J. (2016). *The Basics of Blight: Recent research on its drivers, impacts, and interventions* (No. 3). Vacancy Property Research Network. Retrieved from http://vacantpropertyresearch.com/wp-content/uploads/2016/03/20160126_Blight_FINAL.pdf
- Schlangenotto, D., & Kundisch, D. (2016). Read this paper! A field experiment on the role of a call-to-action in paid search. In ECIS (p. ResearchPaper63).
- Schwabish, J. (2012). *The impact of online Food Stamp applications on participation*. Paper presented November 2012 at the Annual Meeting of the Association of Public Policy and Management, Baltimore.
- Sherman, L. W. (1993). Defiance, deterrence, and irrelevance: A theory of the criminal sanction. *The Journal of Research in Crime and Delinquency*, 30(4), 445–473.
- Sutinen, J. G., & Kuperan, K. (1999). A socio-economic theory of regulatory compliance.

- International Journal of Social Economics, 26(1/2/3), 174–193.
- Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science*. Available at http://onlinelibrary.wiley.com/doi/10.1207/s15516709cog1202_4/full
- Team, B. I. (2013). Applying behavioural insights to charitable giving. Cabinet Office. Available at <http://opencreates.com/wp-content/uploads/2013/05/Behavioural-Insights-Trials-on-Charitable-Giving-May-2013.pdf>
- Team, B. I. (2015). The Behavioral Insights Team Update 2013-2015. London: Cabinet Office. Available at Http://www.Behaviouralinsights.Co.Uk/wp-content/uploads/2015/07/BIT_Update-Report-Final-2013-2015.Pdf [accessed March 28, 2016].
- Thaler, R. H., Tversky, A., Kahneman, D., & Schwartz, A. (1997). The effect of myopia and loss aversion on risk taking: An experimental test. *The Quarterly Journal of Economics*, 112(2), 647–661.
- Thaler, R., & Sunstein, C. (2008). *Nudge: Improving decisions about health, wealth, and happiness*. New Haven: Yale University Press.
- White, G. B. (2015, August 20). New Orleans has a housing crisis despite tens of thousands of vacant homes. *The Atlantic*. Retrieved from <http://www.theatlantic.com/business/archive/2015/08/new-orleans-blight-hurricane-katrina/401843/>
- Winter, S. C., & May, P. J. (2001). Motivation for compliance with environmental regulations. *Journal of Policy Analysis and Management*: , 20(4), 675–698.
- Winter, S. C., & May, P. J. (2002). Information, interests, and environmental regulation. *Journal of Comparative Policy Analysis: Research and Practice*, 4(2), 115–142.
- Yoeli, E., Hoffman, M., Rand, D. G., & Nowak, M. A. (2013). Powering up with indirect reciprocity in a large-scale field experiment. *Proceedings of the National Academy of Sciences of the United States of America*, 110 Suppl 2, 10424–10429.

APPENDIX A

New Orleans - Treatment Courtesy Letter

CODE ENFORCEMENT AND HEARINGS BUREAU
CITY OF NEW ORLEANS

Dear <<Owner POC>>

An inspector has been scheduled to check your property at <address> for code violations.

Below is the reported complaint:

<311 log>

On the back of this letter, you'll find a list of other examples of code violations that you should be checking.

We are sending you this courtesy letter to give you time to fix your property. If the inspector finds that violation(s) exist, you will likely face an administrative hearing and costly fines and fees.

We understand that bringing your property into compliance may be hard, but financial assistance may be available to help you. Please visit bit.do/nolacode for a list of resources.

Fix your property to avoid a hearing and costs.

Respectfully,

Albert Joseph Poche
City of New Orleans
Code Enforcement and Hearings Bureau

CODE ENFORCEMENT AND HEARINGS BUREAU
CITY OF NEW ORLEANS

Potential violation	You can fix it by...
Weeds and plant growth exceeds 18 inches in height	Cutting the grass.
Trash and debris on the property	Cleaning and removing debris.
Sidewalks and/or driveway are impassable or in disrepair	Maintaining sidewalks or driveway in good condition, free from hazardous conditions.
Exterior surfaces of the structure (including doors, windows, wood, and siding) not well maintained	Maintaining all exterior surfaces to avoid decay, corrosion, or intrusion. This may include painting, repairing, or replacing deteriorating materials.
Structural elements (including rafters, floor joists, and columns) not well maintained	Maintaining structural elements. This may include repairing or replacing broken, unsafe, or decayed parts.
Gutters and downspouts not maintained	Maintaining gutters and downspouts. This may include removing debris, cleaning, painting, and/or repairing or replacing broken parts.
Building overhangs not maintained	Maintaining building overhangs. This may include painting, and repairing broken or decayed parts.
Roof not well maintained	Maintaining roof so that it prevents water intrusion. This may include painting or weatherizing sections of your roof and repairing broken, unsafe, or decayed parts.

Full city code available at: bit.do/nolacode

Louisville – Control Citation Letter (First Page)



Louisville-Jefferson County Metro Government

Department of Codes & Regulations

Property Maintenance Division

444 S. 5th Street, Suite 200 - Louisville, KY 40202

Phone: (502)773-2079 Email: Matt.Gallagher@louisvilleky.gov Web Site: www.louisvilleky.gov/government/codes-regulations

Case Number: 15PM27273-457458

Page 1 of 4

11/3/2016

Owner:

Location:

OFFICIAL CITATION

Citation Amount: \$500.00

Date and Time of Offense: November 3, 2016 3:12 pm

A citation in the amount listed above has been assessed against the owner of the above mentioned property for the existence of violation(s) of the codified ordinances in Chapter 155 and/or Chapter 156 and/or Chapter 32 of the Louisville Metro Code of Ordinances. The facts constituting the offense are listed on the attached page(s).

Payment of this civil penalty citation fine can be made by check or money order, payable to Louisville Metro Government. The payments may be delivered or mailed to **Accounts Receivable, 611 W Jefferson Street, 1st Floor, Louisville, KY 40202**. If you do not appeal this notice it will be considered final and you waive any right to a hearing before the Hearing Board to contest the citation. If a payment is not received within 30 days of the date of this notice, a lien bearing interest at 18% per annum will be filed against your property for the amount of the civil fine plus associated administrative and lien filing costs.

You have the right to appeal this matter to the Board stated below by submitting the enclosed form within seven (7) days of the receipt of this notice. If you elect to appeal this citation and the Code Official's citation is upheld, you may be subject to the maximum fine of the amount listed above plus \$100.00. This appeal form must be sent to the Department of Codes and Regulations at 444 S. 5th Street, 2nd Floor, Louisville, KY 40202.

An appeal of a temporary sign violation as well as Landmark violations is to the Code Enforcement Board. An appeal of any other sign violation, including nonconforming right for the sign, is to the Board of Zoning Adjustment. An appeal of a property maintenance violation is to the Property Maintenance Nuisance Board.

Payment of the citation does not eliminate your responsibility to correct existing violations. Failure to correct the attached violations by the date(s) indicated will subject you to additional civil fines of \$100 to \$1,000 per day, per violation or a criminal complaint being filed against you in the Jefferson County District Court and, if convicted, you would be subject to a fine or imprisonment, as provided by law. We may also cause the violations to be corrected at your expense. All assessed penalties and costs not paid by you will become a lien against your property.

If you have questions, please contact me at the number listed below.

If you are not the owner of this property, you have been sent a copy of this notice as an interested party.

MATT C GALLAGHER

Inspector
(502)773-2079
Matt.Gallagher@louisvilleky.gov

Louisville - Treatment Citation Letter (First Page)



Louisville-Jefferson County Metro Government

Department of Codes & Regulations

Property Maintenance Division

444 S. 5th Street, Suite 200 - Louisville, KY 40202

Phone: (502)772-2125 Email: Alex.Stewart@louisvilleky.gov Web Site: www.louisvilleky.gov/government/codes-regulations

Case Number: 15PM162-85363

Page 1 of 4

8/17/2015

SPALDING, WM C & EDITH E
5310 MARYMAN RD
LOUISVILLE, KY 40258-1212

FIX YOUR PROPERTY AND PAY YOUR FINE

Dear Property Owner,

I inspected your property at <address> on <date and time> and found that it is in violation of Louisville Metro's property maintenance regulations.

You must now do two things:

- (1) pay your fine by <due date> and
- (2) correct your violation(s) by the due date(s) indicated on the following pages to prevent additional fines.

Fine: \$200.00

To pay with your credit or debit card: call (502) 574-3430 right now

You can also mail a check or money order payable to "Louisville Metro Government" to:

Accounts Receivable
Attention: Citation Letter Case #<insert number>
611 W Jefferson Street, 2nd Floor
Louisville, KY 40202

To pay in person, please visit our office at the address listed above (cash is accepted).

You have the right to appeal your citation. Please see the following page for more information.

To discuss your violations, please call me at <inspector's number>.

DENNIS STEWART

Inspector
(502)778-2248
W.Stewart@louisvilleky.gov

A citation in the amount listed above has been assessed against the owner of the above mentioned property for the existence of violation(s) of the codified ordinances in Chapter 155 and/or Chapter 156 and/or Chapter 32 of the Louisville Metro Code of Ordinances. The facts constituting the offense are listed on the attached page(s).

If you are not the owner of this property, you have been sent a copy of this notice as an interested party.

Louisville – Control Violation Letter (First Page)



Louisville-Jefferson County Metro Government
Department of Codes & Regulations

Property Maintenance Division
444 S. 5th Street, Suite 200 - Louisville, KY 40202

Phone: (502)773-8029 Email: Kimberly.Pullen@louisvilleky.gov Web Site: www.louisvilleky.gov/government/codes-regulations

Case Number: 14PM10529-2429115

11/3/2016

Page 1 of 2

Owner:

Location:

VIOLATION NOTICE

As authorized by Chapter 155 and/or Chapter 156 and/or Chapter 32 of the Louisville/Jefferson County Metro Code of Ordinances, I inspected your property located at the address above on November 03, 2016. My inspection revealed the existence of violations that violate the codes in Chapter 155 and/or Chapter 156, for which you are responsible. The violations are listed on the attached page(s).

All violations must be corrected by the dates indicated on the attached page(s). If you are either unable to correct the violations by the given date(s) or have any questions, please contact me at the number below. I will make every effort to answer your questions or, if necessary, meet you at your property or wherever is most convenient for you.

If you disagree with this notice, you have the right to appeal this matter to the Board stated below. To properly submit your appeal, you must file a written statement listing the reasons upon which you base your appeal within seven (7) days of receipt of this notice. The appeal must be sent to the Department of Codes & Regulations, Attention: Property Maintenance Division, 444 South Fifth Street, Suite 200, Louisville, KY 40202.

An appeal of a temporary sign violation is to the Code Enforcement Board. An appeal of any other sign violation, including a nonconforming sign for the sign, is to the Board of Zoning Adjustment. An appeal of a property maintenance violation is to the Property Maintenance Nuisance Board.

If you do not appeal this notice within the given time frame and if you fail to correct the violations by the re-inspection date, this notice will be considered final and you will be subject to a citation, including a fine, and possible criminal sanctions as provided by law. If you do not appeal, you waive the right to a hearing on this notice. Furthermore, I may have the uncorrected violations remedied at your expense. Failure to pay any assessed fine and/or the cost to Metro Government for correcting the violations shall result in a lien filed against your property for the total amount due, including administrative and filing costs.

Your property is an important investment for you and the community. I urge you to make the necessary corrections to eliminate all violations so that no further enforcement will be necessary.

If you are not the owner of this property, you have been sent a copy of this notice as an interested party.

Kimberly Pullen

Inspector
(502)773-8029
Kimberly.Pullen@louisvilleky.gov

Louisville - Treatment Violation Letter (First Page)



Louisville-Jefferson County Metro Government

Department of Codes & Regulations

Property Maintenance Division

444 S. 5th Street, Suite 200 - Louisville, KY 40202

Phone: (502)773-2125 Email: Alex.Blaylock@louisvilleky.gov Web Site: www.louisvilleky.gov/government/codes-regulations

Case Number: 15PM160-485363

Page 1 of 4

8/17/2015

SPALDING, WM C & EDITH E
5310 MARYMAN RD
LOUISVILLE, KY 40258-1212

FIX YOUR PROPERTY

Dear Property Owner,

I inspected your property at <address> on <date> at <time> and found that it is in violation of Louisville Metro property maintenance regulations.

Please call me now at <inspector number> so we can talk you through what you need to do.

You must correct your violation(s) by the due date(s) listed below.

Violations (see enclosed pages for details)	Due date
<violation one>	<due date>
<violation two>	<due date>
<violation three>	<due date>

You still have time to correct your violations but if you fail to correct any violations by their due date, you will be subject to a citation, including a minimum \$100 fine, and possible criminal sanctions as provided by law.

You have the right to appeal your violation(s) if you disagree with them. To appeal, you must send a list of reasons for your appeal within seven (7) days of your receipt of this notice to: Department of Codes & Regulations, Attention: Property Maintenance Division, 444 South Fifth Street, Suite 200, Louisville, KY 40202.

Your property is an important investment for you and the community. I urge you to make the necessary corrections to eliminate all violations so that no further enforcement will be necessary.

DENIS STEWART

Inspector
(502)876-2248
W.Stewart@louisvilleky.gov

If you are not the owner of this property, you have been sent a copy of this notice as an interested party.

Chattanooga - Postcard

POST THIS ON YOUR FRIDGE AS A REMINDER TO AVOID VIOLATIONS

Overgrowth	<ul style="list-style-type: none">▪ Keep your lawn mowed to 10 inches to avoid fines▪ Some organizations may be able to mow your lawn for free if you require help for medical reasons
Litter	<ul style="list-style-type: none">▪ Check your garbage collection day at bit.do/GarbageMap▪ If you need to dispose of bulky items or find litter in public areas, call 311. It's free!
Abandoned Vehicle	<ul style="list-style-type: none">▪ If you need to get rid of a vehicle, go to bit.do/DonateCar and WUTC will pick it up as a tax-deductible donation!▪ Call 311 if an abandoned vehicle is blocking traffic
Housing Conditions	<ul style="list-style-type: none">▪ Maintain your roof, windows, gutters, and other structures▪ Local organizations may be able to help with minor repairs, painting, or roofing

Any questions? Call Jen at (423) 643-7325

Dear Property Owner,

I'm writing because your property located at **<locationdesc>** had code violations in the past.

Inspectors will be monitoring your neighborhood, but you can avoid potential violations by taking steps now.

Prepare in advance to avoid fines and multiple inspections! On the back, you will find a list of potential violations to watch out for and tips on how to maintain your property so that it's up to code.

Give me a call at (423) 643-7325 if you have any questions!

Jennifer B.
Neighborhood Services
City of Chattanooga



<owner_name>
<mailingaddress>
<mailingcity>, <mailingstate> <mail

APPENDIX B

Estimating cost savings with all three interventions

Below, we provide a crude estimate of cost savings if a hypothetical mid-size city implements all three interventions discussed in this paper, with estimated compliance improvements of 14.7 percent, 3.3 percent and 9.2 percent respectively (Table 7). The 311 call data below are based on data from New Orleans' BlightStat database; the costs are based on expenditure and budget data obtained from the City of New Orleans. Here, we define mid-size city relative to New Orleans' population of approximately 400,000. Yet the estimates are still just that because we do not know the magnitude of the second and their interventions in New Orleans per se. The first column displays the three intervention types; the second and third columns compares violation percentages for the hypothetical mid-sized city based on whether they utilized the three interventions and uses compliance rates from the studies described above; and the fourth column estimates the saved resources. We calculated minimum and maximum bounds based on whether or not there is overlap across individuals at each intervention stage (i.e. the minimum bounds assume that at least some individuals would receive the first two interventions - complying by the second intervention).

Table 7: Hypothetical estimate of cost savings from implementing all 3 interventions.

	No Interventions ("Control")	All 3 Interventions ("Treatments")	Saved Resources (Difference between Control and Treatment)
Hypothetical starting point of annual 311 calls	6,775 calls	6,775 calls	
By first inspection - intervention = courtesy notice per NOLA trial	Control Violations Baseline: 57.6 percent	Reduction of 6.2 percentage points = 51.4 percent Violations	
	3,902 violations	3,482 violations	420 violations
By third inspection - intervention = simplified notices per Louisville	Control Violations: 52.7 percent	Reduction of 1.6 percentage points = 51.1 percent Violations	
	2,056 ongoing violations	1,779 ongoing violations	277 ongoing violations
The proactive intervention = preventative reminders per Chattanooga	Control Violations: 79 percent	Reduction of 1.9 percentage points = 77 percent violations	
	3,082 violations	3,004 violations	78 violations
Min-Max Bounds of Resources Saved			277 - 775 violations
Cost Savings range given resources saved (\$402/violation)			\$111,354 - \$311,550 (approx. 6-15 percent of \$1.9 million annual office budget)

APPENDIX C

Balance Checks and Regression Equations For Each Study

New Orleans: Randomization

T-tests confirm that the two groups look statistically similar across various property-specific characteristics, including whether the home is occupied, whether it is a commercial property, or whether it is abandoned. There also doesn't seem to be significant differences in the types of complaints made on the call, where the percentage of properties listed as having trash or weeds (the largest category of complaints at 90 percent of cases) or rats (30 percent of cases) is similar across groups.¹³ Importantly, the groups also look balanced in terms of when the inspector visited the property — almost exactly 30 days for both treatment and control groups, so the two groups had the same amount of time to fix their properties. The only difference in pre-treatment characteristics lies in the number of alleged violations. There seem to be slightly more alleged violations listed on average in the treatment group. While we can control for this in our analysis, if it had any effect on our findings, it would lead to an underestimate of our results.

¹³ The categories of complaints are overlapping as one property may have multiple potential violations.

Table 8: New Orleans Randomization Balance Check.

VARIABLES	Control N	Control Mean	Treatment N	Treatment Mean	Difference
Treatment	616	0.53	537	0.47	0.06
Occupied	451	0.57	405	0.55	0.02
Commercial	616	0.04	537	0.03	0.01
Abandoned	616	0.07	537	0.06	0.01
Trash/Weeds	616	0.89	537	0.90	-0.01
Delay	616	29.48	537	29.95	-0.47
Alleged	616	2.08	537	2.23	-0.15**
Rats	616	0.28	537	0.32	-0.04

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

New Orleans: Regression Equation

We estimate the outcome of interest with a regression model¹⁴:

$$Y_{it} = \alpha + \beta_1 T_{it} + \beta_2 Z_{it} + \beta_3 M_{it} + u_i$$

where

Y_{it} is our outcome measure and is a binary variable taking the value of zero (0) if the inspector finds one or more violations on the property and no work in progress upon the first inspection and one (1) if there are no violations or work in progress;

α is the constant;

T_{it} is a binary variable indicating the treatment group (1) or the control group (0);

Z_{it} is a continuous variable that reflects the number of days between the 311 call and the first inspection;

¹⁴ An OLS regression model is used here instead of a logit model, as when we re-fit this same specification using a logistic link, there is strong evidence of complete separation and poor model fit. We are therefore unable to estimate the corresponding causal effects with a logit model. However, the coefficients and p-value results of the OLS regression are closely aligned to those of the logit regression.

M_{it} is a vector of dummy variables that captures the month of violation; and

u_i is an i.i.d. error term with a known form of heteroskedasticity.

The coefficient on T_{it} is the effect of being in the treatment group and is our primary coefficient of interest.

Louisville: Randomization

Again, we see that treatment and control groups are balanced across important variables. Specifically, whether a violation occurred at first inspection (i.e. the inspection hit rate), the number of violations per property, and the vacancy rate are balanced between treatment and control group.

TABLE 9: Louisville Randomization Balance Check

VARIABLES	Control N	Control Mean	Treatment N	Treatment Mean	Difference
Treatment	6,291	0.49	6,438	0.51	-0.02
Vacant	5,941	0.37	6,097	0.37	0.00
Number of Violations	6,013	4.87	6,173	4.76	0.11
Violation	6,013	0.72	6,173	0.72	0.00

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Louisville: Regression Equation

We estimate the outcome of interest with a regression model¹⁵:

$$Y_{it} = \alpha + \beta_1 T_{it} + \beta_2 Z_{it} + \beta_3 M_{it} + \beta_4 S_{it} + u_i$$

where

Y_{it} is our outcome measure and is a binary variable taking the value of zero (0) if the inspector finds one or more violations on the property and no work in progress upon the first inspection

¹⁵ See Note 5.

and one (1) if there are no violations or work in progress;

α is the constant;

T_{it} is a binary variable indicating the treatment group (1) or the control group (0);

Z_{it} is a continuous variable that represents the number of violations present at the first inspection;

M_{it} is a vector of dummy variables that captures the month of violation;

S_{it} is a vector of dummy variables that captures the inspector of the property (therefore controlling for fixed effects by inspector); and

u_i is an i.i.d. error term with a known form of heteroskedasticity.

The coefficient on T_{it} is the effect of being in the treatment group and is our primary coefficient of interest.

Chattanooga: Randomization

Both treatment and control group seem to have statistically similar types of property owners and violation types, although the control group seems to have slightly higher proportions of violators with one property. If having one property (and therefore less to do) increases the likelihood of compliance with a postcard, this slight imbalance should push a treatment effect estimate downwards. Below we include this variable as a control.

Table 10: Chattanooga Randomization Balance Check.

VARIABLES	Control N	Control Mean	Treatment N	Treatment Mean	Difference
Treatment	2,902	0.49	3,016	0.51	-0.02
Days Since Violation	2,902	234.24	3,016	233.22	1.02
Violation Type	2,902	3.45	3,016	3.43	0.02
One Property	2,902	0.63	3,016	0.61	0.02*

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Chattanooga: Regression Equation

We estimate the outcome of interest with a regression model¹⁶:

$$Y_{it} = \alpha + \beta_1 T_{it} + \beta_2 X_{it} + \beta_3 V_{it} + u_i$$

where

Y_{it} is our outcome measure and is a binary variable taking the value of one (1) if the inspector finds one or more violations on the property and no work in progress upon the first inspection and zero (0) if there are no violations or work in progress;

α is the constant;

T_{it} is a binary variable indicating the treatment group (1) or the control group (0);

X_{it} is a vector of control variables, which includes:

- the number of days elapsed between the property's last failed inspection and the launch of the trial;
- type(s) of prior violation(s) associated with the property in 2015 (dummies);
- inspector of the property during our study period (dummies and missing data indicator);

¹⁶ See Note 5.

- source of case opening during our study period (dummies and missing data indicator);
- Whether the owner lives at the property (stratification variable where dummy equal to 1 if the violation location is the same as the property owner's mailing address);
- Whether the owner had one or multiple properties with violations from January 2015 to February 2016 (stratification variable);
- district number (dummies);

V_{it} is a vector of dummy variables that captures the type of violation; and

u_i is an i.i.d. error term with a known form of heteroskedasticity.

The coefficient on T_{it} is the effect of being in the treatment group and is our primary coefficient of interest.

Standard errors are clustered at the owner level. The missing data indicators described in X_{it} associated with inspector and source of case will take the value of 1 if the fields are missing. When these fields are missing, it is always due to the fact that the property did not have a case opened against it during our study period.