Using Behavioral Insights to Help Employers Resolve OSHA Citations

Trial Design and Findings

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The DOL Behavioral Interventions Project

The Department of Labor Behavioral Interventions (DOL-BI) project was launched to explore how insights from behavioral science can be used to improve the performance and outcomes of DOL programs. It is sponsored by the DOL Chief Evaluation Office and executed by Mathematica Policy Research and ideas42. The project team has designed, implemented, and rigorously tested three behavioral trials in selected Labor programs. The project team developed behavioral interventions and executed trials in partnership with (1) the Employee Benefits Security Administration and the Department of Labor's Human Resources division, to increase retirement savings, (2) the Occupational Safety and Health Administration, to boost workplace safety, and (3) the Employment and Training Administration, in partnership with Michigan Works! Southwest and the W.E Upjohn Institute, to help unemployed workers become reemployed.

Access reports, briefs, presentations, and infographics on these trials, as well as more tools for applying behavioral insights, by visiting https://www.dol.gov/asp/evaluation/BIStudy/.

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I. Introduction

Workers across the United States have a right to earn a living without risking their lives. Yet, in 2014, more than 4,800 American workers were killed on the job, and nearly 3 million suffered work-related injuries and illnesses.[1] Previous research suggests that Occupational Safety and Health Administration (OSHA) inspections can reduce the risks workers face.[2] However, for inspections to work as intended, OSHA needs employers to respond promptly when workplace inspections reveal unsafe conditions. When responding to an OSHA citation, employers must document how they have corrected hazards and pay any penalties levied against them. When employers do not respond, OSHA staff cannot confirm whether workers remain at risk. In addition, they must take a more costly step—referring the case to a national debt collection team—to prod employers to resolve their citations.

Given that the inspection and citation process is OSHA's primary tool for enforcing safety standards, a troubling share of employers fail to respond as intended. In 2013, OSHA issued citations with penalties assessed for health and safety violations in approximately 24,000 inspection cases nationwide; of those, OSHA staff referred more than one in five cases to debt collection.[3] Even though some employers may choose not to resolve citations to try to avoid costs, a careful look at citation packages reveals several potential reasons a citation might end up in debt collection.

To begin with, OSHA's citation packages typically contain a dozen or more pages filled with complex regulatory language. Employers who receive a package may intend to read the citation cover letter thoroughly but fail to do so. Those who read the cover letter may conclude that they need more time and information to assess their various response options before taking action. Behavioral science has shown that, when confronting a complex decision without clear, concise guidance, we may fail to act in our best interest.[4] And we might not act at all, even when the stakes are high.

In addition, citation packages do not typically emphasize the personalized help that local OSHA staff can provide to employers navigating the citation process. Further, in the time that elapses between receiving the citation package and then reading it, selecting a response, and taking action, employers may procrastinate or even forget about the citation altogether.

About Behavioral Science

Behavioral science studies how people make decisions and act in a complex world. It draws on decades of research in the social sciences to provide a more realistic model of how we make decisions and act in real life. Other approaches commonly assume that we consider all available information, weigh the pros and cons of each option, optimize our choices, and then reliably act on them. In practice, however, people often decide and act with imperfect information, or fail to act altogether, even when they may want to. Behavioral interventions test whether aligning policies, programs, and products to these human tendencies can result in improved outcomes.

As evidence has mounted on how these various types of roadblocks—complexity, misunderstanding, and procrastination—can lead to less-than-ideal outcomes, a growing body of research has focused on low-cost ways to overcome them. Making options clearer can help people make decisions faster. Personalizing communications and providing simple action steps to reduce misunderstanding can boost responsiveness. And timely reminders can combat procrastination.

In 2014, the U.S. Department of Labor's (DOL) Chief Evaluation Office contracted with Mathematica Policy Research and ideas42 to explore the potential of using insights from behavioral science to improve the performance and outcomes of DOL programs. DOL was especially interested in testing behavioral interventions

that would allow for rapid evaluation and analysis of short-term outcomes, and when appropriate, for testing further iterations based on initial results. The DOL Behavioral Interventions (DOL-BI) team partnered with OSHA to explore whether piloting a limited set of changes to the citation process could improve employers' responsiveness to citations and reduce the number of cases referred to debt collection. From summer 2015 through spring 2016, we conducted a trial in two phases that examined the effect of introducing a handout at the conclusion of inspections, revising the citation cover letter, sending a follow-up postcard, and conducting a reminder telephone call.

Results from this randomized controlled trial indicated notable, statistically significant improvements: the pilot changes we tested increased the proportion of employers who responded to citations by 3.9 percentage points in Phase 1 and 5.4 percentage points in Phase 2. In the second phase, they reduced the number of cases referred to debt collection by 4.4 percentage points, which translates into approximately 1,000 fewer cases referred to debt collection each year.

The existing citation process

To meet its mission of ensuring safe and healthy workplaces, OSHA staff members educate employers about safety standards and conduct workplace inspections to check for compliance. After the inspections, OSHA primarily relies on written citation packages to inform employers about any identified violations. The citation packages explain the violations; the corrections required and fines imposed; and the various response options that employers can take (Box I.1).

Box I.1. Employer options when responding to an OSHA citation

When employers receive a citation following an inspection, they can choose one of three options:

1. **Fix and pay.** The employer may agree to correct all cited health and/or safety hazards and pay the stipulated penalties. If eligible, the employer may enter into an expedited informal settlement agreement (EISA), which qualifies the employer for substantially reduced penalties in exchange for agreeing to the citation as is.
2. **Request a meeting.** The employer may request an informal conference—that is, a meeting with local OSHA officials that provides an opportunity to discuss and, if appropriate, request changes to the cited violations, penalties, or due dates for corrections. After the meeting, the employer may accept the citation as is, formally contest it, or enter into an informal settlement agreement (ISA) and/or a repayment plan.
3. **Formally dispute.** Employers may send a letter formally contesting the citation, which initiates legal review by an administrative law judge who may alter the penalties, violations, or the measures required to correct them.

All three options require the employer to respond within 15 working days after receiving the citation package. Failure to respond leads to OSHA follow-up that may include referral of the case to debt collection. In 2013, over 20 percent of cases were referred to debt collection, and approximately 75 percent of the referred cases lacked any form of employer response—the penalty had not been paid in full, the case had not been contested, and the employer had not signed an ISA or EISA (see Appendix Figure A.1).

When employers fail to respond to citations, OSHA cannot verify that employers have addressed workplace hazards. Failure to respond can also leave employers and their employees worse off by increasing the total amount of fines owed (as interest accrues) and leaving workers exposed to unaddressed workplace hazards.

22%

of cases with penalties were referred to debt collection in fiscal year 2013.

According to OSHA Information System (OIS) data, of the 24,000 inspection cases nationwide in 2013 that had citations issued with penalties, 22 percent were referred to debt collection because employers did not respond as required. OSHA leaders approached the DOL-BI team to learn whether behavioral science might provide novel tools to increase the number of employers who responded to citations, ultimately reducing referrals to debt collection.

OSHA has several ongoing efforts to promote employer compliance with health and safety regulations (Box I.2). However, until this study, it had not directly explored whether changing elements of the inspection and citation process might boost employers' responsiveness to citations.[5] Because inspections and the resulting citations are a central part of the agency's approach to safeguarding worker safety, OSHA identified improving employer responsiveness to citations and reducing referrals to debt collection as priorities. Initial meetings with the DOL-BI team suggested that changes to the citation process grounded in behavioral science might help achieve these goals.

Box I.2. Existing practices to encourage compliance with OSHA safety standards

- **Voluntary hazard management program.** OSHA developed guidelines for voluntary management of workplace health and safety that employers may use for systematically assessing and addressing potential hazards (see OSHA Fact Sheet No. 91-37 for details). Some area offices require employers to institute a voluntary management program in order to qualify for an expedited informal settlement agreement and associated reductions in penalties.
- **Third-party consultations.** Some area offices require employers to contract with an independent workplace safety consultant in order to receive the penalty reduction granted in the EISA.
- **$afety Pays program.** OSHA developed a tool to help employers estimate the cost of accidents in the workplace. This online estimator and related outreach are designed to inform employers about the financial benefits of instituting a comprehensive safety and health program.
- **Mandatory reporting of serious incidents.** In September 2014, DOL issued a new rule mandating employers' reporting of serious health and safety incidents and more intensive follow-up by OSHA to gain access to information about workplace health and safety after such incidents are reported.

Trial synopsis

In this report, we present findings on the effects of four changes to OSHA's citation process that were pilot tested during this trial:

- A new handout that OSHA officers distribute to employers at the close of inspections
- A new cover letter accompanying citation packages that distills essential information into one page
- A reminder postcard mailed 10 days after receipt of the citation package
- A reminder telephone call to selected employers

We designed these four components in collaboration with OSHA, based on an in-depth behavioral diagnosis process that drew on discussions with area office directors, regional administrators, and agency leaders as well as on an analysis of administrative data. The components aimed to address four significant barriers identified during our behavioral diagnosis that may prevent employers from responding to citations:

- Employers' limited attention
- The resulting potential for procrastination
- The complexity of the citation package
- Employers' misunderstanding of the benefits they may gain by responding

For employers who receive a citation, the new handout gives them more information about the citation process and sets their expectations, making the citation appear less complex. (This may allow them to make better use of their limited time and avoid procrastination in responding.) The new cover letter distills essential information into a single page and encourages employers to act promptly and to contact OSHA for help if needed.

Analysis of OSHA data during the diagnosis revealed that 60 percent of employers who do not respond to citations have fewer than 10 employees, and most are in the construction industry. The reminder postcard and telephone call are designed to keep the citation from slipping off the employer's to-do list, given the many competing demands faced by small business owners. Because we learned from OSHA staff that many firms that do not respond to citations appear to be operated by Spanish speakers facing language barriers, we also made the handout, cover letter, and reminder postcard available in Spanish.

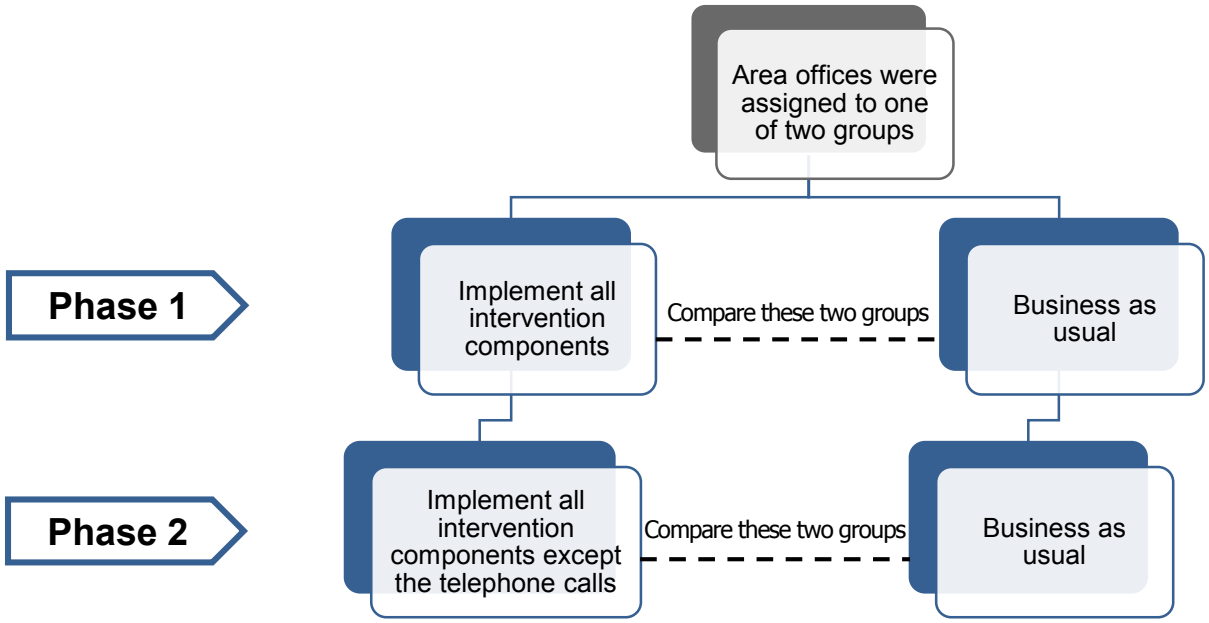
Research questions and trial design

The trial was designed to answer four research questions:

- **Did changes to the citation process lead more employers to respond to—and ultimately resolve—their citations?** Did the pilot changes cause more employers to enter into a settlement agreement (ISA or EISA) with OSHA, make a payment, or formally contest their citations? Did they reduce the number of citations referred to debt collection or increase the number of citations resolved? Did they increase the number of employers who certified having corrected their violations?
- **Did the impact of the changes vary across trial phases?** The trial's second phase eliminated the reminder telephone call, while the trial's first phase included all four changes. Was there a significant difference in impacts between phases?
- **Did the changes work better for certain types of employers, industries, or regions?** Did they have a greater effect on small employers or on citations with smaller penalties? Did the effect vary by industry?
- **What lessons might help guide similar efforts in other contexts?** What challenges did local OSHA staff encounter when implementing changes to the citation process? What solutions did they devise to meet the challenges? How can lessons from the trial be applied when using behavioral science to help other programs, especially those charged with regulatory enforcement, pursue their missions?

To answer these questions, we conducted a randomized controlled trial in two phases that included 69 OSHA area offices in eight out of ten agency regions. Thirty-four area offices, or about half of the offices in the trial, were randomly selected to implement the trial's changes while the other half continued to follow their usual citation procedures (Figure I.1). In Phase 1, which ran from June through September 2015, the randomly selected offices implemented all four changes to the citation process.[6] However, the reminder telephone calls were found to impose a substantial burden on local OSHA staff. For this reason, in Phase 2, which ran from October 2015 through January 2016, the same randomly selected offices implemented only the first three components, allowing us to test the effects of the changes excluding the reminder telephone call.

Figure I.1. Evaluation design



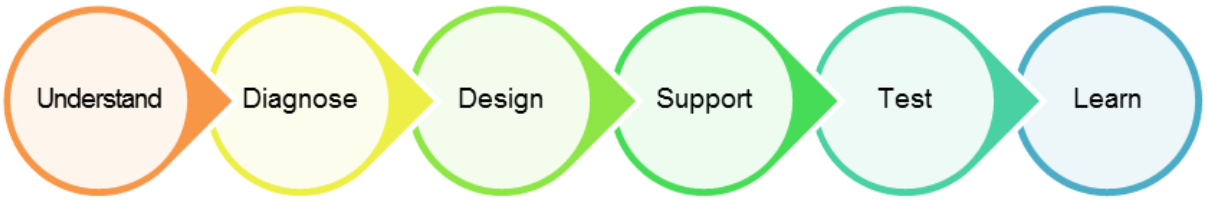
Report roadmap

In this report, we describe how we designed and implemented the changes to OSHA's citation process. We also describe the accompanying evaluation, our findings, and the implications of our findings. In Chapter II and Appendix A, we provide more details on our approach to developing the behaviorally informed changes to OSHA's citation process, for those interested in designing similar changes. In Chapter III and Appendices B and C, we describe our evaluation design so that readers may assess the validity of our findings; we also discuss our target population, data collection, and analysis approaches. Chapter IV and Appendix D discuss our findings. Chapter V concludes by summarizing what we learned, how our results may be used, and lessons for others who wish to apply insights from behavioral science.

II. Designing Changes to the Citation Process

In developing changes to OSHA's citation process and a trial to test their effect on employer responsiveness to OSHA citations, we followed six steps that form the core of our approach to behavioral design (Figure II.1). We began by deepening our understanding of the problem we were attempting to solve and the context in which it occurs. Then, we diagnosed potential behavioral barriers that may be contributing to the problem, designed process changes that addressed those barriers, and provided support for their implementation. Finally, we tested the effectiveness of the changes using a rigorous trial design and learned from our experimental findings. In this chapter, we discuss the first four steps in the process; the remainder are discussed in the following chapters.

Figure II.1. Using behavioral science to improve programs: Six steps



Understanding the problem and its context

To design changes to OSHA's citation process that effectively addressed the agency's concerns, we first needed to develop a detailed understanding of the problem. In initial conversations, agency leaders identified employers' failure to resolve citations—by fixing all hazards and paying all penalties—as a pressing issue for two reasons. First, failure to respond to citations meant that there was no evidence that workplace hazards had been eliminated.[7] Second, pursuing the nonresponsive employers required using scarce agency resources that could be better used elsewhere.

Agency leaders and area directors emphasized that getting an initial response from employers was important to get them to resolve citations and avoid debt collection. In fact, program data demonstrated that approximately 90 percent of employers who respond to a citation by signing a settlement agreement or making a payment ultimately resolve it.[8] OSHA leaders further prioritized encouraging employers to sign EISAs because this option benefits employers (who qualify for reduced penalties) and maximizes efficiency for OSHA (since citations are resolved more quickly without requiring informal conferences).

To inform our diagnosis of behavioral barriers that prevent employers from responding, we needed to know more about the types of employers who do not respond. We also developed a detailed understanding of OSHA's existing citation process. Both are summarized below.

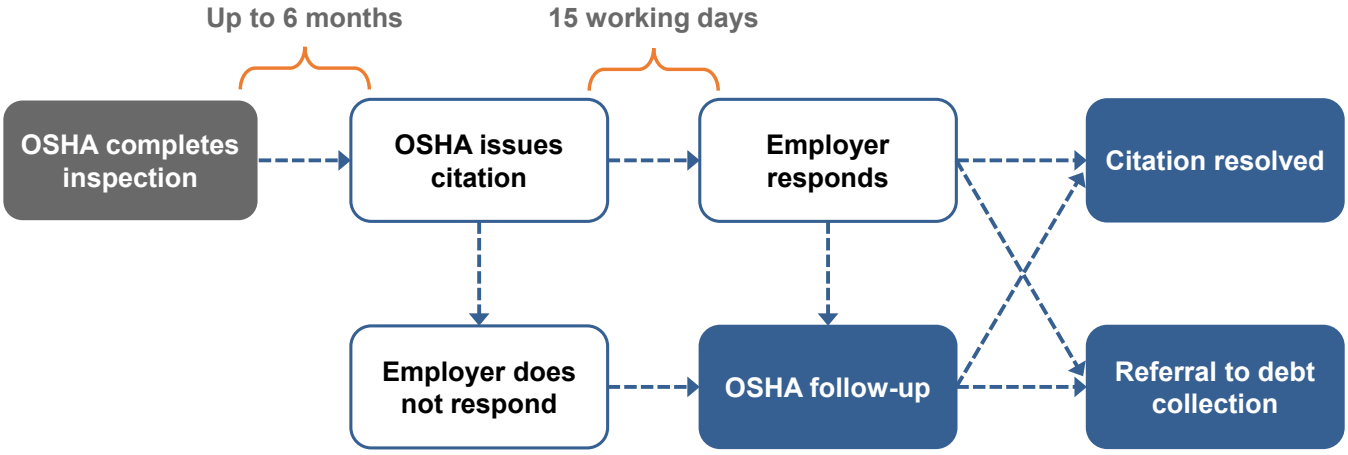
Characteristics of employers with poor citation response rates. Our discussions with federal and regional OSHA staff, together with an analysis of OSHA data, revealed that small employers comprise the majority of cases referred to debt collection due to lack of response. Firms with fewer than 10 employees represented more than 60 percent of the companies that failed to engage with OSHA, despite accounting for only 40 percent of all companies with citations. OSHA staff recognized that, at small companies, owners and

other employees typically play several roles, often handling finance, hiring, administration, and business development as well as performing the company's core work. Their principal concerns likely center on securing the next job and paying their employees and creditors rather than on reading and responding to other correspondence. Given the broad range of their responsibilities and competing demands on their limited time and resources, owners of small businesses may be more likely to fail to notice or forget to respond to OSHA citations.

Our analysis also indicated that the majority of employers who did not respond to citations were in the construction industry. OSHA staff noted that a substantial share of construction employers have limited English proficiency. Language difficulties could make seemingly straightforward tasks, such as scheduling an informal conference, more challenging for these employers and thus contribute to nonresponse.

How the citation process works. As Figure II.2 shows, the OSHA inspection and citation process involves four major steps: (1) the workplace inspection, (2) the issuance of citations when violations are found, (3) the employer's response, and, when needed, (4) OSHA's follow-up. (Appendix Figure A.1 provides additional detail on the citation process.)

Figure II.2. OSHA citation process



An OSHA compliance officer conducts inspections, which may be completed in one day or over several months. An inspection always ends with a closing conference, in which the compliance officer discusses any identified violations and next steps with a workplace manager or other employer representative.

If violations are found, the area director issues a citation requiring the employer to correct the violations noted and pay any applicable penalties. When citations are issued, area office staff send a citation package to the employer, detailing the violations found, the penalties being assessed and due dates, and the employer's response options. Upon receiving the citation package, the employer has 15 working days to respond in one of three ways:

1. **Accept the citation as is, correct cited violations, and pay penalties.** The employer sends documentation that violations have been fixed and pays the penalties listed in the citation. In cases with less severe violations, the employer may be offered and enter into an expedited informal settlement agreement (EISA), which grants employers a reduced penalty in exchange for agreeing to the citation as is and, in some offices, agreeing to preventive measures (Box II.1).
2. **Request a meeting.** The employer may request a meeting with an OSHA representative at the area office to discuss the citation and request changes to the violations cited, the timeline for correcting them, the penalties assessed, and/or the payment timeline. Any changes are formalized in an informal settlement agreement (ISA).
3. **Contest the citation.** The employer may contest the citation by submitting a formal letter, which initiates review before an administrative law judge who determines the citation's final status.

Box II.1. Settlement agreements

Informal settlement agreement (ISA). A legally binding agreement that formalizes the citation and mitigation actions—penalty reductions, correction deadlines, and/or a penalty payment plan—as negotiated by an employer and OSHA in a meeting (called an informal conference).

Expedited informal settlement agreement (EISA). A standardized agreement that allows eligible employers—those with less severe violations—to receive a substantial penalty reduction without meeting with OSHA officials, by agreeing to the citation as is and, in some OSHA offices, agreeing to preventive measures (such as a third-party safety consultation). This reduction is often 30 percent but varies between area offices.

If the employer does not contest the citation by the end of the 15 working-day period—or once the employer accepts the citation or agrees to an informal settlement—the citation becomes a final order, and the cited violations, penalty amounts, and due dates may not be changed.[9] OSHA declares cases with unpaid penalties 30 days after the final order date to be delinquent and sends the employer a demand or default letter. If a case still has unpaid penalties or is in a repayment plan and has not made appropriate payments 30 days after receipt of a demand or default letter, the case is referred to the national office. (Appendix Figure A.1 describes the national office's debt collection activities in more detail.)

Diagnosing why employers do not resolve citations

Diagnostic approach. The DOL-BI team worked with OSHA to identify the potential behavioral bottlenecks that might be limiting employer responses. We conducted a careful review of operational documents (most important, OSHA's field operations manual and the citation letter currently in use), analyzed OSHA data, and participated in fact-finding conversations with OSHA staff at different levels of the organization (national, regional, and local). We also drew on our experience in diagnosing bottlenecks in other similar contexts (Box II.2).[10]

We were unable to interact directly with any employers who had failed to respond to OSHA citations. By definition, employers who did not respond to their citations were difficult for OSHA staff to contact and interview. As the next best alternative, we spoke with OSHA staff who directly worked with employers in several regions in order to deepen our understanding of employers' business contexts and motivations. In reviewing OSHA's citation procedures and materials, we also adopted a "user perspective" and kept in mind the characteristics of employers who commonly failed to respond to citations.

Box II.2. Steps in the employer response process

We developed a behavioral map (see Figure II.3 later in this chapter) that describes the steps employers must complete in order to respond to a citation as OSHA intends. The map highlights issues that commonly surface in responding to correspondence (for example, inattention, misunderstanding, and procrastination). Responding to letters involves a surprisingly complex series of steps, and a lack of response may result from a single misstep:

- **Noticing and opening the package.** Acting on the citation package requires the intended recipient to receive and open it. If the recipient does not know the package's content, he or she may not realize its importance and thus discard it unread.
- **Evaluating and reading the package.** Even after opening the package, the recipient may not fully read it. Rather, the recipient may skim certain components of the package in order to evaluate its importance. If the importance is not immediately apparent, the recipient may not choose to read it in further detail.
- **Deciding to take action and taking action.** After reading and evaluating the letter, the recipient has to decide what to do about the letter and then take steps to follow through on his or her intentions. However, even the simple decision to put off action for a short time can lead to longer delays and, ultimately, a lack of response.

These issues may be exacerbated by elements unique to the OSHA context. For example, a long period might elapse between the initial inspection and the time the letter is mailed. Thus, the earlier inspection may not be fresh in employers' minds, making it more difficult for them to place the letter in its proper context.

Behavioral bottlenecks. With our diagnostic approach, we identified several behavioral bottlenecks that could contribute to employers' failure to respond to citations:

Complexity.[11] The standard citation package is more than a dozen pages long, and many of the details pertinent to employers do not appear until relatively late in the document. For example, the steps the employer should take to resolve the citation are discussed on page 6 of a booklet enclosed in the citation package. As shown in the excerpt to the right, the typical citation cover letter acts as a guide to the larger package instead of concisely providing employers with sufficient information to choose the desired response option and take immediate action.

OSHA citation excerpt

"Enclosed you will find citations for violations of the Occupational Safety and Health Act of 1970 (the Act) which may have accompanying proposed penalties. Also enclosed is a booklet entitled, 'Employer Rights and Responsibilities Following an OSHA Inspection,' (OSHA 3000) revised 2011, which explains your rights and responsibilities under the Act."

Misunderstanding.[12] Employers who skim the citation package may not notice or may misunderstand important details. For instance, OSHA officials indicated that many employers do not realize that they may negotiate their citation penalties or deadlines in an informal conference. In addition, OSHA staff reported that a substantial proportion of employers speak Spanish as a first language and have limited English proficiency, but no area office offered citation packages in Spanish.

Lack of attention.[13] Many employers who do not respond to citations operate small construction firms; their limited time and capacity to address administrative matters could contribute to low rates of response and resolution. Larger firms may have individuals or departments that are responsible for tracking and managing payments, but small businesses may struggle to set aside the time to focus on the citation package and complete the steps needed to respond.

Procrastination.[14] Time pressures and/or complexity could lead employers to put aside the citation package and then forget about the citation altogether. With three weeks from receipt to response deadline, some employers may not have sensed any urgency and therefore set the letter aside. Some employers who intended to respond to the letter before the deadline may have subsequently forgotten to follow up on it.

Designing changes to OSHA's citation process

Our next step was to work closely with national, regional, and local OSHA officials to develop potential solutions grounded in behavioral science. Our approach was guided by the priority identified by our OSHA partners: to reduce the number of cases referred to debt collection by boosting the number of employers who respond to the citation by signing an informal settlement agreement (ISA) or an expedited ISA (EISA). We also considered organizational constraints and assets when designing changes to the citation process.

Key operational features and constraints that influenced the design. Given limited agency resources and competing demands on staff time, only low-cost changes requiring minimal staff effort were feasible to implement. For example, given that an automated process generates citations, any changes to the citation package needed to be compatible with the OSHA Information System (OIS). Further, a complete redesign of OSHA's comprehensive citation package would have necessitated extensive legal review; therefore, OSHA leaders advised us to implement changes to the cover letter only rather than to the full package.

Despite these constraints, the OSHA citation process offered several opportunities to enhance the agency's communications with employers. For example, the inspection's closing conference provided a chance to share information with employers in person and prepare them to expect the citation package. The citation package mailed to employers represented another "touch point." In addition, area offices send citations via certified mail, and the delivery confirmation notice provides information that could be useful in timing reminders ahead of the employer's response deadline.

Proposed changes. We proposed four changes to the citation process, all intended to enhance OSHA's communications with employers:

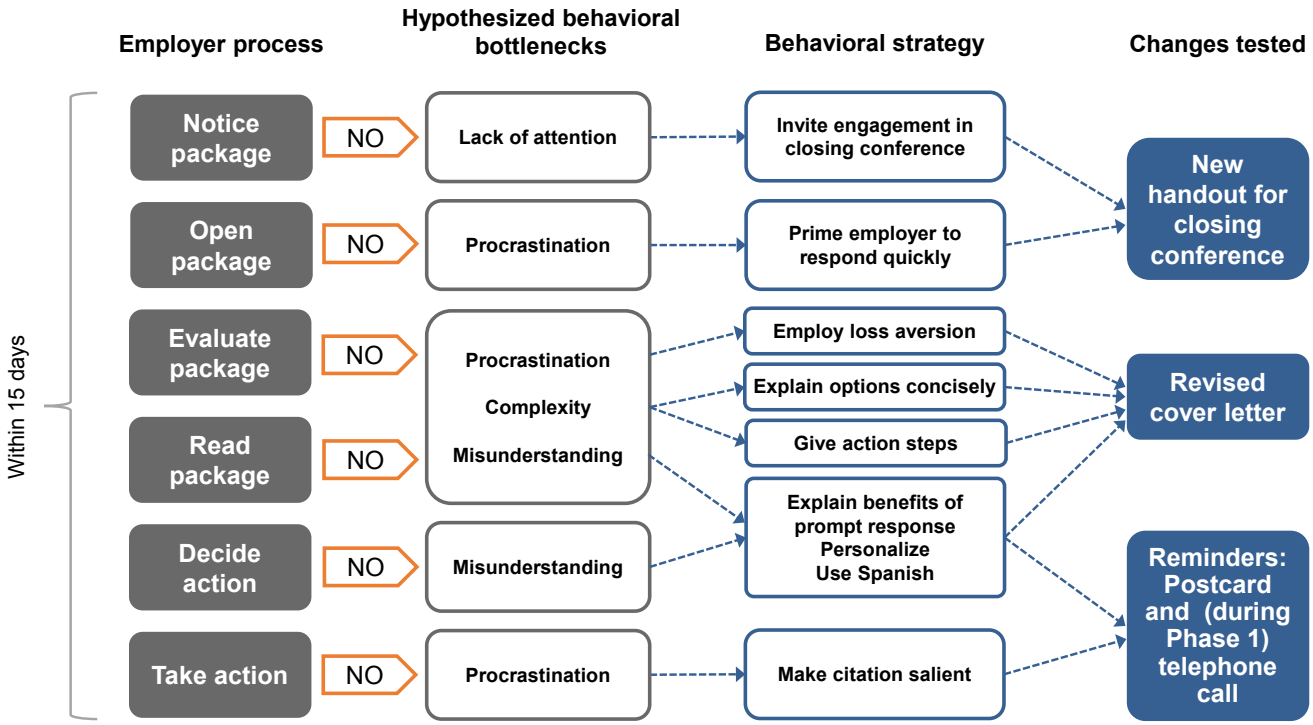
1. An inspection handout (in English and Spanish)
2. A revised citation cover letter (in English and Spanish)
3. A follow-up postcard (in English and Spanish)
4. A follow-up telephone call to EISA-eligible employers (in English and Spanish, as feasible based on the availability of bilingual staff)

The first and second changes took advantage of existing touch points between OSHA staff and employers. The third and fourth changes involved new contacts targeted to employers who failed to respond promptly to citations.

We did not propose changes to OSHA's follow-up procedures for cases that had passed the 15-day response deadline because OSHA administrators had prioritized the goal of eliciting responses within this window. We also did not propose changes to OSHA policies, such as new incentives for employers who responded promptly, in order to test only low-cost modifications that could be easily implemented in all area offices if determined to be effective. Appendix A presents a generic version of each of the changes tested, and Appendix Figure A.2 provides additional detail on how they were integrated into the existing citation process.

Behavioral insights supporting the design. Each of the four proposed changes to the citation process incorporated a range of strategies grounded in behavioral science. All four components were intended to simultaneously address several of the four main bottlenecks identified—complexity, misunderstanding, lack of attention, and procrastination. Figure II.3 illustrates the links among barriers, strategies, and intervention components, which we discuss below.

Figure II.3. Behavioral bottlenecks and changes we tested



1. Combat lack of attention and procrastination

Increase the citation's salience by distributing a new handout during the closing conference. We designed a new handout for inspectors to leave with employers at the end of workplace inspections. The handout was designed to engage employers' attention more strongly during the closing conference and "prime" them, first, to expect a citation package if violations were found and, second, to take prompt action once they received the citation. The new handout included space for the employer to take notes and write the inspector's contact information. It also explained the citation process and response options in a format similar to the new cover letter.

Use "loss aversion" framing to emphasize the need to act promptly. To create a sense of urgency and encourage employers to respond quickly to citations, the new cover letter included language describing the consequences of inaction. It highlighted that penalty amounts and due dates could not be adjusted if employers did not respond before the deadline. This strategy drew on behavioral research showing that we are more strongly motivated to avoid losses than to achieve similar-sized gains.[15]

Bring employers' attention back to the citation with new reminder postcards and telephone calls. After employers received their citation packages, OSHA staff began following up with nonresponsive employers via reminder postcards and telephone calls. The reminders offered an opportunity to include a personalized deadline.[16] Follow-up via postcard and telephone was expected to make the deadline more salient, reduce the likelihood of procrastination, and motivate employers to respond in a timely manner.[17] In addition, telephone calls were expected to capture employers' attention by conveying that the citation was important enough to OSHA to merit a personalized call.

2. Address the complexity of the citation

Concisely describe response options. To address the large amount of important information included in the citation package, the new cover letter simplified the presentation of response options. In place of the original letter's paragraph format (Figure II.4), we presented the three options as a numbered list in a separate box. We briefly described each option, highlighting the main question that employers should consider when choosing—whether they agree with the citation, penalties, and/or correction deadlines. Aligning their choice with this question was intended to help employers more easily compare their options and make a decision.[18]

Figure II.4. Original citation cover letter

U.S. Department of Labor Occupational Safety and Health Administration
XXXXX
San Antonio, TX 78230
Phone: XXX-XXX-XXXX Fax: XXX-XXX-XXXX

05/16/2014

BUSINESS NAME **Inspection Number: XXXXXX**
ADDRESS

Dear Employer,

Enclosed you will find citations for violations of the Occupational Safety and Health Act of 1970 (the Act) which may have accompanying proposed penalties. Also enclosed is a booklet entitled, "Employer Rights and Responsibilities Following an OSHA Inspection", (OSHA 3000) revised 2011, which explains your rights and responsibilities under the Act. If you have any questions about the enclosed citations and penalties, I would welcome further discussions in person or by telephone.

You will note on page 6 of the booklet that, for violations which you do not contest, you must (1) notify this office promptly by letter that you have taken appropriate corrective action within the time set forth on the citation; and (2) pay any penalties assessed. Please inform me of the abatement steps you have taken and of their dates together with adequate supporting documentation; e.g., drawings or photographs of corrected conditions, purchase/work orders related to abatement actions, air sampling results. This information will allow us to close the case.

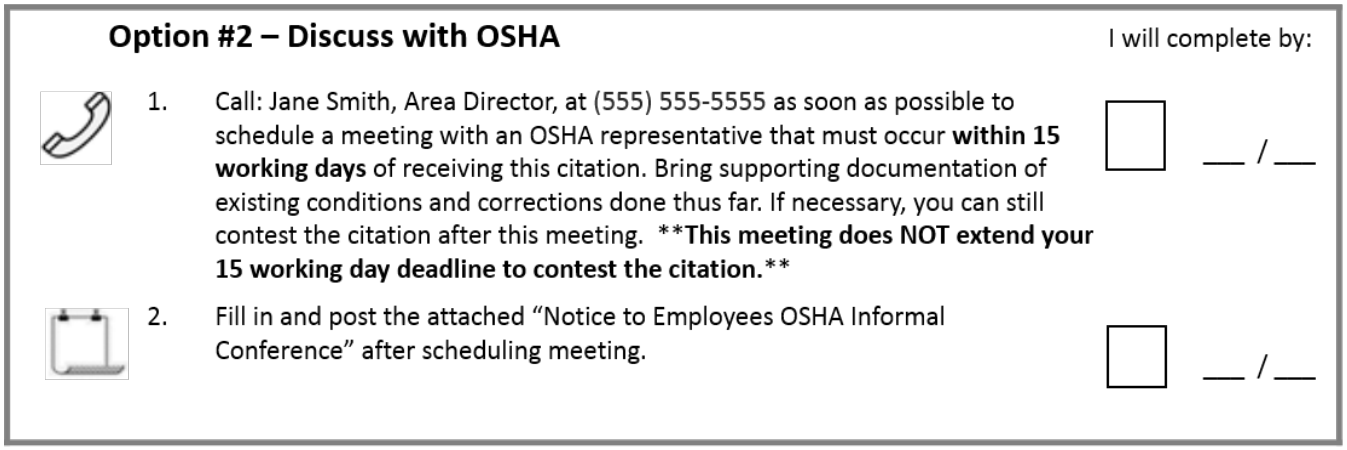
As indicated on page 8 of the booklet, you may request an informal conference with me during the 15-working-day notice of contest period. During such an informal conference you may present any evidence or views which you believe would support an adjustment to the citation or the penalty.

If you are considering a request for an informal conference to discuss any issues related to this Citation and Notification of Penalty, you must take care to schedule it early enough to allow time to contest after the informal conference, should you decide to do so. Please keep in mind that a written letter of intent to contest must be submitted to the Area Director within 15 working days of your receipt of the citation. The running of this contest period is not interrupted by an informal conference.

If you decide to request an informal conference, please complete the enclosed "Notice to Employees of Informal Conference" (page 4) and post it next to the Citations as soon as the time, date and the place of the informal conference have been determined. Be sure to bring to the conference with you any and all supporting documentation of existing conditions as well as of any abatement steps taken thus far. If conditions warrant, we can enter into an informal settlement agreement which amicably resolves this matter without litigation or contest.

Present next steps in a checklist format. The checklist of next steps for each response option aimed to help employers move from selecting a response to completing it (Figure II.5). The availability of easy-to-follow instructions was intended to reduce the time and effort needed to take action, increasing employers' likelihood of follow-through.[19] We also included space for employers to plan when they would complete the various tasks associated with an option. These "planning prompts" were designed to help employers take action by encouraging them to think more concretely about how they will fulfill their obligations.[20]

Figure II.5. Portion of citation checklist from the cover letter's second page



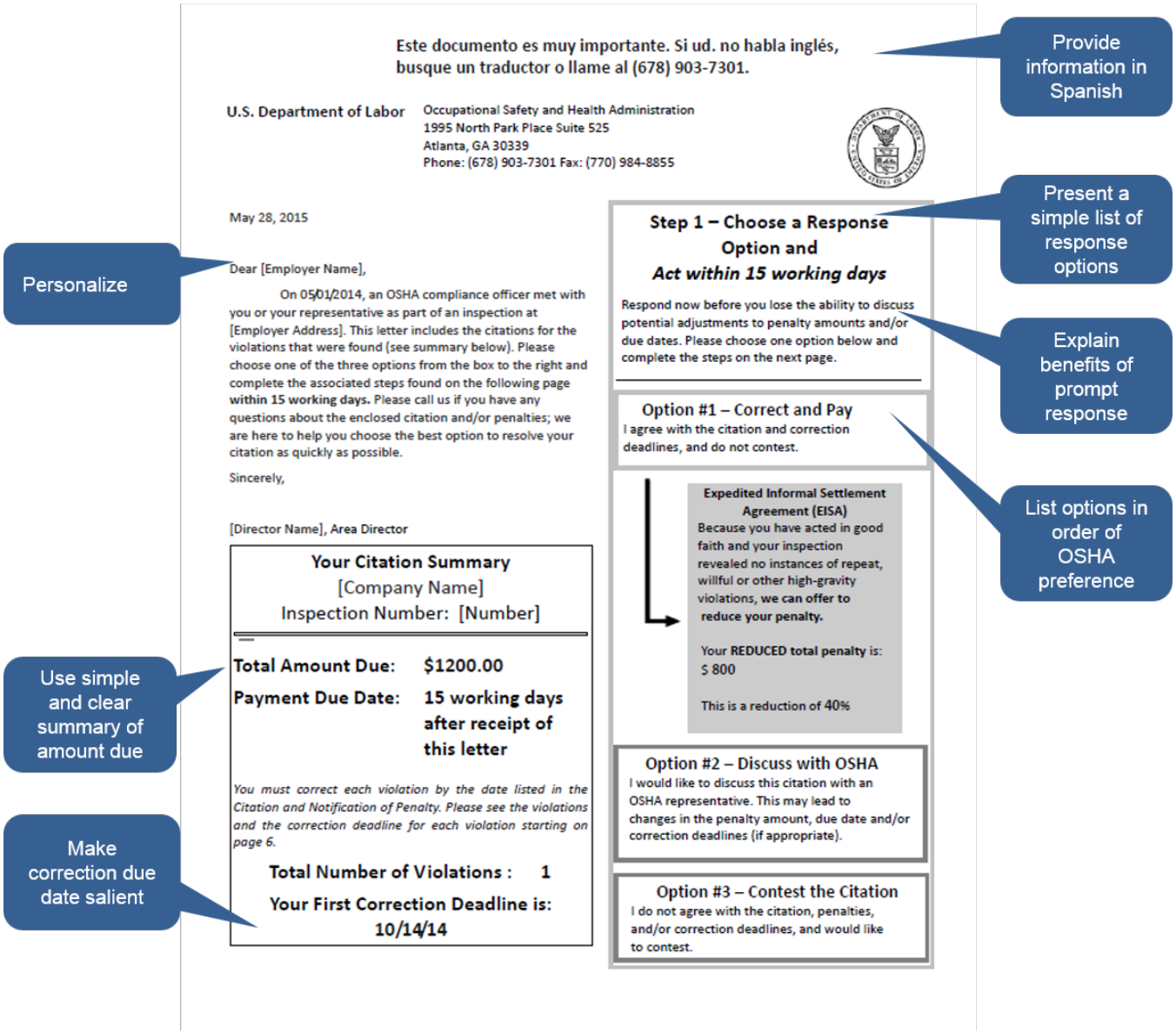
3. Reduce misunderstanding of the benefits of engaging with OSHA

Outline in the cover letter the benefits to the employer of a prompt response. Within the brief descriptions provided for each response option, we highlighted the potential benefits of meeting the deadline, such as a reduced penalty and changes to the correction deadlines (Figure II.6).

Personalize communication and show desire to work together. The revised cover letter included several personalized elements—the employer's name, a summary box with key details of the citation, and the name of the relevant OSHA representative. We added text that emphasizes OSHA's desire to work with the employer to resolve the citation as quickly as possible. Using a personal tone and emphasizing OSHA's willingness to help was intended to help capture the employer's attention and motivate a timely response (Figure II.6).[21]

Provide information in Spanish when needed. Many construction employers are Spanish-speaking; therefore, we developed Spanish-language versions of all trial materials. Since OSHA staff could not always tell which employers would need Spanish-language citation materials, the new English cover letters included a short Spanish-language message highlighting the document's importance and encouraging employers to seek a translator if needed (Figure II.6). Providing materials in Spanish is an example of a "process improvement" that has a nonbehavioral rationale as well as grounding in behavioral science. On the one hand, common sense dictates that employers who cannot read English will not be able to respond to a citation written in English. From the perspective of behavioral science, however, providing materials in Spanish makes it easier for employers who can read some English but are more at ease in Spanish. For Spanish-speaking employers, providing the citation materials in Spanish may also reinforce OSHA's availability and desire to help resolve citations.

Figure II.6. Behavioral elements of the revised cover letter



Developing and refining trial components. After selecting the changes to test, we created prototypes and refined them in collaboration with OSHA national, regional, and local staff. We also recognized that, in practice, designs rarely unfold exactly as planned and therefore wanted to ensure that the planned changes could be implemented and integrated into existing processes with minimum burden. To this end, we conducted a month-long pretrial test run of the new procedures in a single area office. Both the comments from OSHA staff on prototypes and the refinements following the pretrial test run were crucial for developing final designs that were feasible and scalable across all area offices. (Appendix Exhibits A.1 through A.5 present the final versions of each component.)

Drawing on the experiences of the pretrial test run, we targeted the follow-up telephone calls only to EISA-eligible employers and shortened the suggested script to emphasize the informal conference response option. The initial script reviewed employers' response options in detail, and the pilot revealed that the telephone calls took up a fair amount of OSHA staff time. Limiting the calls only to EISA-eligible employers focused OSHA staff time on the employers who qualified for reduced penalties if they accepted the citation "as is"; if these employers still had questions or concerns, the script encouraged them to schedule an informal conference.

We also made small wording and other changes to the trial's materials based on area office feedback during the pretrial run. For example, we instructed area office staff to specify "NA" (not applicable) under the "first correction date" when generating the citation cover letter if all violations had been fixed during the inspection.

After the pretrial run, we continued to gather information on area offices' experiences in implementing the citation process changes during Phase 1, allowing us to identify additional refinements. For instance, we revised the reminder postcard so that it could be sent without specifying the employer's formal response deadline when this date was not known. As noted, we learned that, despite the changes implemented after the pretrial run, area office staff still found the follow-up telephone calls burdensome. In response, we proposed (and OSHA agreed to conduct) a second phase of the trial in which offices implementing the new process eliminated the telephone calls but continued implementing the other three changes. If a less resource-intensive version of the changes to the citation process yielded sufficient improvement in employer responses, OSHA could implement the more limited set of changes nationwide.

Supporting implementation

To help ensure that the changes to the citation process were implemented as planned, we provided upfront training and ongoing support to the OSHA area offices selected to participate in the trial.

OSHA staff roles. Recognizing that the trial introduced changes to OSHA's long-standing operations, we worked with our national office partners to clearly define the roles and responsibilities of key regional and area office staff during the trial's implementation. The compliance officers who conducted the closing conferences distributed the handouts when they were on site with employers. When inspectors found violations, the area office support staff generated the revised cover letters and made sure that the letters were part of any newly issued citation package. Area office support staff also produced and mailed the reminder postcards to employers who had not responded to their citation within 10 days after the citation was mailed. Finally, during Phase 1, the director of the area office or the assistant director conducted the follow-up telephone calls to EISA-eligible employers who had not responded after 10 days.

Nationwide training session. To support implementation of the changes, we delivered a nationwide online training session and developed a comprehensive training manual for area office staff that explained how each component of the trial was expected to work. In addition to addressing questions that arose during the training, we held three question-and-answer sessions during the course of the trial's two phases. Before each session, we solicited comments from area directors and regional administrators. We then prepared responses, presented them during the teleconferences, and addressed additional questions raised by attendees. The sessions and regular contact with operations staff at the national level surfaced additional logistical challenges that we then addressed, drawing on guidance from our national OSHA partners and solutions developed

proactively by area offices. We discuss lessons learned and the solutions developed to address implementation challenges in Chapters IV and V.

Timing. OSHA wanted to launch the trial's changes at a time that would provide the agency with the most informative results. We implemented Phase 1 beginning in June 2015 to increase the representation of small employers from the construction industry within our sample. As noted, employers in the construction industry are more likely to have unresolved citations, and their inspections typically occur during the summer and fall months. Phase 1 of the trial continued until September 30, 2015, when the number of cases processed with the modified citation procedures was sufficient for analysis. Phase 2 ran from October 2015 through January 2016.

III. Evaluation Design

To determine whether the changes to the citation process improved employer outcomes, we designed and conducted a randomized controlled trial in two phases. In the first phase, we tested the effects of *the combination* of the four changes described in Chapter II. (That is, we did not test the effects of each individual change.) On learning that the four changes had positive and statistically significant impacts on employer responsiveness but that the reminder telephone calls imposed a burden on OSHA staff, OSHA and the DOL-BI team decided to test whether similarly positive results could be achieved without the telephone call. The second phase of the trial tested the effects of the combination of the three remaining components.

An experimental design

We conducted a cluster randomized controlled trial to isolate the effects of the pilot changes to OSHA's citation process. Random assignment offered the best strategy for confidently establishing whether any changes in employer responsiveness to citations or referrals to the national office were caused by these changes to the citation process, rather than by other factors. The other factors might include the characteristics of individual cases, the compliance officers, area office leaders, or regional administration. For this evaluation, the area offices were the lowest level of OSHA's organizational structure at which it was feasible to alter citation procedures. We thus randomly assigned 69 area offices nationwide to the trial's treatment and control groups. (Appendix B provides details on the trial's random assignment procedures.)

Study sample. OSHA organizes states into 10 regions, 8 of which were included in the study.[22] Each region is further divided into area offices, where each office is an organizational unit responsible for a distinct geographic area. The 8 regions in our study encompassed a total of 69 area offices, each with exclusive jurisdiction over the citations it issued.

All data used in the analysis came from the OSHA Information System (OIS). The sample included all inspections that resulted in initial penalties under the jurisdiction of the participating area offices. (The study excluded inspections that resulted in no penalties because these citations, by definition, could not be referred to the national office for debt collection and enforcement.) The sample included 67 offices in Phase 1 and 69 in Phase 2. (One area office in the treatment group did not begin implementing the process changes in Phase 1 because of a leadership change that resulted in a lapse in communication near the beginning of the trial. We excluded this office and its matched area office in the control group from our analyses of Phase 1 outcomes.) The first phase included 5,694 employers issued citations, and the second phase included 6,356. Appendices B and C provide more information on the study sample.

Random assignment. Before implementation began, we randomly assigned the 69 area offices to treatment and control groups. We used an approach called stratified random assignment, which reduced the likelihood of randomly choosing a treatment group that is substantially different from the control group. We stratified the area offices by region and by the proportion of cases the area offices had referred to the national office for debt collection in fiscal year 2013. Based on these factors, we created matched pairs of offices within regions.[23] Then, we asked regional directors to assess whether the offices were well matched. After receiving confirmation, we randomly selected one of the area offices in each pair for the treatment group and the other for the control group.

The area offices assigned to the treatment group implemented all four process changes in Phase 1; the area offices assigned to the control group continued operating under business-as-usual procedures. In Phase 2, the treatment group area offices stopped making follow-up telephone calls but continued using the post-inspection handout, revised cover letter, and reminder postcards. The control group area offices continued operating under business-as-usual procedures in Phase 2.

Outcomes of interest. We examined two types of outcomes (Table III.1). The first type measured whether and how employers responded to OSHA citations. They are the intermediate outcomes that our changes sought to affect directly. The second type measured whether and how employers resolved their citations. They are the final outcomes of ultimate interest to OSHA policymakers.

Table III.1. Outcomes of interest

	Employer responsiveness (intermediate outcomes)	Citation resolution (final outcomes)
Summary measure	Responded to OSHA by doing any of the following: • Made a penalty payment • Signed a settlement agreement (ISA or EISA) • Formally contested the citation	Resolved citation by doing all of the following: • Paid all penalties or stayed current on repayment • Abated all hazards • Avoided referral to national office
Individual measures	Made a payment	Paid all penalties or stayed current on payment plan
	Signed a settlement agreement	Certified abatement of hazards
	Formally contested citation	Referred to national office for debt collection

Trial and data collection timing. As shown in Table III.2, Phase 1 began on June 8, 2015, the day that treatment area offices began implementing the process changes. The study sample included all relevant citations that were issued by treatment and control offices on or after June 8, 2015.[24] Our power analysis indicated that we could achieve an optimal balance between statistical power and trial length by conducting each phase of the trial for about three months, thereby including about 6,000 cases per phase. Phase 2 began in most offices on October 5, 2015,[25] which is when the treatment group area offices were instructed to stop making follow-up telephone calls. To ensure that treatment group cases included in the Phase 1 sample were processed using the changes being tested in Phase 1, we restricted the Phase 1 sample to cases with citations issued no later than September 15, 2015.[26] For the same reason, while treatment group area offices stopped using the process changes on February 1, 2016, we restricted the Phase 2 sample to cases with citations issued by January 15, 2016.

Table III.2. Trial and data collection timelines for each phase

Activity	Phase 1 dates	Phase 2 dates
Beginning of phase	6/8/2015	10/5/2015
End of phase	9/15/2015	1/15/2016
Collected intermediate outcome data	11/24/2015	2/18/2016
Collected final outcome data	2/18/2016	7/1/2016

Note: All cases included in the sample for a given phase were issued between the dates in the "beginning of phase" and "end of phase" rows. Even though the majority of treatment offices began Phase 2 on October 5, 2015, some offices started earlier or later. The Phase 2 sample included only cases with a citation issued after the area office began Phase 2 implementation.

To identify lessons learned from area offices' experiences in implementing our citation process changes, we drew on documentation of questions submitted by area office staff—and our responses—during Phase 1 and Phase 2. We also consulted correspondence and notes from meetings with national office staff during the design stage of the trial. These latter documents do not provide rigorous, comprehensive measures of national and area office experiences, but they helped us identify important implementation challenges and lessons learned while remaining true to the trial's low-cost, rapid-cycle design.

A rigorous analytic approach

We conducted several analyses to assess the validity of the experimental design and to estimate the impacts of our process changes.

Confirming baseline equivalence. Our randomization procedure was successful in producing balanced treatment and control groups. In both phases, none of the differences in employer or area office characteristics between treatment and control groups was statistically significant. Appendix C provides baseline equivalence results.

Attrition. Attrition was not a concern for the trial because all inspections are recorded in OIS and all records remain in the database regardless of their outcomes. In consultation with OSHA, we decided to exclude all employers who formally contested their citations from our analysis of final outcomes. (However, these employers were included in the analysis of the intermediate outcomes because they reflect a response to the OSHA citation.) The exclusion could have led to unbalanced samples if the treatment had an impact on the proportion of formal contests. We tested this possibility and found that the treatment and control groups were balanced in the proportion of employers who formally contested their citations (Appendix Table D.2). Table III.3 displays the analysis sample size for each phase and type of outcome we analyzed. Across both phases, the sample for the analysis of intermediate outcomes included 12,050 inspection cases while the sample for analysis of final outcomes included 11,272 cases.

Table III.3. Analysis sample sizes by phase

Phase	Outcome sample	Total	Treatment	Control
Phase 1	Intermediate	5,694	2,717	2,977
	Final	5,350	2,562	2,788
Phase 2	Intermediate	6,356	3,143	3,213
	Final	5,922	2,930	2,992

Estimating impacts. Table III.4 shows the comparisons that we conducted to answer each of our trial's research questions. Appendix B describes our estimation models.

Table III.4. Research questions and relevant analyses

Research questions	Relevant analyses
Do the process changes we developed lead more employers to respond to—and ultimately resolve—their citations?	Compare treatment and control cases' outcomes, listed in Table III.1, separately by trial phase
Did the impact of the changes vary across trial phases?	Combine Phase 1 and Phase 2 analysis samples and formally test whether impacts vary by phase for each outcome listed in Table III.1
Do the changes work better for certain types of employers, industries, or regions?	Test for statistically significant differences in impacts based on the following employer characteristics: • The employer's industry (divided into construction, manufacturing, or other) • Number of employees • Initial citation penalty amount • Number of serious violations • Number of willful violations • Number of repeat violations
What lessons might help guide similar efforts in other contexts?	Review of study team's implementation findings

IV. Findings

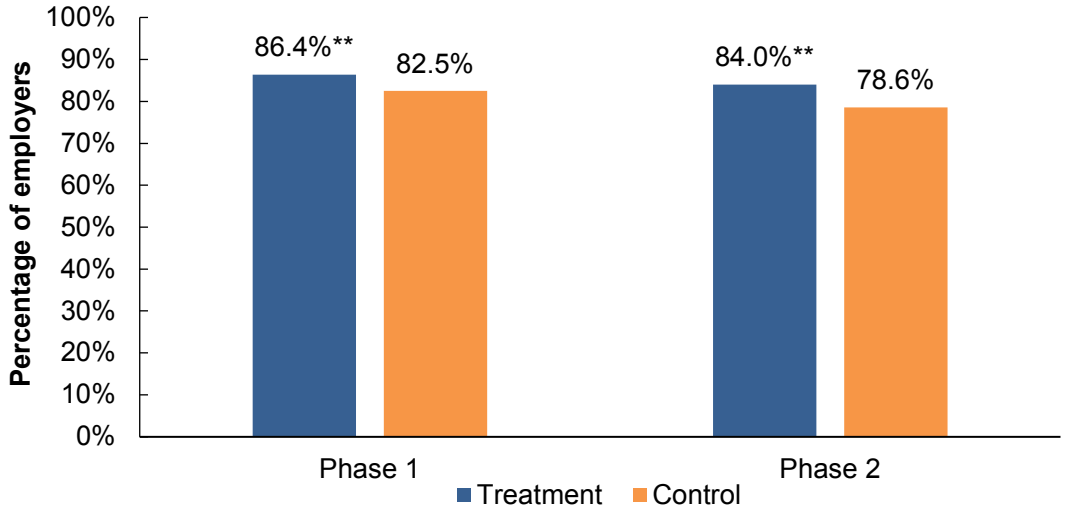
The results from this behavioral trial provide strong evidence that the changes to OSHA's citation process tested in both phases of the trial caused more employers to respond to OSHA citations. Only the less intensive changes tested in Phase 2 improved resolution rates and caused fewer employers to be referred to the national office for debt collection. We also learned several important lessons while implementing the trial in partnership with OSHA, potentially providing direction to similar efforts in the future. Below, we summarize the main findings on the impacts of the changes we tested and the lessons learned during implementation. (Appendix D provides detailed impact estimates.)

Impact findings

THE CHANGES WE TESTED CAUSED MORE EMPLOYERS TO RESPOND TO OSHA CITATIONS IN BOTH TRIAL PHASES.

As Figure IV.1 shows, the estimated difference between treatment and control groups in the proportion of employers who responded to citations was 3.9 percentage points in Phase 1 and 5.4 percentage points in Phase 2. Both estimated impacts were statistically significant. Given an annual caseload of approximately 24,000 cases in which citations were issued with penalties, the average change in response across the two phases (4.7 percentage points) translates into approximately 1,100 more employers responding to citation packages each year. The difference in impact across phases was not significant; we did not find evidence that elimination of the follow-up telephone calls lessened the effect on employer responsiveness.

Figure IV.1. Employer response rate



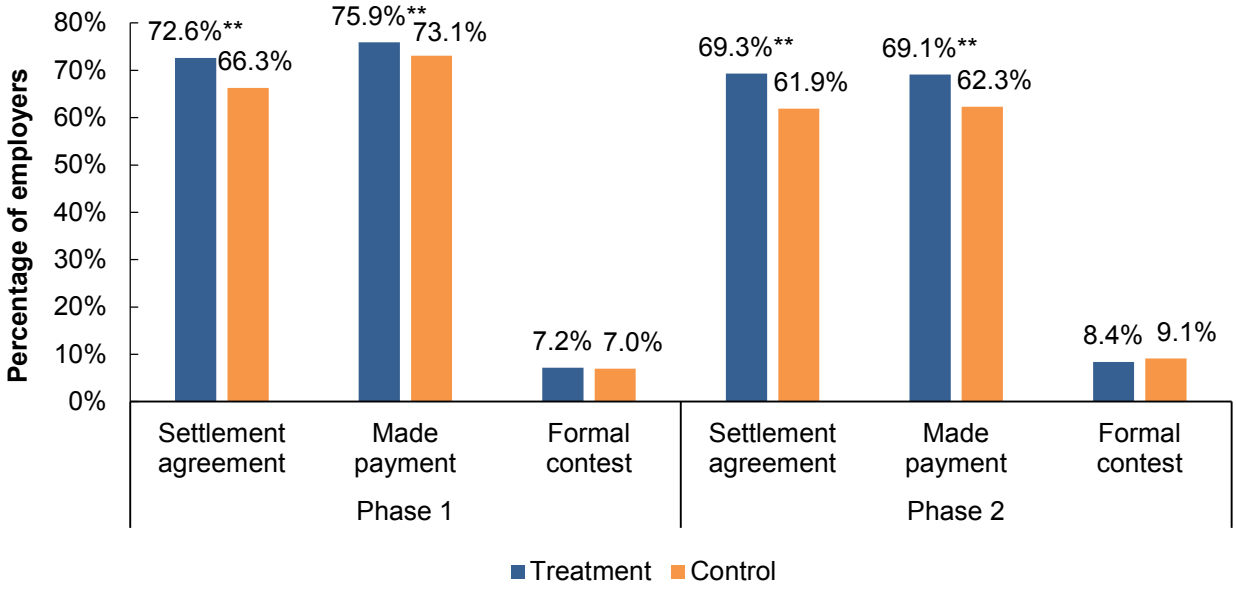
Source: OSHA Information System Data

Note: Significance levels: *p<0.05, **p<0.01. Control group percentages are unadjusted; treatment group percentages are equal to the control group percentage plus the estimated impact. Asterisks refer to the statistical significance of the estimated impact.

THE CHANGES WE TESTED CAUSED MORE EMPLOYERS TO SIGN SETTLEMENT AGREEMENTS AND PAY PENALTIES IN BOTH PHASES.

As Figure IV.2 shows, the estimated impact on employers entering into settlement agreements with OSHA was 6.3 percentage points in Phase 1 and 7.4 percentage points in Phase 2. The estimated impact on making a penalty payment was 2.8 percentage points in Phase 1 and 6.8 percentage points in Phase 2. All of these estimated impacts were statistically significant. As expected, our citation process changes did not cause more employers to contest their citations, which was not an objective of their design.

Figure IV.2. Employer response rate, by response type



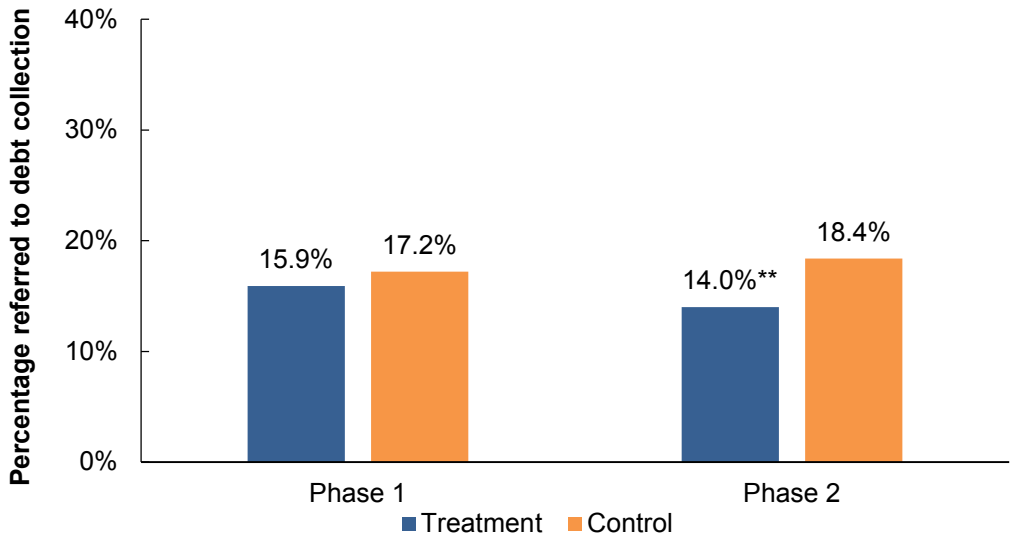
Source: OSHA Information System Data

Note: Significance levels: *p<0.05, **p<0.01. Control group percentages are unadjusted; treatment group percentages are equal to the control group percentage plus the estimated impact. Asterisks refer to the statistical significance of the estimated impact.

THE CHANGES TO THE CITATION PROCESS REDUCED REFERRALS TO DEBT COLLECTION—AND INCREASED RESOLUTION OF CITATIONS—BUT ONLY DURING PHASE 2.

As Figure IV.3 shows, the less intensive set of changes tested in Phase 2 had a statistically significant impact on referrals to the national office for debt collection, the outcome of primary interest to OSHA. In Phase 2, the treatment offices referred a lower share of employers to debt collection, by a statistically significant 4.4 percentage points. Given an annual caseload of 24,000 cases in which citations were issued with penalties, this impact is equivalent to approximately 1,000 fewer employer cases being referred to the OSHA national office for debt collection over the course of a year. By contrast, the estimated reduction in Phase 1 (1.3 percentage points) was not statistically significant. The difference between the estimated impacts for Phase 2 and Phase 1 was statistically significant at the 0.05 level. (Appendix Table D.3 provides details.)

Figure IV.3. Rate of referral to debt collection

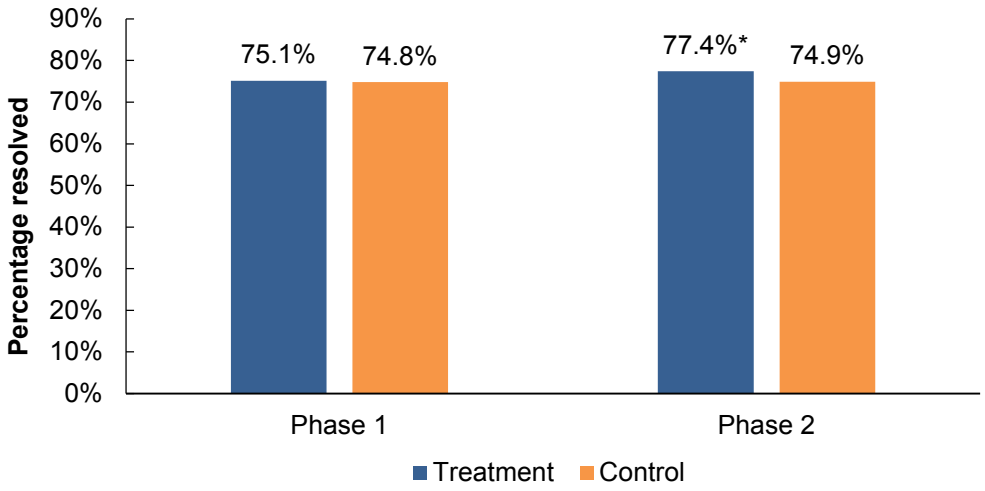


Source: OSHA Information System Data

Note: Significance levels: *p<0.05, **p<0.01. Control group percentages are unadjusted; treatment group percentages are equal to the control group percentage plus the estimated impact. Asterisks refer to the statistical significance of the estimated impact.

Similarly, the less intensive changes tested in Phase 2 caused more employers to resolve their citations while the estimated effect of the changes in Phase 1 was not significant. Citation resolution is a summary measure that combines the two key tasks employers have to complete after receiving a citation: timely payment of penalties and abatement of violations. As Figure IV.4 shows, employers in the treatment area offices were 2.5 percentage points more likely to resolve their citations in Phase 2, a statistically significant difference, whereas the estimated effect of 0.3 percentage points in Phase 1 was not significant. The difference in the treatment effects between phases was not significant.

Figure IV.4. Rate of citation resolution



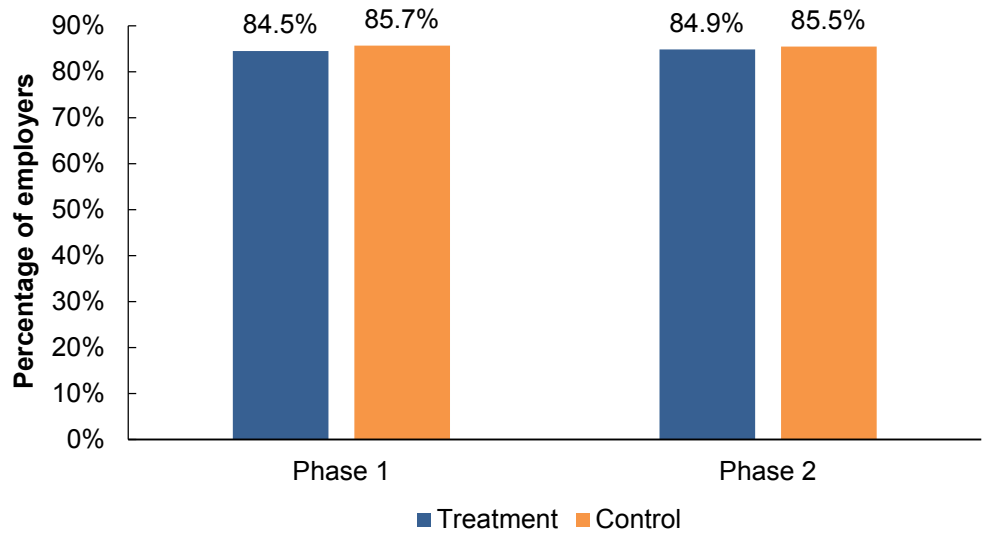
Source: OSHA Information System Data

Note: Significance levels: *$p<0.05$, **$p<0.01$. Control group percentages are unadjusted; treatment group percentages are equal to the control group percentage plus the estimated impact. Asterisks refer to the statistical significance of the estimated impact.

THE CHANGES DID NOT CAUSE MORE EMPLOYERS TO CERTIFY THAT THEY HAD CORRECTED THEIR VIOLATIONS.

As Figure IV.5 shows, we found no impacts on the proportion of employers in either Phase 1 or Phase 2 who certified abatement of all of the violations noted in their citations. In both the treatment and control groups and across both phases of the trial, the vast majority of employers certified that they had completed abatement of all of their violations.

Figure IV.5. Violation correction rate



Source: OSHA Information System Data

Note: Significance levels: *p<0.05, **p<0.01. Control group percentages are unadjusted; treatment group percentages are equal to the control group percentage plus the estimated impact. Asterisks refer to the statistical significance of the estimated impact.

Possible explanations for differences in impacts across phases

We found some notable differences between the estimated impacts of the citation process changes tested in Phase 1 and Phase 2. In Box IV.1 and Figure IV.6, we explore several possible explanations for why we observed a significant impact in Phase 2—but not in Phase 1—on referrals to the national office and the resolution of citations. These explanations include factors related to the timing of the two phases as well as the specific intervention components in each phase. In particular, to help us assess the likelihood of each potential explanation in Box IV.1, we consider evidence on whether impacts changed over the course of each phase of the trial.

Box IV.1. Possible explanations for different impacts in each trial phase

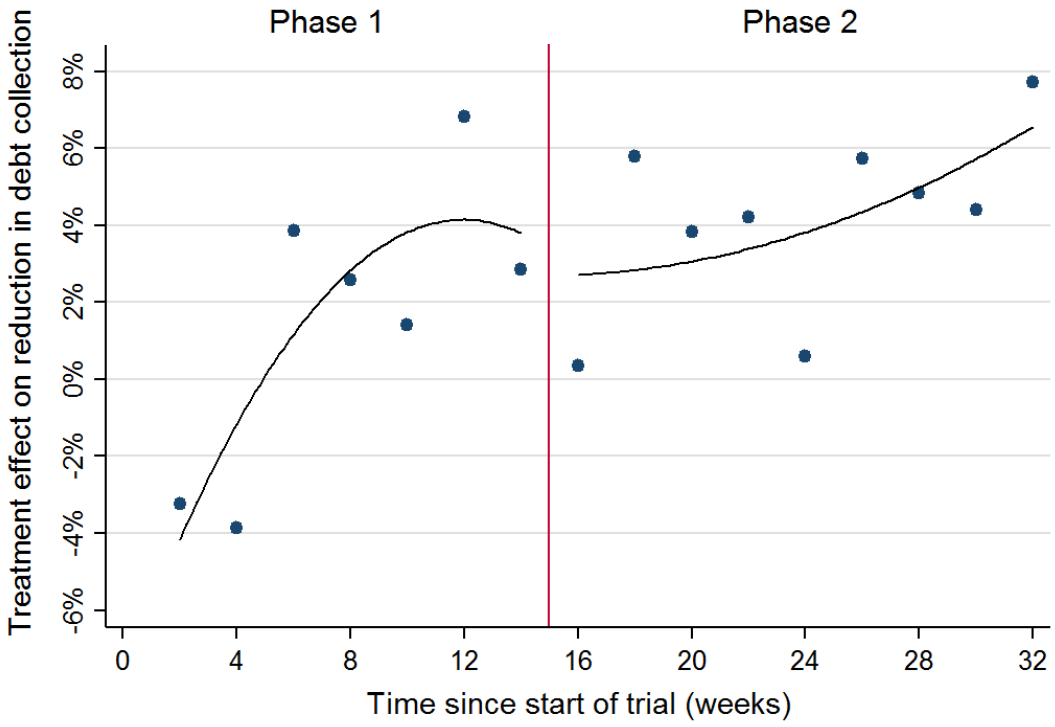
We considered several possible explanations for why we found significant reductions in referrals to debt collection and improvements in the resolution of citations in Phase 2 but not in Phase 1.

1. **Did OSHA personnel improve implementation of the new citation procedures over time?** It may have taken some time for area office staff to become familiar with how to implement the changes to the citation process that we tested. In particular, staff might have needed to develop new methods to track cases in order to send the reminder postcard and make reminder telephone calls during the period in which the employer still had time to respond. OSHA staff may have also learned over time how best to work with employers who previously would have ignored the citation but responded to the new citation cover letter, postcard, or telephone call.
2. **Did contextual factors reduce the impact in Phase 1?** Soon before the start of Phase 1, OSHA introduced new Rapid Response Investigation (RRI) procedures. Our partners at OSHA indicated that the introduction of the initiative led to a substantial workload increase as offices learned how to implement RRIs. The associated learning process might have diverted resources from implementation of the citation process changes, potentially contributing to smaller impacts in Phase 1. In addition, Phase 1 took place primarily in the last quarter of the fiscal year, a time when OSHA may have been conducting increased outreach to resolve active cases. (The control group rate of referral to the national office was 17.2 percent in Phase 1 compared with 18.4 percent in Phase 2.) If effective, the increased outreach to treatment and control offices could have masked some of the impact in Phase 1.
3. **Was the reminder telephone call counterproductive?** The larger impacts in Phase 2, during which we tested changes to procedures excluding the reminder telephone call, might indicate that elimination of the telephone call made the other changes more effective. However, if the calls had been counterproductive, we would have expected to see smaller impacts on intermediate outcomes—such as signing a settlement or making a payment—as well as on citation resolution and referral to debt collection. The similarity in impacts between phases on the intermediate measures casts doubt on the notion that the telephone calls were counterproductive.
4. **Were process changes more effective with particular types of employers who made up more of the Phase 2 sample?** OSHA emphasized that small construction firms are a potential driver of referrals to debt collection, and we would expect more construction inspections during the summer months of Phase 1 than during the fall and winter months of Phase 2. However, we did not find significant differences in employer characteristics between Phase 1 and Phase 2 (Table D.4 in Appendix D). Further, we did not find differences in the estimated effects of the changes by employer characteristics within each phase (Appendix D). However, it is possible that characteristics we could not observe in OSHA data might explain the differences in impacts. For example, the differences could be a function of a greater number of cases eligible for EISAs in Phase 2 and employers in those cases who were more responsive to the changes undergoing testing.

THE IMPACT OF OUR CHANGES TO THE CITATION PROCESS ON REFERRALS TO DEBT COLLECTION GREW AS TIME PROGRESSED.

Figure IV.6 shows the estimated reduction in referrals to debt collection caused by the changes to OSHA's citation process as the study progressed. That is, it compares outcomes for employers who were issued citations *in a particular two-week period* across treatment and control area offices. Such a comparison of impacts allows us to explore if the treatment effect changed with time. If the treatment effect appeared to increase over time, it would suggest that the process changes may have become more effective as staff became more familiar with them. The results of this analysis show that the impact of the citation process changes on national office referrals grew steadily throughout the trial, though more dramatically in Phase 1. Citations issued earlier in the trial exhibited smaller treatment effects as compared to those issued toward the end of the trial. We do not observe a significant jump in the treatment effect near the cutoff between Phase 1 and Phase 2, which would have signaled that elimination of the reminder telephone call coincided with an increase in the effectiveness of the remaining components.

Figure IV.6. Reduction in cases referred to debt collection



Note: The y-axis is the treatment effect on the reduction in referrals to debt collection. For example, 2% indicates that the treatment reduced referrals to debt collection by 2 percentage points for that two-week period.

The pattern in Figure IV.6 is consistent with OSHA staff's increasing comfort with implementing the citation process changes as time went on. (We observed similar patterns for the other outcomes of interest; see Appendix Table D.5.) However, the pattern could also be consistent either with increasing comfort with the new RRI procedures or differences in employer characteristics between Phase 1 and Phase 2 that we did not observe in the OIS data but that are related to the effectiveness of the changes (Box IV.1). The fact that we do not observe a substantial increase in the impact of our citation process changes near the beginning of Phase 2 signals a lack of evidence for the hypothesis that the follow-up telephone call was counterproductive.

Implementation lessons

While designing and implementing the citation process changes tested in this trial, we drew several important lessons from our collaboration with OSHA. Readers should consider these lessons when undertaking similar efforts. (For a broader discussion of the implementation lessons learned from this trial and from two other trials conducted as part of this project, please see the associated implementation findings report.[27])

Carefully consider the burden of process changes when designing and monitoring implementation. Early in our conversations with OSHA administrators, we learned that the agency operates with a relatively small budget and workforce but is nonetheless charged with an expansive mission. For this reason, we needed to make every effort to minimize the staff time and other resources needed to implement any of the tested changes. Accordingly, resource constraints influenced the development and deployment of the follow-up telephone call, in particular. After the pretrial test, we streamlined the call script and targeted the calls only to EISA-eligible employers. Our goal was to reduce the burden imposed by the telephone calls and focus on those most likely to respond.

Comments from the treatment area offices during the trial nevertheless indicated that the calls did not always adhere to the short script and instead evolved into longer discussions that lent themselves to scheduled informal conferences. The resulting demand on resources was the main reason why we eliminated the follow-up telephone call during Phase 2 of the trial.

Identify technological assets and constraints early. OSHA's data specialists worked closely with the DOL-BI team to integrate our changes into the citation cover letter produced by the agency's automated letter-generating system. The system supported a relatively high degree of personalization within the letter, including the employer's name, the total number of violations, and the date of the earliest correction deadline faced by the employer. (Deadlines vary across cited violations.)

Still, the constraints of the letter-generating system made some design elements impractical. For example, we initially intended the citation cover letter to list each violation cited and the associated penalty and correction date, but the system could not accommodate such a feature. The final cover letter represents a compromise that included important summary information about the citation within the constraints of OSHA's letter-generating system.

Draw on the expertise of program staff to address implementation challenges and to exchange innovations. After the trial began, several unforeseen logistical challenges surfaced. National and area office staff played important roles in identifying and implementing solutions to these challenges. Below, we provide three illustrative examples.

First, our procedures called for area office staff to specify the calendar date of the citation response deadline both on the follow-up postcard and during the telephone call, providing employers with a clear and unambiguous response deadline (as compared to a generic deadline of 15 working days after receipt of the citation package). OSHA staff noted, however, that the deadline was known only upon the area office's receipt of a delivery confirmation slip from the U.S. Postal Service and that some offices did not receive confirmation until many days or even weeks after delivery of the citation, if at all.

To address this issue, we worked closely with OSHA staff to develop and issue revised implementation guidance to the treatment area offices. We instructed them to wait 10 working days after mailing the citation before sending the reminder postcards and to conduct the reminder telephone calls to EISA-eligible employers after 12 working days if the employer had not yet responded. This enabled staff in the area office to send reminder postcards and conduct reminder calls even when they had not received a delivery confirmation and therefore needed to use the more generic description of the employer's response deadline (that is, "15 working days after citation delivery").

Second, in one of our trial participating regions, area offices offer multiple levels of penalty reduction in their EISAs, corresponding to different levels of preventive measures agreed to by the cited employer. To address these offices' specialized requirements, we worked with OSHA's technology office and a representative from the region to develop an additional version of the revised citation cover letter that was tailored to the region's policy. Relying on the expertise of the regional representative and OSHA's technology office liaison enabled us to balance the need to tailor the revised cover letter against the desire to keep trial materials as uniform as possible.

Third, tracking the status of citations was essential for determining whether and when to send reminder postcards and make follow-up telephone calls to those employers who had not yet responded to their citations. However, during implementation conference calls, some area offices indicated that they struggled with tracking the status of citations. One area office volunteered that it had developed a simple Excel tracking sheet to keep tabs on when to send the postcard and complete the call. National office staff refined the tracking sheet and made it available to all treatment area offices by integrating it into the OIS system so that staff in these offices can generate it as needed. Regular contact with area offices provided opportunities to identify useful innovations and share them more broadly in a timely way.

Identify dedicated institutional partners. A senior policy advisor in the national office initiated our collaboration with OSHA. She assembled a team of partners representing the national office and area offices. The partners provided critical information about OSHA's institutional context and fostered cooperation in the trial across all levels of the agency. As noted, the committed effort of OSHA's technology team was another ingredient in the trial's successful implementation. By involving members of the team early in the design process, it was possible to refine the design of the new cover letter over multiple iterations to ensure it was compatible with the agency's information system and still met the trial objectives.

Our partners at OSHA also included individuals at the national and regional levels with a long tenure in the agency and long-standing relationships with area directors. We drew on these partners as trusted sources of candid feedback about implementation challenges and benefited from their credibility as internal advocates who encouraged area office directors to implement the process changes.

Educate, and remind, implementing staff about the value of rigorous evidence. While the trial was underway, area office directors frequently shared strong impressions—some positive, some negative—about the perceived effectiveness of individual changes (such as the closing conference handout or the follow-up telephone calls). The exchange of impressions raised concerns that staff might relax implementation of those components they perceived as less effective. To address this concern, during feedback sessions, we underscored the importance of faithful implementation of the trial's changes, the value of conducting a rigorous trial that systematically assesses the effects of the changes, and the potential pitfalls in drawing conclusions from a single office's experiences in isolation. (The diversity of impressions shared by area office directors helped reinforce the last point during feedback sessions.) The trial's final results established that the proposed changes to the citation process improved outcomes that were important to OSHA. However, these results would not be known if area offices had independently decided whether to implement the changes or which changes to implement.

V. Discussion and Lessons Learned

In this chapter, we summarize the results of our study and discuss lessons learned for future applications of behavioral science and related research.

Discussion of results

The results of this behavioral trial indicate that a combination of additional information at the inspection closing conference, a clearer citation cover letter, and timely reminders in the form of postcards and follow-up calls caused more employers to respond to OSHA citations. Results from the trial's second phase provide evidence that these gains in employer responsiveness translated into higher rates of citation resolution and lower rates of referral to the national office for debt collection.

Low-cost changes can generate large benefits. Our citation process changes were all designed to operate at a low cost and impose low burden on OSHA personnel. Still, the impacts were meaningful. Reducing the proportion of cases referred to debt collection from 18.4 to 14 percent during Phase 2 translates into about 1,000 fewer cases referred over the course of a year and represents considerable savings to OSHA in time spent on case follow-up and debt collection.

In addition, when we further reduced the burden of the changes by eliminating the follow-up telephone calls, we saw no decreases in the effects on employer responsiveness or citation resolution. Thus, we were able to establish that the element that imposed the highest burden was not necessary to produce beneficial impacts.

The changes tested are scalable. Given that our process changes were low-cost and allowed for integration into OSHA's existing procedures, they should be easy to implement widely across all OSHA area offices. The closing conference handout and reminder postcards are generic materials suitable for national use. The revised cover letter can be readily incorporated into OSHA's information system so it can be generated automatically as part of the standard citation package in any area office.

Lessons learned

Behaviorally informed changes can be feasible even within a highly structured, enforcement-oriented program. This trial shows that behavioral strategies can be implemented effectively even in the context of highly regulated programs or processes, such as OSHA's citation procedures. We worked with OSHA's national office to identify what could be changed (e.g., revising the cover letter and sending reminders) and what could not (e.g., completely redesigning the citation package or offering employers new incentives for prompt response). We also had to build in time for review of the proposed changes by the agency's legal office and by national, regional, and local staff. Even when official policy determines many aspects of an agency's operations and these aspects do not permit changes, there may still be ample opportunities to apply behavioral insights.

Designing changes that were compatible with OSHA's enforcement activities nevertheless required that we acquire detailed knowledge of the existing citation process, including formal policies and procedures and their application. An iterative design approach allowed OSHA staff familiar with the agency's strategic goals to provide input that informed prototype design and then helped refine the initial prototypes. Technology staff and area directors then provided insights into further refinements that would be needed to integrate the

proposed changes into OSHA's information system and existing practices. Pretrial testing provided direct-user perspectives and surfaced cross-office variation in procedures and other external factors (such as the timeliness of U.S. Postal Service delivery) to be addressed.

Successful design and implementation of behavioral strategies require close coordination with agency partners. The process of designing changes that complemented OSHA's existing citation procedures required in-depth consultation with our agency partners at the national, regional, and local levels. We benefited from their honest feedback on the citation process changes and evaluation ideas put forth by the study team. This ensured that the trial's design drew equally on our team's expertise in principles from behavioral science and evaluation, and the detailed institutional knowledge of our OSHA partners.

Our partners in OSHA's national office leveraged the trust they had cultivated from area office staff to communicate that the trial's successful implementation was a priority for the national office, gain their support and cooperation for the trial, and obtain candid feedback on implementation challenges being encountered along the way. National office staff also facilitated periodic meetings between the DOL-BI research team and the directors of treatment area offices, which provided critical opportunities to collaborate to surmount those barriers.

The effort that many other OSHA officials and frontline staff invested to make the trial a success should also be underscored. We received feedback from all 10 OSHA regional administrators and several area directors on early prototypes of the citation process changes. Experts in OSHA's technology and legal offices provided invaluable targeted assistance and reinforced to area office staff the national office's commitment to the trial. Area office staff, in turn, strove to implement the citation process changes faithfully; over the trial's eight months (across both phases), we did not uncover any serious departures from implementation procedures.

Behavioral strategies can be successfully piloted at scale with strong implementation support. As discussed in Chapter IV, several staff members in each of our 34 treatment area offices needed to put the trial's strategies into practice in order to test their impact on employer behavior. This trial shows that even behaviorally informed strategies that require a relatively high level of coordination across multiple levels can meet their objectives. However, accomplishing this necessitated ongoing implementation support from the research team and key leaders within the implementing agency.

Behavioral trials are best viewed as part of a continuous learning and quality improvement process. This trial was originally designed to be completed in a single, three-month phase. (We did not design Phase 1 of the OSHA trial to disentangle the effects of each individual change to the citation process, because this information was not particularly valuable given the relatively low cost of each individual change.) However, once the early Phase 1 results were available, both OSHA and the research team recognized that conducting a second phase of the trial would help answer new questions. Phase 2 of the trial allowed us to refine our knowledge about the effectiveness of the changes tested and yielded additional, important insights. It showed that a more limited and less burdensome set of citation process changes could produce similar improvements on employer responsiveness. It also showed that improved employer responsiveness could translate into improvements in final citation resolution. In this manner, this trial helps illustrate that individual studies are rarely definitive and, therefore, are best viewed as part of an ongoing learning enterprise.

Further applications of behavioral insights may be especially beneficial for OSHA and similar agencies. Our trial findings add to the growing body of evidence on the value of leveraging insights from behavioral science to better understand and troubleshoot persistent challenges within ongoing programs. Agencies like OSHA, which has an expansive mission but limited resources, may benefit particularly from fully exploiting the potential of behavioral insights to support their missions.

We limited this trial to low-cost changes during the inspection and initial response period that could be implemented without changing existing regulations or collecting any additional information. However, it seems likely that further changes to the citation process may increase employer responsiveness beyond this trial's results. For example, emailing citation packages at the same time that they are mailed might increase the salience of the citation, or help OSHA deliver it to employers who change residences or travel frequently. Redesigning the full citation package to use more concise, accessible language, or translating the full citation package into Spanish, might also help. Sending reminder postcards after demand letters may further reduce referrals to the national office for debt collection. Some of these options might require OSHA to uniformly collect additional information such as email addresses, or change rules and regulations, but may still be worthwhile.

OSHA may also discover additional opportunities to improve employer responsiveness not just to citations but to the agency's overall mission and objectives, by identifying other "pain points" in the agency's ongoing operations and using the behavioral diagnosis and design process from this trial to identify and test possible low-cost solutions. Exploratory interviews with inspected employers, which we could not conduct as part of this trial, could provide valuable insight into the employers' experience of the inspection, citation, and other agency processes; their impressions of OSHA; and barriers that prevent them from more fully engaging with the agency, addressing safety issues and workplace hazards more proactively, or other concerns.

The results of this trial indicate that the up-front work to diagnose behavioral barriers, design changes or new strategies to address them, and pilot the new strategies in a way that allows determining whether and how well they work can yield measurable, substantial benefits to the agency and the members of the public it aims to serve. Moreover, well-targeted, low-cost applications of behavioral science could help OSHA accomplish its goals more cost-effectively as compared to relying predominantly on resource-intensive enforcement strategies. For this reason, behavioral science may become an increasingly useful tool for agencies like OSHA that must meet a broad mission with relatively modest resources.

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Notes

[1] BLS 2014 occupational fatalities injuries and illnesses data (http://www.bls.gov/iif/oshwc/cfoi/cfch0013.pdf and http://www.bls.gov/news.release/archives/osh_10292015.htm).

[2] See Levine (2012).

[3] Mathematica analysis of FY 2013 OSHA data.

[4] See Bettinger et al (2012).

[5] The expedited informal settlement agreement option was introduced in 1996 to encourage prompt resolution of citations.

[6] Per OSHA's advice, the evaluation did not include states with local enforcement plans (state plan states) because, in these states, a local entity takes the place of OSHA in setting and enforcing standards and conducting inspections. Accordingly, OSHA does not direct local practices in these states to the extent that it does in other states. Most or all states in regions 9 and 10, which comprise the west coast and bordering states, operate state plans and were excluded from the evaluation, as advised by OSHA.

[7] Employers must certify that they have addressed all workplace hazards in order to resolve a citation and avoid referral to debt collection; failure to certify can lead to additional penalties (*OSHA Field Operations Manual*, Sections 6.II.A.4 and 7.VIII.B).

[8] Mathematica analysis of OSHA Information System data.

[9] If the employer has agreed to an ISA or EISA, the relevant agreement becomes the final order; if the employer formally contests, the decision of the judge undergoes review by an OSHA commission and becomes a final order.

[10] For example, ideas42 has worked on similar issues for repayment of microfinance and student loans (see http://www.ideas42.org/wp-content/uploads/2015/05/CFED-ideas42-Small-Changes-Real-Impact.pdf and http://www.ideas42.org/wp-content/uploads/2016/09/Nudging-For-Success-FINAL.pdf, respectively). In addition, the Behavioral Interventions to Advances Self-Sufficiency project has examined the use of behavioral interventions to encourage timely payment of child support payments (see http://www.mdrc.org/publication/taking-first-step).

[11] Johnson et al. (2012) summarize how the presentation of information can influence decision makers' choices, including strategies to reduce the cognitive burden associated with weighing different options. Similarly, Bettinger et al. (2009) discuss barriers to action introduced by complexity.

[12] Duflo et al. (2006) discuss the potential role of misunderstanding benefits in explaining large differences in the take-up of two programs with similar benefits but markedly different presentations to target audiences.

[13] See Mani et al. (2013). See also Levin, D., & Baker, L. (2015).

[14] Laibson (1997) presents a model called "hyperbolic discounting," commonly used by economists to explain procrastination and efforts to combat it. See also Frederick et al. (2002).

[15] See Kahneman et al. (1991).

[16] An employer's response deadline is based on the citation delivery date, which is not known at the time the cover letter is generated and the citation package is mailed.

[17] See Ariely and Wertenbroch (2002).

[18] See Johnson et al. (2012).

[19] See "Nudging for Success" (2016).

[20] See van Hooft et al. (2005).

[21] See "Nudging for Success" (2016).

[22] As noted earlier, per OSHA's advice, the evaluation did not include states with local enforcement plans (state plan states) because, in these states, a local entity takes the place of OSHA in setting and enforcing standards and conducting inspections. Accordingly, OSHA does not direct local practices in these states to the extent it does in other states. Most or all states in regions 9 and 10 operate state plans and were excluded from the evaluation, as advised by OSHA.

[23] In regions with odd numbers of offices, we formed one triplet. For each triplet, we first randomly determined whether one or two of the offices would be in the treatment group and then randomly selected that number of offices.

[24] In practice, some cases in the analysis sample were associated with inspections that occurred before the trial's start date. Treatment group employers in these cases did not receive the closing conference handout. However, sensitivity analyses did not produce any evidence that cases with no handout had a different effect of the changes we tested, relative to those that did.

[25] Most treatment group area offices began Phase 2 of the trial (that is, ceased making reminder telephone calls) between September 28, 2015, and October 12, 2015. However, 7 out of the 34 offices in the treatment group did not begin Phase 2 until November 9, 2015. We limited the sample in the treatment and control offices accordingly. That is, if a treatment group office began Phase 2 on September 28, 2105, we included cases issued between September 28, 2015, and January 15, 2016, for both that office and its matched control-group office.

[26] For example, an EISA-eligible employer in the treatment group with a citation issued on October 1, 2015, would not have received a follow-up telephone call because calls were not made after October 5, 2015, and the calls were not made until at least one week following issuance of citations. Since the follow-up telephone call was part of the set of changes being tested in Phase 1, such a case would need to be excluded from the Phase 1 sample.

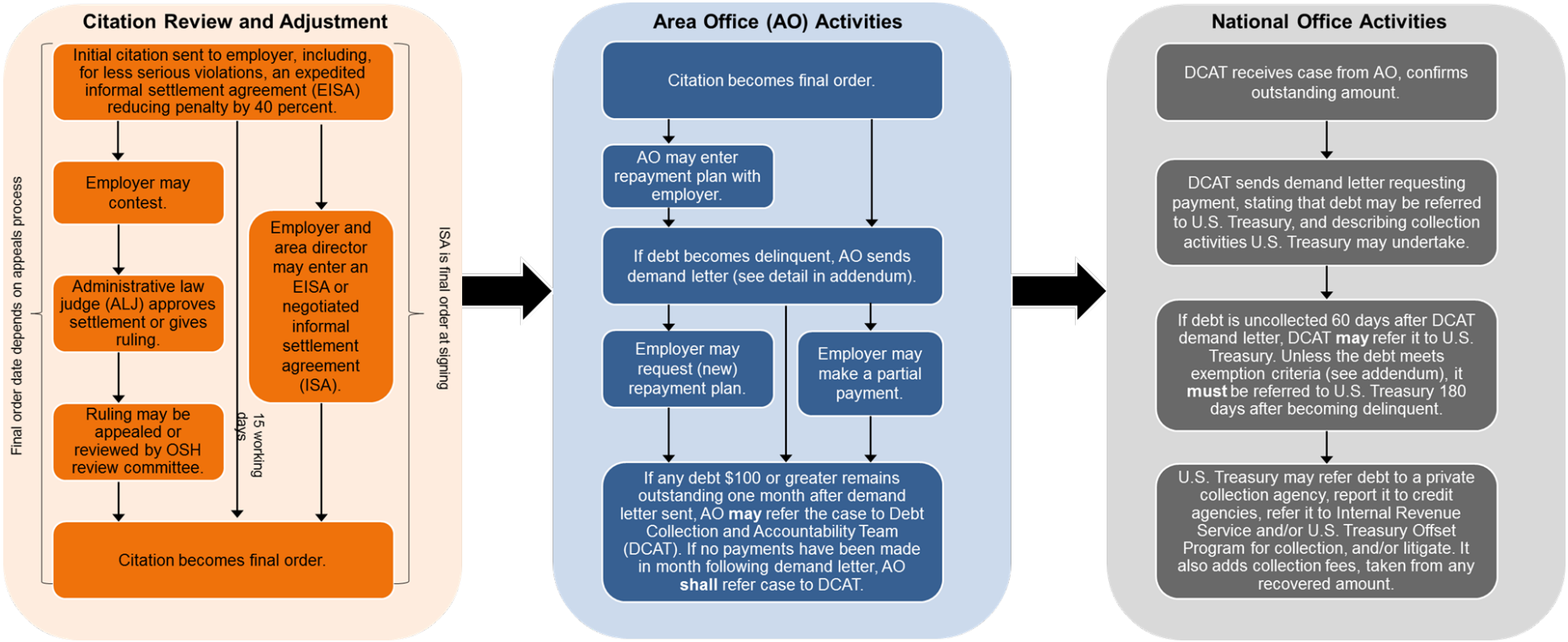
[27] See Lefkowitz et al. (2017).

APPENDIX A

OSHA CITATION PROCESS AND CHANGES TESTED IN THE TRIAL

In Figure A.1, we illustrate the existing citation process. In Figure A.2, we illustrate how the changes tested during the trial fit with the existing process. In Exhibits A.1 through A.5, we present the English-language versions of the materials used by area offices to implement changes to the citation process. Spanish-language versions of Exhibits A.1 through A.4 are available upon request. (We agreed with national office staff that follow-up telephone calls to be conducted in Spanish would be completed by Spanish-speaking area office staff using the English script as guidance.)

Figure A.1. OSHA's existing citation process



Note: This figure does not display all possible variations and details of the citation process. See OSHA's Field Operations Manual for more information.

Figure A.2. How modifications fit with existing process

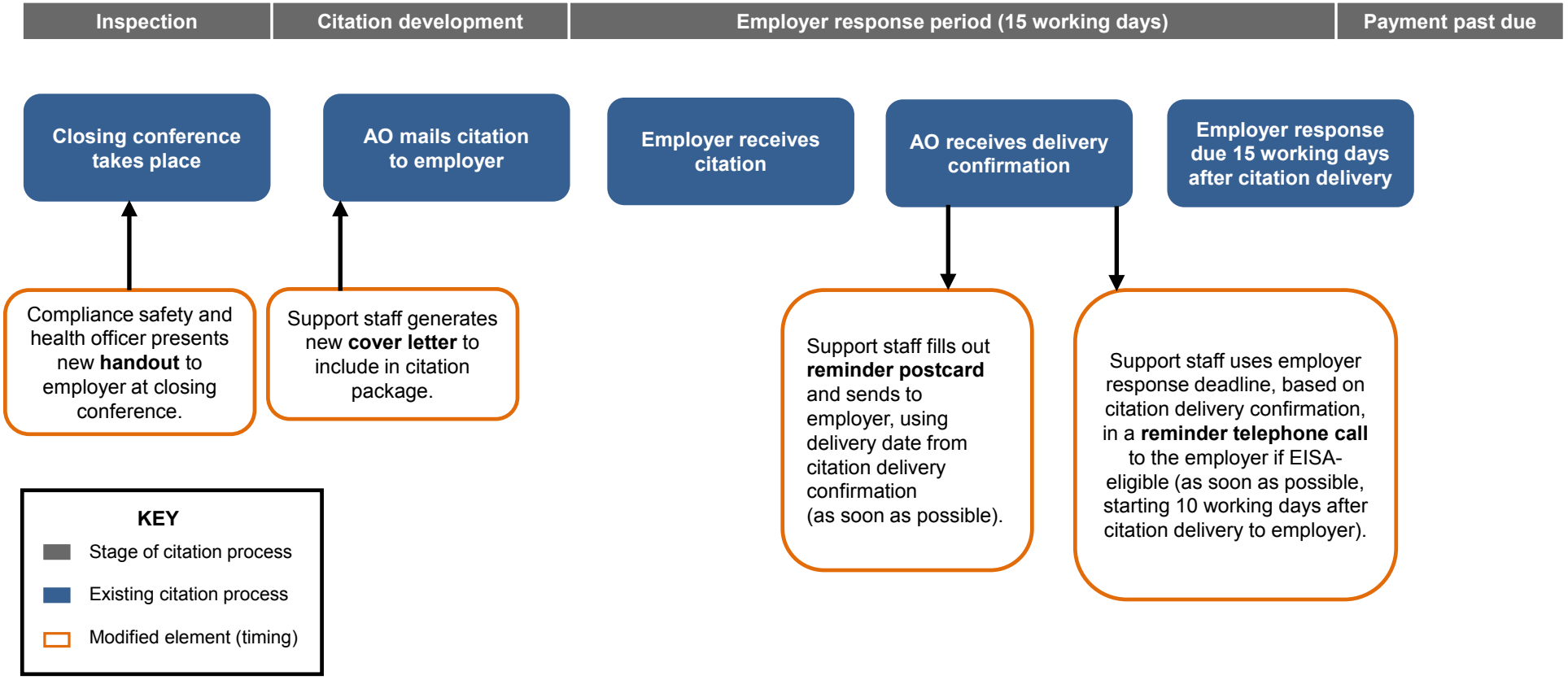


Exhibit A.1. Citation cover letter for expedited-settlement-eligible employers

Este documento es muy importante. Si ud. no habla inglés, busque un traductor o llame al (555) 555-5555.

U.S. Department of Labor Occupational Safety and Health Administration
1995 Jones Road
Atlanta, GA 30339
Phone: (555) 555-5555 Fax: (999) 999-9999

November 6, 2015

Dear John Smith,

On 10/22/2015, an OSHA compliance officer met with you or your representative as part of an inspection at 1776 Main Street Atlanta, GA. This letter includes the citations for the violations that were found (see summary below). Please choose one of the three options from the box to the right and complete the associated steps found on the following page **within 15 working days.** Please call us if you have any questions about the enclosed citation and/or penalties; we are here to help you choose the best option to resolve your citation as quickly as possible.

Sincerely,

Jane Smith, Area Director

Your Citation Summary
Acme Unlimited
Inspection Number: 1212121

Total Amount Due: **$4800.00**

Payment Due Date: **15 working days after receipt of this letter**

You must correct each violation by the date listed in the Citation and Notification of Penalty. Please see the violations and the correction deadline for each violation starting on page 6.

Total Number of Violations : 3

Your First Correction Deadline is: 12/01/15

Step 1 – Choose a Response Option and *Act within 15 working days*

Respond now before you lose the ability to discuss potential adjustments to penalty amounts and/or due dates. Please choose one option below and complete the steps on the next page.

Option #1 – Correct and Pay
I agree with the citation and correction deadlines, and do not contest.

Expedited Informal Settlement Agreement (EISA)
Because you have acted in good faith and your inspection revealed no instances of repeat, willful or other high-gravity violations, we can offer to reduce your penalty.

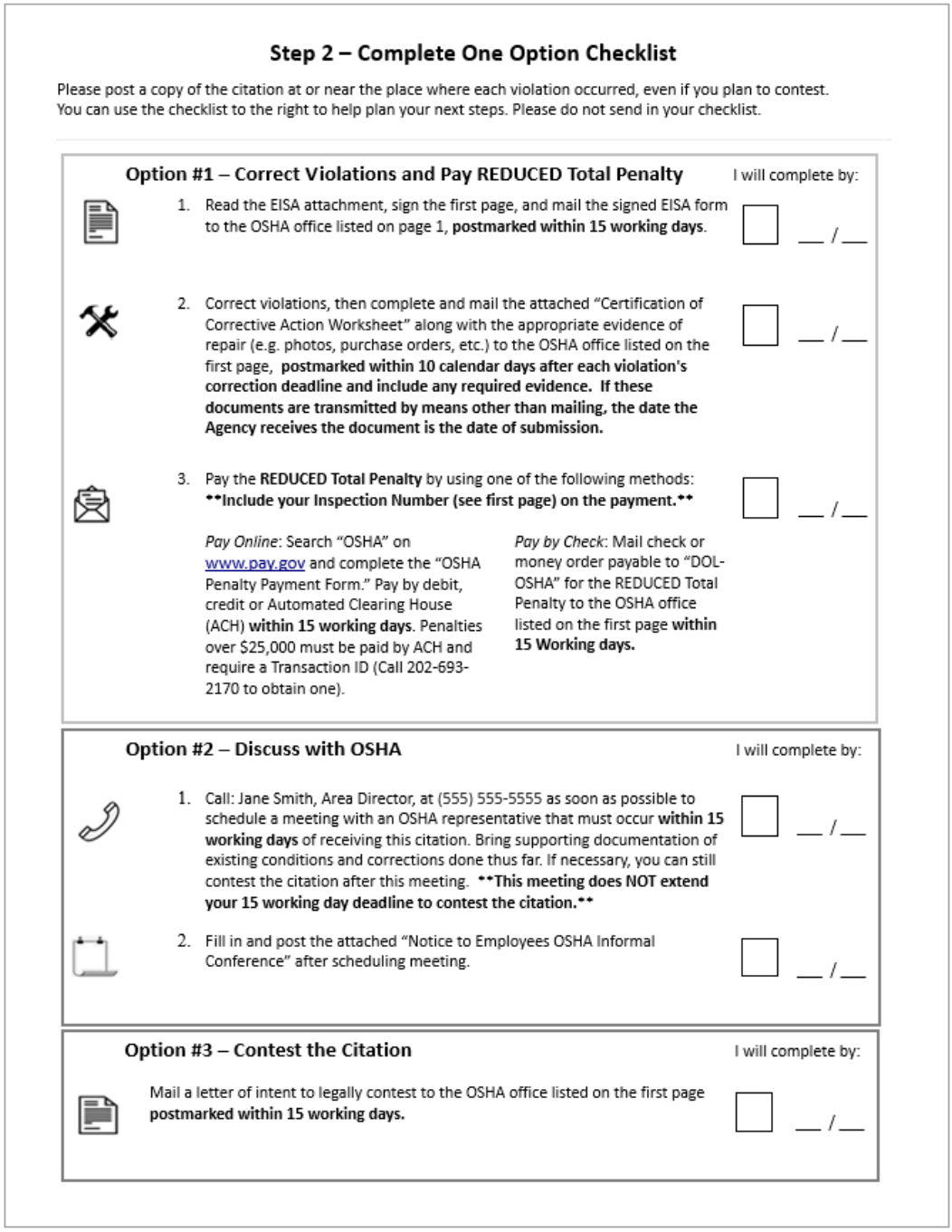
Your **REDUCED total penalty** is: $ 2880.00

This is a reduction of **40%**

Option #2 – Discuss with OSHA
I would like to discuss this citation with an OSHA representative. This may lead to changes in the penalty amount, due date and/or correction deadlines (if appropriate).

Option #3 – Contest the Citation
I do not agree with the citation, penalties, and/or correction deadlines, and would like to contest.

Exhibit A.1. (*continued*)



Step 2 – Complete One Option Checklist

Please post a copy of the citation at or near the place where each violation occurred, even if you plan to contest. You can use the checklist to the right to help plan your next steps. Please do not send in your checklist.

Option #1 – Correct Violations and Pay REDUCED Total Penalty — I will complete by:

1. Read the EISA attachment, sign the first page, and mail the signed EISA form to the OSHA office listed on page 1, **postmarked within 15 working days**. ☐ ___ / ___

2. Correct violations, then complete and mail the attached "Certification of Corrective Action Worksheet" along with the appropriate evidence of repair (e.g. photos, purchase orders, etc.) to the OSHA office listed on the first page, **postmarked within 10 calendar days after each violation's correction deadline and include any required evidence. If these documents are transmitted by means other than mailing, the date the Agency receives the document is the date of submission.** ☐ ___ / ___

3. Pay the **REDUCED Total Penalty** by using one of the following methods: ****Include your Inspection Number (see first page) on the payment.**** ☐ ___ / ___

Pay Online: Search "OSHA" on www.pay.gov and complete the "OSHA Penalty Payment Form." Pay by debit, credit or Automated Clearing House (ACH) **within 15 working days**. Penalties over $25,000 must be paid by ACH and require a Transaction ID (Call 202-693-2170 to obtain one).

Pay by Check: Mail check or money order payable to "DOL-OSHA" for the REDUCED Total Penalty to the OSHA office listed on the first page **within 15 Working days.**

Option #2 – Discuss with OSHA — I will complete by:

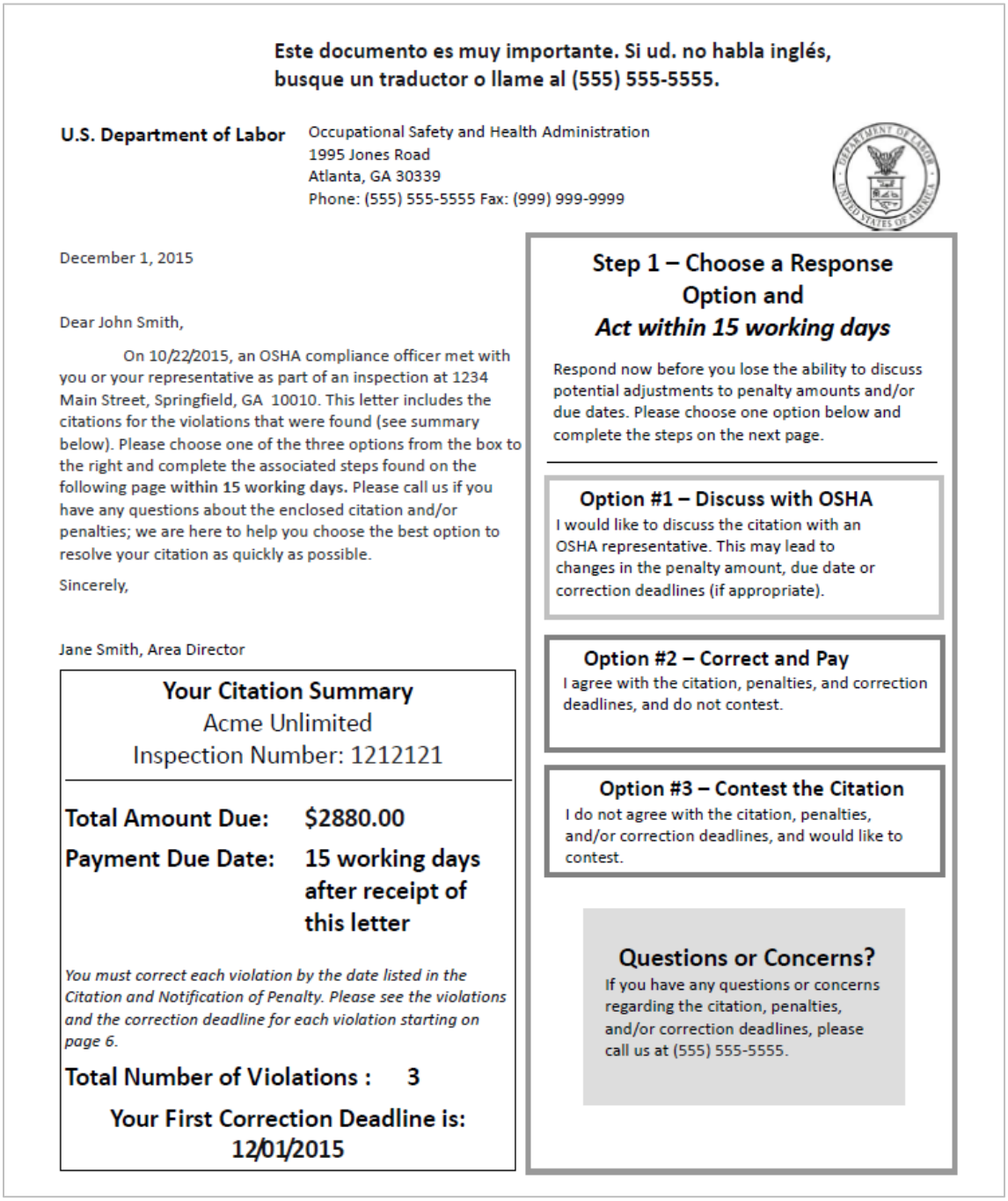
1. Call: Jane Smith, Area Director, at (555) 555-5555 as soon as possible to schedule a meeting with an OSHA representative that must occur **within 15 working days** of receiving this citation. Bring supporting documentation of existing conditions and corrections done thus far. If necessary, you can still contest the citation after this meeting. ****This meeting does NOT extend your 15 working day deadline to contest the citation.**** ☐ ___ / ___

2. Fill in and post the attached "Notice to Employees OSHA Informal Conference" after scheduling meeting. ☐ ___ / ___

Option #3 – Contest the Citation — I will complete by:

Mail a letter of intent to legally contest to the OSHA office listed on the first page **postmarked within 15 working days.** ☐ ___ / ___

Exhibit A.2. Citation cover letter for employers ineligible for expedited settlement



Este documento es muy importante. Si ud. no habla inglés, busque un traductor o llame al (555) 555-5555.

U.S. Department of Labor Occupational Safety and Health Administration
1995 Jones Road
Atlanta, GA 30339
Phone: (555) 555-5555 Fax: (999) 999-9999

December 1, 2015

Dear John Smith,

On 10/22/2015, an OSHA compliance officer met with you or your representative as part of an inspection at 1234 Main Street, Springfield, GA 10010. This letter includes the citations for the violations that were found (see summary below). Please choose one of the three options from the box to the right and complete the associated steps found on the following page **within 15 working days.** Please call us if you have any questions about the enclosed citation and/or penalties; we are here to help you choose the best option to resolve your citation as quickly as possible.

Sincerely,

Jane Smith, Area Director

Your Citation Summary
Acme Unlimited
Inspection Number: 1212121

Total Amount Due: **$2880.00**

Payment Due Date: **15 working days after receipt of this letter**

You must correct each violation by the date listed in the Citation and Notification of Penalty. Please see the violations and the correction deadline for each violation starting on page 6.

Total Number of Violations : 3

Your First Correction Deadline is: 12/01/2015

Step 1 – Choose a Response Option and *Act within 15 working days*

Respond now before you lose the ability to discuss potential adjustments to penalty amounts and/or due dates. Please choose one option below and complete the steps on the next page.

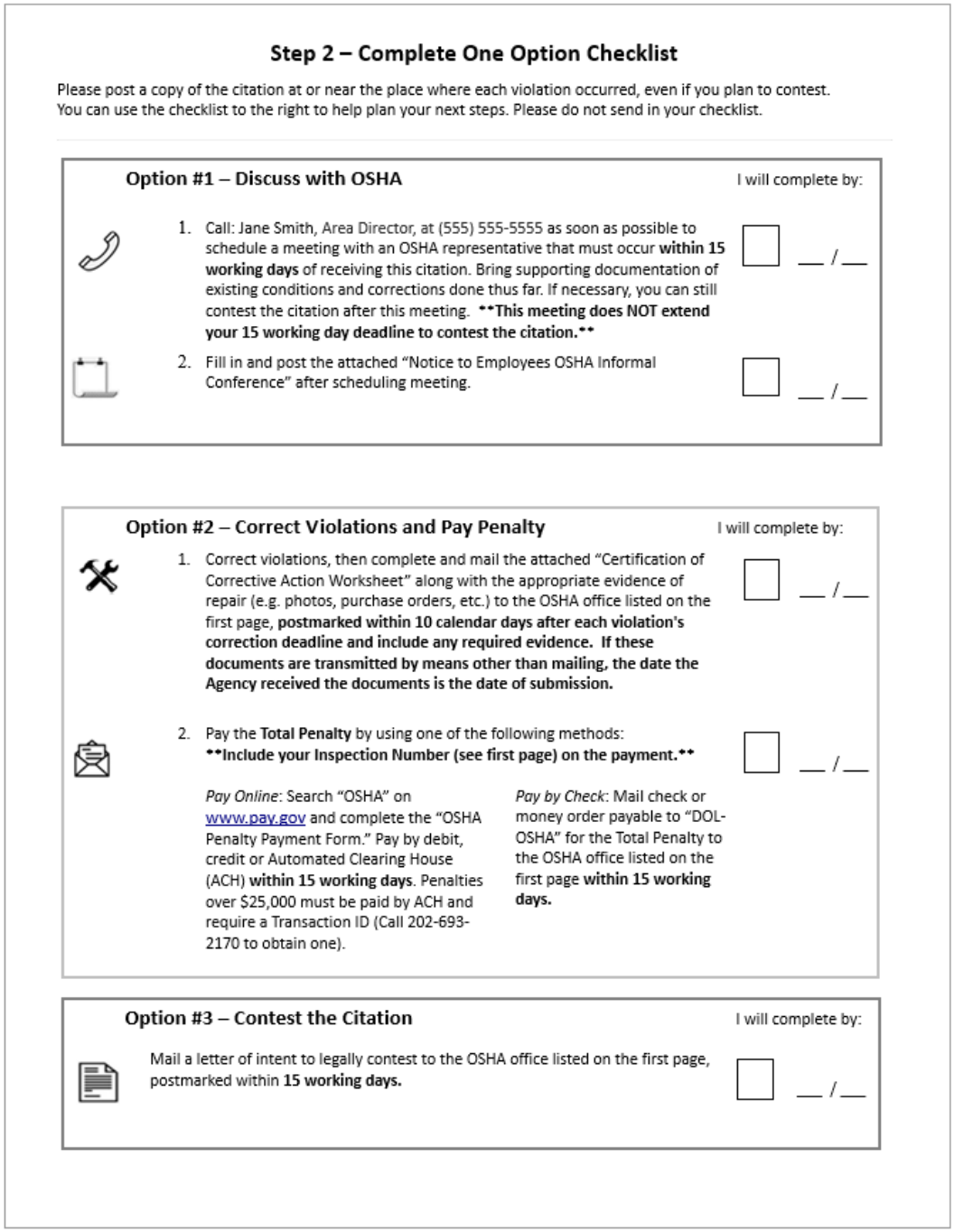
Option #1 – Discuss with OSHA
I would like to discuss the citation with an OSHA representative. This may lead to changes in the penalty amount, due date or correction deadlines (if appropriate).

Option #2 – Correct and Pay
I agree with the citation, penalties, and correction deadlines, and do not contest.

Option #3 – Contest the Citation
I do not agree with the citation, penalties, and/or correction deadlines, and would like to contest.

Questions or Concerns?
If you have any questions or concerns regarding the citation, penalties, and/or correction deadlines, please call us at (555) 555-5555.

Exhibit A.2. *(continued)*



Step 2 – Complete One Option Checklist

Please post a copy of the citation at or near the place where each violation occurred, even if you plan to contest. You can use the checklist to the right to help plan your next steps. Please do not send in your checklist.

Option #1 – Discuss with OSHA — I will complete by:

1. Call: Jane Smith, Area Director, at (555) 555-5555 as soon as possible to schedule a meeting with an OSHA representative that must occur **within 15 working days** of receiving this citation. Bring supporting documentation of existing conditions and corrections done thus far. If necessary, you can still contest the citation after this meeting. ****This meeting does NOT extend your 15 working day deadline to contest the citation.****

☐ __ / __

2. Fill in and post the attached "Notice to Employees OSHA Informal Conference" after scheduling meeting.

☐ __ / __

Option #2 – Correct Violations and Pay Penalty — I will complete by:

1. Correct violations, then complete and mail the attached "Certification of Corrective Action Worksheet" along with the appropriate evidence of repair (e.g. photos, purchase orders, etc.) to the OSHA office listed on the first page, **postmarked within 10 calendar days after each violation's correction deadline and include any required evidence. If these documents are transmitted by means other than mailing, the date the Agency received the documents is the date of submission.**

☐ __ / __

2. Pay the **Total Penalty** by using one of the following methods:
****Include your Inspection Number (see first page) on the payment.****

☐ __ / __

Pay Online: Search "OSHA" on www.pay.gov and complete the "OSHA Penalty Payment Form." Pay by debit, credit or Automated Clearing House (ACH) **within 15 working days**. Penalties over $25,000 must be paid by ACH and require a Transaction ID (Call 202-693-2170 to obtain one).

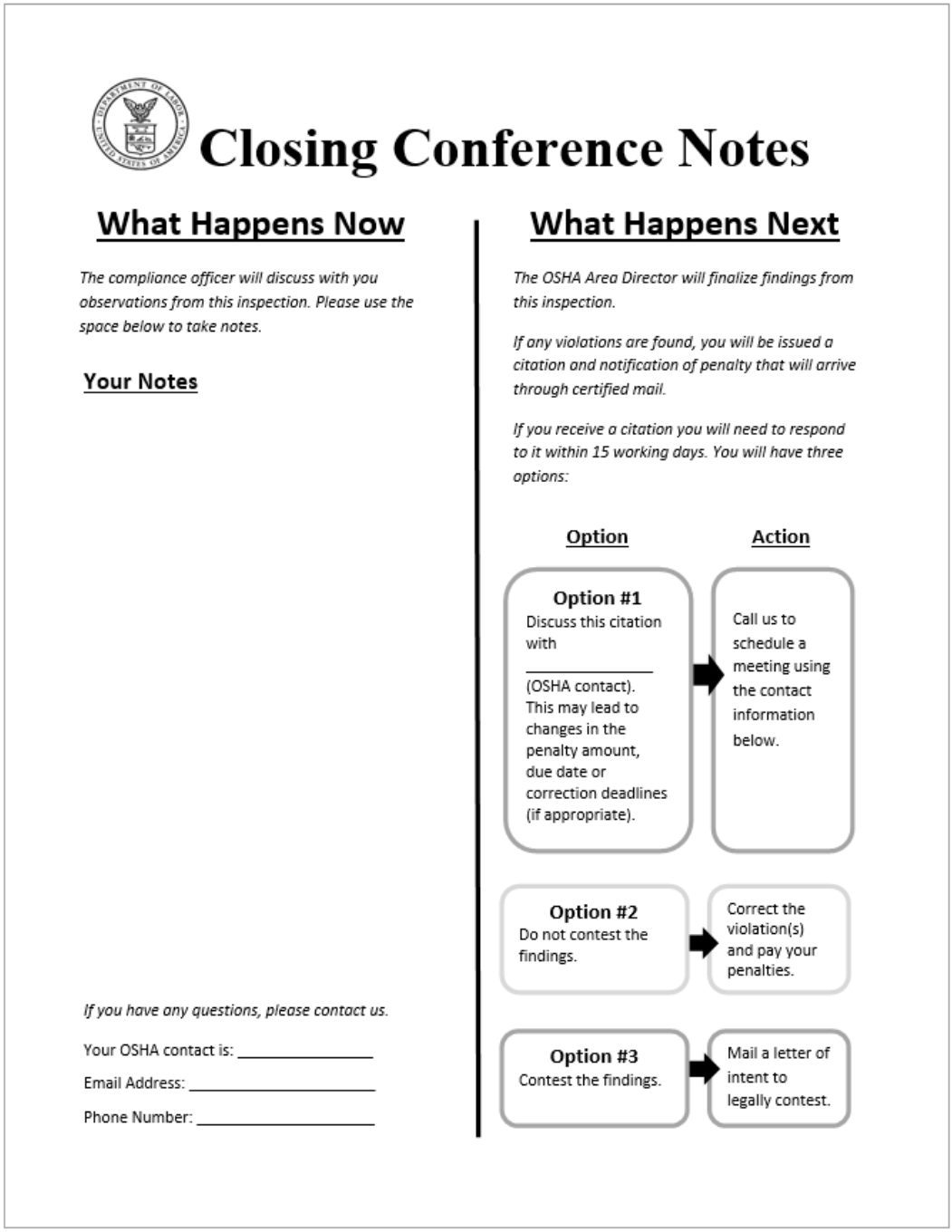
Pay by Check: Mail check or money order payable to "DOL-OSHA" for the Total Penalty to the OSHA office listed on the first page **within 15 working days.**

Option #3 – Contest the Citation — I will complete by:

Mail a letter of intent to legally contest to the OSHA office listed on the first page, postmarked within **15 working days.**

☐ __ / __

Exhibit A.3. Handout shared with employers at inspection closing conference



Closing Conference Notes

What Happens Now

The compliance officer will discuss with you observations from this inspection. Please use the space below to take notes.

Your Notes

If you have any questions, please contact us.

Your OSHA contact is: _____

Email Address: _____

Phone Number: _____

What Happens Next

The OSHA Area Director will finalize findings from this inspection.

If any violations are found, you will be issued a citation and notification of penalty that will arrive through certified mail.

If you receive a citation you will need to respond to it within 15 working days. You will have three options:

Option	Action
Option #1 Discuss this citation with _____ (OSHA contact). This may lead to changes in the penalty amount, due date or correction deadlines (if appropriate).	Call us to schedule a meeting using the contact information below.
Option #2 Do not contest the findings.	Correct the violation(s) and pay your penalties.
Option #3 Contest the findings.	Mail a letter of intent to legally contest.

Exhibit A.4. Reminder postcard

You recently received an important package from OSHA via certified mail.

You must respond to the information in this package ON OR BEFORE _____.

Please call your area office at _____ to schedule a meeting to discuss your options.*

Inspection Number:_____

*If you already responded, please disregard this notice.

Exhibit A.5. Script for reminder telephone call to employers

Behavioral Interventions for Labor-Related Programs:
Script for Follow-Up Phone Call to EISA-Eligible Employers

Hi. My name is [CALLER NAME] and I'm calling from OSHA's [AREA OFFICE NAME] about a citation package you recently received from us. I wanted to inform you that you must respond to the citation package by [DATE], and we'd like to work with you to resolve this as quickly as possible. We can set up a meeting at our office(s)—many employers find that these meetings are a good way to address any concerns.

IF VOICEMAIL → Please call us back at [PHONE NUMBER] to schedule a meeting or if we can help in any way. Thank you for your time. **[END CALL]**

IF LIVE CONVERSATION → Would you like to set up a time to meet?

IF YES → Schedule an Informal Conference.

IF NO → Okay. Please feel free to call us back at [PHONE NUMBER] if you have any questions or if we can help in any way. Thank you for your time.
[END CALL]

APPENDIX B

EVALUATION DESIGN AND ANALYTIC METHODS

In this appendix, we provide details on the experimental design and analytical methods used to test the effect of changes to the citation process.

Experiment design

Cluster random assignment

A random assignment study design offers the best strategy for confidently establishing whether any changes in employer responsiveness to citations or referrals to the national office were caused by our changes to the citation process, rather than by other factors. Our level of random assignment was chosen to accommodate the logistical constraints of OSHA's organizational structure while maximizing statistical power. It was not feasible to ask OSHA personnel within the same area office to use different procedures and materials with different employers. With only eight regions participating in the study, random assignment of OSHA regions to treatment and control would have resulted in low statistical power. Thus, we randomly assigned the 69 area offices to treatment and control in what is termed a cluster randomized design: clusters (area offices) of observations (employers) were assigned to treatment or control groups.

With only 69 area offices, our power analysis indicated that the study would involve only two groups—a treatment group and a control group—for each phase of the study while still allowing for the detection of realistic impacts. While it may have been ideal to have multiple treatment groups—each with different combinations of the four intervention components—such an approach would have resulted in insufficient power to detect differences between the groups. Recognizing that the most important question was whether the sum of the interventions could produce improvements in employer outcomes, we designed each phase to test a treatment group that used all of the relevant components versus a control group that used none of them.

Stratified random assignment

Random assignment of a relatively small number of clusters can give rise to imbalance between the treatment and control groups solely by chance. To guard against this possibility, we stratified the sample of area offices before random assignment. The first dimension of stratification was region because regions are both geographic and administrative entities. This ensured that each region would be equally represented in the treatment and control groups.

We also wanted to ensure that we did not end up with imbalance in terms of the past outcomes of area offices. That is, area offices have different rates of referral to the national office because of either the mix of employers they encounter or other reasons. We collected data on the proportion of cases referred to the national office in the previous fiscal year for each area office, allowing us to stratify on this dimension as well.

We generated strata, with each stratum consisting of a pair or triplet of area offices, and then randomly assigned area offices within each stratum according to the following six steps:

1. Within each region, we ranked area offices according to the proportion of cases they referred to the national office for debt collection in fiscal year 2013.
2. We formed strata of area offices within each region by grouping area offices according to their ranking in the first step. We paired the first two area offices, then the next two, and so forth.
3. In regions with an odd number of area offices, one "pair" was actually a triplet, with three area offices.

4. We sent the list of strata to the regional directors for their feedback on whether the strata generated in their region were appropriate.
5. We revised the strata based on the regional directors' feedback.[1]
6. We randomly assigned one area office from each stratum to the treatment group and the other to the control group. For triplets, we first randomly selected whether we would choose one or two area offices for the treatment group and then randomly selected this number of area offices.

Notably, two area offices *within the same metropolitan area* were sometimes assigned to different study groups. However, given that the area office staff responsible for the inspection and citation process are associated with only one area office, opportunities for contamination of the control group were limited.

Closing conference handouts

Treatment group area offices began using all intervention components on June 8, 2015. The sample included cases with citations issued on or after that date. However, some of the cases, particularly those issued early in the trial, completed their closing conferences before June 8. As such, these employers did not receive the closing conference handout.

Implementation

One treatment group area office did not begin implementing the intervention components at the start of Phase 1. It did, however, begin implementation by the start of Phase 2. As a result, the Phase 1 analysis excluded both that office and its matched control group area office, but the Phase 2 analysis included both offices.

Treatment group area offices were supposed to eliminate reminder telephone calls on October 5, 2015. However, some stopped making the telephone calls before that date and others after that date. When the lack of adherence to the October 5 Phase 1 end date surfaced during regular feedback sessions, we learned when each treatment area office stopped making the reminder telephone calls (that is, when it initiated Phase 2). For each treatment group area office as well as for its matched control group office, we included cases with citations issued after the area office's actual Phase 2 start date, along with those issued within a week before that date. (Reminder telephone calls were to be made no sooner than 10 business days after citation issuance; therefore, all cases with a citation issued within a week before the office stopped making calls would not have received calls.)

Abatement outcome

For the purpose of the study, we classified abatement differently than OSHA. We considered an individual violation to be lacking abatement certification if it met the all of the following conditions:

- The abatement due date had passed
- The violation had not been voided
- The abatement status was missing or listed as not completed for any of the following reasons: (1) the worksite had changed, (2) the employer was out of business, or (3) the area director used their discretion in deciding not to further pursue abatement certification.

[1] In two of the eight regions, regional directors recommended changes to the pairings. In region 2, eight area offices were reassigned to different pairs. In region 5, six area offices were reassigned. Regional administrators in the two regions felt that the new pairs reflected a better balance of caseloads between offices.

OSHA considers cases in which the worksite has changed or the employer is out of business as no longer constituting hazards. For the purpose of being able to detect a change in employer behavior, we considered these cases as failing to provide abatement certification. However, even with our stricter definition of abatement certification, we still found that a high percentage of cases had completed abatement for all of their violations (about 86% in the control group in both phases).

Analytic methods

To estimate the impacts of the interventions, we estimated linear probability models of the following form:

$$y_{ijk} = \chi 1_{ijk}\beta_1 + \chi 2_{jk}\beta_2 + T_{jk}\delta + \theta_k + \varepsilon_{ijk}$$

Where y_{ijk} is the binary outcome of interest for employer *i* in area office *j* within stratum *k*; $\chi 1_{ijk}$ and $\chi 2_{jk}$ are the employer and area office characteristics, respectively, described below; θ_k represents a series of fixed effects for each stratum; and T_{jk} is an indicator for whether area office *j* in stratum *k* was assigned to the treatment group. The parameter associated with T_{jk}, δ represents the treatment effect after adjusting for the covariates in the model and stratum fixed effects. Standard errors are adjusted for clustering at the area office level (the level of random assignment).

We included employer and area office characteristics, *X1* and *X2*, respectively, to increase precision. Our results are robust to excluding these covariates from our model (that is, our main findings remain unchanged). We used the following employer characteristics in *X1*:

- Initial penalty amount
- Number of employees
- An indicator for whether the firm was in the construction industry
- Number of repeat, willful, and serious violations (three variables)

For the models used to estimate impacts on employer responsiveness outcomes, *X2* was the area office-level average of that same outcome calculated from a sample of pretrial cases. For example, the model that estimated the treatment effect on settlement agreements included the area office-level average of cases with settlement agreements in the pretrial period. For each model estimating effects on citation resolution outcomes, *X2* was the area office-level proportion of cases referred to the national office in the pretrial period.

The stratum fixed effects ensured that the treatment effects were estimated by using only variation between cases across area offices in the same stratum. We confirmed that our results are robust to excluding these stratum fixed effects. They are also robust to the use of a logistic regression model specification rather than a linear probability model.

To estimate how the impact varied by employer characteristics, we interacted the treatment indicator with the characteristics of interest (while the main effect of the characteristic was included in *X1*). We examined variation by region by testing (separately for each phase) whether the treatment effect for a given region differed from the average impact across the other seven regions. To estimate whether impacts varied by phase, we pooled data from both phases, accounted for stratum-by-phase fixed effects (rather than for stratum fixed effects), and interacted the treatment indicator with a phase indicator.

APPENDIX C

BASELINE EQUIVALENCE

In this appendix, we provide detailed tables and additional information to supplement the discussion of baseline equivalence in Chapter III.

The validity of our impact estimates depends on whether the treatment and control groups in the analysis sample had similar characteristics at baseline. To help verify the similarity between groups, we assessed whether the two groups showed statistically significant differences in observable baseline characteristics.

In Table C.1, we compare the baseline measures of the treatment group to the control group for each phase for the sample of cases included in the employer responsiveness analysis. In addition to employer characteristics, we display the area office characteristics that we included as covariates in the model. None of the differences were statistically significant.

Table C.1. Baseline equivalence for the sample used for employer responsiveness analysis

	Phase 1			Phase 2		
Background characteristic	Treatment average	Control average	*p*--value	Treatment average	Control average	*p*-value
Initial penalty ($)	9,499.8	8,912.2	0.185	8,955.7	9,764.6	0.268
Number of employees	31.1	30.5	0.716	33.7	32.9	0.544
Serious violations	2.6	2.6	0.412	2.5	2.5	0.669
Repeat violations	0.1	0.1	0.461	0.1	0.1	0.241
Willful violations	0.0	0.0	0.314	0.0	0.0	0.285
Construction	54.9%	56.6%	0.721	55.2%	56.4%	0.425
Manufacturing	25.5%	22.4%	0.328	22.9%	22.4%	0.442
Days between start of trial and issuance	43.4	44.0	0.675	163.3	163.0	0.646
Previous area office employer responsiveness	78.9%	78.7%	0.840	78.2%	79.0%	0.982
Previous area office informal settlements	66.3%	64.9%	0.751	65.8%	65.3%	0.572
Previous area office employer payments	69.7%	67.2%	0.361	68.5%	67.1%	0.265
Previous area office formal contests	5.5%	6.1%	0.900	5.8%	6.1%	0.765
Number of cases	**2,717**	**2,977**	**--**	**3,143**	**3,213**	**--**

Source: OSHA Information System Data

Note: The *p*-values are based on analysis that accounts for matched-pairs, cluster-randomized design. They are not adjusted for multiple comparisons.

In Table C.2, we do the same for the sample of cases included in the citation resolution analysis (that is, excluding cases that formally contested citations). None of the differences were statistically significant.

Table C.2. Baseline equivalence for the sample used for citation resolution analysis

Background characteristic	Phase 1			Phase 2		
	Treatment average	Control average	*p*-value	Treatment average	Control average	*p*-value
Initial penalty ($)	8,039.6	7,936.5	0.711	7,907.8	8,123.9	0.820
Number of employees	29.5	25.6	0.490	31.8	30.6	0.377
Serious violations	2.6	2.5	0.341	2.5	2.5	0.589
Repeat violations	0.1	0.1	0.167	0.1	0.1	0.069
Willful violations	0.0	0.0	0.856	0.0	0.0	0.655
Construction	55.0%	57.3%	0.539	55.5%	56.9%	0.370
Manufacturing	25.5%	22.1%	0.275	23.2%	22.5%	0.388
Days between start of trial and issuance	43.3	43.6	0.972	163.4	162.8	0.559
Previous area office referrals	23.0%	22.3%	0.763	23.1%	22.2%	0.835
Number of cases	**2,562**	**2,788**		**2,930**	**2,992**	

Source: OSHA Information System Data

Note: The *p*-values are based on analysis that accounts for matched-pairs, cluster-randomized design. They are not adjusted for multiple comparisons.

APPENDIX D

DETAILED TABLES ON STUDY FINDINGS

In this appendix, we present further details on the effects of the changes to the citation process. In Table D.1, we display the impacts, by phase, on all employer responsiveness outcomes. The primary outcome of interest is whether the employer responded to OSHA in any way: by signing a settlement agreement (either EISA or ISA), making any payment (including paying in full), or formally contesting the citation. We generally find statistically significant impacts on the main outcome as well as on the components of the main outcome. We did not expect the interventions to influence the proportion of employers who formally contest their citations, and we did not find significant impacts on that component.

Table D.1. Impacts on employer responsiveness

	Phase 1			Phase 2		
Outcome	Control average	Impact	*p*-value	Control average	Impact	*p*-value
Responded	82.5	3.9**	<0.001	78.6	5.4**	<0.001
EISA	14.6	-1.3	0.351	12.1	2.2	0.185
ISA	51.7	5.6**	0.001	49.8	4.8**	0.003
Settlement agreement	66.3	6.3**	<0.001	61.9	7.4**	<0.001
Made payment	73.1	2.8**	0.008	62.3	6.8**	<0.001
Paid in full	55.6	0.7	0.540	47.8	3.1*	0.025
Formal contest	7.0	0.2	0.746	9.1	-0.7	0.365
Cases						
Treatment	**--**	**2,717**	**--**	**--**	**3,143**	**--**
Control		**2,977**			**3,213**	

Source: OSHA Information System Data

Note: The *p*-values are based on analyses that account for matched-pairs, cluster-randomized design. They are not adjusted for multiple comparisons.

In Table D.2, we display the impacts, by phase, on all citation resolution outcomes. We do not find significant impacts in Phase 1. However, we do find significant impacts on referrals to debt collection and citation resolution in Phase 2.

Some cases may not have been referred to debt collection even though employers did not make penalty payments or were considerably behind on their payments. To account for these cases, we examine the impact on the proportion of cases that have either been referred to debt collection or have received a reminder that they are past due on penalty payments and have not made a payment within 30 days of receipt of the reminder letter.

Note that we excluded contested cases from the analyses of the main citation resolution outcomes. Exclusion of such cases could have given rise to bias if the treatment affected the proportion of cases that resulted in formal contests. We explicitly tested whether the treatment affected the share of cases that were contested, as shown in the Table D.2, and included all eligible cases.

Table D.2. Impacts on citation resolution

Outcome	Phase 1			Phase 2		
	Control average	Impact	*p*-value	Control average	Impact	*p*-value
Referred to debt collection	17.2	-1.3	0.348	18.4	-4.4**	<0.001
Referred to debt collection or past due	19.5	-1.2	0.284	20.2	-3.7**	<0.001
Resolved	74.8	0.3	0.832	74.9	2.5*	0.034
Abated	85.7	-1.2	0.473	85.5	-0.6	0.682
Contested	6.4	-0.2	0.816	6.8	0.2	0.827
Cases						
Treatment	**--**	**2,562**	**--**	**--**	**2,930**	**--**
Control		**2,788**			**2,992**	

Source: OSHA Information System Data

Note: The p-values are based on analyses that account for matched-pairs, cluster-randomized design. P-values are not adjusted for multiple comparisons. The sample sizes reported are those used to test all outcomes other than the "contested" outcome. The sample used to test the "contested" outcome included cases that resulted in this outcome.

We did not find differences in impacts by employer characteristics. We tested whether impacts varied by the seven employer characteristics displayed in Appendix Tables C.1 and C.2. In total, we conducted 168 hypothesis tests (seven employer characteristics by 12 outcomes by two phases). We found statistically significant impacts in only 16 tests, when not accounting for multiple comparisons. If the impacts did not vary across characteristics for any outcome in either phase and the outcomes were uncorrelated, we would have expected to find between eight and nine significant *p*-values simply by random chance. Given that we found only a slightly higher number of significant *p*-values than would be expected due to chance alone, and these were not clustered within any specific outcome or characteristic, we concluded that we do not find significant variation in impacts across the employer characteristics observed in the data.

We did not find differences in impacts by region. We tested whether different regions, which are both administrative and geographic entities, had different impacts. We did not find any consistent patterns of certain regions having greater or smaller impacts than average across the outcomes pertaining to employer responsiveness, citation resolution, or referral to debt collection.

We found some significant differences in impacts across phases. The difference between the Phase 2 and Phase 1 impacts on referrals to the national office—the primary outcome of interest to OSHA—was statistically significant. Table D.3, below, displays the differences in impacts for each outcome. We also found that the impact on the proportion of employers who made a payment to OSHA was significantly greater in Phase 2 than in Phase 1.

Table D.3. Differences in impacts across phases

Outcome	Phase 1 impact	Phase 2 impact	Difference	*p*-value	Phase 1 cases	Phase 2 cases
Employer responsiveness outcomes						
Responded	3.9	5.4	1.5	0.143	5,694	6,356
EISA	-1.3	2.2	0.6	0.641	5,694	6,356
ISA	5.6	4.8	0.6	0.744	5,694	6,356
Settlement agreement	6.3	7.4	1.2	0.417	5,694	6,356
Made payment	2.8	6.8	4.3**	0.003	5,694	6,356
Paid in full	0.7	3.1	2.4	0.105	5,694	6,356
Formal contest	0.2	-0.7	-1.0	0.195	5,694	6,356
Citation resolution outcomes						
Referred to debt collection	-1.3	-4.4	-3.2*	0.027	5,350	5,922
Referred to debt collection or past due	-1.2	-3.7	-2.4*	0.018	5,350	5,922
Resolved	0.3	2.5	2.2	0.144	5,350	5,922
Abated	-1.2	-0.6	0.4	0.758	5,350	5,922
Contest	-0.2	0.2	0.3	0.665	5,702	6,352

Source: OSHA Information System Data

Note: The *p*-values are based on analysis that accounts for matched-pairs, cluster-randomized design. They are estimated from models that pool data from both phases, account for strata-by-phase fixed effects, and include treatment-by-phase interactions. *P*-values are not adjusted for multiple comparisons.

To investigate why the Phase 2 impacts were generally more beneficial than the Phase 1 impacts, we tested whether the mix of employers may have differed between phases. As shown in Table D.4, we found no statistically significant differences in employer characteristics.

Table D.4. Employer characteristics by phase

	Employer responsiveness analysis sample			Citation resolution analysis sample		
Background characteristic	Phase 1 average	Phase 2 average	*p*-value	Phase 1 average	Phase 2 average	*p*-value
Initial penalty	9,192.6	9,364.6	0.716	7,985.9	8,017.0	0.901
Number of employees	30.8	33.3	0.440	27.5	31.2	0.159
Serious violations	2.6	2.5	0.632	2.5	2.5	0.240
Repeat violations	0.1	0.1	0.985	0.1	0.1	0.524
Willful violations	0.0	0.0	0.753	0.0	0.0	0.195
Construction	55.8	55.8	0.983	56.2	56.2	0.984
Manufacturing	23.9	22.7	0.229	23.7	22.8	0.408
Number of cases	**5,694**	**6,356**	**--**	**5,350**	**5,922**	**--**

Note: The *p*-values account for the matched-pairs, cluster-randomized design. They are not adjusted for multiple comparisons. We do not compare area office characteristics across phases, as they are based on pretrial data and thus, by design, cannot differ.

To complement our discussion in Chapter IV of why treatment effects may have varied between phases, we examined how the treatment effects changed over time within each phase. Table D.5, below, shows the estimated slope corresponding to the interaction between the treatment indicator and the time between the start of the trial and the date the citation was issued (in fractions of months). For example, the treatment effect on employer response grew by 3.7 percentage points per month in the first phase (a statistically

significant slope), but by only 0.1 percentage points in the second phase (not significant). Generally, we found that the magnitude of the slope was steeper in Phase 1 than in Phase 2, which is consistent with the explanation that OSHA personnel gained competence early in the trial in implementing the changes, with improvement leveling off thereafter. However, this pattern of results may also be consistent with other explanations.

Table D.5. Changes in impact over time within each phase

	Phase 1		Phase 2	
	Slope	*p*-value	Slope	*p*-value
Employer responsiveness outcomes				
Respond	3.7*	0.012	0.1	0.888
Settlement agreement	1.5	0.378	0.9	0.433
Made payment	4.1**	0.009	0.6	0.653
Formal contest	-0.9	0.206	-0.8	0.274
Citation resolution outcomes				
Referred to debt collection	-3.5*	0.016	-0.7	0.457
Referred to debt collection or past due	-4.2**	0.004	-0.6	0.512
Resolved	2.9	0.100	0.1	0.907
Completed abatement	1.7	0.271	-0.6	0.589

Source: OSHA Information System Data

Note: The *p*-values account for the matched-pairs, cluster-randomized design. They are estimated from models that pool data across phases, and estimate the slope associated with the variable denoting time between trial start and issuance for the treatment and control groups in each phase.

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