The Effect of Marketing on Demand for OSHA's On-site Consultation Program

MARKETING STUDY FINAL REPORT

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Executive Summary

The U.S. Department of Labor's (DOL) Occupational Safety and Health Administration (OSHA) runs a voluntary program that provides free and confidential advice to small and medium-sized establishments on approaches to avoiding workplace injuries and illnesses. This effort, known as the On-site Consultation Program (OSC), operates in addition to—but totally separate from—OSHA's enforcement activities. Nationwide, OSC performs approximately 27,000 consultation visits per year at establishments that collectively employ more than 1.25 million workers.

Using content created by a third-party specialist in marketing, Abt Associates empirically tested several behavioral-theory-based marketing messages. The aim of the research was to determine which messages (if any) would increase establishments' likelihood of requesting a consultation visit from OSC representatives in their state. Of particular interest were comparisons of requests generated by establishments receiving these new marketing messages to requests from establishments receiving OSHA's existing marketing brochure as well as to those receiving no marketing from the study.

To implement this study, Abt developed multiple brochure options and companion email messages incorporating the four different theory-based messages. The newly developed brochures and companion emails, as well as the existing OSHA brochure, were sent to 18 randomly selected subsamples of establishments that comprised the Marketing Study's treatment groups. The mailing was conducted three times at one-month intervals. The rate of consultation requests made by establishments in each subgroup was tracked over a six-month follow-up period and then compared to the request rate in a control group.

Our sample sizes are large enough to estimate the impacts with precision. The results, summarized below, are simple and striking:

- *The marketing strategies tested are effective.* Mailing brochures nearly doubled the rate of requests, from 1.1 percent for establishments in the control group to 2.0 percent for establishments that were targeted with marketing materials.
- *The content of these marketing messages does not matter.* There is no detectable difference in impact between the new behavioral-theory-based messages and OSHA's conventional brochure. None of the behavioral-theory-based messages had more impact than any other, and there is no difference in impact across the multiple formats that were tested with each message.
- *Reinforcement through email does not improve the effectiveness of the marketing.* Some establishments were sent three mailings of a brochure followed by three emails to reinforce the message; other establishments were sent the three mailings but no emails. There is no detectable difference in impact for establishments that were sent the email reinforcement.

Thus, the analysis concludes that this type of broad marketing strategy can substantially increase the rate of OSC requests, but that various theory-based brochures do not have an incremental impact beyond the standard OSHA informational brochure already in use.

On a per-brochure basis, marketing generates more OSC requests from establishments that have prior experience with the OSC program than from establishments that do not. Thus, targeting prior OSC customers appears to be the most effective method of increasing the request rate per mailing. However,

this marketing effort was also quite successful at generating entirely new demand for the OSC program. Marketing nearly tripled the request rate among the 92 percent of establishments in the sample that had no prior experience with OSC. Fully 85 percent of marketing-generated requests were made by such establishments. This type of marketing can therefore be used to substantially broaden the pool of OSC customers.

1. Introduction

The Occupational Safety and Health Administration (OSHA) of the U.S. Department of Labor (DOL) runs a voluntary program that provides free and confidential advice to small and medium-sized establishments on approaches to avoiding workplace injuries and illnesses.[1] This effort, known as the On-site Consultation Program (OSC), operates in addition to—but totally separate from—OSHA's enforcement efforts. Nationwide, OSC performs approximately 27,000 consultations per year at establishments employing more than 1.25 million workers.

This document presents the results of a study (referred to in the remainder of this document as the OSC Marketing Study or Marketing Study) that tested the impact of mail and email marketing materials on the rate of requests for consultation services. The purpose of the study is to determine whether theory-based marketing materials can change establishments' behavior, inducing them to request consultation visits at higher rates than if they did not receive the materials. And, if so, which of several marketing strategies is the most effective.

These goals are grounded in two open questions about OSC. The first is whether it is feasible to expand OSC. In this regard, informed observers have expressed concern such expansion might be challenging given the historically small backlog of requests for OSC visits. Mendeloff et al. (2006) framed this issue, writing:

> *The fact that consultation-program waiting lists are short raises questions about whether there is enough unmet demand to justify expansion of the program. In the past, big increase in demand for consultations has occurred only when employers thought they faced a much higher threat of inspection. However, it does seem that state programs have some control over the demand and that it might be possible to expand the demand moderately for consultations from smaller workplaces.*

Understanding the growth and expansion potential for OSC services raises the related question about the potential sources of interest in future consultations. That is, can demand for OSC services be more productively tapped by expanding the **depth** of existing customer relationships (i.e., repeat engagements) or expanding the **breadth** of the customer base (i.e., new engagements) or both? A review of Integrated Management Information System (IMIS) data indicates that consultations are currently requested by a mix of employers, but that more than half are made by employers who have previously received a visit from OSC. However it remains an open question as to where untapped demand lies and how to best convert that potential through targeted marketing. Any lessons learned in this federally managed marketing effort could subsequently be adopted by states that wish to expand demand for their consultation programs.

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[1] In this document we use the terms "establishment" and "worksite" interchangeably to refer to a stand-alone worksite that is the unit of an OSHA On-site Consultation visit. OSHA maintains administrative records on consultations at the establishment level. In contrast, "business" or "firm" refer to the entire company, which may correspond to the worksite or to a collection of worksites.

The balance of this opening chapter provides additional background on OSC (Section 1.1), and then an overview of our study design, including a roadmap to the rest of this report (Section 1.2).

1.1 Overview of the OSC Program

OSHA's On-site Consultation Program (OSC) provides free, confidential, and voluntary consultations to small and medium-sized businesses all across the country, with priority given to high-hazard worksites.[2] OSC aims to help employers identify and correct workplace hazards and improve their safety and health management systems. After an employer schedules a consultation visit, an OSC consultant travels to the worksite to evaluate potential hazards, work practices, and the employer's safety and health management program. The consultant discusses findings with the employer and recommends improvements. All serious hazards that are identified must be corrected within a specific time period agreed upon by the consultant and the employer but no fines or penalties are assessed as a result of the visit.

OSC is administered by state governments or their designees, typically a center or department within a local university. These state designees receive funding through sections 21(d) and 23(g) of the Occupational Safety and Health Act of 1970. For the purposes of OSC, states are broadly divided into two groups: "Federal Plan States" receive only 21(d) funding for private sector consultations; "State Plan States" receive both 21(d) and 23(g) funding for private and public sector consultations. [3] Two states, Kentucky and Washington, are funded through a slightly different mechanism and are not included in this study. Our analysis includes the remaining 48 states, as well as Washington, D.C.

The OSC program is completely separate from OSHA's enforcement activities, and the results of consultations are kept strictly confidential. The only exception is when an employer fails to correct an imminent danger or a serious hazard noted as part of a consultation. In these instances, the consultant is required to report that danger or hazard to OSHA enforcement. State OSHA staff reported that such referrals were extremely rare. Nonetheless, it is conceivable that this requirement could discourage some establishments from seeking a consultation visit.

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[2] For the purposes of the OSHA On-site Consultation Program, a small to medium-sized business is defined as an employer having fewer than 250 employees at a fixed worksite and no more than 500 employees companywide. OSHA prioritizes consultation services using the Consultation Policies and Procedures Manual (CPPM). According to the CPPM, "the Consultation Project Manager must schedule consultation services according to a prioritizing method that focuses on the most serious deficiencies/hazards first, and lists criteria for determining such prioritization." These criteria include the industry injury/illness incidence rate and the employer's own incidence rate (CSP 02-00-002, effective January 18, 2008).

[3] For the purpose of this study:

Federal Plan States include Alabama, Arkansas, Colorado, Delaware, Washington, D.C., Florida, Georgia, Idaho, Kansas, Louisiana, Maine, Massachusetts, Missouri, Mississippi, Montana, North Dakota, Nebraska, New Hampshire, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Dakota, Texas, Wisconsin, and West Virginia.

State Plan States include Alaska, Arizona, California, Connecticut, Hawaii, Iowa, Illinois, Indiana, Maryland, Michigan, Minnesota, North Carolina, New Jersey, New Mexico, Nevada, New York, Oregon, South Carolina, Tennessee, Utah, Virginia, Vermont, and Wyoming.

In addition, establishments that participate in OSC have the right to defer certain OSHA enforcement activities while the OSC visit is ongoing—in particular, programmed inspections which are defined by OSHA as:

Inspections aimed at specific high-hazard industries, workplaces, occupations, health substances, or other industries identified in OSHA's current inspection procedures. OSHA selects industries for inspection on the basis of factors such as the injury incidence rates, previous citation history, employee exposure to toxic substances, or random selection. OSHA also may develop special emphasis programs that are local, regional, or national in scope, depending on the distribution of the workplaces involved. OSHA normally will conduct comprehensive safety inspections in manufacturing in those establishments with lost-workday injury rates at or above the Bureau of Labor Statistics' (BLS) national rate for manufacturing currently in use by OSHA. States with their own occupational safety and health programs may use somewhat different systems to identify industries for inspection.

In deferring a programmed inspection while the OSC visit is ongoing, OSHA regulations define "ongoing" as the period from the opening conference through any correction due dates (including any extensions). This opportunity to defer programmed inspections may actually encourage some establishments to seek a consultation visit. It is important to emphasize, however, that employers cannot defer non-programmed inspections such as those that arise from imminent danger situations, fatal accidents, or employee complaints about workplace hazards.[4]

As a voluntary program, requests for a consultation visit are always initiated by the employer. Most requests are made via phone or fax, though employers occasionally submit requests by email or by filling out forms on their states' OSC websites. Some requests are initiated in response to states' existing marketing efforts, such as mailed brochures, radio advertisements, or booths at trade fairs. Requests are recorded in the OSHA Information System (OIS) or its predecessor, the Integrated Management Information System (IMIS), typically within one week of the request date.[5] Employers can withdraw requests for any reason before the initial consultation visit. Our analysis of IMIS records indicates that employers withdraw approximately 7 percent of requests.

OSHA's OSC program is not the only provider of health and safety consultation services. Similar free services are sometimes offered by other (non-OSC) state and local government entities such as workers' compensation programs, as well as by private insurers. Private-sector consultants also offer similar services for a fee. At least two factors might explain why establishments would pay a fee for a service that is provided by OSHA for free. First, establishments might—incorrectly—perceive that a consultation visit will increase the likelihood of an OSHA enforcement visit. Second, unlike a consultation visit, a non-OSHA for-fee consultation does not require that the employer take any remediation steps, even if hazards are identified.

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4 More information about OSHA inspections can be found at https://www.osha.gov/Publications/osha2098.pdf

5 These two data systems (OIS and IMIS) are described in Section 4.2 of this report. Abt analyzed all requests recorded in IMIS between 2007 and 2011 and found that on average requests are recorded in the data system within approximately one week of the request. Because OSC visits are confidential, IMIS/OIS data are not publicly available.

There is currently little evidence on whether the OSC program is effective at reducing the rates of injuries and illnesses in participating workplaces. However, the limited (and somewhat dated) evidence that does exist suggests an impact. Mendeloff and Gray (2001) showed that injury rates decline by a small amount—and violations decline by a larger amount—following consultation visits. Unfortunately, that study's methodology is not sufficiently robust to unambiguously attribute this decline, in a causal sense, to the OSC visit.

1.2 Overview of the Marketing Study and the Balance of this Document

The goal of the Marketing Study is to understand the potential impact of marketing on the rate at which worksites request consultation visits. To create promising marketing approaches, Abt worked with a third-party marketing specialist who drew on psychosocial theories of behavior change to develop several behavioral-theory-based marketing messages. Each message was designed to appeal to a different motivating factor: self-determination, fear, the hope of achieving a desired outcome, or risk avoidance. In addition, several exemplars were designed as a way to convey the messages. The exemplars, also called formats, include a myth/fact format in which myths about OSC are set straight, a dialogue format in which two employers discuss OSC, and a future format that invites the reader to visualize the process of requesting and proceeding through the OSC program. Each exemplar is flexible enough to convey any of the theory-based messages. We used the new theory-based marketing message and exemplar combinations as the basis for designing marketing brochures that were mailed to worksites across the country. The Marketing Study is designed to address the following five research questions:

1. What is the effect of different messages on the take-up of the On-site Consultation Program relative to a no-brochure control?

2. Are theory-based messages (i.e., those developed specifically for the OSC program by an outside marketing consultant and grounded in a distinct psychosocial theory of behavior change) more effective at increasing take-up than the current OSHA brochure, which was not explicitly grounded in behavior-change theory?

3. Which combination of theory-based message and brochure format (exemplar) has the largest impact? And, relative to no marketing, how large is that impact?

4. To what extent does sending messages via both regular mail and email have a different effect on take-up of the On-site Consultation Program relative to using only regular mail?

5. Are the different messages more effective for establishments in specific high-hazard industry/ establishment groups than in others?

Chapter 2 describes how the marketing materials used to address these research questions were developed. Under contract to DOL's Chief Evaluation Office (CEO), Applied Research and Consulting, LLC (ARC) specified several theory-based messaging appeals to be tested and then drafted the associated brochure content. ARC also specified several broad formats for presenting that text. From those theory-based appeals, text, and formats, and in close consultation with OSHA, Abt's Creative Services Department developed the final marketing materials, which consisted of brochures and emails. (Further information can be found in Chapter 2 and in Appendix A. Appendix J includes samples of the brochures and emails.)

Abt then distributed these marketing materials, via mail (in envelopes with an OSHA return address) and email (sent from an "opinioncast.com" email address), to a carefully structured, yet randomly selected set of establishments. We randomly selected these establishments from the Dun and Bradstreet Hoover's system and then randomly assigned each one to receive one of 18 possible marketing packages. Finally, we assigned the remaining establishments in the target sample to a control group that functioned in a "business as usual" mode. Chapter 3 describes how the samples of establishments were drawn up and their size, as well as how we distributed the marketing materials. Chapter 4 describes the data used in the analysis and Chapter 5 the analytic methods.

Chapter 6 presents the results. In brief, we find that marketing increases the request rate by approximately 1.0 percentage point over the study period, from 1.05 percent of establishments in the control group to 2.03 percent of establishments in the treatment group, averaged across marketing strategies. This impact is precisely estimated and represents a 93 percent increase in the request rate. We find no difference in impact across the nine brochures (i.e., eight combinations of message and format, plus the existing OSHA brochure), and no additional impact from sending the brochures via email in addition to postal mail. The results section of this report discusses these findings in detail.

Chapter 7 provides concluding remarks, summarizes the findings, and discusses directions for future work.

2. Marketing Strategy

This chapter describes the development of the marketing strategies (messages and formats) as well as the specific marketing materials that implemented those strategies. Section 2.1 describes the basic marketing strategies specified by Applied Research and Consulting, LLC. Section 2.2 describes how Abt's Creative Services Department, in consultation with CEO and OSHA, converted those broad marketing strategies into brochures and email messages. Finally, Section 2.3 describes how we gathered stakeholder feedback on the brochure content and layouts before distribution.

2.1 Message Content

Message content was specified by Applied Research and Consulting, LLC (ARC), a behavioral science consulting firm hired by CEO. ARC had considerable previous experience designing research and theory-based communication campaigns and was therefore well-suited for this task.

ARC (ARC, 2013) explained its goals and approach as follows:

To determine which theories would provide the greatest likelihood of success, [ARC] *conducted a thorough review of current and historical theories of attitude and behavior change. The search crossed fields of psychology, communication, marketing, and medicine. Manifold articles were reviewed and many theoretical approaches were considered.*

ARC ultimately recommended four theory-based messaging approaches, "each one taking a different path for increasing the likelihood that outreach efforts [would] result in increased utilization of OSC." The following descriptions are drawn directly from ARC (2013).

1. Self-Determination Theory (SDT). *This framework was created with the goal of explaining when and why people will be motivated to engage in a specific behavior. SDT proposes that increasing a person's feelings of autonomy, competence, and relatedness maximizes internal motivation, which is the best basis for lasting behavioral change. Messages based on an SDT approach would be written so that feelings of autonomy, competence, and relatedness are maximized on the part of the employer. If a message successfully increases an employer's feelings in these regards, intrinsic motivation to use the OSC program will increase and an increase in the likelihood of the behavior, in this case contacting the OSC program, will follow.*

2. Extended Parallel Processing Model (EPPM). *While SDT focuses on increasing internal motivation, the EPPM turns attention on external motivators—in particular, fear. Fear appeals can successfully increase a targeted behavior; however, they can also backfire. The EPPM offers insight into when fear appeals will lead a person to engage in the behavior advocated in the message (e.g., calling the OSC program) and when fear appeals will have the opposite effect. In many contexts, such as this one, the key ingredient is likely to be whether the employer feels capable of avoiding the harms threatened in the message. If the employer believes their workplace can be shut down as a result of violations, and they fear this will happen, a message that makes it clear that this negative outcome can be avoided by requesting an on-site consultation, while also providing useful information on how to do so, should be highly effective.*

3. Expectancy Theory: Safety Pays (SP). *An expectancy approach proposes that individuals are more likely to engage in behaviors that are seen as leading to desirable outcomes rather than ones that will not. The key is to link a behavior to a desired outcome, in the case of the OSC program, it was decided to expand and enhance one theme already present in some OSC literature—Safety Pays. As such, theory-based messages focus on creating the expectancy that if establishments contact the OSC program, they will see real financial benefits. A good expectancy-based Safety Pays message will activate specific needs among establishments (e.g., financial gain, avoidance of costs) and then convince them that contacting the OSC program will satiate those needs.*

4. Risk Communication Framework (RCF). *The RCF is based on the assumption that survival requires the ability to avoid harmful environments. This framework will be used to reduce perceptions of risk that employers might have in terms of using the OSC service. As unlikely as referral to OSHA, or being shut down as a result of a hazard might be, program participation still places the companies at risk. The RCF offers insight into the best ways to communicate about risk and also explains why blanket denials (e.g., "that never happens") could curtail any efforts to influence employers to call for on-site consulting.*

ARC also recommended that each message be conveyed using four different formats for communicating the messages. They made this recommendation in their design report (ARC, 2013) based on earlier research by their associates (Siegel et al., 2008) and others (Siegel & Burgoon, 2002; Alvaro et al., 2006). That literature suggests that if each message were presented in only one format, it would be impossible to separate the responses to the message versus the interaction between the message and the way it was presented. By testing each message using multiple formats, it was possible to analyze the effectiveness of one message over another. Brief descriptions of each format (summarized from ARC [2013]) are as follows:

- **Dialogue:** The Dialogue format features the use of text bubbles (as used on smart phones) to convey each message and a question and answer format to clearly present the employer's possible concerns and then address each of these concerns.

- **Myth-Fact:** The Myth-Fact format presents each message through paired statements, where the first is labeled "Myth" and the second is labeled "Fact." Each Myth and Fact statement is intended to bring up possible false assumptions and then clarify each assumption. (This exemplar was originally envisioned by ARC as *False-True* and later revised at OSHA's request).

- **Future Orientation:** The Future Orientation format asks the reader to visualize the process of requesting and proceeding through the OSC program. This format aims to demystify the process and encourage take-up of the service.

- **Solutions:** The Solutions format presents each message assuming that the employer anticipates problems, thinks ahead, and plans so everything works out as intended. This format is intended to encourage the employer to think and plan in this forward-looking way.

2.2 Development of Marketing Materials

ARC specified the messaging appeals and the brochure formats to be tested, and provided standard text content for the proposed brochures. The preparation and refinement of the prototypes (e.g., graphics and layout) was the responsibility of Abt's Creative Services Department working in close consultation with OSHA's program and communications offices, CEO, ARC, and Abt project staff. Creating the final marketing materials involved developing numerous drafts of each brochure, vetting the drafts with CEO, OSHA, and ARC staff, and making revisions as needed. This process is described in detail in Appendix A.

In brief, that process began with OSHA's review of ARC's proposed messaging approaches and ultimately, resulted in the selection of three theory-based messages—Self-Determination Theory, Extended Parallel Processing Model, and Expectancy Theory. OSHA decided that the fourth messaging approach—Risk Communication Framework—should not be tested. OSHA further specified that each message should be tested using all four messaging formats.

Based on OSHA's decision to proceed with three messages and four brochure formats, Abt Creative Services designed a total of 12 new printed brochures for review. For each brochure, Abt also developed a companion email message, which incorporated the brochure's messaging and images in an HTML format. At the request of OSHA, Abt made these two additional refinements to the materials:

- Two industry-specific versions of each brochure and email were prepared—one with images related to manufacturing and one with images related to nursing homes. The two versions were created because OSHA anticipated that manufacturing-related images would not appeal to nursing home staff; i.e., nursing home staff might perceive that the brochure did not apply to them and discard it without reading. All other brochure content—including message and format—was identical across industries.

- Each brochure was designed so that establishments received state-specific contact information. This was important because OSC is administered at the state level.

In addition to these new materials, the study design also called for examining the impact of OSHA's existing OSC marketing brochure. For purposes of the study, the existing brochure was modified slightly to add state-specific contact information (similar to what was included in the 12 new brochures).

2.3 Stakeholder Feedback on Marketing Materials

Once the drafts were approved by DOL, Abt gathered stakeholder feedback on each brochure. Specifically, the brochures were sent to safety directors from nine Safety and Health Achievement Recognition Program (SHARP) firms, board members from the National Association of Occupational Safety and Health Consultation Programs (OSHCON), and members of the Marketing Study's Technical Working Group (TWG) to gather their feedback.[6] It was intended that SHARP firm safety directors would provide feedback from the "establishment" point of view, while members of OSCHON and the

[6] Nine SHARP firms were selected by OSHA and asked to participate in the feedback process.

TWG would provide perspective as federal grantees and individuals knowledgeable about the OSC program.

Each reviewer was sent a set of four randomly assigned draft brochures for review and comment.[7] Reviewers were asked to respond to questions that captured their initial reactions and to provide feedback on the brochure messaging and format. Abt analyzed and summarized responses, which were submitted using a web platform.

This external vetting process led to two kinds of changes. First, four draft brochures were dropped before field testing—the three brochures using the Solutions messaging format and the Extended Parallel Processing Model (EPPM) brochure in the Dialogue format. OSHA made this decision because (1) multiple stakeholders commented negatively about the Solutions format and the EPPM brochure in the Dialogue format and (2) no stakeholders responded very positively to them (for all of the other brochure combinations, there were both negative and positive comments). Second, minor formatting and wording changes were made to the remaining new brochures based on stakeholder feedback.

After the stakeholder review, a total of eight new message/format combinations were advanced to field testing, along with a slightly modified version of the standard OSHA brochure. Each of the eight new message/format combinations included a manufacturing version and a nursing home version along with a companion email message. To reserve the possibility of using the brochures in future tests, none of the brochures are publicly available at this time. Samples of the brochures are included in Appendix J.

[7] ARC provided Abt with a randomization plan that mapped out nine four-brochure combinations designed to be theoretically distinct and ensure that we received comments on all brochures under consideration. We randomly assigned these brochure combinations to the individuals completing the review.

3. Study Design

This chapter reviews our approach to sample selection and random assignment for the Marketing Study. Specifically, Section 3.1 describes how we selected the groups of industries on whom we would test the impact of the marketing materials. Section 3.2 discusses the creation of the sampling frame using Dun & Bradstreet's database of establishments. Section 3.3 explains the process of random assignment. Section 3.4 describes the processes for distributing brochures and emails.

3.1 Identification of Targeted Establishments

This study estimates the impact of marketing to establishments in three groups of high-hazard industries, plus a group of especially high-hazard worksites that were sent OSHA's High Rate Letter (HRL) in 2013.[8] These industry and establishment groups were selected in consultation with CEO and OSHA and were intended to represent the kinds of industries and establishments that would most benefit from OSC services. They largely comprise industries subject to one or more of OSHA's National Emphasis Programs (NEPs). OSHA uses NEPs to focus enforcement activities on particularly high-risk workplaces while maximizing the impact of scarce inspection resources. The four industry/establishment groups included in this study are defined as follows:

Group 1: Industries in the Amputation NEP. This NEP-related group consists of manufacturing establishments in industries covered by OSHA's inactive Amputation National Emphasis Program. Establishments in this NEP are of particular interest to OSHA because of their high injury rates and may constitute the sample for a subsequent study of OSC's impact on health and safety outcomes.[9]

Group 2: Other high-hazard manufacturing industries. This group includes establishments in the 47 manufacturing industries covered by one or more of the six active NEPs, plus industries included on OSHA's 2010–2013 high-hazard lists (which identify industries that are a high priority for consultations). Group 2 does not include establishments covered by the Nursing and Residential Care Facilities NEP, which we examine separately.

[8] OSHA's Site-Specific Targeting (SST) program sent High Rate Letters each year to establishments with particularly high rates of injuries and illnesses informing them they may be selected for an inspection and advising them of the availability of OSC services. A portion of the establishments that received letters were subsequently inspected. Juras et al. (2015) provide a copy of OSHA's FY2011 High Rate Letter.

[9] Because such a study would derive its sample from the Amputation NEP, we limited the size of the treatment arm that received marketing in this group, so as to leave as many establishments in the Amputation NEP as possible "untouched" by OSC.

Group 3: Nursing and residential care facilities. This industry group comprises establishments covered by the NEP on Nursing and Residential Care Facilities.[10] After discussions with OSHA, we anticipated that establishments in this industry may respond differently to marketing messages than manufacturing-oriented industry groups, and we created brochures with separate images that are more relevant to the type of work performed in these facilities.

Group 4: 2013 SST High Rate Letter list. This group includes establishments on OSHA's 2013 High Rate Letter (HRL) list, which was a component of OSHA's 2013 Site Specific Targeting (SST) program. The list consists of individual establishments that reported an injury and illness rate placing them among the roughly 15,000 most-hazardous workplaces in the country.[11] Through 2013, OSHA annually sent letters to that year's HRL list warning them that they may be subject to inspections, notifying them that the list of firms receiving the letter was being made public, and encouraging worksites with fewer than 250 employees to contact their state consultation program to schedule a visit.[12] Along with the HRL, in 2013 OSHA also mailed an informational brochure about the consultation program. That brochure was nearly identical to the one used in one of the treatment conditions for this study. Some of the firms on the HRL list also received programmed inspections in 2013. In a previous study (Juras et al., 2015), we found suggestive evidence that the HRL is an effective marketing tool, increasing the consultation request rate by approximately 20 percent during the year after the letter is sent. This study constitutes a test of whether *additional* marketing is effective at encouraging even more high rate establishments to request a consultation (beyond those that requested assistance after initial receiving the High Rate Letter and the OSC brochure).

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[10] OSHA created the Nursing and Residential Care Facilities NEP because, in 2010, the rate of incidents requiring days away from work experienced by these care facilities was 2.3 times higher than the average rate in private industries. The majority of injuries in such care facilities were the result of overexertion, slips, trips, and falls. In addition to injuries, workers in the health care field continuously face hazards, such as exposure to blood, infectious materials, chemicals, drugs, and communicable diseases, as well as ergonomic stressors.

[11] OSHA used the 2012 OSHA Data Initiative (ODI) Survey of Establishments to create this list. The ODI survey requires sites in specific industries to provide data on serious work-related injuries and illnesses that occurred during the previous calendar year. Using these data, OSHA calculated site-specific injury/illness rates and targeted enforcement activities to sites with the highest reported rates. In particular, the SST program implemented two types of enforcement activities: (1) High Rate Letters were sent to sites to inform them that they were among the sites with high reported injury/illness rates and 2) inspections were made of sites with the highest reported injury/illness rates.

The 2012 ODI sample consisted of two groups: (1) establishments that had high reported injury and illness rates in previous years and (2) randomly selected establishments in industries targeted by the 2012 ODI. (The industries targeted by the ODI change each year so that over a cycle of three years, all industries within the scope of the ODI are targeted, including all manufacturing industries.) The injury and illness rate generated from those data are the Days Away, Restricted, or Transferred (DART) rates and Days Away from Work Injury and Illness (DAFWII) rates in calendar year 2011.

[12] A copy of the letter and the high rate list are available on the OSHA website at https://www.osha.gov/as/opa/foia/letter13.html

These four establishment groups—including a total of 553 industries as defined by 6-digit NAICS code—constituted the basis for the study's sampling frame, which is described in the next section. Appendix B provides the full list of NAICS (North American Industry Classification System) codes for each of these industry/establishment groups.

3.2 Creation of the Sampling Frame

Within these four precisely specified groups it was then necessary to identify specific establishments that could be targeted to receive the marketing materials or, alternately, assigned to the control group. To create this sampling frame, Abt used the Dun & Bradstreet Hoovers system. First, using query tools in the Hoovers system, the evaluation team specified a sample of high-priority establishments. According to OSHA regulations, high-priority establishments are those that employ between 10 and 250 employees at the worksite and are not part of a company with more than 500 employees companywide. Using this definition, we excluded all other establishments from the sampling frame. Next, we identified establishments in Group 4 using the DUNS number (Dun & Bradstreet's unique establishment identifier), which was provided by OSHA for each establishment on the high rate list. These establishments were marked as ineligible for sampling in the remaining industry groups. We then identified all establishments that belonged to each of the three industry groups (Groups 1–3) based on NAICS classifications.[13]

With the exception of the states of Washington and Kentucky, which we excluded from the sample before downloading from Hoovers, the sample for each group was nationwide in scope as defined by Dunn & Bradstreet (including the District of Columbia). The samples were further refined by excluding establishments that are part of OSHA's ongoing SST study. Summit Consulting, which is conducting that study, provided the relevant DUNS numbers.

Exhibit 3.1 shows the final number of establishments in the sampling frame for each of the four industry/ establishment groups.

Exhibit 3.1: Sample Size for Each Industry/Establishment Group

Industry/Establishment Group	Sample Size (number of establishments)
Group 1: Amputation NEP	46,306
Group 2: High-Hazard Industries	39,270
Group 3: Nursing and Residential Care Facilities	11,606
Group 4: SST High Rate Letter	4,840
TOTAL: All Industry/Establishment Groups	102,022

[13] These groups were formed hierarchically beginning with Group 1, then moving to Groups 2 and 3 (i.e., we selected the sample for Group 1 before selecting the sample for Group 2, and so on). Establishments were selected without replacement—once an establishment was selected for a group it was removed from the pool from which lower-numbered groups were drawn. This resulted in four mutually exclusive samples. Using this procedure, the nursing and residential care facilities group, for instance, did not include any establishments that received a High Rate Letter nor any establishments covered by the Amputation NEP.

3.3 Random Assignment of Establishments

As noted above, the selection criteria used to generate the sampling frame resulted in a nationwide sample of 102,022 establishments across the four industry/establishment groups. From this sampling frame, the study team randomly selected a total of 34,096 of these establishments to receive "any marketing." [14] The remaining 67,926 establishments were assigned to a control arm, which did not receive any marketing from the study team.

The proportion of establishments within each industry/establishment group that was randomly selected to receive marketing was determined separately by group, based on several design and budget considerations.[15] Exhibit 3.2 shows the final number of establishments selected to receive OSC marketing, and the number of establishments remaining in the no-marketing control group, for each of the four industry/establishment groups. Within each of the four industry/establishment groups, the random selection process was stratified by the number of employees in the parent company of each firm to minimize the possibility of imbalance on this key characteristic.[16] In the HRL sample, selection was also stratified by whether the establishment had been assigned to the Primary, Secondary, or Tertiary inspection list.

Exhibit 3.2: Sample Sizes by Treatment Status

Industry Group	Sample Size for		
	Treatment (any marketing)	Control (no marketing)	Total (treatment plus control)
Group 1: Amputation NEP	11,433	34,873	46,306
Group 2: High Hazard	11,643	27,627	39,270
Group 3: Nursing Homes	7,776	3,830	11,606
Group 4: SST High Rate Letter	3,244	1,596	4,840
Total	*34,096*	*67,926*	*102,022*
Pooling Groups 1–3	30,852	66,330	97,182

[14] This number reflects a balance of several factors including desired precision and study budget. In the largest groups, the team strived to achieve as close to a 1:1 treatment-to-control ratio as possible, given budget, practical, and political constraints. In the smaller groups, we implemented an unbalanced design with more establishments assigned to the treatment group than the control group, so that comparisons among treatment arms would be sufficiently well-powered.

[15] The treatment/control ratio in each industry group reflects a compromise between statistical precision (both the ability to detect an impact of any marketing vs. no marketing and an ability to detect differences between marketing strategies), the study's budget for mailing brochures, and the desire to leave as many establishments "untouched" by marketing in certain industry groups as possible so that they could comprise the sample for a future study. Additional detail on these considerations is provided in Abt's design report for this study (Juras et al., 2014).

[16] We generated two strata for each industry/establishment group, based on the median number of employees across all firms.

All non-selected establishments in each of the four industry/establishment groups collectively comprise the control group. As such, they continued to operate under "business as usual" conditions in which they received no marketing from the study team. Because state OSC programs engage in periodic efforts of their own to promote their services, the control group may have been exposed to some marketing during the study period.[17] Since (each of) the treatment group(s) were exposed to this ongoing marketing as well, this study represents a test of whether certain kinds of marketing—implemented *in addition to* whatever marketing is already under way—increase the consultation request rate.

Within the treatment group of 34,096 establishments, we implemented a partial factorial design to allow us to identify the "most promising" marketing strategies—that is, the message, exemplar, and mode as well as the combination of these three variables that yields the highest request rate. To this end, we further randomly assigned each of the 34,096 establishments to one of 18 separate treatment arms. For each of the new theory-based messages, random assignment to each factor (message, exemplar, mode) was determined independently of assignment to any other factor. This generated 16 treatment arms: eight new brochures (combinations of messages and exemplars) times two distribution modes (mail or mail plus email).[18] For establishments assigned to receive the existing OSHA brochure, mode was randomly determined, generating two additional treatment arms. Random assignment of each factor was implemented using a balanced random assignment ratio (i.e., one establishment assigned to each level of a factor per establishment assigned to another level). As with selection into the treatment group, random assignment was stratified by number of employees and, for the SST group, whether the establishment was on the Primary, Secondary, or Tertiary inspection list.

This partial factorial design allows us to examine every feasible combination of message, exemplar, and mode while maintaining statistical power to estimate the average impact of each message compared with no marketing. This multi-arm structure is summarized in Exhibit 3.3 below.

Exhibit 3.3: Description of the Study's 18 Treatment Arms

Brochure	Message	Exemplar	Mode	Number of Treatment Arms (exemplars x modes)	Number of Establishments in Each Treatment Arm*
New	Self Determination Theory	Dialogue False/True Future Orientation	Mail or Mail+Email	6	1,714

[17] At our request, Federal OSHA agreed to avoid any formal marketing that specifically targeted the four industry/establishment groups during the course of the study. In particular, the existing OSC brochure was not mailed to any establishments by Federal OSHA during the course of the study. To our knowledge, the last formal marketing of services by Federal OSHA before the study began occurred with the last routine distribution of the standard OSC brochure to establishments in the High Rate Letter establishment group. This was distributed in 2013, approximately one year before the pilot.

[18] We elected not to include an "email only" treatment due to sample size constraints. Because emails are only available for approximately 50 percent of establishments, we did not want to average the impact of each message across an email-only treatment condition as that would have diluted the impact (i.e., would have substantially increased the sample size required to detect a given impact).

Brochure	Message	Exemplar	Mode	Number of Treatment Arms (exemplars x modes)	Number of Establishments in Each Treatment Arm*
New	Fear Appeals (EPPM)	False/True Future Orientation	Mail or Mail+Email	4	1,700
New	Expectancy Theory	Dialogue False/True Future Orientation	Mail or Mail+Email	6	1,706
Existing	Existing OSC	N/A	Mail or Mail+Email	2	3,401
TOTAL	Four Messages	Three Exemplars	Two Modes	18	34,096

*Note: For each row, the numbers in the final column represent the average number of establishments assigned to the treatment arms corresponding to the indicated message (e.g., for Self-Determination Theory, on average a rounded total of 1,714 establishments were assigned to each of the six treatment arms). However, the precise number of establishments assigned to each treatment arm varied slightly across arms because random assignment was carried out at the *firm* level rather than the establishment level, with equal numbers of *firms* assigned to each arm for each message. For that reason, the (rounded average) numbers in the last column do not sum to the (precise) total at the bottom of the column.

In summary, the design includes eight arms that each received one of the eight distinct brochure designs by mail and eight arms that each received one of those same eight distinct brochure designs by mail *and* email. The design also includes one arm that received the existing OSC brochure by mail and one arm that received the existing OSC brochure by mail *and* email.

3.4 Distribution of Marketing Materials

The Marketing Study compares two modes of distributing the marketing materials to the treatment group: mail alone versus mail *and* email. This section explains the process of distributing both the brochures and emails to the treatment group. Appendix J includes samples of the brochures and emails.

3.4.1 Mailing Brochures

All establishments in the treatment group received three hard-copy mailings of the same brochure. Each mailing consisted of an OSHA envelope containing two items—the designated marketing brochure and a cover letter from OSHA Assistant Secretary Michaels (see Appendix C). The body of the letter contained text drafted by ARC and customized to match the establishment's assigned message/format combination. Identical mailings were sent in April, May, and June 2014.

We included contact information for the appropriate state OSC program in each letter and brochure. This reference was based on an establishment's *physical address* (i.e., location of the workplace), even if, for instance, packages were sent to an out-of-state *mailing address*.[19]

When possible, the envelope and letter were addressed to the individual identified as the most relevant contact in the Hoovers database. We used a two-stage process to identify the most relevant contact at each establishment. First we generated an ordered list of "relevant" job titles and then—in a fully automated process—we compared Hoovers contact records for each establishment with the ordered list. To generate the ordered list, OSHA provided us with a database containing establishment-level contact information for the SHARP program. We extracted job titles from this database, standardized them (e.g., changing both VP and Vice Pres. to "Vice-President"), grouped similar job titles together (e.g., safety director and safety manager) and then sorted them by the frequency with which they occurred in the data.[20] Next, we compared the (standardized) job titles of Hoovers contacts with those on the ordered list. For each establishment, we sent the letters to the person with the highest-ranked job title. In the rare instances when no contact person in an establishment had a job title on the SHARP list, we addressed the mailing to a randomly selected contact person at that establishment.

3.4.2 Emailing Brochures

In addition to the hard-copy mailings, randomly selected establishments also received emails containing portions of the brochure content and images. The body of each email was customized to the establishment's assigned message/exemplar combination using text and images drawn from the brochure that the individual had received by mail. Abt SRBI staff sent these emails to establishments selected for this treatment. In total, we sent three rounds of emails in a three-month period.[21] The emails were sent approximately two weeks after the hard-copy mailings. We sent each round of emails over a three-day

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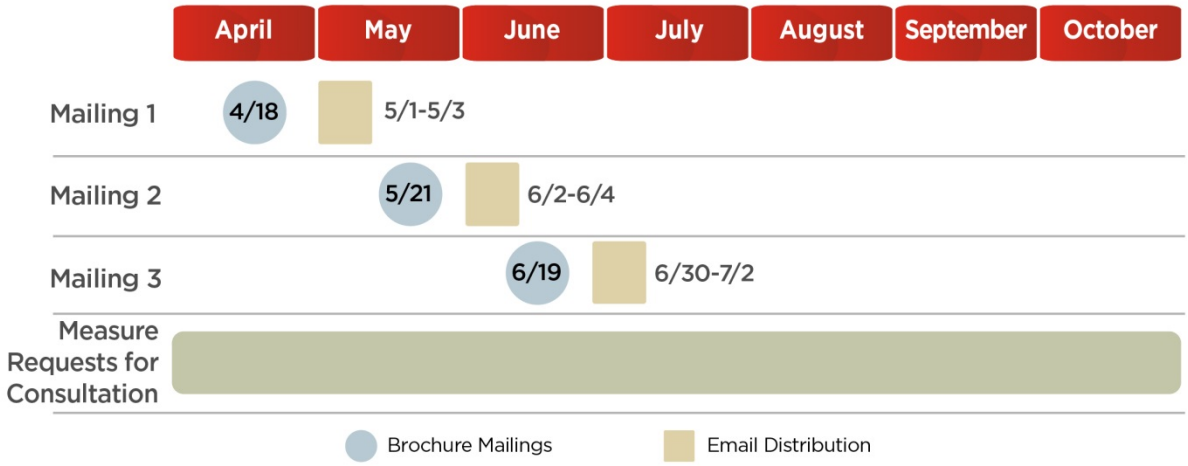
[19] For example, if an establishment in Nevada had a letter sent to its corporate offices in Delaware, the letter still provided information for contacting Nevada state OSC officials to schedule a consultation. Before finalizing the mailing list, duplicates were removed so that a corporate office with three establishments on our list would receive only one brochure/letter. The only situation in which we mailed more than one letter to a single address was when that address was linked to establishments in different states (e.g., the address was a corporate headquarters linked with multiple worksites), so that appropriate state OSC contact information could be provided for each establishment. We mailed the brochures to recipients via USPS with return mail service. The return mail service notified Abt if the mailing was not successfully delivered to an address, but it did not provide any information about who received the mailing at a given establishment.

[20] The most frequently occurring job titles on the SHARP list were: Safety Director/Manager, Human Resources Director/Coordinator, President, Plant/Facilities Manager, General Manager, Manager, and Vice-President.

[21] Each email template contained an unsubscribe link. If an establishment asked to unsubscribe via this link, or by replying to the email or returning a letter, the establishment was removed from subsequent rounds of the mailing and emails. For those establishments with multiple email addresses, we removed all addresses associated with that establishment from future mailings even if only one sent an unsubscribe request. In total, we received 220 such requests out of the 34,096 establishments that were sent marketing. Of these, 217 unsubscribe requests were received by email from the sample of 9,601 establishments to whom we successfully sent an email.

period to reduce the possibility that messages would be classified by the receiving servers as spam. Exhibit 3.4 shows the date of each hard-copy mailing as well as the date of email distributions.

Exhibit 3.4: Timeline of Marketing Distribution



For each establishment in the "mail plus email" treatment group, the Abt team concurrently sent emails to up to three individuals for whom an email address was provided in Hoovers. First, we sent an email to the same individual to whom the letter was addressed if that person's email address was available. Emails were simultaneously sent to others in the same establishments, starting with individuals whose job titles appeared most often on the SHARP list. If this process did not yield three email addresses, we randomly selected additional email addresses from Hoovers for that establishment (i.e., even for job titles not on the SHARP list). If no email address was available for an establishment, no email was sent.

Across all four industry/establishment groups, we were able to successfully send at least one email to 9,601 out of the 17,048 establishments, or 56 percent of all establishments assigned to receive a companion email.[22] Thus, the impact of email should be viewed as an intent-to-treat impact (i.e., the impact of the option of sending an email when available, not the impact of actually sending an email). To aid with interpretation, we also report a nonexperimental estimate of the marginal impact of actually sending an email (see Section 6.2).

[22] At least one email address was available for 65 percent of establishments. In addition, Abt tracked emails that bounced back as undeliverable, and recorded whether this occurred for all contacts in an establishment. There were 1,534 such establishments. In total there were 7,447 establishments that did not receive an email (either because there was no email on record or because the email on record led to a bounce back for all contacts).

4. Preparation of Data for Analysis

Having discussed the development of the marketing materials in Chapter 2 and their distribution to a random sample of establishments in Chapter 3, in this chapter we describe how we created the dataset used for analysis. We defer discussion of analytic methods until the next chapter (Chapter 5).

4.1 Composition of the Final Analysis File

To support the analysis, we created an analysis file with one record for each of the 102,022 establishments that comprise the treatment and control groups in the sampling frame. The file has four kinds of essential information for each record:

1. ***The outcome measure***. The study's primary outcome is an indicator of whether each establishment requested a consultation visit during the six months after the first marketing materials were mailed. The six-month follow-up covers the three-month period during which brochures were mailed, and allows an additional three months for requests to be made after the final mailing.

2. ***Results of random assignment.*** Treatment/control status, which was generated by Abt, allows us to identify which marketing materials (if any) were sent to the establishment.

3. ***Industry/establishment group and corporate parent.*** Group identifiers allow us to conduct analyses separately for each of the three industry groups and for establishments on the High Rate Letter list. Information on which establishments share a corporate parent is used in the statistical analysis.

4. ***Additional background information.*** We use establishment-level demographic characteristics as covariates. These characteristics include size (number of employees), inspection history, consultation request history, and Federal or State Plan status.

We created this analysis file by linking records across three data sources. We obtained outcome data and some background information (consultation request history) from OSHA Information System (OIS) consultation records. We obtained inspection history from OIS enforcement records. All other information (demographics, industry and corporate parent, and randomization status) was obtained from Abt's sample file, which was created using Dun & Bradstreet's Hoovers database as described in Chapter 3. The following section (4.2) describes each of these data sources in greater detail.

Linking records across data sources was challenging. The sample file and OIS do not share a common establishment-level identifier such as the Dun & Bradstreet DUNS number. Likewise, establishment names and addresses recorded in OIS are not guaranteed to align exactly with name and address information recorded in the sample file (which was drawn from the Hoovers database) due to idiosyncrasies and/or data entry errors (e.g., simple typos, conventions about reporting addresses, two different addresses for the same establishment). Section 4.3 provides detail on our approach to linking the records from each contributing data source.

4.2 Underlying Data Sources

The analysis file was created by linking records across three data sources: Abt's sample file of establishments, OIS consultation records, and OIS inspection records.

Abt's sample file contains establishment-level records on all 102,022 establishments in the study's sampling frame. Each establishment's identifying information (name and address), industrial classification, and corporate parentage were downloaded from Dun & Bradstreet's Hoovers database, which is described in Chapter 3. Using this information, Abt randomly assigned each establishment to one of 19 study conditions (18 possible treatment groups, 1 control group) and recorded this status in the sample file.

OIS consultation records contain detailed information on each request for a consultation visit made during the study period. Current OSHA policy requires that all requests for consultations be recorded in the OSHA Information System (OIS).[23] The OIS database includes all data fields on the OSHA Request Form 20 (e.g., request date, establishment identifying information, primary and secondary NAICS codes, the number of employees, hazard classification, services requested, and the source of the request).[24]

OSHA provided complete data from OIS Request Form 20 records spanning the duration of the six-month follow-up period, from April 18, 2014, through October 18, 2014. We also obtained OIS data on consultation requests for the eight full years before the beginning of the study—April 18, 2006, through April 17, 2014—which allowed us to create a baseline covariate indicating previous consultation requests.[25] Variables recorded in OIS and used for the Marketing Study fall into three broad categories:

1. ***Identifying information***. Identifying information on the establishment that made the request (such as establishment name, street address, and industry), which we use to link the OSHA administrative data to the sample file. This allows us to determine which establishments in the treatment and control groups requested consultations.

2. ***Timeline.*** Information on the date of request, date visit was scheduled, date of visit, and date by which hazards were abated allows us to determine which requests were made during the follow-

[23] OSC program staff may immediately reject a request for a consultation visit. Rejected requests are not entered into OIS. Based on conversations with five OSHCON board members, it appears that immediate rejection of requests is uncommon and would only apply to requests from the very largest and/or lowest-hazard establishments, which are not targeted in the Marketing Study.

[24] At the time data were collected from OSHA, OIS was in the process of replacing OSHA's previous data system—the Integrated Management Information System (IMIS). IMIS and OIS records are identical, and OIS retains all fields that were recorded in IMIS.

[25] Establishments that recently requested a consultation may be less likely to request another. Using historical data on requests, we can assess whether our results are sensitive to including these establishments and increase the precision of our estimates. Although eight years of request data were available, the baseline covariate was only used to flag cases with previous requests within the past five years.

up period and provides information on the time line of requests. This information can also be used to determine whether marketing induces a backlog of requests.[26]

3. ***Request Source and Disposition.*** OIS records whether each request was completed or withdrawn. These data allow for the calculation of "net requests" which is the number of requests minus the number of withdrawals.[27] We also obtained information on the source of each request. OIS includes a field identifying the source, with pre-set options including "marketing brochure" and "direct solicitation by mail." We anticipated that we could use this information to help us establish whether or not the request was generated by marketing. However, because the source of the request was not consistently recorded for some OIS records, we were unable to use it for this purpose. Appendix D includes a table summarizing the source of request by treatment/control status from this incomplete data field. The table reveals no obvious treatment/control pattern in the recorded source of request.

Finally, ***OIS inspection records*** contain detailed information on each inspection conducted by OSHA enforcement during the study period. OIS inspection records contain similar types of information as OIS consultation records, and include establishment identifying information (e.g., name, address, and industry). OSHA provided complete data on inspections for one year before the study (April 18, 2013 through April 17, 2014).

4.3 Linking Records Across Data Sources

To complete the analysis, we needed to determine which establishments in the sample file requested consultations (the main outcome) and which had previously received inspections (used for subgroup analysis). This required that we be able to link individual OIS records with individual records in the sample file. As noted at the outset of this chapter, the sample file and the OIS data do not have a common identifier. Establishment name, address, and NAICS code appear in both files, but they are not always consistently recorded across the two datasets. Thus, a simple match would fail to associate at least a subset of requests for consultation visits with establishment-level records in the sample file. This would lead to an underestimate of the rate of requests.

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[26] A very successful marketing campaign could create a backlog, or waiting list, for OSC. Because the key outcome for this Marketing Study is "net requests for a consultation," even backlog resulting in the consultation not occurring until well after the request is made is not an issue unless it is so long after that it dissuades employers from requesting a consultation. However, generating a study-induced backlog would be problematic from the perspective of the OSC's reputation for prompt service. We received no reports that such a backlog was induced during the course of the study.

[27] The number of consultation visits completed cannot be accurately measured during the time frame for the study because many consultations are scheduled with substantial delay (e.g., because the requesting establishment asks for the consultation visit to occur more than 90 days in the future or because of a backlog of more than 90 days, which means the consultation might occur after the end of our data collection period). Another potential concern with OIS records on requests is that consultants might not enter requests for consultation until the consultation actually occurs. Careful inspection of the IMIS data allowed us to rule this out as a major concern.

To address this problem, we adopted a probabilistic matching procedure to link records in the sample file with OIS consultation request records and OIS inspection records. Unlike a deterministic match, a probabilistic match does not require exact correspondence across multiple fields. Instead, a probabilistic match considers the information in each pair of records (one from each of the datasets) and determines the probability of these two records being the same establishment based on similarities across multiple fields (e.g., name, address, phone number, and other factors). Such a program requires extensive calibration using a training file with a set of "known" matches, to assign weights to each of the matching criteria.

The matching algorithm adopted for this study is a modified version of an algorithm originally developed by Gray (1996) to link IMIS and BLS records, recalibrated using a sample of IMIS and Dun & Bradstreet records from the Hoovers system, and previously used to link records for Abt's study of High Rate Letters. This algorithm assesses agreement or disagreement for each of several pairwise comparisons of variables, ultimately calculating a value for each potential match, called a T-score. The T-score, which is the sum of weights assigned to agreement/disagreement for each comparison, is proportional to the probability that a potential match is a true match as determined by the training file. Dr. Gray provided us with an implementation of his algorithm as a SAS program.

For the High Rate Letter study, we modified this existing program to use Dun & Bradstreet rather than BLS data, as well as to take advantage of newer technologies, such as geographic information system (GIS) capabilities and improved computing power since the program's initial development in 1996. In particular, we updated the program to (1) read in the current IMIS (now OIS) format; (2) read in the Dun & Bradstreet data format (rather than the BLS data format); (3) match the set of characteristics common to the OIS and Dun & Bradstreet datasets; and (4) incorporate GIS-derived latitude and longitude information. As a result of these modifications, we had to recalibrate the program's internal weights. A discussion of our modifications to Gray's original (1996) program and details of the recalibration process are provided in Abt's report on the effect of High Rate Letters on OSC requests (Juras et al., 2015).

Our sample file includes records on 102,022 establishments across the four industry/establishment groups. The OIS consultation dataset includes records on 232,704 consultation requests over a six-year period. After stratifying by state to reduce the dimensionality of the problem (i.e., to reduce the number of potential matches by not comparing across states), this results in 814,915,758 potential matches between the two files. The probabilistic matching algorithm sorts each of these approximately 815 million potential matches into three categories based on the calculated T-value: definite matches, definite non-matches, and possible matches. The 5,167 possible matches, which had indeterminate T-values between 15 and 24 (i.e., possible but not certain matches), were verified by hand.

We estimate that this probabilistic matching algorithm produces low Type I and Type II error rates, of 5.87 percent and 2.91 percent, respectively. In this context, the Type I error rate, or false positive rate, is the proportion of establishments that are categorized as having requested a consultation, although they did not in fact request one (calculated as the number of such false positives divided by the total number of positives). The estimated false positive rate of 5.87 percent means that 5.87 percent of establishments flagged as having made a request did not actually make one. This implies that an observed request rate of 1.00 percent is likely to reflect a true request rate closer to 0.94 percent. The Type II error rate, or false negative rate, is the proportion of establishments that requested a consultation but were incorrectly categorized as not having requested one (calculated as the number of such false negatives divided by the number of establishments that in fact made a request). The estimated false negative rate of 2.91 percent

implies that the request rate is somewhat higher than observed; if 1.00 percent of establishments were recorded as having requested a consultation, the true request rate is likely to be closer to 1.03 percent. Taking these error rates together, it is likely that on balance the true request rate is approximately 3 percent lower than recorded in the sample file (e.g., 0.97 percent instead of a recorded 1.00 percent). Therefore, impact estimates denoted in percentage point terms will be upwardly biased by a small amount (e.g., a true impact of 0.97 percentage points would be estimated as an impact of 1.00 percentage points).

These error rates were calculated as follows. First, we extensively hand-matched records for two small states, South Dakota and Massachusetts, to create a new calibration file of known matches.[28] In particular, we hand-verified each potential match in these states with a T-value greater than zero, thereby generating a file in which (approximately) all true matches are known.[29] We then compared this file with the final analytic sample to determine which matches had been mis-categorized. In this sample of establishments, 426 had been flagged in the analysis file as having requested a consultation. Of these, 25 appear to be non-matches (i.e., false positives), giving a false positive rate of 5.9 percent. In the calibration file, 413 establishments were verified as having requested a consultation. Of these, 12 had not been flagged in the analysis file (i.e., false negatives), giving a false negative rate of 2.9 percent.

We used an identical process to link records in the sample file with the 49,853 OIS inspection records from the year preceding the first mailing.

The result of the record-linkage process was an analysis file with one record for each establishment in the sample file. This analysis file includes variables for the number of requests and the date of each request, as well as a flag indicating whether the establishment had been inspected in the last year. From the two request variables, the study created a binary variable indicating whether the establishment made a consultation request during the follow-up period, as well as a baseline variable indicating whether each establishment had requested a consultation in the five years before the study. In sum, 13,397 of the 102,022 establishments in the study sample were matched with at least one request in the OIS consultation file, with 1,671 matched to a request during the six-month follow-up period.

4.4 Characteristics of Establishments in the Analytic Sample

Exhibit 4.1 presents baseline descriptive statistics for the analytic sample, pooled and by industry subgroup. In most respects, establishments appear to be substantively similar across the three industry groups.[30] About half of establishments in our sample (between 43.4 percent and 51.2 percent) are in

[28] We did not recalibrate the weights using this file; it was solely used to estimate error rates. South Dakota and Massachusetts were chosen for hand-matching due to their small size, which made hand-matching feasible, and also because the sample across these two states includes a wide variety of industrial classifications. The error rates calculated in these states should be considered a rough estimate of the overall error rate, as we cannot guarantee that the estimate is generalizable to the full sample.

[29] Such a strategy was not feasible for the entire study sample across all 48 states plus Washington, D.C., due to the very large number of potential matches that would have needed to be verified by hand.

[30] We do not perform statistical tests of differences, because as a practical matter our sample is so large that even substantively minor differences would appear statistically significant. In fact, our analysis incorporates the universe of establishments in many industries.

Federal Plan States. The average number of employees per establishment is well below the cutoff of 250 employees for an establishment to receive priority for a consultation visit. However, establishments in nursing and care facilities have about twice as many employees on average (83) as establishments in the other two industry groups (41 and 44). Between 7 percent and 9 percent of establishments in the three industry groups have requested a consultation visit in the previous five years, while a much smaller number (between 1.5 percent and 2.6 percent) have been inspected by OSHA enforcement in the previous 12 months. The geographical distribution of establishments (i.e., across OSHA regions) is similar across industry groups.

Exhibit 4.1 shows that establishments on the 2013 SST High Hazard list are different in many respects from other establishments in the sample. They tend to have more employees (83 versus an average of 47 in the rest of the sample). They are also far more likely to have made a request for a consultation visit than other establishments, with 28 percent having requested a visit in the previous five years, and are much more likely to be in Federal Plan States.[31]

We conducted baseline balance tests across the treatment (pooled across messages) and control groups in each of these four industry/establishment groups (see Appendix E). We found no evidence of systematic imbalance. Our regression analyses control for any, even statistically insignificant, imbalances in the characteristics shown in Exhibit 4.1.

Exhibit 4.1: Baseline Descriptive Characteristics of Establishments in the Marketing Impact Analysis Sample

Characteristic	Groups Defined by Industry				Establishments on SST List
	Amputation NEP	Nursing Homes	High Hazard	Pooled	
General Characteristics					
Number of establishments	46,306	11,606	39,270	97,182	4,840
Federal Plan	43.9%	51.2%	43.4%	44.6%	75.0%
Average number of employees per establishment	40.9	82.8	44.0	46.9	82.8
Consultation Request History					
Made OSC request in past 5 years*	8.4%	9.0%	7.4%	8.1%	28.0%
Number of OSC requests per establishment in past 5 years**	0.2	0.2	0.1	0.2	0.6

[31] This is not surprising, many State Plan states do not use high rate letters as an enforcement tool.

Characteristic	Groups Defined by Industry				Establishments on SST List
	Amputation NEP	Nursing Homes	High Hazard	Pooled	
Inspection History					
Received an inspection in past 12 months***	2.6%	1.5%	2.2%	2.3%	0.1%
Average number of inspections in past 12 months	0.03	0.02	0.03	0.03	0.00
OSHA Region					
I Boston	5.6%	5.9%	5.6%	5.7%	13.2%
II New York City	8.0%	6.4%	9.4%	8.4%	11.7%
III Philadelphia	8.6%	9.4%	8.0%	8.4%	12.0%
IV Atlanta	17.1%	17.3%	16.6%	16.9%	12.6%
V Chicago	25.6%	21.1%	23.6%	24.2%	22.2%
VI Dallas	10.1%	13.8%	10.3%	10.6%	14.4%
VII Kansas City	4.7%	9.4%	5.0%	5.4%	6.9%
VIII Denver	3.0%	4.4%	3.1%	3.2%	4.2%
IX San Francisco	14.7%	10.2%	16.4%	14.8%	1.4%
X Seattle	2.6%	2.2%	2.1%	2.3%	1.3%

Note: Each column reports sample means or sample proportions.

* The table reports the total number of establishments that made requests during the previous 5 years. Our analysis of the data indicates that approximately 7% of these requests were withdrawn prior to an OSC visit occurring. We report total rather than net requests because we use this covariate as a proxy for whether the establishment was already aware of the OSC program.

** The number of OSC requests per establishment is calculated as the total number of OSC requests made by establishments in the (sub-)sample during the past 5 years, divided by the number of establishments in the (sub-) sample.

*** Many establishments in the SST group received programmed inspections during FY2013. These inspections do not appear to be recorded in the OIS data provided by OSHA.

5. Analytic Methods

The study's two main research goals are to determine (1) which messages, exemplars, and modes successfully increase the number of requests for consultations and (2) which complete marketing strategy (combination of these three factors) generates the highest request rate and what the predicted impact of this marketing strategy would be. We use two similar (but distinct) methods to address each of these two goals. Both begin with a common mixed (i.e., fixed and random effects) ANOVA model (McLean et al., 1991). We address the first research goal primarily from the fixed effects; we address the second research goal by calculating Best Linear Unbiased Predictions (BLUPs) from the full mixed model. Although the mixed model is only necessary for calculating BLUPs, we use an identical model across all analyses in order to generate consistent estimates across research questions. All statistical procedures described in this section were pre-specified prior to data analysis, and Stata code was pre-tested using simulated data.

The following sections describe this methodology. Section 5.1 describes the regression framework used to determine the impact of messages, exemplars, and modes. Section 5.2 describes how the regression estimates are used to predict the impact of each message*exemplar*mode combination in an Empirical Bayes (EB) framework.

5.1 Regression Framework

We estimate the impact of each message, exemplar, and mode using a hierarchical linear probability model of the following general form:

(1)

$$
\begin{aligned}
y_{ijk} = {} & \alpha + \theta_1 OSHA_{jk} + \sum_{g=2}^{4} \delta_g (ESTAB_g * OSHA_{jk}) + \sum_{p=1}^{3} \theta_{p+1} MESSAGE_{jkp} \\
& + \sum_{p=1}^{3} \sum_{g=2}^{4} \delta_{gp} (ESTAB_g * MESSAGE_{jkp}) + \sum_{q=2}^{3} \pi_q EXEMPLAR_{jkq} \\
& + \sum_{q=2}^{3} \sum_{g=2}^{4} \delta_{gq} (ESTAB_g * EXEMPLAR_{jkq}) + \gamma EMAIL_{jk} \\
& + \sum_{g=2}^{4} \delta_{g,email} (ESTAB_g * EMAIL_{jk}) + \sum_{c=1}^{C} \varphi_c COVARIATE_{ijk} \\
& + \sum_{m=1}^{M} STRATA_m + \varepsilon_{ijk} + e_{jk} + \mu_k
\end{aligned}
$$

In this model,

y_{ijk}	is the outcome of interest (i.e., a consultation request) for establishment *i* in company *j*. The *k* subscript references random interactions and is described below.
$OSHA_{jk}$	is a binary variable equal to 1 for establishments assigned to receive the current OSHA brochure

$MESSAGE_{jkp}$	are binary variables equal to 1 for establishments assigned to receive message p
$EXEMPLAR_{jkq}$	are binary variables equal to 1 for establishments assigned to receive exemplar q
$EMAIL_{jk}$	is a binary variable equal to 1 for establishments assigned to receive an email
$ESTAB_g$	are dummy variables indicating industry/establishment groups 2–4
$COVARIATE_{ijk}$	are C establishment-level baseline covariates (e.g., number of employees)
$STRATA_m$	are dummy variables representing the *m* random assignment strata.
ε_{ijk}	is an establishment-level random term with variance $\sigma^2_{\varepsilon_k}$
e_{jk}	is a corporate-parent level random term with variance σ^2_e
μ_k	is an interaction-level random term with variance σ^2_μ

The model in Equation 1 allows for clustering (random intercepts) at the level of random assignment (i.e., corporate parent, not establishment, as discussed in Chapter 3), indexed by *j*. To facilitate the goal of predicting the impact of the most effective marketing strategy, we also consider each of the 19 full interactions between messages, exemplars, and modes (plus the OSHA brochure with two modes and the control group) to be random rather than fixed effects.[32] We index those interactions by *k*. (We motivate this strategy in the following section). Because the study's primary outcome is binary, the establishment-level error is necessarily heteroskedastic. Because the current OSHA brochure and the control group fall outside of the factorial structure of message*exemplar*mode, we also allow for heteroskedasticity in the level-*k* error term; i.e.

$$\mu_k \sim \begin{cases} N\left(0, \sigma^2_{\mu 1}\right) \text{ if } k \in (1,2,3) \\ N\left(0, \sigma^2_{\mu 2}\right) \text{ if } k > 3 \end{cases}$$

where *k*=1,2,3 are the control group and the two OSHA brochure arms, and *k*>3 are the other 16 treatment arms.[33]

Estimation proceeds on the universe of eligible firms in the Dun & Bradstreet data. For two reasons, we nevertheless report conventional standard errors. First, random assignment induces true statistical variability. Another run of the random assignment would have assigned different establishments to the various treatment arms. This would have led to different outcomes. Conventional standard errors reflect this variability. Second, a super-population approach also suggests using conventional standard errors (Deming & Stephan, 1941). Impact estimates are useful to project impact, not for the current period, but

[32] Eight new brochures times two delivery modes result in 16 interactions within the factorial structure, plus the OSHA brochure delivered by two modes (2 interactions) and the control group equals 19 interactions.

[33] Because the random component of the model is intended to capture, in part, the interaction between messages and exemplars, there is no reason to expect that this random component would have a common variance across the factorial and non-factorial parts of the model, as the latter part does not include such interactions.

for the future. In the future, establishments will enter and leave; and those establishments that remain might make different choices.

The large number of coefficients in Equation 1 induces a multiple comparison problem. We mitigate this problem using a testing strategy that was specified before data analysis. We define the confirmatory test as a test of "any marketing" versus "no marketing." If we detect a statistically significant impact of marketing, then we will proceed to test for differences in impacts across levels of each factor (message, exemplar, and mode), considering each of the factors as a distinct domain. For messages, this is a two-step process: we first test for a difference between the OSHA brochure and the theory-based messages, then test for differences among the theory-based messages. Only if we detect significant differences will the separate impacts for each level of the factor (i.e., for different messages, different modes, and different exemplars) be discussed in detail.

Within each domain (but across levels of the factor), we jointly test for significance of the interaction terms for industry groups 2 and 3.[34] If these terms are jointly significant, then we report impacts for that domain separately by industry group. If the terms are *not* jointly significant, then we report impacts pooled across the three industry groups for that domain.

Finally, we test whether the impact of marketing is larger for certain subgroups, defined using baseline characteristics (e.g., State versus Federal Plan States). We implement these tests by interacting a dummy variable indicating subgroup membership with each of the terms in Equation 1 and testing for significance of the interaction term on the variable of interest (or joint significance, for tests of differences across several variables).

When reporting marginal effects, our specification implicitly adopts the standard linear assumption that the impact of a factor is constant across the other factors (e.g., the effect of adding email is a constant percentage point impact across all three messages).

Testing and reporting proceed in a manner consistent with the approach to estimation; i.e., impacts are discussed in terms of percentage points. From some perspectives, impacts reported as a percent of baseline rates are also of interest. Given very different baseline rates across subgroups, the ordering of which impact is "larger" will vary with whether we consider percentage point or percent impacts.

Below, we report some percent impacts. Nevertheless, for two reasons, we focus on the percentage point impacts. First, given that the cost per mailing is approximately constant, percentage point impacts are the appropriate scale for cost-benefit analyses. Second, one goal of this effort was to determine if the impact of marketing was large enough to support an encouragement design. That determination is also in terms of percentage point impacts.

The coefficients from regression models are presented in Appendix F.

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[34] Impacts for all messages, modes, and exemplars will be reported separately for establishment group 4 due to its unique nature—the SST list—regardless of whether differences are statistically significant. Nonetheless, we include all four establishment groups in Equation 1 to facilitate testing for differences between the SST group and the other three establishment groups.

5.2 Predicting Impacts for Complete Marketing Strategies

We use Empirical Bayes (EB) estimates derived from the fitted model in Equation 1 to predict what the impact of each complete marketing strategy would be if implemented as part of a future OSC impact study (where "complete marketing strategy" describes each of the 18 possible combinations of message*exemplar*mode plus the current brochure sent by two modes).[35] The straightforward estimates from the fixed part of the model in Equation 1 are unbiased estimates of the average impact of each message, exemplar, and mode considered separately.

However, simple predictions based on the parameter estimates are insufficient for *predicting* the likely future impact of each complete marketing strategy. One reason for this is that there could be interactions between messages, exemplars, and modes—for example, perhaps email works well for reinforcing fear appeals but not for appeals to self-determination. One option for addressing this issue is to include all interaction terms in the model, in which case the predicted request rate for each marketing strategy would simply be the mean request rate for the corresponding treatment arm. However, if we did so, part of the reason why the "winning" combination looked best would be sampling variability—even if each of the message*exemplar*mode combinations had an identical true impact, in any given sample one of them would appear to be best and another would appear to be worst. Ultimately, we opted to calculate an EB estimate called a Best Linear Unbiased Prediction (BLUP) that backs out the likely impact of that sampling variability and as a result yields a prediction that is typically between the estimate from the model in Equation 1 and the estimate from a fully-interacted model (Rabe-Hesketh & Skrondal, 2008; Henderson, 1975; Robinson, 1991).

We calculate BLUPs for each of the 18 treatment arms. Conceptually, BLUPs are predicted impacts that lie somewhere between (i.e., are weighted averages of) the observed mean impact for a marketing strategy (the "cell mean") and the model-based fixed-effects estimate for the marketing strategy that would be obtained from Equation 1. How far between the two (i.e., what the weights should be) depends on the number of observations used to estimate the cell mean and the fit of the model in Equation 1. More observations would imply that the best prediction would be closer to the cell mean, because it is precisely estimated. A better-fitting model would imply that the best prediction would be closer to the model-based estimate, because it does a good job of explaining the variation across marketing strategies.

Empirical Bayes theory tells us how to calculate the weights. In Appendix G, we show that if the variance of μ_k in a two-level model is σ_μ^2 and the variance of ε_{ik} is σ_ε^2, then the weights are

(2) $$\rho_\mu = \frac{\sigma_\mu^2}{\sigma_\mu^2 + \sigma_k^2}$$

and

(3) $$\rho_k = \frac{\sigma_k^2}{\sigma_\mu^2 + \sigma_k^2} = (1 - \rho_\mu)$$

The best prediction for treatment *k* is:

[35] On empirical Bayes, see Casella (1985) and Robinson (1991).

(4) $$BLUP = (1 - \rho_\mu) y_k^m + \rho_\mu y_k^d$$

where y_k^m is the model-based estimate of the cell mean and y_k^d is the observed cell mean.[36]

[36] We implement this strategy in SAS. Before data analysis, we used simulated data to confirm that our program produced the expected weights and impact estimates in a framework similar to the data structure for this analysis.

6. Results

This chapter presents the analytic results. We first present the results of the analysis showing impact estimates overall (Section 6.1). We next present these results separately by message, then by exemplar (also Section 6.1), and finally by distribution mode (i.e., email versus no email; Section 6.2). This is followed by a description of how impacts evolved over the six-month follow-up period (Section 6.3). Next, we determine the most effective overall marketing strategy and predict what the impact would be if implemented in the future (Section 6.4). We then present results for several subgroups of interest (Section 6.5) followed by results for the group of establishments that received OSHA's 2013 High Rate Letter (Section 6.6). In reviewing these findings, the reader should be reminded that results represent the impact of this brochure and email marketing campaign above and beyond any existing marketing initiatives already in place.

The results presented in this chapter can be summarized as follows:

- On average, sending marketing brochures nearly doubles the six-month consultation request rate, from 1.05 percent of establishments in the control group to 2.01 percent of establishments in the treatment group as a whole ($p<0.001$).
- We find no evidence that the type of message affects the impact.[37] In particular, we find no evidence that the impact of marketing differs between the existing OSHA brochure and the new theory-based brochures ($p=0.65$), or that the impact differs across the three theory-based messages ($p=0.65$). Likewise, we find no evidence that the brochure messaging format (i.e., exemplar) affects the impact ($p=0.95$); the impact of each format is precisely estimated and there is no evidence of substantive variation in the magnitude of impact across brochure formats.
- We find no evidence that sending an email to establishments after mailing a brochure increases the effectiveness of marketing ($p=0.98$). Strikingly, the marginal impact of email is precisely estimated and statistically indistinguishable from zero.
- We find no evidence that the impact of marketing differs by industry group ($p=0.57$ for messages; $p=0.43$ for exemplars; $p=0.57$ for mode).
- We find no evidence that the impact is significantly different in the group of establishments that received the 2013 SST High Rate Letter compared with other establishments ($p=0.64$ for messages; $p=0.29$ for exemplars; and $p=0.86$ for distribution mode). However, the study was not well powered to detect such differences.
- On a per-brochure basis, the impact of marketing is significantly larger for establishments that have previously requested a consultation visit. In particular, establishments that requested a visit in the past five years are 0.9 percentage points more likely to request a new visit in response to

[37] We use the term "no evidence" to indicate that we were unable to reject the null hypothesis of zero impact. Due to the large sample size, some estimates were not statistically different from zero and the confidence intervals were narrow. In those cases, we say both that we have no evidence of an impact and that the impact is estimated to be zero.

marketing than establishments that have no history of consultation requests (p=0.004). However, this marketing effort was also quite successful at generating entirely new demand for the OSC program. Marketing nearly tripled the request rate among the 92 percent of establishments in the sample that had no prior experience with OSC, and fully 85 percent of marketing-generated requests were made by such establishments. In contrast, we find no evidence that the impact of marketing differs across subgroups defined by inspection history (p=0.308), establishment size (number of employees) (p=0.643), or location in a Federal versus State Plan State (p=0.846).

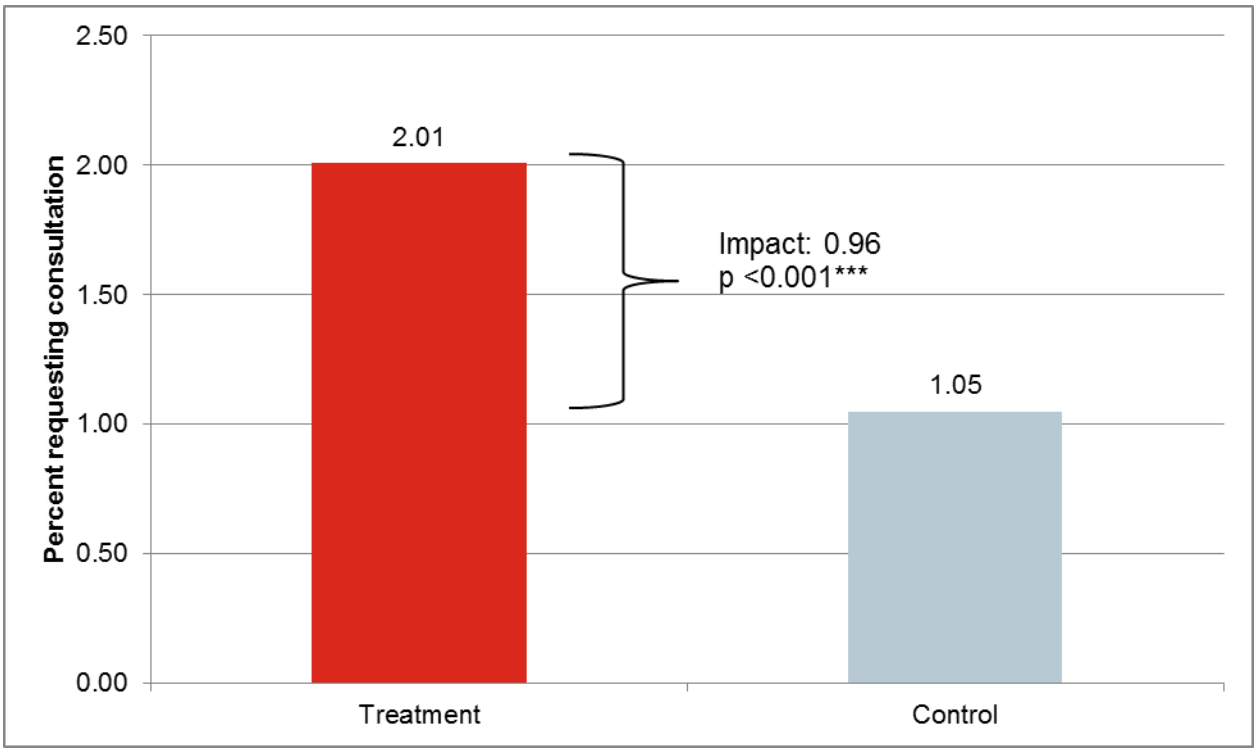
In summary, our estimates indicate that sending marketing materials increases the probability that the establishment will request an OSC consultation; however, this impact did not appear to be sensitive to the various messages and formats that were tested. The balance of this chapter explores these findings in more detail. Because we find no evidence that the impact differs across industry groups, this chapter focuses on estimates that are an average (i.e., pooled) across the three industry groups. However, we report impacts separately for the group of establishments that received the 2013 High Rate Letter due to OSHA's intrinsic interest in this high-risk group and because these establishments previously received OSC marketing.

6.1 Overall Impact of Marketing Messages

Estimating the impact of marketing messages on the consultation request rate addresses two of the research questions specified in Section 1.2: *What is the effect of different messages on take-up of the On-site Consultation Program relative to a no-brochure control?* and *Are theory-based messages more effective at increasing take-up than the current OSHA brochure*?

We address these research questions by calculating (1) the average impact of marketing relative to no marketing, across all message types; (2) the impact of the OSHA brochure compared with the pooled impact of the three theory-based messages; and (3) the impact of each of the three theory-based messages and the difference in impacts across them. Exhibit 6.1 presents the main results (i.e., the estimated impact of receiving a marketing brochure on requests for consultation measured over the following six months, on average across all types of marketing).

Exhibit 6.1: Impact of Marketing on Six-Month Consultation Request Rate



Note: Results in this figure are based on a regression with 97,182 observations (30,852 treated and 66,330 controls).

We estimate that sending marketing brochures increased the consultation request rate by more than 90 percent (0.96 percentage points) averaged across the four messages (i.e., the conventional OSHA brochure and the three theory-based messages). This impact is statistically significant at the 99.9 percent confidence level ($p<0.001$). Specifically, the request rate was 1.05 percent in the control group, which did not receive any marketing from the study team, and 2.01 percent in the treatment group, which did.

Exhibit 6.2 presents the results for the overall impact of marketing, as well as the estimated impact broken down by message type. The first row of Exhibit 6.2 presents the findings for the impact of marketing versus no marketing, pooled across all four messages (i.e., the results shown in Exhibit 6.1). The second set of results in Exhibit 6.2 (rows two and three) shows the impact separately for two types of messaging: the current OSHA brochure compared with the average theory-based message. We do not find a statistically significant difference between the two types of messages ($p=0.65$). We estimate that the OSHA brochure increased the request rate by 0.90 percentage points ($p<0.001$) and that theory-based messages increased the request rate, on average, by 0.98 percentage points ($p<0.001$).

Exhibit 6.2: Impact of Marketing on Six-Month Consultation Request Rate, by Message

Type of Marketing	Model Adjusted Treatment	Unadjusted Control	Treatment Effect	Standard Error	p-Value	Treatment Effect as % of Control Group Mean
Percentage of Establishments that Requested a Consultation within 6 Months						
Any marketing	2.01	1.05	0.96	(0.092)	<0.001***	90.9%
By Message	**Test for homogeneity of OSHA and theory-based messages: p=0.650**					
OSHA brochure	1.96	1.05	0.90	(0.142)	<0.001***	85.6%
Any theory-based message	2.03	1.05	0.98	(0.106)	<0.001***	92.7%
By Theory-Based Message	**Test for homogeneity across theory-based messages: p=0.654**					
Self-Determination Theory	2.02	1.05	0.97	(0.155)	<0.001***	91.7%
Extended Parallel Processing Model (a.k.a. fear appeals)	1.93	1.05	0.87	(0.200)	<0.001***	82.8%
Expectancy Theory (a.k.a. Safety Pays).	2.14	1.05	1.09	(0.155)	<0.001***	103.4%

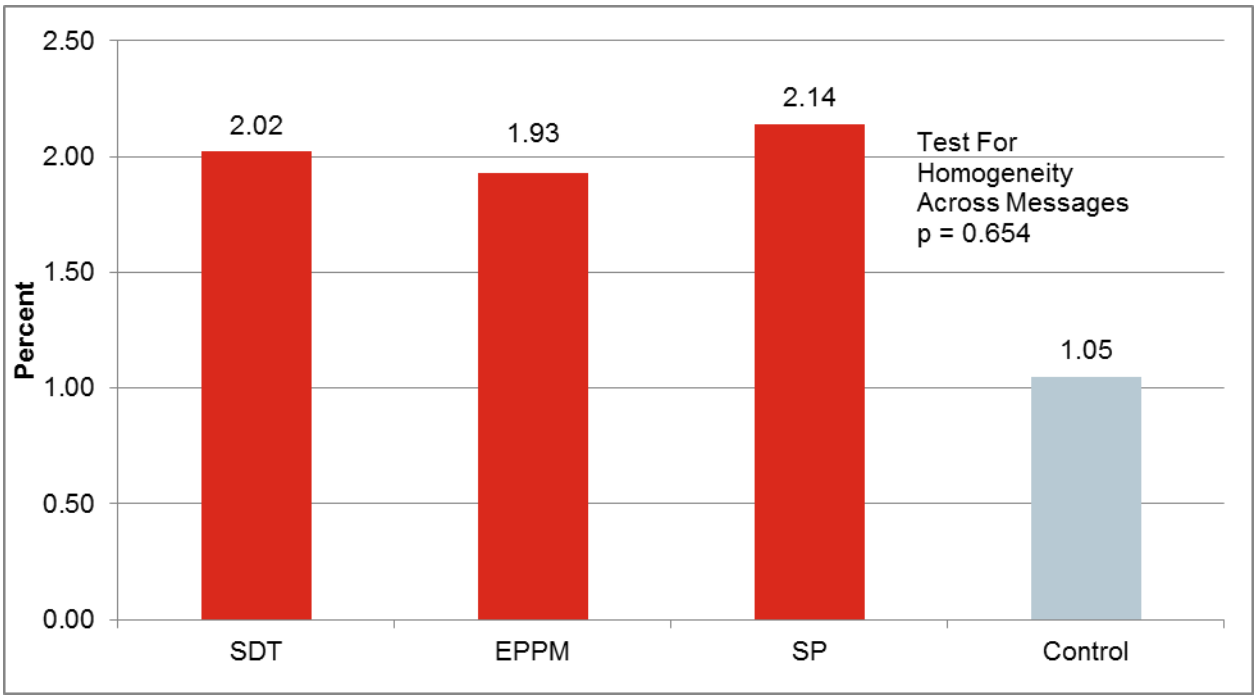
Notes: Two-sided test: *p<0.1, **p<0.05, ***p<0.01.

Results in this figure are based on a regression with 97,182 observations. Due to rounding, reported impacts (T-C differences) may differ from differences between reported regression-adjusted means for the treatment and comparison groups.

Considering the three theory-based messages (the third set of results in Exhibit 6.2), we do not find any evidence to suggest that the type of message affects the impact of marketing.[38] We estimate that brochures using Self-Determination Theory (SDT) increased the request rate by 0.97 percentage point; brochures using the Extended Parallel Processing Model (EPPM, a.k.a. fear appeals) increased the request rate by 0.87 percentage points; and brochures using Expectancy Theory (a.k.a. Safety Pays or SP) increased the request rate by 1.09 percentage points. The statistical test indicates that it is likely that this small variation in impact across the three messages is due to chance (p=0.65). These results are illustrated in Exhibit 6.3.

[38] Although message does not affect the magnitude of the impact, it might affect the type of establishment that responds to marketing. We have not formally tested this hypothesis.

Exhibit 6.3: Request Rate for Each Theory-Based Message



Note: Results in this figure are based on a regression with 97,182 observations. This includes 66,330 control observations, 9,232 treated observations receiving the SDT message, 6,203 treated receiving the EPPM message, and 9,256 treated receiving the SP message. (The remaining 6,161 treated observations received the original OSHA brochure.) Due to rounding, reported impacts (T-C differences) may differ from differences between reported regression-adjusted means for the treatment and comparison groups.

We also find no evidence that the different messages are more effective for establishments in any specific high-hazard industry groups than in others. We conducted statistical tests for interactions between messages and industry groups (i.e., tests of whether the overall impact or impact of any individual messages differ across the three industry groups (industries in the Amputation NEP, other high-hazard industries, and nursing and residential care facilities). We found no evidence to suggest that the impact differs across establishment groups (p=0.57 overall).

Finally, each of the three behavioral-theory-based messages was implemented using three exemplars, or messaging formats. The three exemplars are Dialogue, Myth/Fact, and Future Orientation. Exhibit 6.4 shows the average impact of the theory-based messages, when implemented with each of these three exemplars. The first row in Exhibit 6.4 reiterates the impact of the behavioral-theory-based messages on average across the three messages and three exemplars, which is equivalent to the result given in Exhibits 6.1 and 6.2. On average, theory-based messages increased the request rate by 0.98 percentage points, from 1.05 percent of establishments in the control group to 2.03 percent of establishments that received one of the three messages.

Exhibit 6.4: Impact of Marketing on Six-Month Consultation Request Rate, by Exemplar

Type of Marketing	Model Adjusted Treatment	Unadjusted Control	Treatment Effect	Standard Error	p-Value	Treatment Effect as % of Control Group Mean
Percentage of Establishments that Requested a Consultation within 6 Months						
Any theory-based message	2.03	1.05	0.98	(0.106)	<0.001***	92.7%
By Exemplar	**Test for homogeneity across exemplars: p=0.954**					
Dialogue	2.05	1.05	1.00	(0.200)	<0.001***	94.9%
Myth/Fact	2.05	1.05	0.99	(0.155)	<0.001***	94.1%
Future Orientation	1.99	1.05	0.94	(0.154)	<0.001***	89.0%

Notes: Two-sided test: *p<0.1, **p<0.05, ***p<0.01.

Results in this figure are based on a regression with 97,182 observations. Due to rounding, reported impacts (T-C differences) may differ from differences between reported regression-adjusted means for the treatment and comparison groups.

The second panel of Exhibit 6.4 presents the average impact of the theory-based messages, when implemented using each of the three exemplars. The results show that marketing is equally effective regardless of which exemplar is used: the impact is statistically indistinguishable across exemplars (p=0.954).

6.2 Mode of Distribution

We distributed each of the marketing brochures via two modes: postal mail alone or postal mail plus a follow-up email after each of the three postal mailings. Estimating the impact of marketing on the consultation request rate by distribution mode addresses the following research question specified in Section 1.2: *To what extent does sending messages via both regular mail and email have a different effect on take-up of the On-site Consultation Program relative to using regular mail?*

Exhibit 6.5 presents these results (i.e., the estimated impact of receiving a marketing brochure on requests for consultation measured over the following six months, by mode of distribution). We find no evidence that sending a follow-up email has any effect on the impact of marketing. The first row of Exhibit 6.5 restates the impact of marketing on average across all brochure types. We estimate that marketing increases the request rate from 1.05 percent in the control group to 2.01 in the treatment group, which is an impact of 0.96 percentage points. The second section in Exhibit 6.5 shows that this impact is nearly identical whether marketing is sent by postal mail alone (an impact of 0.96 percentage points) or by postal mail plus email (also an impact of 0.96 percentage points). The less than 0.01 percentage point difference in impacts between the two modes is not statistically significant (p=0.982).

Exhibit 6.5: Impact of Marketing on Six-Month Consultation Request Rate, by Distribution Mode

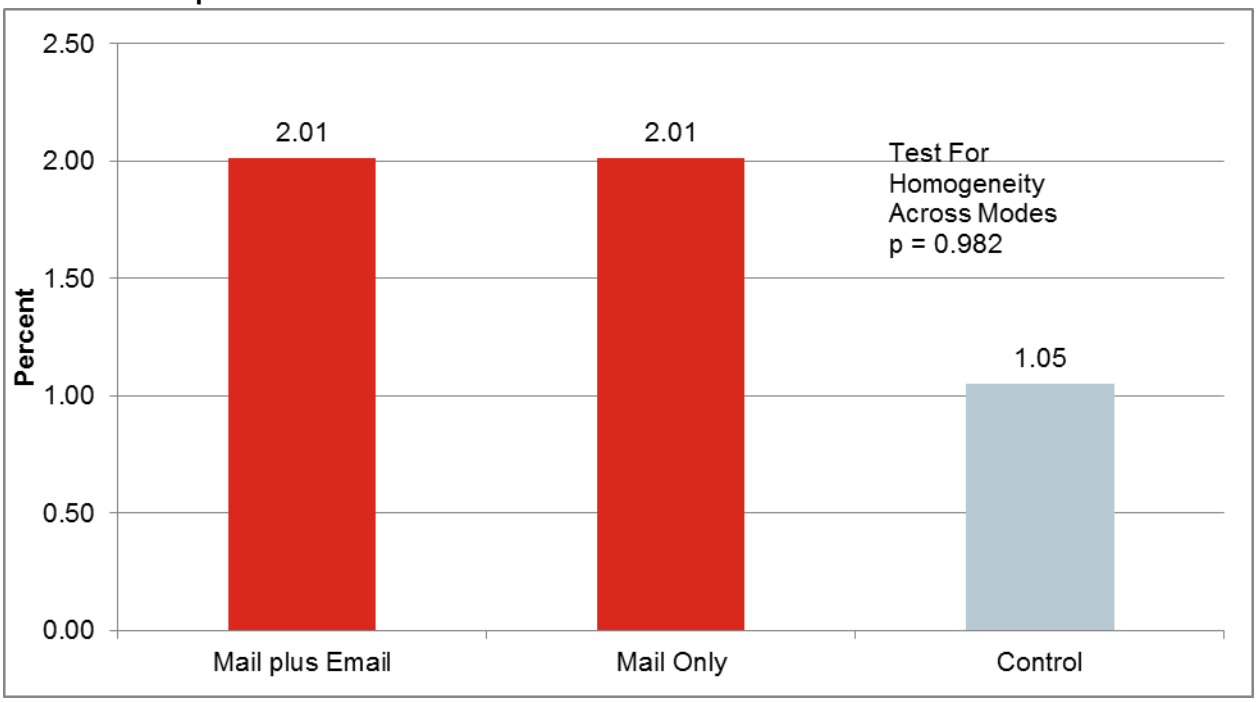
Type of Marketing	Model Adjusted Treatment	Unadjusted Control	Treatment Effect	Standard Error	p-Value	Treatment Effect as % of Control Group Mean
Percentage of Establishments that Requested a Consultation within 6 Months						
Any mode	2.01	1.05	0.96	(0.092)	<0.001***	90.9%
By Mode	**Test for homogeneity across modes: p=0.982**					
Mail	2.01	1.05	0.96	(0.118)	<0.001***	91.1%
Mail and email	2.01	1.05	0.96	(0.118)	<0.001***	90.7%

Notes: Two-sided test: *p<0.1, **p<0.05, ***p<0.01.

Results in this figure are based on a regression with 97,182 observations. Due to rounding, reported impacts (T-C differences) may differ from differences between reported regression-adjusted means for the treatment and comparison groups.

Exhibit 6.6 illustrates the request rate by distribution mode.

Exhibit 6.6: Request Rate for Each Distribution Mode



Note: Results in this figure are based on a regression with 97,182 observations (66,330 controls, 15,446 treated who received mail plus email, and 15,406 treated who received mail only). Due to rounding, reported impacts (T-C differences) may differ from differences between reported regression-adjusted means for the treatment and comparison groups.

As we noted in Section 3.4.2, because email addresses were not available for all establishments, the evaluation team sent an email to only 56 percent of establishments assigned to the "mail plus email" treatment group. For that reason, we also calculated a nonexperimental estimate of the impact of actually sending an email, as opposed to merely attempting to send one. This estimate is calculated using the methodology outlined by Bloom (1984), which assumes that sending emails has no effect on treatment

group members for whom we do not have an email address. Computationally, the ToT estimator is computed as the ITT impact estimate divided by $1 - R_N$ to get the TOT estimate, where R_N is the program nonparticipation rate in the treatment group. Division by this factor, which is always less than 1, increases the estimated impact, such that the effect of being sent an email (TOT) will be larger on average than the effect of having the option to send an email (ITT). The standard error of the adjusted estimate is also divided by this factor.

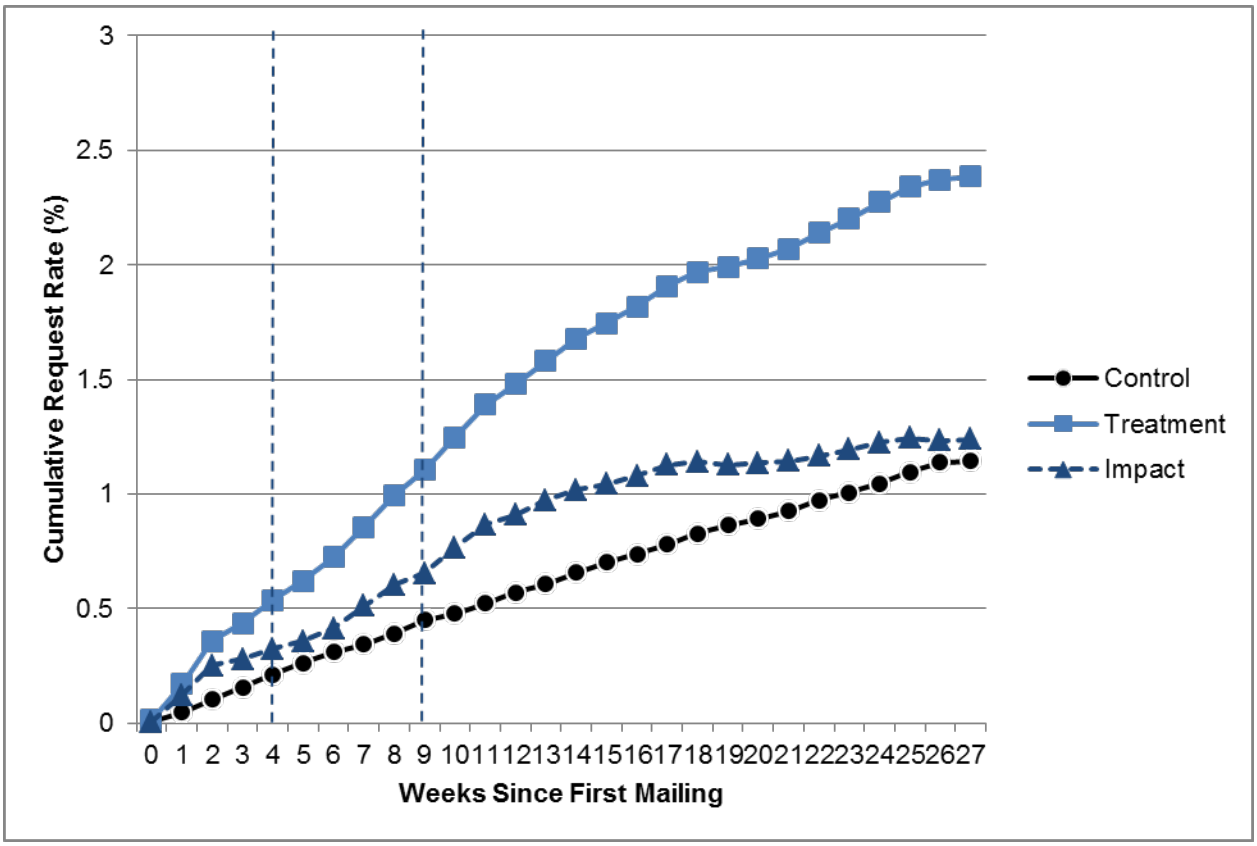
Because the (rounded) difference in impacts between the two distribution modes is less than 0.01 percentage points, the two estimates (of being randomly assigned to being sent an email and having a valid email such that an email was sent) are nearly identical. We estimate that the impact of actually sending an email is 0.01 percentage points, which—although nearly twice as large as the ITT estimate—remains substantively small. This rescaling does not affect the statistical significance of the estimate.

6.3 Impacts Over Time

This section considers the evolution of impacts over time, which explains when impacts occur. We would expect the largest impacts to be generated shortly after establishments receive the initial marketing brochure. However, it is not clear how long we would expect impacts to persist. One conjecture would be that the second and third mailings (and for some of the sample, the emails) would induce additional requests for consultations. If so, then impacts would be positive—but smaller—in the later period. An alternative hypothesis would be that the early additional consultations are merely drawing forward requests for consultation that would have happened anyway—but later. As requests are drawn forward, the net impact on requests in the later period might be negative.

To understand the timing of impacts, we tracked weekly consultation requests for six months after the first marketing brochure was mailed to establishments in the treatment group. Exhibit 6.7 plots the cumulative number of requests in the treatment group compared with the control group for each week after the first mailing was sent to establishments in the treatment group (week zero). As noted in Exhibit 3.4, second and third copies of the same brochure were mailed to each establishment in weeks 4 and 9. For establishments assigned to the email treatment arm, follow-up emails were sent in weeks 2, 6, and 10.

Exhibit 6.7: Cumulative Consultation Request Rate by Week, Marketing Versus No Marketing



Note: Vertical lines at 4.5 and 9.5 weeks indicate when second and third mailings occurred.

As Exhibit 6.7 shows, the control-group request rate appears to follow a roughly linear trend (i.e., approximately the same number of requests are made each week during the follow-up period, totaling a cumulative 1.05 percent of establishments after six months). In contrast, it appears that the number of requests in the treatment group increases much more rapidly than in the control group for roughly the first three months of the follow-up period (during which a brochure was mailed each month); during the subsequent three months (when no brochures were sent), the request rate appears similar to the control-group request rate. The percentage point impact thus increases for the first three months and remains approximately constant thereafter.

The observation that most of the impact occurs during the first three months suggests the intriguing hypothesis that marketing may continue to be effective as long as brochures are sent. A competing hypothesis is that only the initial brochure is effective, and the impact from that brochure persists for approximately three months. This study was not designed to test such hypotheses, and additional research would be required to distinguish between them.

Exhibit 6.8 reports a more formal analysis of the distribution of impacts over the six-month follow-up period.

Exhibit 6.8: Monthly Impact of Marketing on Consultation Request Rate

Outcome	Model Adjusted Treatment	Unadjusted Control	Treatment Effect	Standard Error	p-Value	Treatment Effect as % of Control Group Mean
Percentage of Establishments that Requested a Consultation						
Full six-month follow up	2.01	1.05	0.96	(0.092)	<0.001***	90.9%
By month						
April 18 – May 17	0.48	0.21	0.27	(0.039)	<0.001***	130.2%
May 18 – June 17	0.43	0.19	0.24	(0.037)	<0.001***	128.5%
June 18 – July 17	0.45	0.17	0.27	(0.037)	<0.001***	159.5%
July 18 – August 17	0.29	0.17	0.11	(0.034)	0.001***	63.1%
August 18 – Sept. 17	0.16	0.15	0.01	(0.029)	0.775	5.3%
Sept. 18 – October 17	0.26	0.17	0.08	(0.032)	0.010**	47.1%

Note: Results in this figure are based on a regression with 97,182 observations. Due to rounding, reported impacts (T-C differences) may differ from differences between reported regression-adjusted means for the treatment and comparison groups.

The first row of Exhibit 6.8 reiterates the full six-month request rate, which is identical to the result shown in Exhibits 6.1 and 6.2. The second set of results (rows 2 through 7) show that the impacts in each of the first three months are considerably larger than in each of the subsequent months. Crucially, however, the longer-term impact estimates are still (weakly) positive. This result suggests that additional requests made in the treatment group over the first few months do not come at the expense of longer-term requests, as would be expected if marketing efforts simply shifted the timing of requests rather than generating new requests that would not otherwise have been made. This general pattern was consistently generated across all messages, exemplars, and distribution modes. (Details are presented in Appendix H).

6.4 Most Effective Strategy: Predicted Impact

Predicting the impact of each complete marketing strategy (i.e., each message*exemplar*mode combination plus the OSHA brochure distributed via two modes) addresses the following research question specified in Section 1.2: *Which combination of theory-based message and exemplar has the largest impact? And, relative to no marketing, how large is that impact?*

To answer this research question, we used the methodology described in Section 5.2 to calculate the BLUP of the impact for each of the 18 complete marketing strategies, as implemented in the pooled sample of three industry groups. This methodology adjusts for the fact that some of the reason why the (apparently) "best" combination appears best is pure sampling variability. Exhibit 6.9 presents each of these predictions. Each row in Exhibit 6.9 describes a complete marketing strategy (i.e., combination of message, exemplar, and mode), which is defined in columns 1–3 of the table. The fourth column shows the unadjusted treatment-control mean difference (i.e., unadjusted impact estimate) for that marketing

strategy, which is the actual mean request rate for establishments assigned to that treatment arm minus the control-group request rate. The fifth column shows the model-based (i.e., regression-adjusted) estimate of the impact. The sixth (second-to-last) column shows the EB estimate of the residual (i.e., the distance from the model-based estimate to the BLUP, calculated using the methodology described in Section 5.2 and Appendix D). The final column presents the BLUP itself.

Exhibit 6.9: Predicted Impact of Each Marketing Strategy (Empirical Bayes Predictions)

Message	Exemplar	Mode	Unadjusted Impact Estimate	Model-Based Impact Estimate	Empirical Bayes Residual	Predicted Impact (BLUP)
Current OSHA	Current OSHA	Mail Only	0.97	0.92	0.01	0.92
Current OSHA	Current OSHA	Mail and Email	0.92	0.92	-0.01	0.92
SDT	Myth/Fact	Mail Only	1.05	1.00	0.03	1.03
SDT	Future	Mail Only	0.45	0.95	-0.05	0.90
SDT	Dialogue	Mail Only	0.57	1.01	-0.05	0.96
SDT	Myth/Fact	Mail and Email	1.46	1.00	0.02	1.02
SDT	Future	Mail and Email	1.02	0.94	-0.01	0.94
SDT	Dialogue	Mail and Email	1.34	1.01	0.01	1.02
EPPM	Myth/Fact	Mail Only	0.94	0.91	-0.01	0.90
EPPM	Future	Mail Only	1.13	0.85	0.01	0.86
EPPM	Myth/Fact	Mail and Email	1.09	0.90	0.03	0.94
EPPM	Future	Mail and Email	0.43	0.85	-0.05	0.81
Safety Pays	Myth/Fact	Mail Only	0.96	1.13	-0.03	1.09
Safety Pays	Future	Mail Only	1.33	1.07	0.00	1.07
Safety Pays	Dialogue	Mail Only	1.74	1.13	0.05	1.18
Safety Pays	Myth/Fact	Mail and Email	0.78	1.12	-0.04	1.08
Safety Pays	Future	Mail and Email	1.37	1.07	-0.01	1.06
Safety Pays	Dialogue	Mail and Email	0.70	1.13	-0.04	1.09

Note: Results in this figure are based on a regression with 97,182 observations. Numbers may not add precisely across columns due to rounding.

Because the regression model fits the data well (i.e., the coefficients are precisely estimated and the model has good explanatory power), the EB predictions for each of the marketing strategies shown in Exhibit 6.9 tend to be closer to the model-based predictions than to the unadjusted impact estimate (i.e., they are close to the impact estimates calculated by adding together the coefficients from the regression model). Exhibit 6.9 shows that the most effective complete marketing strategy (highlighted in gray) incorporates the Safety Pays message with the Dialogue exemplar and no follow-up email, which is consistent with the estimates presented in Exhibits 6.1–6.6. We predict that the impact of this marketing strategy would be approximately 1.18 percentage points; said differently, we predict that marketing using this combination would more than double the request rate from 1.05 percent in the absence of marketing to 2.23 in the group that receives marketing brochures.

However, the difference across combinations is small. This "best" combination's impact of 1.18 percentage points is only moderately higher than the grand mean of 0.96 percentage points, which is in turn only moderately larger than the impact of "worst" combination (i.e., EPPM message, Future exemplar, and email) of 0.81 percentage points. Consistent with the earlier analyses, this analysis suggests that broadly marketing in this manner can generate a statistically and substantively significant impact on requests for consultations. However, the specific details of message, exemplar, and mode are not particularly relevant.

6.5 Impact of Marketing by Subgroup

In addition to the average impact across the sample of all OSC-eligible (i.e., small and medium-sized) workplaces, we estimate impacts for several subgroups of particular interest. These subgroups are defined by consultation request history (requested a consultation in the past five years), inspection history (inspected in past 12 months), number of employees (compared with median for industry group), and State versus Federal Plan status. For subgroup analyses, we mainly discuss impacts measured in percentage point terms rather than as proportional increases. Such impact estimates facilitate comparisons across subgroups to determine for which subgroups marketing is most effective—i.e., for which subgroups marketing generates the most new requests per brochure mailed and/or emailed.[39] Because the control-group request rate varies across subgroups, impacts measured in proportional terms would not allow for a direct comparison of effectiveness and could potentially be misleading in this regard. We do, however, report proportional impacts when we believe such a metric aids in interpretation. The impact estimates for each subgroup, averaged across the three industry groups but excluding the High Rate Letter sample, are presented in Exhibit 6.10.

[39] In order to determine cost effectiveness, the study must determine which marketing generates the most new requests *per brochure mailed*, because the cost of marketing is directly proportional to the number of brochures. In this section we do not address cost directly, so we refer to "effectiveness" rather than "cost effectiveness."

Exhibit 6.10: Impact of Marketing on Six-Month Consultation Request Rate, by Subgroup

Subgroup	Model Adjusted Treatment	Unadjusted Control	Treatment Effect	Standard Error	p-Value
Any treatment (n=97,182)	2.01	1.05	0.96	(0.092)	<0.001***
Request in Past 5 Years	**Test for homogeneity across subgroups: p=0.004*** **				
Past requests (n=7,849)	8.95	7.19	1.76	(0.290)	<0.001***
No past requests (n=89,333)	1.41	0.51	0.90	(0.086)	<0.001***
Inspection in Past Year	**Test for homogeneity across subgroups: p=0.308**				
Past inspection (n=2,238)	2.97	1.45	1.52	(0.551)	0.006***
No past inspection (n=94,944)	1.99	1.04	0.95	(0.083)	<0.001***
Number of Employees	**Test for homogeneity across subgroups: p=0.643**				
Above median (n=50,846)	2.50	1.50	1.00	(0.114)	<0.001***
Below median (n=46,336)	1.48	0.56	0.92	(0.119)	<0.001***
OSHA Plan	**Test for homogeneity across subgroups: p=0.846**				
Federal plan (n=43,338)	2.29	1.34	0.95	(0.123)	<0.001***
State plan (n=53,844)	1.81	0.83	0.98	(0.111)	<0.001***

Notes: Two-sided test: *p<0.1, **p<0.05, ***p<0.01.

Results in this figure are based on a series of regressions, each with 97,182 observations. Due to rounding, reported impacts (T-C differences) may differ from differences between reported regression-adjusted means for the treatment and comparison groups.

Exhibit 6.10 indicates that on a per-brochure basis, marketing is statistically and substantively more effective when targeted to establishments that have prior experience with the OSC program. The first set of results in Exhibit 6.10 shows that the baseline (control group) request rate for establishments that had requested a consultation in the five years before the study is much higher, at 7.2 percent, than the request rate for establishments that had never requested a consultation, at 0.5 percent. The impact of marketing was also larger for establishments that had previously requested a consultation, as measured by the number of new requests per brochure mailed. For such establishments, marketing increased the request rate by 1.8 percentage points, from 7.2 percent of establishments in the control group to 9.0 percent of establishments in the treatment group. In contrast, we estimate that marketing increased the request rate by a smaller 0.9 percentage points for establishments with no history of consultation requests, from 0.5 percent in the control group to 1.4 percent in the treatment group. The difference in these impacts is 0.9 percentage points ($p<0.001$).

Looked at differently, however, these results demonstrate that marketing substantially expanded the pool of OSC customers. Although marketing was more successful at generating new consultation requests among the "past request" subgroup *per brochure mailed*, the proportional impact was much larger in the "no past request" subgroup (a 176 percent increase) than in the "past request" subgroup (a 24 percent increase). Because a large proportion (92 percent) of the sample is comprised of establishments that have not previously made a request, this translates into a large number of new customers. In total, 85 percent of marketing-driven requests were made by establishments that had not requested a consultation in the past

five years.[40] A broadly targeted marketing effort therefore appears capable of substantially expanding the pool of OSC customers.

Exhibit 6.10 also reports analyses for subgroups defined by inspection history (inspection in the past 12 months), number of employees (above or below the median), and Federal versus State Plan status. Specifically, we test for homogeneity (i.e., equal impacts) across subgroups, finding no evidence of different impacts for any of them. The results of these tests are presented at the start of each group of results listed in Exhibit 6.10—for example, the ***test for homogeneity across subgroups*** defined by inspection history is not significant (p=0.308). Because we find no significant differences across these subgroups, the estimated impact for individual subgroups should be interpreted with caution. We note that the power of the analysis to differentiate the impact between subgroups defined by inspection status is limited due to the small number of establishments that received an inspection in the past year (n=2,238).

6.6 Marketing to Establishments on the SST List

We estimate impacts separately for the group of establishments on OSHA's 2013 High Rate Letter list, which consists of individual establishments that reported an injury and illness rate greater than the average for their industry on the previous year's ODI survey. Employees in these workplaces are at especially high risk of injuries and illnesses, and these establishments thus represent a high-priority group for the OSC program. OSHA sent a High Rate Letter to each of these establishments in 2013, warning them that they may be subject to inspections, notifying them that the list of firms receiving the letter was being made public, and encouraging them to contact their state consultation program if they are a small or medium-sized business. In 2013, OSHA also mailed an informational brochure about the consultation program along with the High Rate Letter. Because this is not the first OSC marketing communication these establishments have received, we would expect the impact of (additional) marketing to be smaller than in the other groups.

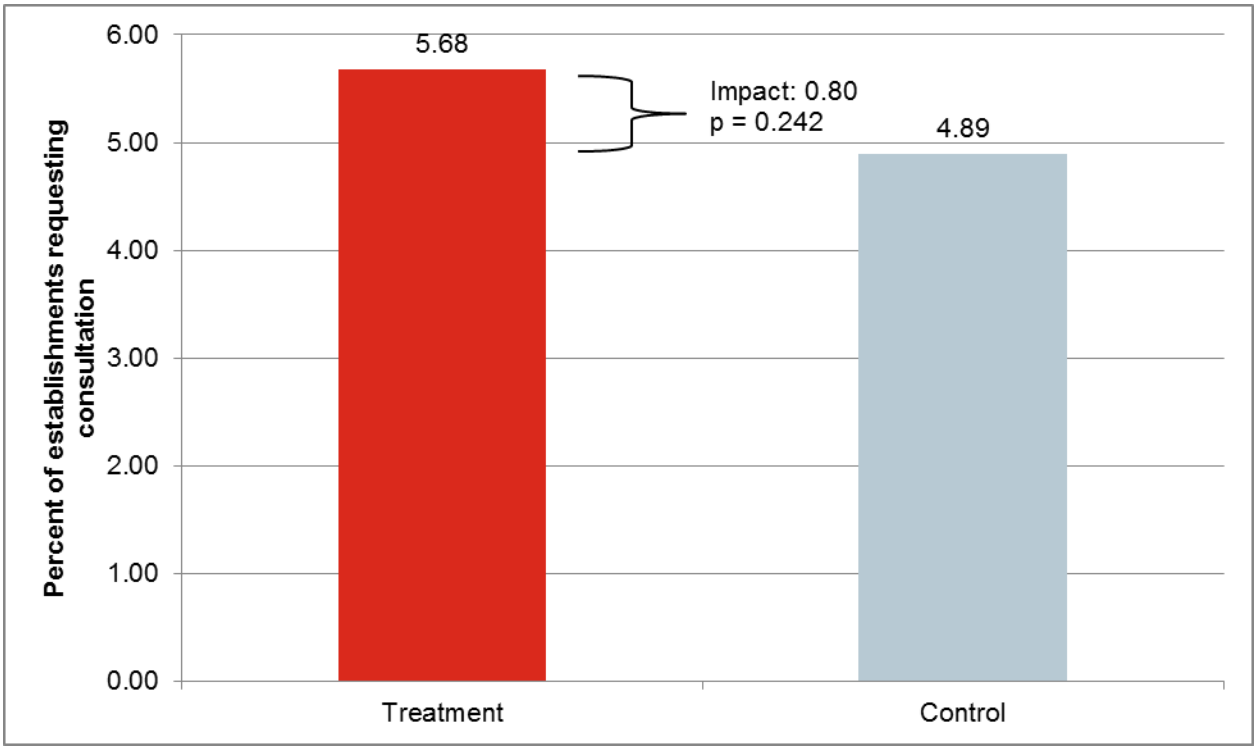
Some evidence suggests that the High Rate Letter itself is an effective strategy for increasing OSC requests (Juras et al., 2015). The High Rate Letter conveys a message about OSC that is similar in tone to the EPPM ("Fear Appeals") message. However, unlike the brochures sent for this study, the letter is not purely an OSC marketing tool—it informs specific workplaces that they have a high rate of injuries and illnesses and conveys a warning about the possibility of an inspection. In the final report for the High Rate Letter study, we suggested three possible inter-related responses to the letter that would not result from marketing targeted at a more general audience. It is possible that the letters could spur an increase in OSC requests due to: (1) increased cognizance on the part of employers that they are operating unsafe workplaces; (2) fear of inspections and penalties; and/or (3) employers wishing to delay an inspection. The High Rate Letter study was not designed—and did not have sufficient statistical power—to distinguish between these mechanisms. Nonetheless, if one or more of these multiple mechanisms has an effect on OSC requests, then we would expect the High Rate Letter to be more effective at increasing

[40] The figure is calculated as follows (but using exact percentages): 8.1 percent of the sample made a request in the past five years, and the impact in this group was 1.76 percentage points. 91.9 percent of the sample had not made a request, and the impact in this group was 0.90 percentage points. The weighted average request rate was thus 0.96 percentage points, of which 0.83 percentage points, or 85 percent, was contributed by establishments that had not previously requested a consultation.

OSC requests than marketing alone. Our previous study of the impact of the High Rate Letter on consultation requests found that for small and medium-sized workplaces (i.e., OSC-eligible establishments), the High Rate Letter increased requests by 1.9 percentage points over the full year after the letter was sent (p=0.074). Without the High Rate Letter, 8.8 percent of these workplaces would have requested a consultation during the subsequent 12 months; with the High Rate Letter, 10.6 percent requested a consultation in that time period. This represents a 21.2 percent increase in the annual consultation request rate.

Sending marketing brochures to the same group of establishments that previously received the High Rate Letter represents a test of whether *additional* marketing is effective at increasing the consultation request rate. Exhibit 6.11 presents the findings for the impact of marketing versus no marketing, pooled across all four messages, for establishments on the 2013 SST High Rate Letter list.

Exhibit 6.11: Impact of Marketing on Six-Month Consultation Request Rate in the SST Establishment Group



Note: Results in this figure are based on a regression with 4,840 observations (1,596 treated and 3,244 controls).

Due to the relatively small sample size, this analysis is less well powered to detect impacts than the earlier analysis, which was pooled across the three industry groups. As Exhibit 6.11 shows, we find no statistically significant evidence that sending marketing brochures to these high-risk establishments caused an increase in the consultation request rate. The point estimate of the impact (0.80 percentage points) is smaller than the estimated impact of the original High Rate Letter, and it is not statistically distinguishable from zero at conventional levels (p=0.242). However, it is also not statistically

distinguishable from the impact of 0.96 percentage points found for the broad sample pooled across three industry groups. The control-group request rate of 4.89 percent for these establishments is much higher than for establishments in the study's other three industry groups. [41] Exhibit 6.11 should thus be interpreted as showing that the marketing brochures may have no *additional* impact above and beyond the impact of the High Rate Letter.

Exhibit 6.12 presents the result for the overall impact of marketing as well as the estimated impact broken down by message type. The first row of Exhibit 6.12 presents the findings for the impact of marketing versus no marketing, pooled across all four messages, for establishments on the 2013 SST list (i.e., the results just shown in Exhibit 6.10). The remaining rows in Exhibit 6.12 show that there is no single message, exemplar, or mode for which we detect a statistically significant impact. Furthermore, we find no evidence that the (negligible) impact of marketing in the SST group varies between the current OSHA brochure and the theory-based messages (p=0.570), or that the impact varies across theory-based messages (p=0.459), exemplars (p=0.945), or distribution modes (p=0.940).

[41] The request rate for establishments in this group may already be inflated by marketing. Juras et al. (2015) showed that the annual request rate for establishments that received the High Rate Letter (the treatment group in that study) was 10.6 percent in the year after the letter was sent, and that the impact (i.e., the increase in requests relative to the control group) persisted over the duration of the year. This implies a six-month request rate of approximately 5.3 percent, which is only slightly larger than the 4.9 percent six-month request rate shown for the control group in Exhibit 6.12.

Exhibit 6.12: Impact of Marketing on Six-Month Consultation Request Rate in the SST Establishment Group

Type of Marketing	Model Adjusted Treatment	Unadjusted Control	Treatment Effect	Standard Error	p-Value	Treatment Effect as % of Control Group Mean
Percentage of Establishments that Requested a Consultation within 6 Months						
Any marketing	5.68	4.89	0.80	(0.680)	0.242	16.3%
By Message	**Test for homogeneity of OSHA and theory-based messages: p=0.570**					
OSHA brochure	6.10	4.89	1.21	(1.019)	0.235	24.8%
Any theory-based message	5.54	4.89	0.66	(0.713)	0.357	13.4%
By Theory-Based Message	**Test for homogeneity across theory-based messages: p=0.459**					
Self-Determination Theory	4.91	4.89	0.02	(0.896)	0.980	0.5%
Extended Parallel Processing Model (a.k.a. fear appeals)	5.56	4.89	0.67	(1.085)	0.534	13.8%
Expectancy Theory (a.k.a. Safety Pays).	6.16	4.89	1.27	(0.894)	0.154	26.1%
By Exemplar	**Test for homogeneity across exemplars: p=0.945**					
Dialogue	5.31	4.89	0.42	(1.088)	0.701	8.6%
Myth/Fact	5.65	4.89	0.77	(0.895)	0.392	15.7%
Future Orientation	5.67	4.89	0.79	(0.894)	0.378	16.1%
By Mode	**Test for homogeneity across modes: p=0.940**					
Mail	5.71	4.89	0.82	(0.782)	0.292	16.9%
Mail and Email	5.65	4.89	0.77	(0.784)	0.328	15.7%

Two-sided test: *p<0.1, **p<0.05, ***p<0.01.

Note: Results in this figure are based on a regression with 4,840 observations. Due to rounding, reported impacts (T-C differences) may differ from differences between reported regression-adjusted means for the treatment and comparison groups.

7. Discussion

This study used a random assignment-based methodology to test the effectiveness of new behavioral-theory-based marketing messages in generating requests for OSC consultations among establishments. Of particular interest were comparisons of rates of requests for consultation services from establishments receiving these new marketing messages to rates of requests among establishments receiving OSHA's existing marketing brochure as well as to those receiving no marketing from the study team. Marketing materials were distributed, via mail and email, to a carefully structured, yet randomly selected set of establishments. The 34,096 establishments randomly selected into the treatment group received one of 18 possible marketing packages. The remaining 67,926 establishments in the target sample were assigned to a control group that received no marketing from the study. The analysis estimated the impact of each marketing strategy on the rate of requests for consultation visits over a six-month follow-up period.

The study sample sizes are large enough to estimate the impacts with considerable precision. The results are simple and striking.

- First, *the marketing strategies we tested are effective*. Over the six months after the initial mailing, the marketing strategies nearly doubled the rate of requests from 1.05 percent for establishments that did not receive any marketing materials to 2.01 percent for establishments that did.

- Second, *the content of these marketing messages does not affect the rate of requests*. There was no difference in the magnitude of the impact between the behavioral-theory-based messages created for the study and OSHA's conventional brochure. Additionally, there was no difference in the magnitude of the impact across the behavioral-theory-based messages, or across the messaging formats.

- Finally, we find *that reinforcing the messages by sending emails does not increase the effectiveness of the marketing.* Some establishments were sent three mailings of a brochure and also three emails to reinforce the message; other establishments were sent the three mailings but no email. There is no difference in impact for establishments that were also sent the email reinforcement.

Thus, while this type of marketing—i.e., mailing a color brochure—does increase requests for a voluntary consultation, the various theory-based brochures do not have an incremental impact beyond the standard OSHA informational brochure.

While we cannot rule out the possibility that there exists a more effective mail-based marketing strategy that was not tested in this study, it seems unlikely. This study included a broad array of theory-based messages developed by marketing experts and designed to appeal to a variety of motivations. None of these appeals performed better than the current OSHA informational brochure, and there was no single message that was clearly better than the others.

One possible interpretation of the finding that impact does not differ across messages is that there is a latent demand for consultation services; i.e., there are a certain number of employers who would request a consultation, but who are either unaware of the program or have forgotten about it. Providing employers with information about OSC (regardless of the surrounding message) is sufficient to convert this latent demand into consultation requests. On the other hand, the theory-based messages—i.e., motivational appeals designed to increase the likelihood of action—were apparently not effective at changing the

behavior of employers who were hesitant to request a consultation. Although this interpretation suggests that the theory-based brochures are effective primarily because they constitute a reminder about the program, we cannot rule out the possibility that such appeals made through another medium—such as in-person, radio, or television—would be more effective than information alone.

Another possible explanation for the similarity of impacts across messages is that the accompanying cover letter, which did not vary across treatment arms, mitigated the emotional/motivational impact of the brochures. The cover letter's text, reproduced in Appendix C, was brief and carefully designed to be purely informational. Nonetheless, the implicit message conveyed by the letter may have had a strong impact, either positive or negative, on employers' attitudes about OSC. If so, this could have "washed out" the impact of the brochure-based messages. It would be difficult to test this hypothesis, because the letter was sent to every establishment that received a brochure. However, we can clearly state that after reading the cover letter, no theory-based message was sufficiently powerful to induce more employers to request OSC services compared with the existing OSHA brochure.

It does appear, however, that this form of marketing has different impacts on establishments that have prior experience with the OSC program relative to those that do not, as measured by the number of new requests per brochure mailed. In this study, establishments that had requested a consultation in the previous five years were both more likely to request a consultation in the absence of marketing, and also more likely to respond to marketing by requesting a consultation than establishments that had not previously requested one. That said, this marketing effort also did substantially expanded the pool of OSC customers; the proportional impact was much larger in the "no past request" subgroup (a 176 percent increase over a baseline request rate of 0.51 percent) than in the "past request" subgroup (a 24 percent increase over a baseline request rate of 7.19 percent). Because a large proportion of the sample is comprised of establishments that have not previously made a request, this translates into an expanded base of new requests. A broadly targeted marketing effort thus appears capable of substantially broadening the pool of OSC customers. Although we have no evidence that the first OSC request is any more impactful than repeated requests, it seems plausible that the first visit would identify existing and pressing issues, with lower priority or incremental issues identified at subsequent visits. If this hypothesis is true, it suggests that continuing to expand the OSC client base would be a productive endeavor, and one that could be accomplished through additional marketing.

The timing of requests suggests that sustained marketing efforts may continue to pay off in terms of increased demand for the program. Considering the cumulative impacts by week since the initial mailing, it appears that marketing generates a substantial number of additional requests during the first three months, when materials were being sent, and only a small number of additional requests thereafter. Because the request rate in the subsequent three months (months four through six) remained at the pre-mailing levels, the additional consultation requests generated during the first three months appear to be new requests that would not otherwise have been made (i.e., they do not simply represent a shift in the timing of requests that would have been made anyway). The observation that most of the impact occurs during the first three months suggests the intriguing hypothesis that marketing may continue to be effective as long as brochures are sent. A competing hypothesis is that only the initial brochure is effective, and the impact from that brochure persists for approximately three months. A limitation of this study is that it was not designed to test such hypotheses, and additional research would be required to distinguish between them.

Finally, our analysis allowed us to predict the impact for each complete marketing strategy across the three groups of industries included in the study's sample. (Because these industries were purposively selected, we cannot generalize the results to a broader set of industries.) We find that the most effective "package" incorporates the Safety Pays message with the Dialogue exemplar and no follow-up email. If OSHA were to mail this marketing brochure over three months to the universe of 66,330 establishments that comprise this study's control group (i.e., all establishments in these high-hazard industries that have not already received marketing in the states included in this study and excluding establishments on the 2013 High Rate Letter list), we project that the effort would result in approximately 780 additional requests for consultation visits over the subsequent six months.

However, the difference across marketing strategies is small and not statistically significant. This "best" marketing strategy's impact of 1.18 percentage points (for the combination of the Safety Pays message with the Dialogue format) is only moderately larger than the grand mean of 0.96 percentage points, which is in turn, only moderately larger than the impact of the "worst" combination (i.e., EPPM message, Future exemplar, and email) of 0.81 percentage points. Thus, even choosing the "worst" marketing strategy would increase the number of requests by 537 (vs. 780).

While we do not have direct evidence, federal OSHA and state OSC programs clearly believe that consultation improves health and safety outcomes. Given that mailings to employers cost, on average, only $2.78 per establishment and that such mailings clearly increase requests for consultation, mailing materials to all high risk employers seems to warrant full consideration.[42] Given that the differences across specific mailings are small, allowing state consultation programs to choose between the existing OSHA brochure and the eight theory-based brochures also seems appropriate.

[42] The total cost of printing, printing materials, and typesetting was $44,673, or $1.31 for each of the 34,096 establishments that received a mailed brochure. The cost of postage was an additional $50,007, or $1.47 per establishment. Thus, on average, the total direct marketing cost was $2.78 per establishment. Given an estimated impact of 1.0 percentage points, the marketing cost per additional consultation request generated was approximately $278. This cost does not include sending emails, because we have no evidence that sending emails is an effective marketing strategy. The cost of acquiring email addresses from Dun & Bradstreet was 78 cents per email.

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Appendix A: Designing the Marketing Materials

The following section discusses the details for the design of the marketing materials. Two sub-sections in turn review the initial brochure and email design process followed by a summary of the review and revision process used to refine the initial brochures.

Initial Brochure and Email Design

Using the messages and brochure formats developed for the study, Abt's Creative Services Department designed prototype brochures for the hard-copy mailing. Doing so involved translating ARC's narrative guidance for each brochure format into a graphic design and then incorporating the message-specific brochure text.

To ensure the brochures were as appealing and relevant as possible to establishments receiving them, Abt designed two versions of each brochure—one with images related to manufacturing and one with images related to nursing homes. In addition to the varied workplace images, the two different industry group designs featured distinct color palettes. Abt also customized the brochures to incorporate the recipient's state consultation office's contact information, including the phone number, email, and website.[43]

Creative Services started by designing four of the 12 desired prototype brochures. These four prototypes combined the three messages (SDT, EPPM, and Safety Pays) with the four different brochure formats (Dialogue, False-True, Future Orientation, and Solutions). Specifically, the first four prototypes were SDT Dialogue, Safety Pays Future Orientation, EPPM Solutions, and SDT False-True with manufacturing images. Initially, the brochures had a tri-fold design. However, after laying out the first four prototypes, the Creative Services team recommended moving to a bi-fold design to simplify the content and streamline the presentation. To achieve this simplified bi-fold format, CEO requested that ARC revise each message to include 20 percent less sample text.

As described earlier, half of the establishments in the treatment group were also to receive an email in addition to the hard-copy marketing brochure. The original plan was to attach a PDF file containing a copy of the assigned brochure to the email. However, this approach had several potential problems. First, there was concern that establishments might not (perhaps, were unlikely to) open the brochure attachment. This concern was particularly salient if the email was being read on a mobile device. Second, the file size of the brochure PDF was quite large, which had the potential to route the email into a junk or spam folder, greatly reducing the likelihood that the attachment would be opened and viewed. Third, it was not possible to easily customize the PDF files to include the specific state OSC program contact information for each establishment.

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[43] Initially, each of the 17 brochure design combinations was going to contain a customized website. These unique websites were intended to be "mirror" websites of the OSC program website, designed to track the number of hits as a result of each brochure. This data would offer evidence as to which brochure solicited the most interest in the OSC program. After further consideration, OSHA decided to list the relevant state's OSC website on the brochure. The assumption was that establishments seeking additional information would find the state websites to be more informative.

In light of these issues, the team decided to use an alternative approach. Creative Services staff designed emails incorporating the key messaging and images from each of the brochure formats. These emails were in an HTML format, so that the primary components of each brochure and relevant images displayed as soon as the email was opened. (Appendix J contains all of the email formats.)

Brochure and Email Review Process

Several iterations of these brochure and email designs were shared with OSHA and CEO and they provided feedback. To collect initial feedback on the brochures, Abt presented the four brochure prototypes during an in-person briefing at DOL. This briefing provided an opportunity for CEO and OSHA staff to ask questions and provide input into the design of the marketing brochures, as well as the selected images. After seeing the text in combination with the images, OSHA staff recommended that the False-True language used in one set of brochures be changed to Myth-Fact. Reviewers also provided feedback on ways to improve the brochure text. Incorporating the feedback on the format, messages, and images, we revised the existing brochures and laid out the remaining eight brochures. As the review process progressed, we selected numerous images depicting manufacturing and nursing home employees at work, which we sent to OSHA's Communications Department for approval. A second in-person briefing with CEO and OSHA staff presented all 12 of the brochure formats for feedback. During their final review OSHA staff requested that the EPPM Dialogue brochure be removed from the pilot because DOL was not comfortable with the way the combined message text and images portrayed the OSC program.

After finalizing the brochures, Creative Services staff laid out the HTML email formats. CEO and OSHA then reviewed the emails and had few comments since the content mirrored the final brochures.

Finalizing the Marketing Materials

To obtain feedback from additional stakeholders about the design and content of the marketing brochures, Abt conducted an online review of the brochures.[44] Reviewers included safety directors from nine Safety and Health Achievement Recognition Program (SHARP) firms, The National Association of Occupational Safety and Health Consultation Programs (OSHCON) board members, and members of the pilot study's Technical Working Group (TWG). It was intended that SHARP firm safety directors would provide feedback from the "establishment" point of view, while members of OSCHON and the TWG would provide perspective as federal grantees and individuals knowledgeable about the OSC program.

Each reviewer was sent a set of four randomly assigned draft brochure formats for review and comment and an online review form on which to comment.[45] The review form contained questions about the respondent's initial reaction to the marketing brochures and requested feedback on the brochure

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[44] The online review for stakeholders was originally included in ARC's scope of work. They designed the review form but were unable to implement it because their contract ended before it could be administered. Abt took responsibility for fielding the online review and analyzing the results.

[45] ARC provided Abt with a randomization plan that mapped out nine four-brochure combinations designed to be theoretically distinct and ensure that we received comments on all brochures under consideration. We randomly assigned these brochure combinations to the individuals completing the review.

messaging and format. Questions on the review form varied in format, with some based on a Likert scale (scaled rating from 1 to 7) while others were open-ended.

We analyzed the review's results in December 2013 and subsequently produced a memorandum on the responses for CEO. Overall, reviewers provided positive feedback on nearly all of the brochures. The exceptions to this were the brochures that followed the Solutions format. Multiple stakeholders responded negatively about the Solutions brochure format, and, unlike other formats, there were no positive comments. In the end, CEO and OSHA decided to remove the Solutions brochure format from the pilot study. They decided it was more efficient to drop this brochure format than to attempt the significant modifications recommended by the stakeholders.

Once the list of brochures to be tested was finalized, Abt Creative Services staff designed a set of brochures with nursing home images. Exhibit 2 shows the final theories and brochure formats implemented in the pilot hard-copy brochure mailings and emails. HTML emails based on the key brochure components were also developed by Creative Services.

Exhibit A.1: Final Pilot Study Brochure Messages and Formats

Message (Theoretical Framework)	Brochure Format		
	Dialogue	False-True	Future Orientation
Self Determination Theory (SDT)	✓	✓	✓
Extended Parallel Processing Model (EPPM)		✓	✓
Expectancy Theory: Safety Pays (SP)	✓	✓	✓
Existing On-site Consultation Program Brochure			

After finalizing the brochures and emails, we performed several additional tasks to prepare for the hard-copy mailing.

Worked with CEO to draft a cover letter. In an effort to legitimize the hard-copy mailing, establishments received a cover letter from OSHA Assistant Secretary Michaels. The cover letter briefly described the program and provided the contact information for the state OSC office where the establishment is located (The letter is provided in Appendix C).

Obtained OSHA letterhead and envelopes. To increase the probability that the hard-copy mailings would be opened and read, the brochures were mailed in OSHA envelopes, and the cover letters were printed on OSHA letterhead.

Confirmed state contact information for inclusion on the brochures and cover letters. In January 2014, we called the OSC state offices to verify each program's phone number, email, and website. The confirmed information was then printed onto the brochures.

Prior to the first hard-copy mailing, we FedExed an information packet to each of the 48 state consultation offices with establishments included in the pilot study. The packet included a copy of each of the 17 marketing brochures and a cover letter from Douglas Kalinowski, the Director of OSHA/Directorate of Cooperative and State Programs (Appendix C).[46] This cover letter was sent to inform state OSC offices about the pilot study and gain their support so that they would be willing and able to answer questions posed by the establishments receiving the mailings. Their support and understanding was critical because the OSC program is administered by state offices and these staff would be the recipients of all consultation requests encouraged by the mailings. In addition to these information packets, OSHA staff sent each state director an email announcing the timing of the first mailing. The email included a Frequently Asked Questions (FAQ) document designed to address many of the states' concerns about the pilot. Prior to the second and third round mailings, OSHA staff sent similar emails to the state directors highlighting the mailing dates and again providing the FAQ document.

[46] The packets were also to include a copy of the cover letter sent to establishments and signed by Assistant Secretary Michaels. This letter was inadvertently omitted from the original FedEx packets. Instead, a copy of the letter was sent via email to state directors.

Appendix B: List of NAICS Codes for Marketing Groups

Group 1: Manufacturing establishments with high-hazard machinery in OSHA's Amputation National Emphasis Program

NAICS Code	Description
113	**Forestry and Logging**
113310	Logging
311	**Food Manufacturing**
311212	Rice Milling
311340	Nonchocolate Confectionery Manufacturing
311423	Dried and Dehydrated Food Manufacturing
311513	Cheese Manufacturing
311611	Animal (except Poultry) Slaughtering
311612	Meat Processed from Carcasses
311613	Rendering and Meat Byproduct Processing
311615	Poultry Processing
311812	Commercial Bakeries
311824	Dry Pasta, Dough, and Flour Mixes Manufacturing from Purchased Flour
311830	Tortilla Manufacturing
311911	Roasted Nuts and Peanut Butter Manufacturing
311920	Coffee and Tea Manufacturing
311941	Mayonnaise, Dressing, and Other Prepared Sauce Manufacturing
311942	Spice and Extract Manufacturing
311991	Perishable Prepared Food Manufacturing
311999	All Other Miscellaneous Food Manufacturing
313	**Textile Mills**
313110	Fiber, Yarn, and Thread Mills
313210	Broadwoven Fabric Mills
313220	Narrow Fabric Mills and Schiffli Machine Embroidery
313230	Nonwoven Fabric Mills
313310	Textile and Fabric Finishing Mills
314	**Textile Product Mills**
314999	All Other Miscellaneous Textile Product Mills
321	**Wood Product Manufacturing**
321113	Sawmills
321911	Wood Window and Door Manufacturing
321912	Cut Stock, Resawing Lumber, and Planing
321918	Other Millwork (including Flooring)
321920	Wood Container and Pallet Manufacturing
321999	All Other Miscellaneous Wood Product Manufacturing

NAICS Code	Description
322	**Paper Manufacturing**
322121	Paper (except Newsprint) Mills
322122	Newsprint Mills
322211	Corrugated and Solid Fiber Box Manufacturing
322220	Paper Bag and Coated and Treated Paper Manufacturing
323	**Printing and Related Support Activities**
323111	Commercial Printing (except Screen and Books)
326	**Plastics and Rubber Products Manufacturing**
326111	Plastics Bag and Pouch Manufacturing
326112	Plastics Packaging Film and Sheet (including Laminated) Manufacturing
326121	Unlaminated Plastics Profile Shape Manufacturing
326122	Plastics Pipe and Pipe Fitting Manufacturing
326199	All Other Plastics Product Manufacturing
327	**Nonmetallic Mineral Product Manufacturing**
327332	Concrete Pipe Manufacturing
327390	Other Concrete Product Manufacturing
327999	All Other Miscellaneous Nonmetallic Mineral Product Manufacturing
331	**Primary Metal Manufacturing**
331210	Iron and Steel Pipe and Tube Manufacturing from Purchased Steel
331221	Rolled Steel Shape Manufacturing
331222	Steel Wire Drawing
331513	Steel Foundries (except Investment)
332	**Fabricated Metal Product Manufacturing**
332111	Iron and Steel Forging
332117	Powder Metallurgy Part Manufacturing
332119	Metal Crown, Closure, and Other Metal Stamping (except Automotive)
332215	Metal Kitchen Cookware, Utensil, Cutlery, and Flatware (except Precious) Manufacturing
332216	Saw Blade and Handtool Manufacturing
332312	Fabricated Structural Metal Manufacturing
332313	Plate Work Manufacturing
332322	Sheet Metal Work Manufacturing
332323	Ornamental and Architectural Metal Work Manufacturing
332410	Power Boiler and Heat Exchanger Manufacturing
332420	Metal Tank (Heavy Gauge) Manufacturing
332439	Other Metal Container Manufacturing
332510	Hardware Manufacturing
332618	Other Fabricated Wire Product Manufacturing
332710	Machine Shops

NAICS Code	Description
332919	Other Metal Valve and Pipe Fitting Manufacturing
332999	All Other Miscellaneous Fabricated Metal Product Manufacturing
333	**Machinery Manufacturing**
333318	Other Commercial and Service Industry Machinery Manufacturing
333413	Industrial and Commercial Fan and Blower and Air Purification Equipment Manufacturing
333414	Heating Equipment (except Warm Air Furnaces) Manufacturing
333415	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing
333511	Industrial Mold Manufacturing
333514	Special Die and Tool, Die Set, Jig, and Fixture Manufacturing
333924	Industrial Truck, Tractor, Trailer, and Stacker Machinery Manufacturing
333999	All Other Miscellaneous General Purpose Machinery Manufacturing
336	**Transportation Equipment Manufacturing**
336211	Motor Vehicle Body Manufacturing
336310	Motor Vehicle Gasoline Engine and Engine Parts Manufacturing
336320	Motor Vehicle Electrical and Electronic Equipment Manufacturing
336330	Motor Vehicle Steering and Suspension Components (except Spring) Manufacturing
336340	Motor Vehicle Brake System Manufacturing
336350	Motor Vehicle Transmission and Power Train Parts Manufacturing
336360	Motor Vehicle Seating and Interior Trim Manufacturing
336370	Motor Vehicle Metal Stamping
336390	Other Motor Vehicle Parts Manufacturing
337	**Furniture and Related Product Manufacturing**
337110	Wood Kitchen Cabinet and Countertop Manufacturing
337122	Nonupholstered Wood Household Furniture Manufacturing
337215	Showcase, Partition, Shelving, and Locker Manufacturing

Group 2: Other high-hazard manufacturing establishments, identified as those on any of the 2010-2013 high-hazard listing or included in one or more current National Emphasis Programs

NAICS Code	Description
311	**Food Manufacturing**
311111	Dog and Cat Food Manufacturing
311211	Flour Milling
311213	Malt Manufacturing
311221	Wet Corn Milling
311224	Soybean and Other Oilseed Processing
311225	Fats and Oils Refining and Blending
311230	Breakfast Cereal Manufacturing
311313	Beet Sugar Manufacturing
311314	Cane Sugar Manufacturing
311411	Frozen Fruit, Juice, and Vegetable Manufacturing
311412	Frozen Specialty Food Manufacturing
311512	Creamery Butter Manufacturing
311514	Dry, Condensed, and Evaporated Dairy Product Manufacturing
311710	Seafood Product Preparation and Packaging
311813	Frozen Cakes, Pies, and Other Pastries Manufacturing
311821	Cookie and Cracker Manufacturing
312	**Beverage and Tobacco Product Manufacturing**
312113	Ice Manufacturing
312130	Wineries
312140	Distilleries
312230	Tobacco Manufacturing
313	**Textile Mills**
313240	Knit Fabric Mills
314	**Textile Product Mills**
314120	Curtain and Linen Mills
314910	Textile Bag and Canvas Mills
314994	Rope, Cordage, Twine, Tire Cord, and Tire Fabric Mills
315	**Apparel Manufacturing**
315110	Hosiery and Sock Mills
315210	Cut and Sew Apparel Contractors
315220	Men's and Boys' Cut and Sew Apparel Manufacturing
315240	Women's, Girls', and Infants' Cut and Sew Apparel Manufacturing
315990	Apparel Accessories and Other Apparel Manufacturing
316	**Leather and Allied Product Manufacturing**
316210	Footwear Manufacturing
316998	All Other Leather Good and Allied Product Manufacturing

NAICS Code	Description
324	**Petroleum and Coal Products Manufacturing**
324199	All Other Petroleum and Coal Products Manufacturing
325	**Chemical Manufacturing**
325130	Synthetic Dye and Pigment Manufacturing
325180	Other Basic Inorganic Chemical Manufacturing
325194	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing
325212	Synthetic Rubber Manufacturing
325612	Polish and Other Sanitation Good Manufacturing
325910	Printing Ink Manufacturing
325991	Custom Compounding of Purchased Resins
326	**Plastics and Rubber Products Manufacturing**
326191	Plastics Plumbing Fixture Manufacturing
326211	Tire Manufacturing (except Retreading)
326212	Tire Retreading
327	**Nonmetallic Mineral Product Manufacturing**
327110	Pottery, Ceramics, and Plumbing Fixture Manufacturing
327120	Clay Building Material and Refractories Manufacturing
327212	Other Pressed and Blown Glass and Glassware Manufacturing
327213	Glass Container Manufacturing
327310	Cement Manufacturing
327992	Ground or Treated Mineral and Earth Manufacturing
327993	Mineral Wool Manufacturing
331	**Primary Metal Manufacturing**
331313	Alumina Refining and Primary Aluminum Production
331318	Other Aluminum Rolling, Drawing, and Extruding
331420	Copper Rolling, Drawing, Extruding, and Alloying
333	**Machinery Manufacturing**
333243	Sawmill, Woodworking, and Paper Machinery Manufacturing
333913	Measuring and Dispensing Pump Manufacturing
333995	Fluid Power Cylinder and Actuator Manufacturing
336	**Transportation Equipment Manufacturing**
336112	Light Truck and Utility Vehicle Manufacturing
336213	Motor Home Manufacturing
336414	Guided Missile and Space Vehicle Manufacturing
337	**Furniture and Related Product Manufacturing**
337124	Metal Household Furniture Manufacturing
337211	Wood Office Furniture Manufacturing
337910	Mattress Manufacturing

NAICS Code	Description
337920	Blind and Shade Manufacturing
339	**Miscellaneous Manufacturing**
339910	Jewelry and Silverware Manufacturing
339940	Office Supplies (except Paper) Manufacturing
339992	Musical Instrument Manufacturing
339993	Fastener, Button, Needle, and Pin Manufacturing
339995	Burial Casket Manufacturing

Group 3: Nursing and residential care facilities

NAICS Code	Description
623	**Nursing and Residential Care Facilities**
623110	Nursing Care Facilities (Skilled Nursing Facilities)
623210	Residential Intellectual and Developmental Disability Facilities
623311	Continuing Care Retirement Communities

Group 4: Employers who are on OSHA's 2013 Site-Specific Targeting inspection plan

NAICS Code	Description
111	**Crop Production**
111411	Mushroom Production
111419	Other Food Crops Grown Under Cover
111421	Nursery and Tree Production
111422	Floriculture Production
112	**Animal Production and Aquaculture**
112111	Beef Cattle Ranching and Farming
112112	Cattle Feedlots
112210	Hog and Pig Farming
113	**Forestry and Logging**
113310	Logging
213	**Support Activities for Mining**
213112	Support Activities for Oil and Gas Operations
221	**Utilities**
221310	Water Supply and Irrigation Systems
221320	Sewage Treatment Facilities
236	**Construction of Buildings**
236115	New Single-Family Housing Construction (except For-Sale Builders)
236220	Commercial and Institutional Building Construction
237	**Heavy and Civil Engineering Construction**
237110	Water and Sewer Line and Related Structures Construction
237130	Power and Communication Line and Related Structures Construction
237310	Highway, Street, and Bridge Construction
238	**Specialty Trade Contractors**
238150	Glass and Glazing Contractors
238160	Roofing Contractors
238190	Other Foundation, Structure, and Building Exterior Contractors
238210	Electrical Contractors and Other Wiring Installation Contractors
238220	Plumbing, Heating, and Air-Conditioning Contractors
238290	Other Building Equipment Contractors
238320	Painting and Wall Covering Contractors
238350	Finish Carpentry Contractors
238390	Other Building Finishing Contractors
238910	Site Preparation Contractors
238990	All Other Specialty Trade Contractors
311	**Food Manufacturing**
311119	Other Animal Food Manufacturing
311351	Chocolate and Confectionery Manufacturing from Cacao Beans

NAICS Code	Description
311352	Confectionery Manufacturing from Purchased Chocolate
311421	Fruit and Vegetable Canning
311422	Specialty Canning
311511	Fluid Milk Manufacturing
311513	Cheese Manufacturing
311520	Ice Cream and Frozen Dessert Manufacturing
311611	Animal (except Poultry) Slaughtering
311612	Meat Processed from Carcasses
311613	Rendering and Meat Byproduct Processing
311615	Poultry Processing
311710	Seafood Product Preparation and Packaging
311812	Commercial Bakeries
311919	Other Snack Food Manufacturing
311920	Coffee and Tea Manufacturing
311930	Flavoring Syrup and Concentrate Manufacturing
311991	Perishable Prepared Food Manufacturing
312	**Beverage and Tobacco Product Manufacturing**
312111	Soft Drink Manufacturing
312112	Bottled Water Manufacturing
312230	Tobacco Manufacturing
313	**Textile Mills**
313210	Broadwoven Fabric Mills
313230	Nonwoven Fabric Mills
313320	Fabric Coating Mills
314	**Textile Product Mills**
314999	All Other Miscellaneous Textile Product Mills
315	**Apparel Manufacturing**
315190	Other Apparel Knitting Mills
315240	Women's, Girls', and Infants' Cut and Sew Apparel Manufacturing
316	**Leather and Allied Product Manufacturing**
316110	Leather and Hide Tanning and Finishing
321	**Wood Product Manufacturing**
321113	Sawmills
321114	Wood Preservation
321211	Hardwood Veneer and Plywood Manufacturing
321212	Softwood Veneer and Plywood Manufacturing
321213	Engineered Wood Member (except Truss) Manufacturing
321214	Truss Manufacturing

NAICS Code	Description
321219	Reconstituted Wood Product Manufacturing
321911	Wood Window and Door Manufacturing
321912	Cut Stock, Resawing Lumber, and Planing
321918	Other Millwork (including Flooring)
321920	Wood Container and Pallet Manufacturing
321991	Manufactured Home (Mobile Home) Manufacturing
321992	Prefabricated Wood Building Manufacturing
321999	All Other Miscellaneous Wood Product Manufacturing
322	**Paper Manufacturing**
322121	Paper (except Newsprint) Mills
322130	Paperboard Mills
322211	Corrugated and Solid Fiber Box Manufacturing
322212	Folding Paperboard Box Manufacturing
322219	Other Paperboard Container Manufacturing
322220	Paper Bag and Coated and Treated Paper Manufacturing
322230	Stationery Product Manufacturing
322291	Sanitary Paper Product Manufacturing
322299	All Other Converted Paper Product Manufacturing
323	**Printing and Related Support Activities**
323111	Commercial Printing (except Screen and Books)
323113	Commercial Screen Printing
323120	Support Activities for Printing
325	**Chemical Manufacturing**
325211	Plastics Material and Resin Manufacturing
325220	Artificial and Synthetic Fibers and Filaments Manufacturing
325314	Fertilizer (Mixing Only) Manufacturing
325412	Pharmaceutical Preparation Manufacturing
325413	In-Vitro Diagnostic Substance Manufacturing
325510	Paint and Coating Manufacturing
325520	Adhesive Manufacturing
325611	Soap and Other Detergent Manufacturing
325992	Photographic Film, Paper, Plate, and Chemical Manufacturing
325998	All Other Miscellaneous Chemical Product and Preparation Manufacturing
326	**Plastics and Rubber Products Manufacturing**
326111	Plastics Bag and Pouch Manufacturing
326112	Plastics Packaging Film and Sheet (including Laminated) Manufacturing
326113	Unlaminated Plastics Film and Sheet (except Packaging) Manufacturing
326121	Unlaminated Plastics Profile Shape Manufacturing

NAICS Code	Description
326122	Plastics Pipe and Pipe Fitting Manufacturing
326130	Laminated Plastics Plate, Sheet (except Packaging), and Shape Manufacturing
326140	Polystyrene Foam Product Manufacturing
326150	Urethane and Other Foam Product (except Polystyrene) Manufacturing
326160	Plastics Bottle Manufacturing
326199	All Other Plastics Product Manufacturing
326220	Rubber and Plastics Hoses and Belting Manufacturing
326291	Rubber Product Manufacturing for Mechanical Use
326299	All Other Rubber Product Manufacturing
327	**Nonmetallic Mineral Product Manufacturing**
327110	Pottery, Ceramics, and Plumbing Fixture Manufacturing
327120	Clay Building Material and Refractories Manufacturing
327211	Flat Glass Manufacturing
327215	Glass Product Manufacturing Made of Purchased Glass
327320	Ready-Mix Concrete Manufacturing
327331	Concrete Block and Brick Manufacturing
327332	Concrete Pipe Manufacturing
327390	Other Concrete Product Manufacturing
327420	Gypsum Product Manufacturing
327910	Abrasive Product Manufacturing
327991	Cut Stone and Stone Product Manufacturing
327999	All Other Miscellaneous Nonmetallic Mineral Product Manufacturing
331	**Primary Metal Manufacturing**
331110	Iron and Steel Mills and Ferroalloy Manufacturing
331210	Iron and Steel Pipe and Tube Manufacturing from Purchased Steel
331221	Rolled Steel Shape Manufacturing
331222	Steel Wire Drawing
331313	Alumina Refining and Primary Aluminum Production
331314	Secondary Smelting and Alloying of Aluminum
331315	Aluminum Sheet, Plate, and Foil Manufacturing
331318	Other Aluminum Rolling, Drawing, and Extruding
331410	Nonferrous Metal (except Aluminum) Smelting and Refining
331420	Copper Rolling, Drawing, Extruding, and Alloying
331491	Nonferrous Metal (except Copper and Aluminum) Rolling, Drawing, and Extruding
331492	Secondary Smelting, Refining, and Alloying of Nonferrous Metal (except Copper and Aluminum)
331511	Iron Foundries
331512	Steel Investment Foundries

NAICS Code	Description
331513	Steel Foundries (except Investment)
331523	Nonferrous Metal Die-Casting Foundries
331524	Aluminum Foundries (except Die-Casting)
331529	Other Nonferrous Metal Foundries (except Die-Casting)
332	**Fabricated Metal Product Manufacturing**
332111	Iron and Steel Forging
332112	Nonferrous Forging
332114	Custom Roll Forming
332117	Powder Metallurgy Part Manufacturing
332119	Metal Crown, Closure, and Other Metal Stamping (except Automotive)
332215	Metal Kitchen Cookware, Utensil, Cutlery, and Flatware (except Precious) Manufacturing
332216	Saw Blade and Handtool Manufacturing
332311	Prefabricated Metal Building and Component Manufacturing
332312	Fabricated Structural Metal Manufacturing
332313	Plate Work Manufacturing
332321	Metal Window and Door Manufacturing
332322	Sheet Metal Work Manufacturing
332323	Ornamental and Architectural Metal Work Manufacturing
332410	Power Boiler and Heat Exchanger Manufacturing
332420	Metal Tank (Heavy Gauge) Manufacturing
332431	Metal Can Manufacturing
332439	Other Metal Container Manufacturing
332510	Hardware Manufacturing
332613	Spring Manufacturing
332618	Other Fabricated Wire Product Manufacturing
332710	Machine Shops
332721	Precision Turned Product Manufacturing
332722	Bolt, Nut, Screw, Rivet, and Washer Manufacturing
332811	Metal Heat Treating
332812	Metal Coating, Engraving (except Jewelry and Silverware), and Allied Services to Manufacturers
332813	Electroplating, Plating, Polishing, Anodizing, and Coloring
332911	Industrial Valve Manufacturing
332912	Fluid Power Valve and Hose Fitting Manufacturing
332913	Plumbing Fixture Fitting and Trim Manufacturing
332919	Other Metal Valve and Pipe Fitting Manufacturing
332991	Ball and Roller Bearing Manufacturing
332992	Small Arms Ammunition Manufacturing

NAICS Code	Description
332993	Ammunition (except Small Arms) Manufacturing
332994	Small Arms, Ordnance, and Ordnance Accessories Manufacturing
332996	Fabricated Pipe and Pipe Fitting Manufacturing
332999	All Other Miscellaneous Fabricated Metal Product Manufacturing
333	**Machinery Manufacturing**
333111	Farm Machinery and Equipment Manufacturing
333112	Lawn and Garden Tractor and Home Lawn and Garden Equipment Manufacturing
333120	Construction Machinery Manufacturing
333131	Mining Machinery and Equipment Manufacturing
333132	Oil and Gas Field Machinery and Equipment Manufacturing
333241	Food Product Machinery Manufacturing
333244	Printing Machinery and Equipment Manufacturing
333249	Other Industrial Machinery Manufacturing
333314	Optical Instrument and Lens Manufacturing
333316	Photographic and Photocopying Equipment Manufacturing
333318	Other Commercial and Service Industry Machinery Manufacturing
333413	Industrial and Commercial Fan and Blower and Air Purification Equipment Manufacturing
333414	Heating Equipment (except Warm Air Furnaces) Manufacturing
333415	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing
333511	Industrial Mold Manufacturing
333514	Special Die and Tool, Die Set, Jig, and Fixture Manufacturing
333515	Cutting Tool and Machine Tool Accessory Manufacturing
333517	Machine Tool Manufacturing
333519	Rolling Mill and Other Metalworking Machinery Manufacturing
333612	Speed Changer, Industrial High-Speed Drive, and Gear Manufacturing
333613	Mechanical Power Transmission Equipment Manufacturing
333618	Other Engine Equipment Manufacturing
333911	Pump and Pumping Equipment Manufacturing
333912	Air and Gas Compressor Manufacturing
333921	Elevator and Moving Stairway Manufacturing
333922	Conveyor and Conveying Equipment Manufacturing
333923	Overhead Traveling Crane, Hoist, and Monorail System Manufacturing
333924	Industrial Truck, Tractor, Trailer, and Stacker Machinery Manufacturing
333991	Power-Driven Handtool Manufacturing
333992	Welding and Soldering Equipment Manufacturing
333993	Packaging Machinery Manufacturing

NAICS Code	Description
333994	Industrial Process Furnace and Oven Manufacturing
333996	Fluid Power Pump and Motor Manufacturing
333999	All Other Miscellaneous General Purpose Machinery Manufacturing
334	**Computer and Electronic Product Manufacturing**
334210	Telephone Apparatus Manufacturing
334220	Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing
334290	Other Communications Equipment Manufacturing
334310	Audio and Video Equipment Manufacturing
334412	Bare Printed Circuit Board Manufacturing
334413	Semiconductor and Related Device Manufacturing
334416	Capacitor, Resistor, Coil, Transformer, and Other Inductor Manufacturing
334417	Electronic Connector Manufacturing
334418	Printed Circuit Assembly (Electronic Assembly) Manufacturing
334419	Other Electronic Component Manufacturing
334510	Electromedical and Electrotherapeutic Apparatus Manufacturing
334511	Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing
334512	Automatic Environmental Control Manufacturing for Residential, Commercial, and Appliance Use
334513	Instruments and Related Products Manufacturing for Measuring, Displaying, and Controlling Industrial Process Variables
334514	Totalizing Fluid Meter and Counting Device Manufacturing
334515	Instrument Manufacturing for Measuring and Testing Electricity and Electrical Signals
334516	Analytical Laboratory Instrument Manufacturing
334519	Other Measuring and Controlling Device Manufacturing
334613	Blank Magnetic and Optical Recording Media Manufacturing
334614	Software and Other Prerecorded Compact Disc, Tape, and Record Reproducing
335	**Electrical Equipment, Appliance, and Component Manufacturing**
335110	Electric Lamp Bulb and Part Manufacturing
335121	Residential Electric Lighting Fixture Manufacturing
335122	Commercial, Industrial, and Institutional Electric Lighting Fixture Manufacturing
335129	Other Lighting Equipment Manufacturing
335210	Small Electrical Appliance Manufacturing
335221	Household Cooking Appliance Manufacturing
335228	Other Major Household Appliance Manufacturing
335311	Power, Distribution, and Specialty Transformer Manufacturing
335312	Motor and Generator Manufacturing

NAICS Code	Description
335313	Switchgear and Switchboard Apparatus Manufacturing
335314	Relay and Industrial Control Manufacturing
335911	Storage Battery Manufacturing
335912	Primary Battery Manufacturing
335921	Fiber Optic Cable Manufacturing
335929	Other Communication and Energy Wire Manufacturing
335931	Current-Carrying Wiring Device Manufacturing
335932	Noncurrent-Carrying Wiring Device Manufacturing
335991	Carbon and Graphite Product Manufacturing
335999	All Other Miscellaneous Electrical Equipment and Component Manufacturing
336	**Transportation Equipment Manufacturing**
336111	Automobile Manufacturing
336120	Heavy Duty Truck Manufacturing
336211	Motor Vehicle Body Manufacturing
336212	Truck Trailer Manufacturing
336214	Travel Trailer and Camper Manufacturing
336310	Motor Vehicle Gasoline Engine and Engine Parts Manufacturing
336320	Motor Vehicle Electrical and Electronic Equipment Manufacturing
336330	Motor Vehicle Steering and Suspension Components (except Spring) Manufacturing
336340	Motor Vehicle Brake System Manufacturing
336350	Motor Vehicle Transmission and Power Train Parts Manufacturing
336360	Motor Vehicle Seating and Interior Trim Manufacturing
336370	Motor Vehicle Metal Stamping
336390	Other Motor Vehicle Parts Manufacturing
336411	Aircraft Manufacturing
336412	Aircraft Engine and Engine Parts Manufacturing
336413	Other Aircraft Parts and Auxiliary Equipment Manufacturing
336419	Other Guided Missile and Space Vehicle Parts and Auxiliary Equipment Manufacturing
336510	Railroad Rolling Stock Manufacturing
336611	Ship Building and Repairing
336612	Boat Building
336991	Motorcycle, Bicycle, and Parts Manufacturing
336992	Military Armored Vehicle, Tank, and Tank Component Manufacturing
336999	All Other Transportation Equipment Manufacturing
337	**Furniture and Related Product Manufacturing**
337110	Wood Kitchen Cabinet and Countertop Manufacturing
337121	Upholstered Household Furniture Manufacturing

NAICS Code	Description
337122	Nonupholstered Wood Household Furniture Manufacturing
337125	Household Furniture (except Wood and Metal) Manufacturing
337127	Institutional Furniture Manufacturing
337212	Custom Architectural Woodwork and Millwork Manufacturing
337214	Office Furniture (except Wood) Manufacturing
339	**Miscellaneous Manufacturing**
339112	Surgical and Medical Instrument Manufacturing
339113	Surgical Appliance and Supplies Manufacturing
339114	Dental Equipment and Supplies Manufacturing
339115	Ophthalmic Goods Manufacturing
339920	Sporting and Athletic Goods Manufacturing
339950	Sign Manufacturing
339991	Gasket, Packing, and Sealing Device Manufacturing
339994	Broom, Brush, and Mop Manufacturing
339999	All Other Miscellaneous Manufacturing
423	**Merchant Wholesalers, Durable Goods**
423110	Automobile and Other Motor Vehicle Merchant Wholesalers
423120	Motor Vehicle Supplies and New Parts Merchant Wholesalers
423130	Tire and Tube Merchant Wholesalers
423220	Home Furnishing Merchant Wholesalers
423310	Lumber, Plywood, Millwork, and Wood Panel Merchant Wholesalers
423320	Brick, Stone, and Related Construction Material Merchant Wholesalers
423330	Roofing, Siding, and Insulation Material Merchant Wholesalers
423390	Other Construction Material Merchant Wholesalers
423450	Medical, Dental, and Hospital Equipment and Supplies Merchant Wholesalers
423510	Metal Service Centers and Other Metal Merchant Wholesalers
423520	Coal and Other Mineral and Ore Merchant Wholesalers
423610	Electrical Apparatus and Equipment, Wiring Supplies, and Related Equipment Merchant Wholesalers
423710	Hardware Merchant Wholesalers
423720	Plumbing and Heating Equipment and Supplies (Hydronics) Merchant Wholesalers
423830	Industrial Machinery and Equipment Merchant Wholesalers
423860	Transportation Equipment and Supplies (except Motor Vehicle) Merchant Wholesalers
423920	Toy and Hobby Goods and Supplies Merchant Wholesalers
423930	Recyclable Material Merchant Wholesalers
423990	Other Miscellaneous Durable Goods Merchant Wholesalers

NAICS Code	Description
424	**Merchant Wholesalers, Nondurable Goods**
424410	General Line Grocery Merchant Wholesalers
424420	Packaged Frozen Food Merchant Wholesalers
424430	Dairy Product (except Dried or Canned) Merchant Wholesalers
424450	Confectionery Merchant Wholesalers
424460	Fish and Seafood Merchant Wholesalers
424470	Meat and Meat Product Merchant Wholesalers
424480	Fresh Fruit and Vegetable Merchant Wholesalers
424490	Other Grocery and Related Products Merchant Wholesalers
424810	Beer and Ale Merchant Wholesalers
424820	Wine and Distilled Alcoholic Beverage Merchant Wholesalers
442	**Furniture and Home Furnishings Stores**
442110	Furniture Stores
444	**Building Material and Garden Equipment and Supplies Dealers**
444110	Home Centers
444190	Other Building Material Dealers
445	**Food and Beverage Stores**
445110	Supermarkets and Other Grocery (except Convenience) Stores
481	**Air Transportation**
481111	Scheduled Passenger Air Transportation
481112	Scheduled Freight Air Transportation
483	**Water Transportation**
483113	Coastal and Great Lakes Freight Transportation
484	**Truck Transportation**
484110	General Freight Trucking, Local
484121	General Freight Trucking, Long-Distance, Truckload
484122	General Freight Trucking, Long-Distance, Less Than Truckload
484210	Used Household and Office Goods Moving
484220	Specialized Freight (except Used Goods) Trucking, Local
484230	Specialized Freight (except Used Goods) Trucking, Long-Distance
485	**Transit and Ground Passenger Transportation**
485410	School and Employee Bus Transportation
485999	All Other Transit and Ground Passenger Transportation
487	**Scenic and Sightseeing Transportation**
487110	Scenic and Sightseeing Transportation, Land
487210	Scenic and Sightseeing Transportation, Water

NAICS Code	Description
488	**Support Activities for Transportation**
488119	Other Airport Operations
488190	Other Support Activities for Air Transportation
488320	Marine Cargo Handling
488330	Navigational Services to Shipping
488490	Other Support Activities for Road Transportation
488991	Packing and Crating
488999	All Other Support Activities for Transportation
492	**Couriers and Messengers**
492110	Couriers and Express Delivery Services
492210	Local Messengers and Local Delivery
493	**Warehousing and Storage**
493110	General Warehousing and Storage
493120	Refrigerated Warehousing and Storage
493130	Farm Product Warehousing and Storage
493190	Other Warehousing and Storage
511	**Publishing Industries (except Internet)**
511110	Newspaper Publishers
511120	Periodical Publishers
511130	Book Publishers
511199	All Other Publishers
532	**Rental and Leasing Services**
532412	Construction, Mining, and Forestry Machinery and Equipment Rental and Leasing
541	**Professional, Scientific, and Technical Services**
541712	Research and Development in the Physical, Engineering, and Life Sciences (except Biotechnology)
561	Administrative and Support Services
561720	Janitorial Services
561730	Landscaping Services
562	**Waste Management and Remediation Services**
562111	Solid Waste Collection
562119	Other Waste Collection
562211	Hazardous Waste Treatment and Disposal
562212	Solid Waste Landfill
562213	Solid Waste Combustors and Incinerators
562219	Other Nonhazardous Waste Treatment and Disposal
562920	Materials Recovery Facilities
562998	All Other Miscellaneous Waste Management Services

NAICS Code	Description
621	**Ambulatory Health Care Services**
621610	Home Health Care Services
621910	Ambulance Services
622	**Hospitals**
622110	General Medical and Surgical Hospitals
622310	Specialty (except Psychiatric and Substance Abuse) Hospitals
623	**Nursing and Residential Care Facilities**
623110	Nursing Care Facilities (Skilled Nursing Facilities)
623210	Residential Intellectual and Developmental Disability Facilities
623220	Residential Mental Health and Substance Abuse Facilities
623311	Continuing Care Retirement Communities
623312	Assisted Living Facilities for the Elderly
624	**Social Assistance**
624120	Services for the Elderly and Persons with Disabilities
713	**Amusement, Gambling, and Recreation Industries**
713930	Marinas
713990	All Other Amusement and Recreation Industries
811	**Repair and Maintenance**
811310	Commercial and Industrial Machinery and Equipment (except Automotive and Electronic) Repair and Maintenance

Appendix C: Cover Letters

C.1 Cover Letter to Establishments

U.S. Department of Labor

Assistant Secretary for
Occupational Safety and Health
Washington, D.C. 20210

Mr./Ms. First Name Last Name
Job Title
Company Name
Mailing Address
City, State 00000-0000

Dear First Name Last Name:

The OSHA On-site Consultation Program is an excellent way for employers with 250 or fewer workers to address workplace safety and health. This program is administered by a state agency or university, and operated separately from OSHA's enforcement program. Designed for small employers, the On-site Consultation Program can help you identify hazards and find effective and economical solutions for eliminating or controlling them. The service is cost-free and confidential, and there are no fines even if problems are discovered during the consultant's visit to your site. The consultant can also assist you in developing and implementing an injury and illness prevention program—an effective way to manage safety and health at your workplace.

In your state, the OSHA On-site Consultation Program may be contacted at:

Telephone:
E-mail:
Website:

Please refer to the enclosed brochure for more information.

Sincerely,

David Michaels, PhD, MPH

C.2 Cover Letter to State OSHA Offices

U.S. Department of Labor

Occupational Safety and Health Administration
Washington, D.C. 20210

First Name Last Name
State Office
Address
City, State ZIP

Dear First Name Last Name:

As you know, Abt Associates is working with the DOL Chief Evaluation Office to conduct the DOL On-site Consultation Marketing Study. As a contractor to the Department of Labor, Abt Associates is working closely with OSHA and the OSHCON board to develop and test the effectiveness of 17 different marketing brochures.

To evaluate the brochures, the U.S. Department of Labor is conducting a mass mailing of the marketing brochures to a focused set of small businesses:

- establishments in industries that were affected by the former Amputation NEP,
- establishments that appeared on the 2013 SST List,
- establishments that are in other non-construction industries with high rates of illness and injury, and
- establishments in the nursing home industry.

In total, 102,000 small businesses across the United States were included in the study. These businesses are located in 48 states and the District of Columbia. Kentucky and Washington were excluded from the mailing due to the structure of their state consultation programs. U.S. territories were also excluded.

From the total pool of businesses, 34,000 businesses were selected by lottery to receive OSHA's current consultation brochure or one of 16 new brochures designed by marketing experts. Another 68,000 were selected to receive no brochure. The sites that were selected to receive brochures will receive three mailings. The first round of brochures was mailed earlier this week, the second mailing will occur on May 19th, and the third will occur in June 16th. Half of these sites will also receive 3 emails.

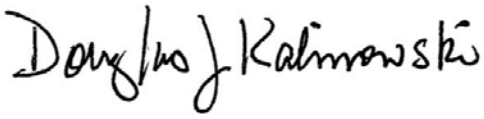
We understand that this study has the potential to create an increased backlog in some states. The Department of Labor will be collecting information about this in order to understand any backlog that occurs. This is important given the implication a backlog might have on overall service delivery. As a result of this study, you may receive an increased number of calls, emails, or website visits. Any replies to the study emails sent will be forwarded directly to your state using the email listed on the brochure.

Enclosed are the 17 brochures that have been mailed as well as a copy of the cover letter that was signed by Dr. Michaels and sent to each business. When you review the brochures you will notice that there are three brochure formats and multiple brochures within each format. For example, there are four brochures with a smart phone texting format, two with manufacturing related images and two with nursing home related images. These brochures represent two different marketing messages; each message laid out with both manufacturing and nursing home images.

The brochures include your state program's telephone number, email address, and website on the back. As you may recall, in January 2014, a representative from Abt Associates called your state consultation program to confirm your contact information. However, if any of the contact information on the brochures is incorrect, please notify Cora Goldston at (617) 520-2672 or cora_goldston@abtassoc.com. Abt will note the revised contact information and update the brochures prior to next round of mailings in May 2014.

If you have any questions about the study, please contact Bruce Love in the Office of Small Business Assistance at (202) 693-2373 or love.bruce@dol.gov, or the project director, Amy Minzner at (617) 349-2314 or amy_minzner@abtassoc.com.

Sincerely,



Douglas J. Kalinowski
Director
OSHA/Directorate of Cooperative and
State Programs

Appendix D: Source of Request

Each record in OSHA's OIS and IMIS consultation data systems includes a field describing the source of the request. This field identifies the manner in which the establishment's staff became aware of the OSHA consultation program and what caused them to make the request, chosen from a list of 18 possible hard-coded possibilities (see Exhibit D.1). These data were used to conduct an exploratory analysis of the difference in identified sources of requests between the establishments that did and did not receive marketing materials for requests made in the six month period after the marketing letters and emails were sent out. Because of the conceptual difficulty associated with attributing a request to any single source, the small sample sizes available for analysis, and the large number of requests for which the source was identified as "other," we recommend interpreting this data with caution.[47]

Exhibit D.1 displays the number and proportion of establishments within five different random assignment conditions that marked each option as the source of the request. The white cells in each row indicate the number of establishments that selected each option and the gray highlighted cells report what percentage of all establishments with that treatment condition selected that specific option. The exhibit reports the number and percentages for five randomly assigned groups: the control group, the OSHA-brochure treatment group separately by distribution mode and the theory-based brochure treatment group separately by distribution mode.

Several factors make it difficult to conduct a rigorous analysis of the sources of the request. First, some response options were only available for consultation requests coming from either the OIS or the IMIS systems, but not both (these response options are shown in the exhibit with *IMIS* or *OIS* labels). Because different options were available depending on which system the state OSHA agency was using at the time, a direct comparison is difficult to make, and the "Other" category may also not be an unbiased comparison. Additionally the source of request field has been largely unchanged since the implementation of IMIS in 1996. While an "Online" option was added with the rollover to OIS, an "Email" option is still unavailable, making it unclear which option would have been selected by establishments in the study's "mail plus email" treatment arms. For these reasons, we limit our analysis to the presentation of this data in Exhibit D.1.

Exhibit D.1: Source of Request by Treatment Status

Source of Request	Treatment Status					
	Control Group	OSHA Mail	OSHA Email	Theory-Based Mail	Theory-Based Email	Total
Marketing Brochure (*OIS*)	1	1	1	5	9	17
	0.1%	1.1%	1.2%	1.5%	2.7%	
Direct Solicitation by Mail	48	7	17	50	38	160
	5.9%	7.9%	19.8%	14.8%	11.3%	

[47] Consider an establishment that schedules a consultation after receiving a brochure and then visiting OSHA's website. Would the establishment attribute the request to the brochure or to the website?

Source of Request	Treatment Status					
	Control Group	OSHA Mail	OSHA Email	Theory-Based Mail	Theory-Based Email	Total
Client Referral	105	9	9	37	41	201
	12.8%	10.1%	10.5%	10.9%	12.2%	
Direct Solicitation Door To Door	34	1	3	6	9	49
	4.2%	1.1%	3.5%	1.8%	2.7%	
Direct Solicitation by Telephone	211	25	19	93	92	440
	25.7%	28.1%	22.1%	27.4%	27.3%	
Media (Newspaper/Magazine)	0	0	0	1	0	1
	0.0%	0.0%	0.0%	0.3%	0.0%	
New Standard	0	0	0	2	0	2
	0.0%	0.0%	0.0%	0.6%	0.0%	
OSHA Complaint Referral	30	4	0	5	5	44
	3.7%	4.5%	0.0%	1.5%	1.5%	
OSHA Publication (*IMIS*)	0	0	1	1	0	2
	0.0%	0.0%	1.2%	0.3%	0.0%	
OSHA Standard	12	1	2	3	4	22
	1.5%	1.1%	2.3%	0.9%	1.2%	
Online (*OIS*)	68	11	7	28	28	142
	8.3%	12.4%	8.1%	8.3%	8.3%	
Other (*IMIS*)	58	4	6	26	21	115
	7.1%	4.5%	7.0%	7.7%	6.2%	
Other (*OIS*)	196	20	18	69	75	378
	23.9%	22.5%	20.9%	20.4%	22.3%	
Professional/Trade Association Publication	4	0	0	0	0	4
	0.5%	0.0%	0.0%	0.0%	0.0%	
Professional/Trade Association Meeting	8	0	1	3	4	16
	1.0%	0.0%	1.2%	0.9%	1.2%	
Referral from other Discipline	18	4	1	3	3	29
	2.2%	4.5%	1.2%	0.9%	0.9%	
Safety/Health Conference	4	0	1	2	0	7
	0.5%	0.0%	1.2%	0.6%	0.0%	
Settlement/Litigation Referral	23	2	0	5	8	38
	2.8%	2.3%	0.0%	1.5%	2.4%	
Total	820	89	86	339	337	1671

Appendix E: Baseline Treatment/Control Balance Tests

Random assignment should ensure that there are no systematic differences in the baseline characteristics of establishments across study arms. To check whether random assignment was successfully implemented, and to verify that there were no large chance differences in baseline characteristics, we conducted baseline balance tests across the treatment (pooled across messages) and control groups in each of the four industry/establishment groups. Exhibits E.1–E.4 report these tests. We tested for balance across the pooled "any marketing" treatment group (column 2) and the "no marketing" control group (column 3). The p-value for each test is reported in the final column of each table. Across the four industry/establishment groups, we conducted 32 balance tests and found 3 significant differences with p-values less than 0.10, which is approximately what would be expected by chance. None of these differences are substantively large.

Exhibit E.1: Amputation NEP (Group 1)

Characteristic	Any Marketing	Control	Difference	P value
Federal Plan	43.8%	43.9%	-0.1%	0.811
Establishment number of employees	40.3	41.0	-0.7	0.196
Consultation Request History				
Made OSC request in past 5 years	8.4%	8.4%	0.0%	0.989
Number of OSC requests in past 5 years	0.17	0.16	0.01	0.167
Inspection History				
Received an inspection in past 12 months	2.6%	2.5%	0.0%	0.978
Number of inspections in past 12 months	0.03	0.03	0.00	0.559
OSHA Region				
I Boston	5.3%	5.7%	-0.4%	0.520
II New York City	7.9%	8.1%	-0.2%	
III Philadelphia	8.8%	8.5%	0.3%	
IV Atlanta	17.2%	17.1%	0.2%	
V Chicago	25.9%	25.5%	0.4%	
VI Dallas	10.2%	10.1%	0.1%	
VII Kansas City	4.8%	4.7%	0.2%	
VIII Denver	2.8%	3.1%	-0.3%	
IX San Francisco	14.5%	14.7%	-0.2%	
X Seattle	2.6%	2.6%	0.0%	

Note: Two-sided test: *p<0.1, **p<0.05, ***p<0.01.

Exhibit E.2: High-Hazard Industries (Group 2)

Characteristic	Any Marketing	Control	Difference	P value
Federal Plan	43.9%	43.2%	0.7%	0.233
Establishment number of employees	44.7	43.8	0.9	0.141
Consultation Request History				
Made OSC request in past 5 years	7.2%	7.5%	-0.3%	0.304
Number of OSC requests in past 5 years	0.13	0.14	-0.01	0.209
Inspection History				
Received an inspection in past 12 months	2.1%	2.3%	-0.3%	0.106
Number of inspections in past 12 months	0.02	0.02	0.00	0.168
OSHA Region				
I Boston	5.5%	5.6%	-0.2%	0.120
II New York City	9.3%	9.4%	-0.1%	
III Philadelphia	8.6%	7.7%	0.9%	
IV Atlanta	16.5%	16.6%	-0.1%	
V Chicago	23.1%	23.9%	-0.8%	
VI Dallas	10.3%	10.3%	0.0%	
VII Kansas City	5.0%	5.0%	0.0%	
VIII Denver	3.0%	3.1%	-0.1%	
IX San Francisco	16.5%	16.4%	0.1%	
X Seattle	2.3%	2.0%	0.3%	

Note: Two-sided test: *p<0.1, **p<0.05, ***p<0.01.

Exhibit E.3: Nursing and Residential Care Facilities (Group 3)

Characteristic	Any Marketing	Control	Difference	P value
Federal Plan	51.7%	50.4%	1.3%	0.181
Establishment number of employees	82.8	82.9	-11.5%	0.932
Consultation Request History				
Made OSC request in past 5 years	8.7%	9.5%	-0.7%	0.194
Number of OSC requests in past 5 years	0.15	0.17	-1.1%	0.374
Inspection History				
Received an inspection in past 12 months	1.5%	1.5%	0.0%	0.967
Number of inspections in past 12 months	0.02	0.02	0.1%	0.810
OSHA Region				
I Boston	5.9%	6.0%	-0.1%	0.213
II New York City	6.4%	6.4%	0.0%	
III Philadelphia	9.1%	10.0%	-0.8%	
IV Atlanta	17.4%	17.2%	0.2%	
V Chicago	21.0%	21.3%	-0.3%	
VI Dallas	13.8%	13.8%	0.0%	
VII Kansas City	9.8%	8.5%	1.3%	
VIII Denver	4.2%	4.6%	-0.4%	
IX San Francisco	10.1%	10.4%	-0.4%	
X Seattle	2.4%	1.9%	0.6%	

Note: Two-sided test: *p<0.1, **p<0.05, ***p<0.01.

Exhibit E.4: SST High Rate Letter List (Group 4)

Characteristic	Any Marketing	Control	Difference	P value
Federal Plan	75.1%	74.6%	0.5%	0.706
Establishment number of employees	81.7	85.0	-329.2%	0.137
Consultation Request History				
Made OSC request in past 5 years	27.1%	29.7%	-2.6%	0.061*
Number of OSC requests in past 5 years	0.59	0.68	-8.4%	0.043**
Inspection History				
Received an inspection in past 12 months	0.2%	0.1%	0.1%	0.395
Number of inspections in past 12 months	0.00	0.00	0.1%	0.353
OSHA Region				
I Boston	12.8%	13.8%	-1.0%	0.729
II New York City	11.5%	12.2%	-0.8%	
III Philadelphia	12.1%	11.7%	0.4%	
IV Atlanta	12.8%	12.2%	0.5%	
V Chicago	22.6%	21.6%	1.0%	
VI Dallas	14.4%	14.5%	-0.1%	
VII Kansas City	7.0%	6.9%	0.1%	
VIII Denver	4.4%	3.9%	0.4%	
IX San Francisco	1.4%	1.4%	0.0%	
X Seattle	1.1%	1.8%	-0.6%	

Note: Two-sided test: *p<0.1, **p<0.05, ***p<0.01.

Appendix F: Regression Coefficients

Exhibits F.1 and F.2 report the regression parameters from the mixed model used to estimate the main impacts. The tables report the estimated coefficient, standard error, and p-value for each of the treatment conditions and covariates used in the models. Exhibit F.1 reports the regression parameters for the model estimating impacts on the pooled sample of three establishment groups (amputation NEP, nursing homes, and high-hazard industries) and Exhibit F.2 reports parameters from the model used to estimate the impact for the SST establishment group. These models were used to calculate the estimated impacts and predicted treatment effects displayed in Chapter 6.

Exhibit F.1: Regression Parameters for Model Estimating Across Three Pooled Establishment Groups

	Coefficient	Standard Error	p-Value
Message: SDT	0.0099	0.0023	<0.001***
Message: EPPM	0.0090	0.0030	0.003***
Message: Safety Pays	0.0112	0.0023	<0.001***
Exemplar: Myth/Fact	-0.0001	0.0024	0.973
Exemplar: Future	-0.0006	0.0024	0.798
OSHA brochure	0.0090	0.0016	<0.001***
Email	0.0000	0.0015	0.982
Consultation request in past 5 years	0.0679	0.0013	<0.001***
Inspection in past 12 months	0.0022	0.0024	0.347
OSHA Federal Plan	0.0031	0.0007	<0.001***
Number of Employees (divided by 10)	0.0002	0.0001	0.001***
Employee Strata	0.0039	0.0008	<0.001***
Establishment Group 2: High Hazard	-0.0017	0.0008	0.026**
Establishment Group 3: Nursing Homes	0.0009	0.0013	0.501

Notes: n=97,183 observations. Level-1 R-squared = 0.01; Level-2 R-squared = 0.15

Two-sided test: *p<0.1, **p<0.05, ***p<0.01.

Exhibit F.2: Regression Parameters for Model Estimating for SST Group

	Coefficient	Standard Error	p-value
Message: SDT	-0.0019	0.0121	0.877
Message: EPPM	0.0046	0.0153	0.761
Message: Safety Pays	0.0106	0.0121	0.378
Exemplar: Myth/Fact	0.0035	0.0118	0.768
Exemplar: Future	0.0037	0.0118	0.754
OSHA brochure	0.0124	0.0109	0.256
Email	-0.0006	0.0078	0.940
Consultation request in past 5 years	0.1006	0.0070	<0.001***
OSHA Federal Plan	-0.0085	0.0073	0.242
Number of Employees (divided by 10)	0.0008	0.0004	0.090*
Employee Strata	0.0170	0.0084	0.044**

Notes: n=4,840 observations. Level-1 R-squared = 0.00; Level-2 R-squared = 0.30

Two-sided test: *p<0.1, **p<0.05, ***p<0.01.

Appendix G: Empirical Bayes Theory

This appendix provides technical detail on the methods used in the analysis of research question #3; i.e., determining how large is the impact of the theory-based message, exemplar, and mode that has the largest impact, relative to no marketing. The first section of the appendix presents a derivation of Empirical Bayes (EB) shrinkage estimators formulated for this analysis. The second section relates that generic derivation to this analysis.

G.1 Empirical Bayes and Shrinkage

Suppose you have a noisy measure (with a "d" for "data" superscript) of the true mean (with a "t" for "true" superscript) for cell *k* (of *K* cells). Denoting the (mean zero across all cells) measurement error (i.e., sampling variability) by ε, we have:

$$(1)\quad y_k^d = y_k^t + \varepsilon_k; \quad E[\varepsilon_k] = 0; \quad Var[\varepsilon_k] = \sigma_\varepsilon^2$$

Suppose you also have a "model" (with an "m" superscript)—where the model might simply be the grand mean or some estimated regression—and the model deviates from the true mean by μ:

$$(2)\quad y_k^t = y_k^m + \mu_k; \quad E[\mu_k] = 0; \quad Var[\mu_k] = \sigma_\varepsilon^2$$

Substituting from (2) into (1) yields:

$$(3)\quad y_k^d = y_k^m + \mu_k + \varepsilon_k$$

In this model, as the noise gets small (i.e., $\sigma_\varepsilon^2 \sim 0$), the data-based estimate approach the true mean, i.e.,:

$$(4)\quad y_k^t \sim y_k^d$$

Conversely, when the model is very good (i.e., $\sigma_\mu^2 \sim 0$), the model approaches the true mean:

$$(5)\quad y_k^t \sim y_k^m$$

Empirical Bayes shrinkage estimators (with an "s" superscript) use estimators of the form:

$$(6)\quad \begin{aligned} y_k^s &= \rho_k y_k^d + (1 \quad \rho) y_k^m \\ &= \rho_k (y_k^m + \mu_k + \varepsilon_k) + (1 \quad \rho)(y_k^m) \\ &= y_k^m + \rho_k \mu_k + \rho_k \varepsilon_k \end{aligned}$$

And we will now show that the minimum mean square error value for ρ_κ is:

$$(7)\quad \rho_k = \frac{\sigma_{\mu_k}^2}{\sigma_{\varepsilon_k}^2 + \sigma_{\mu_k}^2}$$

Specifically, we choose ρ, to minimize the mean square error:

(8)
$$\begin{aligned}\min_{\rho} MSE &= E\left[\left\{y_k^s - y_k^t\right\}^2\right] \\ &= E\left[\left\{\left(y_k^m + \rho_k\mu_k + \rho_k\varepsilon_k\right) - \left(y_k^m + \mu_k\right)\right\}^2\right] \\ &= E\left[\left\{\rho_k\varepsilon_k - \left(1-\rho_k\right)\mu_k\right\}^2\right] \\ &= E\left[\rho_k^2\varepsilon_k^2 + \left(1-\rho_k\right)^2\mu_k^2\right] \\ &= \rho_k^2\sigma_{\varepsilon_k}^2 + \left(1-\rho_k\right)^2\sigma_{\mu_k}^2\end{aligned}$$

Where the cross-term is zero because μ and ε are assumed independent. Then, the first order condition for an optimum is given by:

(9)
$$\begin{aligned}0 &= 2\rho_k\sigma_{\varepsilon_k}^2 - 2\left(1-\rho_k\right)^2\sigma_{\mu_k}^2 \\ \rho_k &= \frac{\sigma_{\mu_k}^2}{\sigma_{\mu_k}^2 + \sigma_{\varepsilon_k}^2}\end{aligned}$$

Which is exactly Equation 7.

G.2 Applying Shrinkage to Estimated Cell Means

The previous derivation assumed that we knew σ_ε^2 and σ_μ^2. In our application, we can estimate them from the data.

We estimate the simple cell mean, y_k^d , from micro-data. The variance of the estimated cell mean provides an estimate of $\sigma_{\varepsilon_k}^2$.

We assume that the (variance of the) modelling error is constant across cells; i.e., $\sigma_{\mu_k}^2 = \sigma_\mu^2$.

Then, returning to Equation 3 and noting that each of the terms on the right are orthogonal, we can write:

(10) $\sigma_d^2 = \sigma_m^2 + \sigma_\mu^2 + \bar{\sigma}_\varepsilon^2$

We observe y_k^d and we estimate y_k^m , so we can compute σ_d^2 and σ_m^2 directly from the data. We can estimate the mean value of σ_ε^2 , $\bar{\sigma}_\varepsilon^2$, as we estimate y_k^d. It follows that we can estimate σ_μ^2 by subtraction:

$\sigma_\mu^2 = \sigma_d^2 - \sigma_m^2 - \bar{\sigma}_\varepsilon^2$

Appendix H: Cumulative Request Rates by Week

This appendix presents graphs showing the week-by-week cumulative request rate broken down by industry/establishment group, message, exemplar, and distribution mode. Statistical tests for the impact of each of these factors are presented in the main text for the six-month follow-up period as a whole. The graphs in this appendix are intended as supplementary material; no additional statistical tests are presented and no interpretation is offered.

For the main analysis, we pre-specified a six-month follow-up window for the statistical analysis. To ensure that all consultation requests made during that window were recorded in OIS at the time we received the data, we requested data for a 29-week follow-up period. The graphs in this appendix show the rate of requests for this full 29-week window.

Exhibit H.1 shows the cumulative request rate for each week after the first brochures were mailed, broken down by industry/establishment group—the Amputation NEP (amp), Nursing Homes (nur), and High-Hazard Manufacturing industries (hih) as well as the 2013 SST High Rate Letter group of establishments (sst). The statistical tests presented in the main text confirm that there is no significant difference in the impact across the three industry groups, which were pooled for analysis purposes in the body of the report. For each industry/establishment group, Exhibit H.1 shows the request rate separately for the treatment group (pooled across messages, exemplars, and modes) and the no-marketing control group.

Exhibit H.1: Cumulative Request Rate, by Industry/Establishment Group

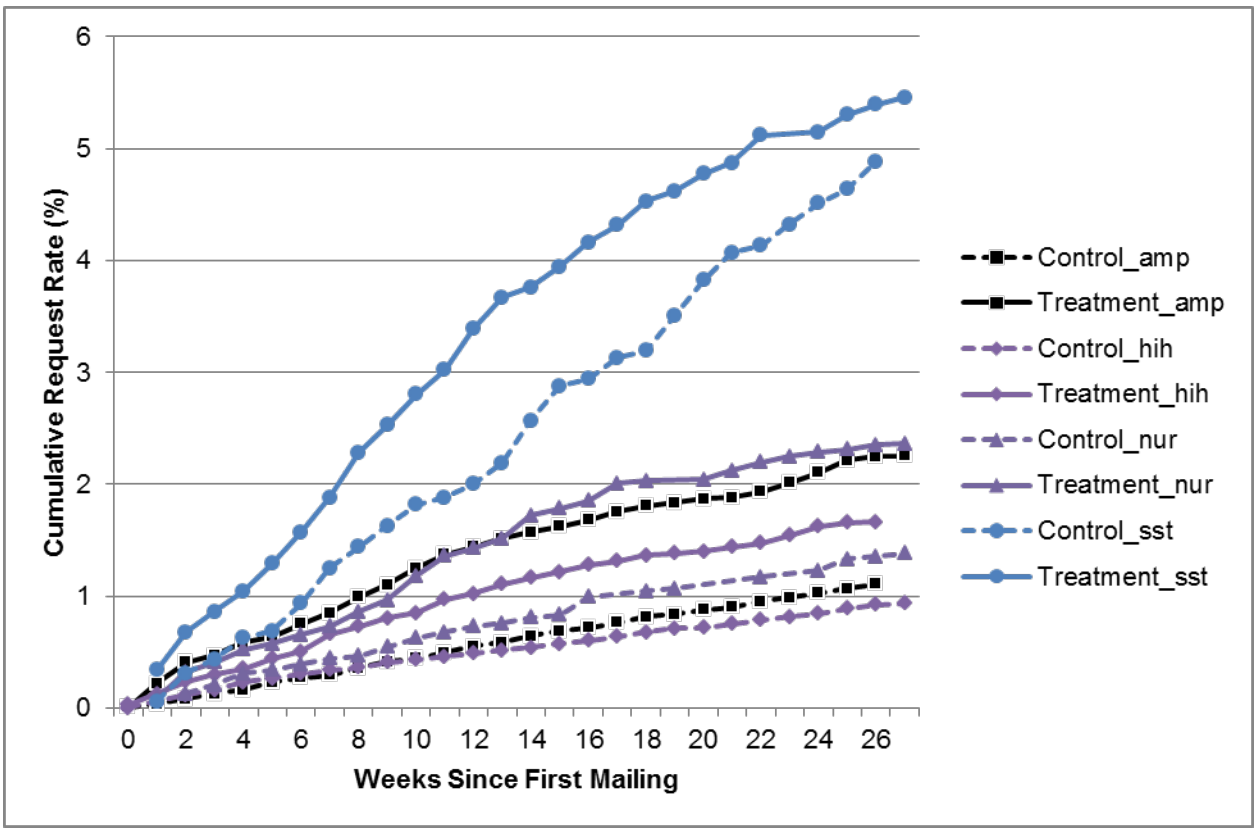


Exhibit H.2 shows the cumulative request rate for each week after the first brochures were mailed, broken down by the type of message (i.e., Extended Parallel Processing Model/EPPM, Self-Determination Theory/SDT, Expectancy Theory/Safety Pays/SP, and the current OSHA brochure). Exhibit H.2 shows the request rate for the control group, as well as for the treatment group assigned to each of the four messages. These request rates are pooled across (i.e., are an average of) the three industry groups but exclude establishments on the 2013 SST list. Statistical tests presented in Chapter 6 confirm that there is no significant difference in the impact across messages during the full six-month follow up.

Exhibit H.2: Cumulative Request Rate, by Message

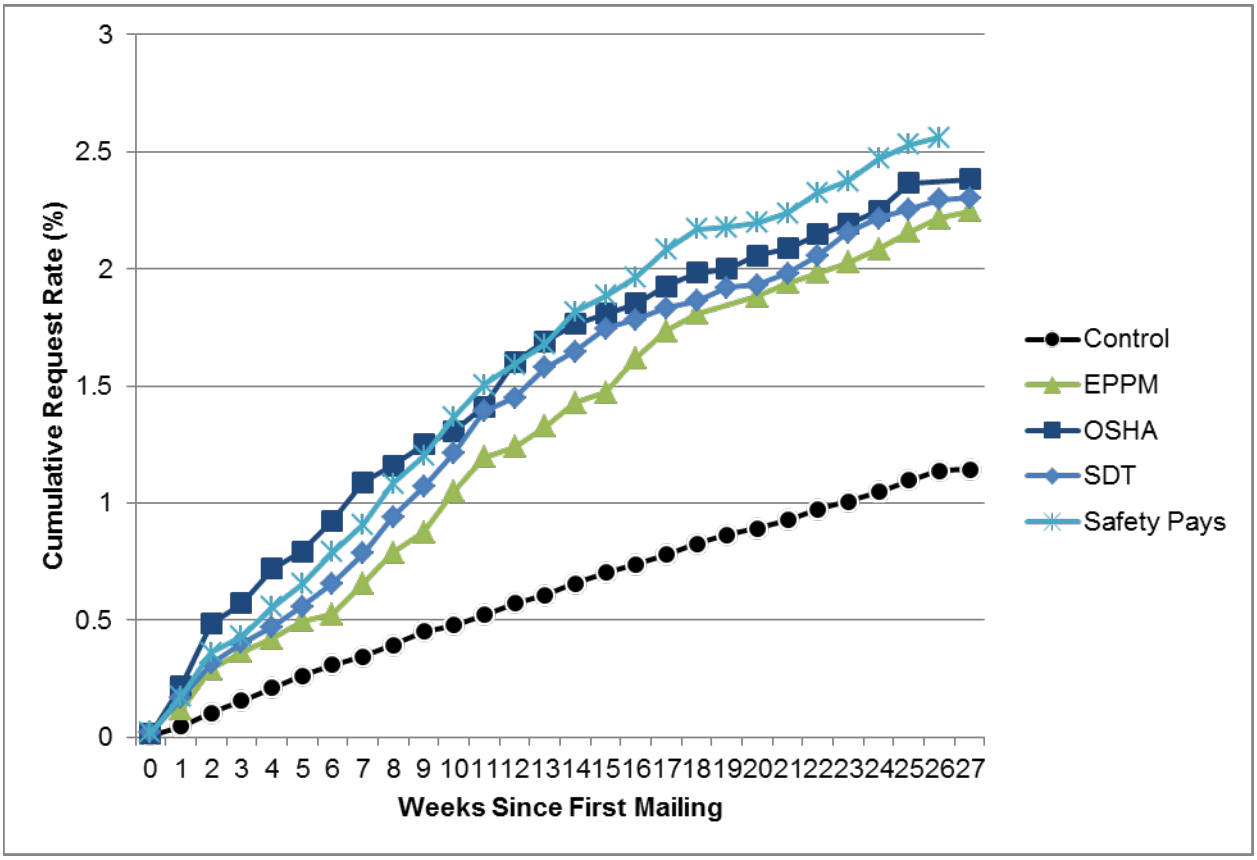


Exhibit H.3 shows the cumulative request rate for each week after the first brochures were mailed, broken down by exemplar (i.e., Dialogue, Future Orientation, Myth/Fact, and the current OSHA brochure). Exhibit H.3 shows the request rate for the control group, as well as for the treatment group assigned to each of the three exemplars. These request rates are pooled across (i.e., are an average of) the three industry groups (again excluding establishments on the 2013 SST list). Statistical tests presented in Chapter 6 confirm that there is no significant difference in the impact across exemplars during the full six-month follow up.

Exhibit H.3: Cumulative Request Rate, by Exemplar

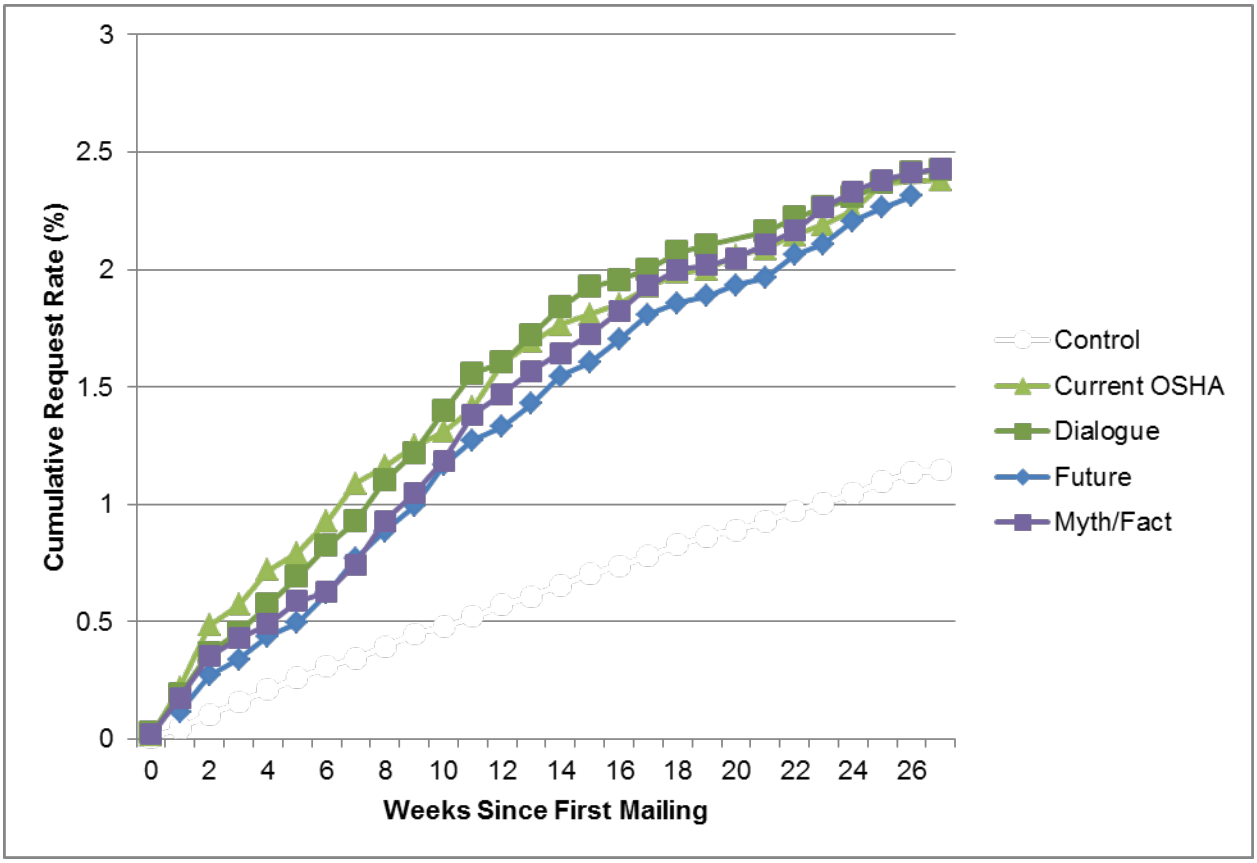
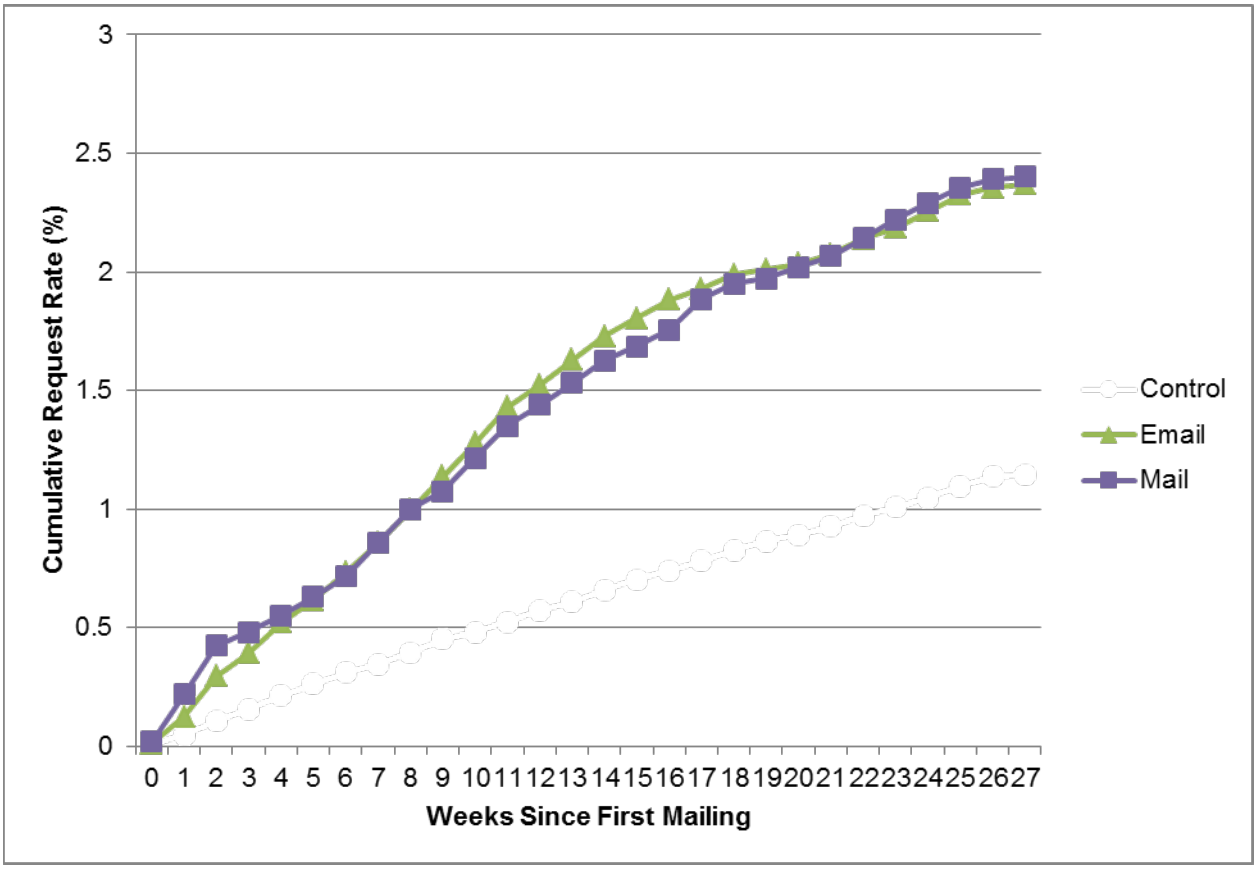


Exhibit H.4 shows the cumulative request rate for each week after the first brochures were mailed, broken down by distribution mode (i.e., mail only versus mail plus email). Exhibit H.4 shows the request rate for the control group, as well as for the treatment group assigned to each of the two distribution modes. These request rates are pooled across (i.e., are an average of) the four messages, and are also pooled across the three industry groups (again excluding establishments on the 2013 SST list). Statistical tests presented in Chapter 6 confirm that there is no significant difference in the impact across modes during the full six-month follow up.

Exhibit H.4: Cumulative Request Rate, by Distribution Mode



Appendix I: Tracking

After the hard-copy brochures and emails were sent out, we made an effort to track which communications were successfully delivered to the intended recipients. Determining the actual rate of successful delivery helps to shed light on the viability of using Dun & Bradstreet address data for this type of research. Understanding which establishments, or types of establishments, were more or less likely to receive the brochures could also be a useful interpretive factor when conducting the actual impact analysis.

Abt, Abt SRBI, and OSHA worked collaboratively on this tracking effort. For the hard-copy mailings, USPS returned to OSHA's office in Washington, DC, all mail with invalid addresses or which the recipient had marked as undeliverable. OSHA's mailroom then held the undeliverable mailings for pickup. Abt SRBI staff made three trips to the OSHA office to collect the undelivered mail, one between the first and second mailing, and two between the second and third mailings.[48] We classified all returned letters as "undeliverable" and noted them in our logs. Because it often took several weeks to receive returned mail from USPS, the establishments with undeliverable letters were only removed from the third and final round of mailings once that information had been collected. Based on tracking data from the first two rounds of mailings, roughly 5 percent of the letters that were sent out were returned as undeliverable. Such a low return rate is promising for the study, and is small enough to have little to no impact on our final analyses.

Across the four establishment groups, we saw a much lower rate of returned mailings for establishments that were selected based on their inclusion on OSHA's 2013 HRL list. This suggests that OSHA's HRL list contains more accurate information than the Dun & Bradstreet database. Although the HRL list was created before the data were pulled from Dun & Bradstreet, there may have been a lower rate of returned mailings because the HRL list had been updated more recently than the Dun & Bradstreet database. Exhibit I.1 shows the rate of returns from the first round of mailings.

Exhibit I.1: Mail Returns from the First Round of Mailings

	HRL List		Amputation NEP		Nursing Homes		High Hazard		Total Pooled	
Status	number	%	number	%	number	%	number	%	number	%
Mail Sent	3244	100	11433	100	7776	100	11643	100	34096	100
Mail Returned	63	2	555	5	487	6	658	6	1763	5
Net Mailings (Sent minus Returned)	3181	98	10878	95	7289	94	10985	94	32333	95

Finally, Abt SRBI also tracked the delivery rate of emails that were sent. All emails that could not be delivered (because either they were bounced back due to invalid addresses or they were queued by the recipient's server and never delivered) were considered undeliverable. If an email bounced back or was

[48] We did not collect returned mail returned after the third and final mailing since we did not need the information to update our sample.

not able to be delivered, Abt SRBI removed the address from future rounds of emails. Among establishments for which we had at least one email address, 86 percent were successfully delivered.

Appendix J: Marketing Materials

This appendix has two sections:

- Brochures
- Emails