

## What is the evidence on targeted or remote compliance assistance and enforcement strategies to assist employers in conforming to new and existing health, safety, and work requirements under COVID-19?

For both businesses and regulatory bodies, the COVID-19 pandemic has increased the complexity of following, enforcing, and providing assistance around new and existing health, safety, and work regulations.<sup>2</sup> As regulatory agencies consider how to best support employers and workers during this time, the evidence on existing remote compliance assistance and enforcement strategies and the features that make them effective can inform approaches and support the health and safety goals of agencies, businesses, and workers. This rapid evidence review summarizes the literature on three types of strategies:

1. Targeted enforcement
2. Compliance assistance
3. Self-monitoring programs

In reviewing this literature, we focused on studies that documented the disparate impacts of remote versus in-person compliance assistance and regulation, as well as evidence on strategies to limit the impacts on disadvantaged populations, given the pandemic's disproportionate effects on these groups (Rho et al., 2020; Hawkins, 2020). The evidence presented here is based on a rapid review conducted by the U.S. Department of Labor's (DOL) Clearinghouse for Labor Evaluation and Research (CLEAR).<sup>3</sup> This rapid review includes 40 publications; of these, 26 are causal, 9 are descriptive, and 5 are other types of studies (Figure 1). A supplement to this rapid evidence review provides citations with links to the publications and details about how this review was conducted.

**Targeted enforcement** prioritizes workplace inspections toward some firms or industries. The strategy helps allocate resources efficiently. In the context of COVID-19, targeted enforcement may be a way to deter workplace violations while limiting onsite inspections.

**Compliance assistance** refers to the guidance that regulatory agencies provide to firms to help them understand and comply with laws and regulations. This may take the form of trainings and educational materials provided through bulletins, posters, and fact sheets to promote and clarify regulations to both employers and employees. Compliance assistance may be additionally valuable in the current environment to the extent that it can be done effectively and remotely.

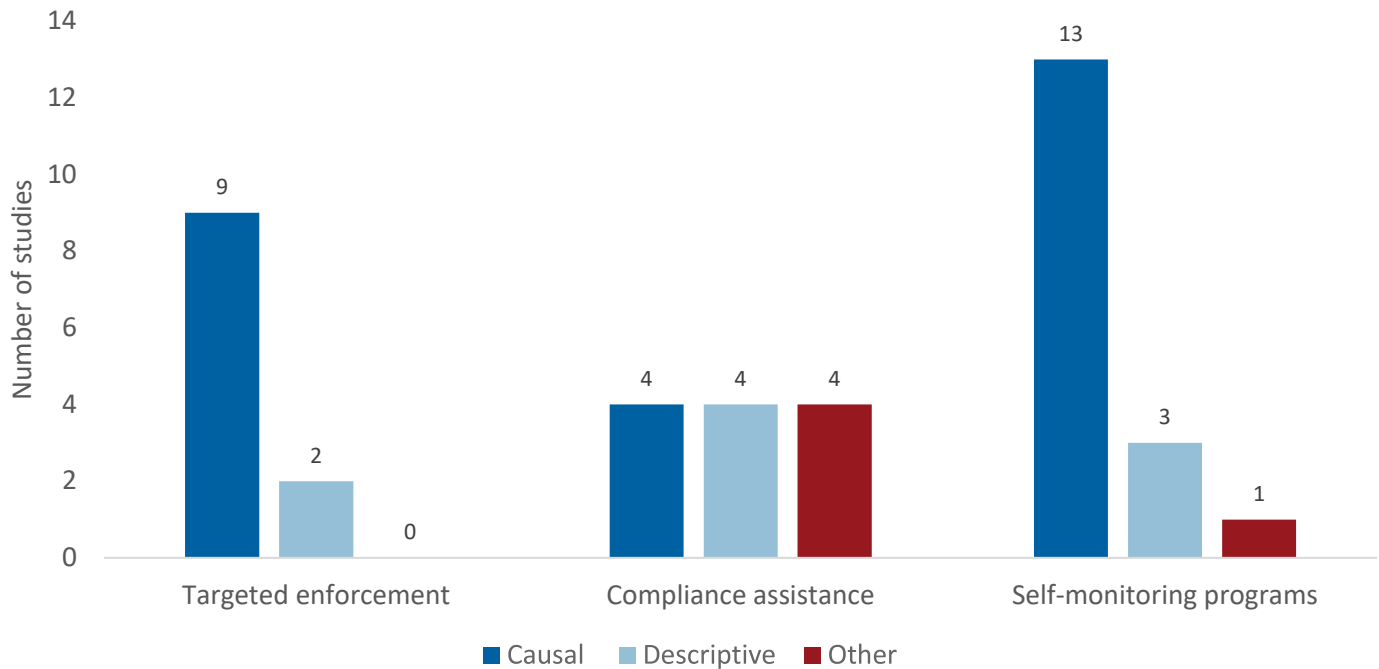
**Self-monitoring programs** are initiatives that encourage firms to monitor their own regulatory compliance and voluntarily report their violations. These programs are often accompanied by incentives such as lower penalties or immunity for self-disclosed violations. Regulators have employed these programs as a nonadversarial way to enforce laws and regulations. Given that self-monitoring programs do not require in-person contact between regulators and firms, the strategy might be a good alternative to onsite enforcement mechanisms.

<sup>1</sup> This version includes literature published between January 1, 2000, and October 15, 2021. The Department of Labor's (DOL) Clearinghouse for Labor Evaluation and Research (CLEAR) continues to search for relevant literature and may update this synthesis as new research emerges.

<sup>2</sup> Regulatory agencies such as the Occupational Safety and Health Administration (OSHA) and the Wage and Hour Division (WHD) under DOL have issued new rules and guidelines to mitigate risks associated with the COVID-19 pandemic. For example, OSHA introduced rules aiming to limit the exposure of workers to the virus, and WHD introduced rules to allow workers paid time off to care for the health of family members.

<sup>3</sup> CLEAR's mission is to make research on labor topics more accessible to practitioners, policymakers, researchers, and the public, and to support evidence-informed decision making. CLEAR does this by conducting systematic evidence reviews, summarizing individual studies of programs, and synthesizing research across individual evidence bases. To date, CLEAR has conducted more than 21 evidence reviews and summarized more than 1,300 studies.

**Figure 1. Types of studies by strategy**



## 1. Targeted enforcement

► **The evidence suggests that targeting workplace inspections to high-risk establishments is effective at fostering workplace safety, particularly in some industries.** The most relevant evidence comes from two rigorous evaluations of the Occupational Safety and Health Administration’s (OSHA) Site-Specific Targeting (SST) plan that directs routine inspections toward establishments with historically high rates of accidents and injuries. Through the plan, OSHA inspections reduced serious injuries and illnesses<sup>4</sup> over a 5-year period by an average of 9 percent (or 2.4 injuries) for high-risk establishments that were randomly chosen for inspections relative to other establishments on the priority list (Johnson et al., 2020).

A separate study compared the outcomes of firms that barely satisfied the criteria to be included in the SST plan to those firms that barely did not; the authors estimated that the plan averted a broader range of injuries involving days away from work, job restrictions, and job transfers by as much as 20 percent in the year following an inspection, or 1.8 injuries per 100 full-time equivalent workers (Li & Singleton, 2019). Research further suggested that targeted inspections were most effective when directed toward firms in the manufacturing industry and least effective in health services (for example, nursing homes). Ergonomics-related injuries represented a large share of nursing home injuries, and OSHA did not have standards for ergonomics. Therefore, researchers hypothesized that the low efficacy within the health services sector might be due to the lack of ergonomics standards and noted further research would be needed (Johnson et al., 2020).

<sup>4</sup> “Serious injuries and illnesses” refers to injuries and illnesses that lead to days away from work.

Evidence from other countries also pointed to both the effectiveness and limits of targeted enforcement. Cross-country evidence comparing outcomes across Great Britain, Germany, and France suggested that workplace injuries did not necessarily decline with more workplace inspections but that targeting establishments that pose the highest risks of violating safety standards might improve outcomes. Although workplace inspections were conducted 2 to 4 times more often in Germany and France, Great Britain experienced substantially fewer fatal occupational injuries per capita than both countries from 2008 to 2014. Researchers found that an important factor in achieving this outcome is Great Britain's extensive use of establishment data and risk indicators to target its inspections (Blanc, 2018). In Canada, however, a randomized controlled trial (Hogg-Johnson et al., 2012) did not find any observed differences in work injury claims and disability day rates among high-risk firms that were selected to receive targeted health and safety consultations, selected to receive targeted inspections, or received services as usual. However, the authors of this study suggested that targeted efforts might not have worked as expected because the targeting strategy did not account for firm size (inadvertently targeting smaller firms that might or might not have truly been high risk) or because inspections had relatively limited durations and intensities.<sup>5</sup>

Another approach that was studied involves selecting firms to target based on how they are performing relative to their peers. Specifically, audits are targeted toward firms that are believed to be less compliant, thus creating competition among the regulated entities to *avoid* such an audit by increasing their level of compliance. In a recent study of U.S. chemical manufacturing facilities, Earnhart and Friesen (2021) determined that this approach, which they term "relative targeting," improved compliance with discharge limits established by the U.S. Clean Water Act.

Relatedly, transparency may improve enforcement outcomes for both the entities targeted with negative publicity (specific deterrence) and similar facilities that wish to avoid such publicity (general deterrence). In 2009, OSHA created a policy stating that a press release would be issued noting a facility's violations if the financial penalties exceeded \$40,000 or \$45,000 (the cutoff value depended on the region). Prior to 2009, OSHA regional offices had issued press releases noting specific violations and fines assessed at facilities; however, these press releases were at the discretion of each regional office. Reasoning that noninspected facilities in the same industry would learn of the violation and penalties through local newspapers or industry publications, Johnson (2020) studied the effect of the policy on specific and general deterrence for a 3-year period after the penalties were assessed. Johnson found that violations and financial penalty amounts were significantly lower in noninspected facilities in the same industry. The author found that these effects lasted for 3 years and, while more pronounced at facilities within 5 kilometers, were seen in facilities as far away as 50 kilometers. The author concluded that one press release had a general deterrence effect equal to 210 OSHA inspections. Johnson also found a general deterrence effect in the number of inspections triggered due to a facility having a fatal

---

<sup>5</sup> The method for identifying high-risk firms in this study's targeted enforcement program involved identifying the worst performing firms based on work injury claims per worker and comparing these firms with other firms in the sector, irrespective of size. As a result, some firms were classified as high risk simply because they were small and had a single, high-cost injury event. The authors explained that this could have led to ineffective targeting, which in turn drove the lack of significant effects.

injury or an incident in which three or more workers were hospitalized in the 3 years after its peer's penalty. In a study that examined the U.S. Securities and Exchange Commission's (SEC) decision to make its comment letters public, the authors found that this public transparency improved both the quality of the SEC review process and public and private enforcement, which could improve enforcement outcomes (Hutton et al., 2022).

Some limited evidence suggested that whistleblower complaints filed by employees, relatives, ex-employees, and others could also be an effective way to direct inspections.<sup>6</sup> A descriptive study of workplace overexposure to chemical substances showed that inspections directed toward establishments that were the subject of complaints in Washington State were at least as likely to uncover violations of chemical exposure standards as targeting firms with historically high rates of health hazards (Lofgren et al., 2010).

► **The use of algorithms or machine learning techniques might further improve targeted enforcement.** A study that examined simulations of alternative targeting policies that employed state-of-the-art algorithms (Johnson et al., 2020) suggested it may be possible to avert additional injuries under the SST plan by directing inspections toward establishments where these efforts are predicted to have the largest impact or toward establishments predicted to have the most injuries (rather than simply to those with *historically* high injury rates). Rapid advances in these machine learning and predictive modeling tools may make the targeting of workplace inspections more efficient in the same way that these tools have been demonstrated to work in similar contexts. For example, the use of predictive models on online reviews for restaurants has been demonstrated to predict the restaurants that have severe public health violations with an 82 percent level of accuracy (Kang et al., 2013). However, a separate study of the same data (Altenburger & Ho, 2019) cautioned against overstating the predictive power of these models, because data could be based on a select sample of establishments (in the case of the original study, those restaurants having extremely high or low inspection scores). One important limitation of targeted approaches is that they may reduce the threat of inspections for a broader set of firms and may encourage noncompliance; thus, maintaining some form of random selection for inspections may be optimal (Johnson et al., 2020).

► **Targeted enforcement can be cost effective.** Impact estimates from the experimental and quasi-experimental evaluations of OSHA's SST plan suggested that the gains from targeting exceed its costs (Johnson et al., 2020; Li & Singleton, 2019). One study (Johnson et al., 2020) estimated that each targeted inspection prevented \$120,000 in injury costs over a 5-year period—about 35 times the cost of an inspection (estimated at \$3,400 per inspection). Additional evidence suggested that targeted enforcement provided

---

<sup>6</sup> Strictly speaking, regulatory agencies do not consider investigations initiated by complaints as targeted enforcement, although using complaints to direct inspections is certainly one way to prioritize inspections (see, for example, these [WHD Fact Sheets](#) and [OSHA's Field Operations Manual](#)). For OSHA, inspections that are initiated by complaints are classified as unprogrammed inspections. In contrast, programmed inspections refer to scheduled inspections conducted to verify that randomly selected job sites falling under particular industries follow OSHA's rules and regulations. Targeted enforcement refers to the strategy of prioritizing particular firms or industries in programmed inspections.

spillovers in the form of general deterrence for similar noninspected firms, generating further cost savings. For example, corporate siblings of SST-inspected establishments (that is, firms with the same corporate parent as inspected establishments) exhibited lower injury rates, especially if they were in close geographic proximity to inspected firms (Johnson et al., 2017).

## 2. Compliance assistance

► **The evidence that traditional compliance assistance leads to greater regulatory compliance is mixed.** Compliance assistance often takes the form of trainings, webinars, and educational materials provided to firms. The evidence on whether these efforts work comes mostly from studies of environmental regulations that show that compliance assistance is effective for small firms but not large ones. Two quasi-experimental studies examined the compliance assistance program of the U.S. Environmental Protection Administration (EPA) and suggested that compliance assistance had a greater impact when provided to smaller firms because they have fewer resources to achieve regulatory compliance. For example, smaller firms are unlikely to have the resources to hire compliance personnel (Stafford, 2006, 2012). Findings also suggested that compliance assistance could better be viewed as a complement to, rather than as a substitute for, traditional enforcement tools because training becomes more effective when coupled with workplace inspections and citations (Stafford, 2012). Indeed, an informal poll of safety professionals indicated that many experts agree that safety in the workplace is best achieved with a combination of compliance assistance and enforcement (Morrison, 2011).

Additional evidence is based on case studies of unique compliance assistance programs. Findings from a case study of an air quality compliance program, which used a compliance web portal and inspection checklists at an Air Force base in Florida, suggested that the program reduced emissions by 32 percent after program implementation (Fortenberry et al., 2012), but the author did not present the accompanying data to support this claim. Findings from a case study of an agricultural training program in New Zealand found that the program did not translate to greater compliance, even as it increased employee knowledge of laws and regulations (Calcinai, 2011).

Although compliance assistance may be additionally valuable in the current context if it can be performed remotely to mitigate the spread of COVID-19, our search did not yield any studies that considered the effectiveness of delivering compliance assistance remotely as opposed to in person.

► **Compliance assistance efforts need to be straightforward and tailored to the context.** Some stakeholders report that compliance assistance programs may be less effective because of their generic and broad context compared to current industry or firm requirements. This critique is found in qualitative interviews with program recipients (Calcinai, 2011; Puhakainen & Siponen, 2010) and in a literature review that noted the importance of personnel in compliance and recognized that compliance is often a long-term endeavor (Armour et al., 2020). Because government rules and regulations can be complex and subject to revision, several case studies suggested that compliance assistance should be simple, practical, and tailored to the context (Calcinai, 2011; Fortenberry et al., 2012; Hai-Jew, 2014; Puhakainen & Siponen, 2010).

In this light, new technologies offer a way to enhance the compliance learning experience for employees. One study described the use of 3D animation in safety training for forklifts to simulate hazardous events so that employees could have greater awareness of injuries and fatalities that could occur if proper workplace procedures were not followed (Weppel, 2012). At Stanford University, a recent research effort aimed to develop an innovative tool called REGNET, a web-based compliance assistance system, to help consolidate and facilitate the understanding of government rules and regulations for firms (Law et al., 2014). Although many reference guides exist to help facilities comply with regulations, REGNET is designed to organize and simplify information for users. Key features of REGNET include the linking of referenced regulation provisions with terms and definitions, the ability to compare regulatory documents, and the ability to conduct tailored compliance checks for users.

▶ **Insights from behavioral science may improve compliance assistance by managing behavioral barriers.** These barriers include employers' (1) potential for procrastination regarding the compliance process, (2) lack of motivation about compliance, and (3) misunderstanding of compliance and regulations. A randomized controlled trial found that low-cost changes to OSHA's citation process designed to overcome such barriers resulted in higher rates of citation resolution and lower rates of referral to debt collection (Chojnacki et al., 2017). The intervention involved providing employers with a handout and cover letter that aimed to distill essential information and make the citation process less complex. The intervention was followed by reminders in the form of postcards and telephone calls. Although the results pertained to the citation process, the findings suggest that streamlining information provided to employers through compliance assistance may play a role in improving workplace safety.

A study by Hofeditz et al. (2017) that focused on motivation for business compliance suggested that aligning company values and needs with those of their employees should be a top priority for workplace compliance. The authors examined intrinsic motivators (e.g., integrity, self-regulation) and extrinsic motivators (e.g., legal compliance, coercive control) and their relationship to compliance behavior intention. Study participants were asked to respond to a survey that assessed their motivation for holding higher levels of compliance behavior toward workplace standards. Results indicated that a generally positive attitude toward conforming to compliance management requirements, shaped by extrinsic and intrinsic motivators, was essential for achieving high levels of compliance intention. The authors concluded that compliance management should be perceived as a holistic concept of internalization of external company values.

### 3. Self-monitoring programs

▶ **The evidence on the effectiveness of self-monitoring programs is mixed and may depend on factors such as employee traits, employer standards, or a firm's global standing.** While some experts supported these initiatives as an efficient way to enforce laws and regulations, others raised concerns

that firms mostly use self-monitoring to deflect attention away from noncompliant behavior.<sup>7</sup> The empirical evidence is based on quasi-experimental evaluations of environmental self-monitoring programs such as EPA's Audit Policy, but other government agencies also use self-monitoring as an enforcement tool.<sup>8</sup> EPA's Audit Policy reduces or waives certain penalties for environmental violations when firms disclose their violations to the government. The violations take numerous forms including failure to meet performance standards, emitting air pollutants above regulatory thresholds, making false statements, and tampering with monitoring devices. A key part of the EPA Audit Policy is that firms should self-police their behavior by establishing internal mechanisms to monitor compliance with regulations. Some studies that compared the outcomes of firms that self-disclosed under the policy with nonparticipating firms found that encouraging self-disclosures generally improved regulatory compliance and environmental performance, as measured by inspections that resulted in no compliance violations and no abnormal releases of toxic chemical emissions (Short & Toffel, 2010; Toffel & Short, 2011).

That said, other studies of the EPA Audit Policy and EPA's voluntary pollution prevention practices showed that these approaches do not appear to improve compliance and environmental performance in certain industries (Sam, 2010; Stretesky & Lynch, 2009). One possible reason is that firms with a history of noncompliant behavior are less likely to follow through with commitments to improve their operations (Short & Toffel, 2010). However, Short and Toffel (2010) also found that organizations' commitment to self-regulate was most effective at improving compliance when firms were subject to heavy regulatory surveillance and self-regulation was adopted in the absence of an explicit set of sanctions. While these findings suggest a limitation to using self-regulation as a tool and imply that self-monitoring programs may not substitute for traditional deterrence-based enforcement, self-regulation can still be a useful strategy for motivating regulated organizations (Short & Toffel, 2010).

Evidence from other Organisation for Economic Co-operation and Development (OECD) countries suggests mixed impacts from self-monitoring programs. In the Netherlands, an event study analyzed the Peterson Committee, a private sector self-regulation initiative that involved voluntary compliance reporting and monitoring on a set of rules to improve the management and supervision of firms but lacked enforcement of a code of conduct among firms. The event study indicated that the initiative failed to improve measures of corporate governance (de Jong et al., 2005). In contrast, a case study of self-regulation as applied to the auto repair industry in the United Kingdom suggested that self-regulation offered numerous advantages to

---

<sup>7</sup> Khanna and Brouhle's (2009) literature review of voluntary environmental initiatives likewise concluded that the evidence on the effectiveness of these initiatives is mixed. In contrast to this rapid review, their literature review covered articles published prior to 2000 and focused on the effects of a broader range of outcomes apart from regulatory environmental compliance.

<sup>8</sup> OSHA's Voluntary Protection Program exempts companies from workplace inspections if they establish internal mechanisms to comply with workers' health and safety regulations. WHD's new Payroll Audit Independent Determination program allows firms to conduct self-audits of potential minimum wage or overtime violations and then self-disclose these to avoid litigation and expensive legal fees. The U.S. Department of Justice, the U.S. Department of Defense, and the SEC provide incentives to persuade companies to disclose fraudulent behavior; these incentives can include amnesty, limited liability, leniency, and confidentiality (Short & Toffel, 2010).

small businesses by promoting transparency and offering flexibility while reducing the costs of compliance on safety and other minimum standards in the quality of work performed (Anderson & Russell, 2011).

In another recent study, Smirnow (2020) investigated whether the Global Reporting Initiative (GRI), a commonly adopted voluntary standard for environmental, social, and governance standards (ESG), would improve ESG disclosure quality and performance. This study found that firms claiming GRI adoption produced more transparent ESG disclosures, as intended.

Other research cites additional firm characteristics that may influence self-monitoring and its effectiveness. Alquist and Mosley (2020) examined factors that impacted a firm's participation in voluntary regulatory initiatives. The authors found that a firm's willingness to participate in the Accord on Building and Fire Safety and the Alliance for Worker Safety in Bangladesh depended on whether they were consumer-facing, publicly traded, or if they imported more garments from Bangladesh.

Other factors may impact self-reporting. Rablen and Samuel (2021) used sophisticated economic modeling to see how the type of enforcement (self-reporting or no reporting), firm size, audit probability, enforcement costs, clean-up (abatement) costs, the level of market competitiveness,<sup>9</sup> and other factors affected compliance. The authors demonstrated that the impact of self-reporting on compliance was affected by market forces, with the optimal level of compliance dependent on the level of market competition, enforcement costs, and public harm.

► **Existing research further suggests using caution in implementing self-monitoring programs because they might help firms circumvent regulations.** Findings from several quasi-experimental studies of self-monitoring programs have led researchers to hypothesize that firms may strategically disclose violations to deter future scrutiny. Studies of EPA's Audit Policy, for example, found that firms that self-disclosed were rewarded with fewer inspections (Stafford, 2007; Toffel & Short, 2011). Facilities that faced recent enforcement actions or were inspected frequently were also more likely to self-disclose than others; researchers hypothesized this was because the self-disclosing firms had more to gain from reduced scrutiny (Short & Toffel, 2008; Stafford, 2007). Researchers also examined the nature of violations that were self-disclosed under the EPA Audit Policy and found that most were minor and involved record-keeping and reporting violations, suggesting firms might be hiding more serious violations (Pfaff & Sanchirico, 2004).

A quasi-experimental study of the Responsible Care (RC) program, a voluntary self-regulation program to adopt codes of conduct to improve safety for firms in the chemical industry, indicated that participating firms were subject to fewer OSHA inspections, less intense inspections, and lower penalties for workplace violations compared to nonparticipating firms (Li & Khanna, 2018). Previous research had estimated that RC averted more than 2.99 accidents per 100 participating plants each year from 1988 to 2001 (Finger

---

<sup>9</sup> In the study, market competitiveness could be one of four types: sufficiently concentrated, moderately concentrated, moderately competitive, or sufficiently competitive.



& Gamper-Rabindran, 2013). However, analysis of more recent data suggested that this impact was associated only with early adopters of RC and did not apply to subsequent years of the program (Li et al., 2018).

▶ **While third-party monitoring might provide a mechanism for ensuring the effectiveness of self-monitoring programs, current evidence about its usefulness is limited.** Third-party monitoring involves certification by independent auditors to ensure that firms are operating up to industry standards. Two quasi-experimental studies investigated the impacts of mandatory third-party certification by leveraging its introduction into the RC program in 2005. Comparing outcomes between RC and non-RC firms before and after third-party monitoring, researchers found no discernable changes associated with the initiative in the probability and severity of accidents in worksites or on pollution abatement (Li et al., 2018; Vidovic et al., 2019). These studies suggest that the lack of punishment associated with third-party monitoring may have ultimately rendered it insufficient as a means of supporting a self-monitoring program.

## **Where are the gaps in evidence on targeted or remote compliance assistance and enforcement?**

- **More research on remote compliance assistance is needed.** As organizations look for more information about how to safely reopen and engage workers remotely, the ongoing pandemic has brought about a great demand for compliance assistance. This demand has resulted in a significant number of online resources, including webinars, podcasts, fact sheets, data, and reports. But little research exists on the effectiveness of these remote forms of compliance assistance. In many cases, the studied programs included in this review involved a bundle of services that combined in-person training and workshops with virtual educational material in the form of web resources and guides. More research is necessary to understand whether any of these components are effective on their own or when conducted remotely to inform how these could be deployed effectively in a pandemic situation.
- **There is a lack of evidence on disparate impacts of compliance assistance and enforcement strategies on people with low income or people of color and on strategies that limit these disparities.** People with low income and people of color tend to be overrepresented in certain essential services occupations (such as childcare, social services, and cleaning services) that put them at risk for COVID-19 (Hawkins, 2020; Rho et al., 2020). Similarly, these populations tend to be overrepresented in occupations with a high risk of workplace injuries, illnesses, and fatalities (Steege et al., 2014). This review identified no research that discussed how any of the compliance assistance and enforcement strategies may benefit or disadvantage certain groups of people, although, as discussed above, some studies emphasized that strategies can be more effective for certain types of industries (e.g., manufacturing) (Li & Singleton, 2019; Johnson et al., 2020) or firms (e.g., smaller firms) (Stafford, 2006; Stafford, 2012).
- **None of the evidence comes from pandemic situations; it is possible that lessons from the existing literature do not generalize to the current context.** For example, the unprecedented

nature and severity of the pandemic put a strain on the resources of employers who may want to comply with new and existing regulations and guidelines but lack the ability to do so. As such, the strategies discussed in this review may have more muted impacts than previously found. Future research may need to reflect a different safety environment than that of the past, as workplaces and employee populations become more concerned with personal safety, organizational policies, and employee behavior.

## **Rapid Evidence Review Supplement: Citations and Further Information**

This supplement to the rapid review—*What is the evidence on targeted or remote compliance assistance and enforcement strategies to assist employers in conforming to new and existing health, safety, and work requirements under COVID-19?*—provides citations and brief study summaries for the evidence summarized in the rapid review. The final section describes the approach used to create the rapid review.

---

### **CITATIONS AND STUDY SUMMARIES**

This supplement presents the citations and summaries using the same organization as the rapid review with an additional category for other citations supporting the synthesis. The supplement’s subsections are as follows:

1. Targeted enforcement
2. Compliance assistance
3. Self-monitoring programs
4. Other citations supporting the synthesis

Citations are alphabetized by last name within each strategy. Bolded text in the summaries denotes the data source(s), timing, location, and analytic method for studies that included this information.

#### **1. Targeted enforcement**

Altenburger, K. M., & Ho, D. E. (2019). Is Yelp actually cleaning up the restaurant industry? A re-analysis on the relative usefulness of consumer reviews. In *The World Wide Web Conference* (pp. 2543–2550). <https://doi.org/10.1145/3308558.3313683>

- Type of research: Causal (matched comparison group)
- Summary: This study examined whether restaurant reviews on the social media platform Yelp can assist with targeted inspections. Using a **matched dataset** from a previous study containing approximately 13,000 inspections of 1,756 **Seattle** restaurants and 152,000 Yelp reviews **between 2006 and 2013**, the authors examined whether customer reviews can predict a restaurant’s future inspection performance using machine learning. Yelp reviews were found to have lower predictive power than a prior study (Kang et al., 2013) suggested, and the reviews did not appear to significantly improve predictions or assist with regulatory targeting as previously suggested.

Blanc, F. (2018). Tools for effective regulation: Is “more” always “better”? *European Journal of Risk Regulation*, 9(3), 465–482. <https://doi.org/10.1017/err.2018.19>

- Type of research: Descriptive (quantitative)
- Summary: Using a **regional database of occupational inspections and accidents**, the author

examined whether more inspections are related to fewer fatal accidents by comparing occupational inspections and outcomes in **Great Britain, France, and Germany**. The findings suggested that a higher number of inspections in a country did not correlate with fewer fatal incidents. Instead, reductions in fatal accidents were best achieved through fewer inspection visits, a more focused approach targeting establishments with a high risk of violating safety standards, and a regulator approach composed of greater engagement with regulated industries and risk-proportionate enforcement.

Earnhart D., & Friesen L. (2021, May). Use of competitive endogenous audit mechanisms by federal and state inspectors within environmental protection agencies. *Journal of Environmental Economics and Management*, 9(101). <https://doi.org/10.1016/j.jeem.2021.102476>

- Type of research: Causal (instrumental variables)
- Summary: The primary goal of this study was to determine whether any regulatory agency employs the targeted inspection approach of competitive endogenous audit mechanisms. Using data from the **U.S. Environmental Protection Agency's (EPA) Permit Compliance System** and other EPA data, this study examined the likelihood of inspection in 424 manufacturing facilities permitted to discharge wastewater under the Clean Water Act **between January 1998 and June 2001**. Noting that guidance is provided on how facilities should be chosen for inspection, the authors added to the literature by not only examining two methods of targeting facilities for inspection—using an entity's own compliance history (termed absolute targeting) and using the compliance history of an entity's peer group (termed relative targeting)—but also by comparing these roles of targeting between state and federal inspections. The study used advanced statistical models including **probit regression and instrumental variables**, to investigate the predictors of actual inspection decisions at the federal and state levels. Controlling for multiple factors (e.g., community characteristics, seasonal indicators, facility and firm characteristics, EPA regional and year indicators), they found that both state and federal agencies engage in competitive endogenous audit mechanisms. However, EPA regional offices followed relative targeting, and state agencies did not. The results of this study provide empirical evidence that some agencies do employ competitive endogenous audit mechanisms and that these mechanisms can improve compliance in practice.

Hogg-Johnson, S., Robson, L., Cole, D. C., Amick, B. C., Tompa, E., Smith, P. M., Van Eerd, D., & Mustard, C. (2012). A randomised controlled study to evaluate the effectiveness of targeted occupational health and safety consultation or inspection in Ontario manufacturing workplaces. *Occupational and Environmental Medicine*, 69(12), 890–900. <https://doi.org/10.1136/oemed-2011-100333>

- Type of research: Causal (randomized controlled trial)
- Summary: This study examined the effectiveness of targeted health and safety consultations and inspections on safety outcomes in manufacturing workplaces in **Ontario, Canada**. Firms that previously performed poorly in measures of occupational health and safety were **randomly assigned** to receive a Health & Safety Association consultation, a Ministry of Labour inspection, or services as usual. There were no significant differences in work injury claims and disability day

rates among firms targeted for consultation or inspection compared to those that received usual services after follow-up. The three groups of firms showed similar trends in injury outcomes over time.

Hutton, A., Shu, S., & Zheng, X. (2022). Regulatory transparency and the alignment of private and public enforcement: Evidence from the public disclosure of SEC comment letters. *Journal of Financial Economics*, 145(1), 297–321. <https://doi.org/10.1016/j.jfineco.2021.07.011>

- Type of research: Causal (other regression methods)
- Summary: This study examined whether the **U.S. Securities and Exchange Commission’s** decision to publicly disclose its comment letters facilitated alignment of private and public enforcement. Using **logistic regression analyses**, the findings suggested that regulator transparency enhances public and private enforcement and therefore may improve enforcement outcomes.

Johnson, M. S. (2020). Regulation by shaming: Deterrence effects of publicizing violations of workplace safety and health laws. *American Economic Review*, 110(6), 1866–1904. <https://pubs.aeaweb.org/doi/pdfplus/10.1257/aer.20180501>.

- Type of research: Causal (regression discontinuity design)
- Summary: This study analyzed the impact of the Occupational Safety and Health Administration’s (OSHA) policy of publicly disclosing certain health and safety regulation violations on OSHA violations and workplace accidents at the targeted and nearby facilities. In 2009, OSHA standardized its policy so that press releases would be sent to local newspapers and industry publications when a violation exceeded \$40,000 or \$45,000, depending on the region. This policy change was not made public. Using **OSHA’s Integrated Management Information System** internal database, the author obtained detailed information on all OSHA inspections in the **United States** from **2009 to 2013**, including facility characteristics and reason for inspection. The author constructed a **regression discontinuity design**, focusing on firms meeting specific criteria (e.g., the author omitted mining industry firms, 22 states with state-run OSHA offices, and several regions after determining they likely did not adhere to the new standardized cutoff penalty amounts for issuing press releases). The author found that a press release reduced OSHA violations by 73 percent at facilities within 5 kilometers and 62 percent at facilities within 50 kilometers. Additionally, the author found a general deterrence effect in the number of inspections triggered due to a facility having a fatal injury or an incident in which three or more workers were hospitalized in the 3 years after their peer’s penalty. The author also found that the strength of unions and media coverage from newspapers were associated with increased compliance associated with press releases. The author recommended that regulatory firms use media publicity to increase compliance given the high cost of inspections.

Johnson, M. S., Levine, D. I., & Toffel, M. W. (2017). Organizational and geographic spillover effects of regulatory inspections: Evidence from OSHA. *U.S. Department of Labor Scholars Final Report*. <https://www.dol.gov/sites/dolgov/files/OASP/legacy/files/Organizational-and-Geographic-Spillover-Effects-of-Regulatory-Inspections-Evidence-from-OSHA.pdf>

- Type of research: Causal (randomized controlled trial)
- Summary: This **randomized controlled trial** estimated the extent to which OSHA’s targeted inspections caused general deterrence—that is, occupational health and safety compliance among noninspected firms. Focusing on inspections under OSHA’s Site-Specific Targeting (SST) program **between 2001 and 2010** in the **United States**, the authors compared the safety outcomes of corporate siblings and neighbors of establishments randomly selected for SST inspections to those of siblings and neighbors of establishments that were eligible for an inspection but not selected. In addition to **OSHA’s SST target lists**, the study authors used **annual OSHA Data Initiative survey data on injuries and employment and OSHA’s inspection data**. The study authors merged these OSHA data with business information from the **National Establishment Time Series database**. Using **statistical regression models**, each SST inspection of an establishment in a multiunit firm was associated with a 2.2 percent decrease in the rate of injury related to days away from work among the establishment’s corporate siblings over a 4-year period, but there was no evidence of spillover effects across other firms.

Johnson, M. S., Levine, D. I., & Toffel, M. W. (2020). *Improving regulatory effectiveness through better targeting: Evidence from OSHA*.<sup>10</sup> <http://dx.doi.org/10.2139/ssrn.3443052>

- Type of research: Causal (randomized controlled trial)
- Summary: This study estimated the effect of targeted OSHA inspections on injury rates in the **United States** in OSHA’s SST program. The study authors merged three OSHA data sources: annual **SST target lists for 2001–2010**, annual **OSHA Data Initiative survey data on injuries and employment from 1996 to 2011**, and **inspection data from 1990 to 2016** with **National Establishment Time Series data from 1990 to 2013** to compare safety outcomes of establishments **randomly assigned** to an SST inspection to similar establishments that were eligible for an inspection but not selected. The authors also applied **machine learning methods** to simulate the number of injuries that resulted in days away from work if alternative targeting policies were implemented during this period. **Using statistical regression models**, they found that each SST inspection of an establishment was associated with a 9 percent decrease (or 4 fewer days away due to work injuries) over the 5-year period following an inspection. Findings further suggested that OSHA could have prevented more than twice as many injuries if its inspection policy targeted establishments where inspections were predicted to have the most impact or if inspections were directed toward establishments with the most predicted injuries over the same time period.

Kang, J. S., Kuznetsova, P., Luca, M., & Choi, Y. (2013, October 18–21). Where *not* to eat? Improving public policy by predicting hygiene inspections using online reviews. In *Proceedings of the 2013 Conference on Empirical Methods in Natural Language Processing* (pp. 1443–1448). <https://www.aclweb.org/anthology/D13-1150.pdf>

---

<sup>10</sup> This research was initially published in 2019 and is available at <https://escholarship.org/uc/item/1gq7z4j3>.

- Type of research: Causal (other regression methods)
- Summary: This study presented an approach for using restaurant reviews posted on the social media platform Yelp to target restaurant health inspections. Using **Yelp restaurant reviews between 2006 and 2013** and **publicly available inspection records of Seattle, Washington, restaurants**, the authors built a **statistical model** and used **machine learning** to predict health inspection outcomes. The model achieved 82 percent accuracy when distinguishing between severe offenders and those with no violations, indicating that the statistical model may be a useful tool for targeting health inspections.

Li, L., & Singleton, P. (2019). The effect of workplace inspections on worker safety. *ILR Review*, 72(3), 718–748. <https://doi.org/10.1177/0019793918801575>

- Type of research: Causal (regression discontinuity design)
- Summary: This study estimated the effect of OSHA’s SST plan on worker safety. The SST plan prioritized workplace inspections toward establishments that were known to have high rates of accidents and injuries in the **United States**. Data for the analysis came from annual **OSHA Data Initiative survey data on injuries and employment from 1996 to 2011**. Using a **regression discontinuity design** that exploited the sharp increase in inspections experienced by firms included in the SST versus those that were not, the authors analyzed days away from work, job restriction, and job transfers. They found that the SST plan was associated with a decrease in the number of cases in the year immediately following the inspection cycle for establishments in the plan—but not thereafter. The study also suggested that inspection from the SST plan was most effective for manufacturing firms but not the health services industry.

Lofgren, D. J., Reeb-Whitaker, C. K., & Adams, D. (2010). Surveillance of Washington OSHA exposure data to identify uncharacterized or emerging occupational health hazards. *Journal of Occupational and Environmental Hygiene*, 7(7), 375–388. <https://doi.org/10.1080/15459621003781207>

- Type of research: Descriptive (quantitative)
- Summary: This study **compared the percentage** of workers exposed to substances above OSHA’s allowable chemical exposure limits by targeting firms for inspection based either on prior health violations or received complaints. Data on chemical substance exposure from **Washington’s Division of Occupational Safety and Health, Department of Labor and Industries** (the state OSHA agency) **between 2003 and 2008** were used to compare exposure rates between the two groups. Worker overexposure was identified at the same rate for firms where inspections were complaint-initiated and those targeted based on prior health violations. However, complaint-initiated inspections were conducted for a wider variety of industries, and a greater assortment of chemical substance exposures were observed in these firms than for targeted inspections based on previous violations.

## 2. Compliance assistance

Armour, J., Gordon, J., & Min, G. (2020). Taking compliance seriously. *Yale Journal on Regulation*, 37(1), 3–66. <https://core.ac.uk/download/pdf/275780007.pdf>

- Type of research: Other (literature review)
- Summary: Compliance programs play a central role in society’s response to encouraging firms to avoid socially harmful conduct. However, what does effective compliance look like at a corporate level? This **literature review** looked at different types of compliance activities a corporation can conduct, such as hiring a gatekeeper or creating incentives (e.g., stock-based pay) to monitor compliance. The authors noted the importance of personnel in compliance, recognizing that compliance is often a long-term endeavor that outlives most managers’ and executives’ tenure in a corporation.

Calcinaï, B. (2011). Effective training and assessment of competency and compliance for New Zealand primary industry. In *XXVIII International Horticultural Congress on Science and Horticulture for People (IHC2010): VI International Symposium on 920* (pp. 83–88).

[https://www.actahort.org/books/920/920\\_10.htm](https://www.actahort.org/books/920/920_10.htm)

- Type of research: Descriptive (qualitative)
- Summary: This article examined an alternative compliance training program to help employers in **New Zealand** meet compliance regulations. A major rural retail company participated in assessing the effectiveness of the Supplier GROWSAFE course by having their **employees interviewed for 40 minutes** to evaluate the training program. The employees who attended the training program provided positive feedback (i.e., participants enjoyed spending time with employees from other branches, and they liked the tutor and venue), while the most common negative feedback was related to the density of the course workbook. However, the employees’ ability to pass a compliance knowledge test after training did not translate into better compliance in the workplace, based on self-reports.

Chojnacki, G., Deutsch, J., Amin, S., Perez-Johnson, I., Darling, M., & Lefkowitz, J. (2017, May). *Using behavioral insights to help employers resolve OSHA citations: Trial design and findings*.

Mathematica Policy Research. <https://www.dol.gov/sites/dolgov/files/OASP/legacy/files/9-50291-OSHA-FinalTechnicalReport-20170505.pdf>

- Type of research: Causal (randomized controlled trial)
- Summary: This study examined how small tweaks to OSHA’s citation process based on behavioral science could improve employers’ responsiveness to these citations. Thirty-four OSHA offices in the **United States** were randomly assigned to implement a new process that sought to address three possible behavioral barriers (complexity, limited attention, and procrastination) that limit employers’ ability to act on a citation, while another 34 offices followed the usual process. Analyzing data on more than 12,000 inspection cases **between June and September 2015 and between October and January 2016** (the **randomized controlled trial** was conducted in two phases), as well as outcome data collected **between November 2015 and February 2016 and between February and July 2016**, researchers found evidence suggesting that the new process



led to a 5.4 percentage point increase in the proportion of employers who responded to citations and a 4.4 percentage point reduction in the number of employers referred to debt collection for failing to resolve their case.

Fortenberry, H., Newman, K., & Banks, E. A. (2012). Innovating for cleaner air. *Military Engineer*, 104(675), 51–52. <https://www.jstor.org/stable/26353936>

- Type of research: Descriptive (case study)
- Summary: This article described the air quality program at Eglin Air Force Base in **Florida** and the challenges it faces. The Air Force base worked with the Science Application International Corporation and developed the **Air Quality Compliance Program, which combines web-based compliance tools and a team of compliance experts to conduct in-person assistance**. After the program was implemented, emissions decreased by 32 percent. Information is provided on the Air Quality Resource Web Portal—an easy-to-use website that provides online guidance to air source managers; standardized procedures for data collection, analysis, and reporting; links to other essential databases; general compliance information; compliance assistance tools; an air emission inventory system; material issue and consumption systems; and training.

Hai-Jew, S. (2014). Online policy-compliance training in higher education: A preliminary design model. In *Remote Workforce Training: Effective Technologies and Strategies* (pp. 53–80). IGI Global. <https://www.igi-global.com/chapter/online-policy-compliance-training-in-higher-education/103184>

- Type of research: Other (literature review)
- Summary: This article provided a description of a simplified preliminary model for the design and delivery of online policy compliance training in a higher education environment. The design and delivery concepts were derived from limited research literature and common practices and trainings in **online policy-compliance training** at a university in the **United States**. The model suggested that anchoring online trainings to real world cases with potential scenarios was an effective way to deliver them.

Hofeditz, M., Nienaber, A. M., Dysvik, A., & Schewe, G. (2017). “Want to” versus “have to”: Intrinsic and extrinsic motivators as predictors of compliance behavior intention. *Human Resource Management and Innovation*, 56(1), 25–49. <https://doi.org/10.1002/hrm.21774>

- Type of research: Causal (other regression methods)
- Summary: This study examined the intrinsic and extrinsic motivators of 119 employees of compliance behavior intention in **Germany**. Using a standardized questionnaire from **December 2012 to February 2013**, the authors **surveyed** employees at all levels of organizations to assess their motivation for compliance. Using **logistic regression**, the authors found that intention to conform to the requirements of the internal corporate compliance management system was largely shaped by the individual’s perceptions and attitude toward compliance behavior. The employees developed their attitude, in part, based on their perceived beliefs about the consequences (costs) of courses of action. The perceived cost of compliance was measured by asking participants how time-consuming, burdensome, and costly it would be to comply with

the compliance practice. The perceived cost of noncompliance was measured by asking participants about the negative consequences of not complying with the practice.

Law, K. H., Lau, G., Kerrigan, S., & Ekstrom, J. A. (2014). REGNET: Regulatory information management, compliance and analysis. *Government Information Quarterly*, 31, S37–S48.

<https://doi.org/10.1016/j.giq.2014.01.006>

- Type of research: Other (policy brief)
- Summary: This article provided an overview of the REGNET project, which investigated methodologies and tools to facilitate access, compliance, and use of government regulations in the **United States**. The research involved the development of prototype information service infrastructures for methods and tools designed to locate, merge, compare, and analyze the information. Using select examples, the **article presented a regulatory compliance assistance framework** that focused on both translating government requirements into computational rules and improving understanding and interpretation of the regulations.

Morrison, K. W. (2011, January 1). 2011 State of safety—Keeping workers safe: Does compliance assistance or enforcement work best? *Safety & Health*.

<https://www.safetyandhealthmagazine.com/articles/2011-state-of-safety-2>

- Type of research: Descriptive (quantitative)
- Summary: This article discussed whether government agencies should focus on compliance assistance or enforcement of the law for injury and illness prevention. The article used data from the **U.S. Bureau of Labor Statistics (BLS)** and an **informal poll** in *Safety+Health* magazine. Based on the informal poll, most people stated that the most effective means to ensure workplace safety was to use an equal mix of strong enforcement and compliance assistance. Based on BLS data, the author found that occupational injury and illness rates have been on a downward trend since BLS started recording incidents. However, the author could not use the BLS data to assess how various regulatory policies and legislative initiatives impacted workplace injuries, illnesses, and fatalities.

Puhakainen, P., & Siponen, M. (2010, December). Improving employees' compliance through information systems security training: An action research study. *MIS Quarterly*, 34(4), 757–778. \_

<https://doi.org/10.2307/25750704>

- Type of research: Descriptive (case study)
- Summary: This article discussed the effectiveness of an information systems security training on employee compliance in a technology company in **Helsinki, Finland**. Data from **interviews, surveys, and participatory observation** were used to assess the training. Among other insights, the authors recommended that those conducting compliance training consider the personal relevance of the training tasks to learners. They also suggested that security training and security communications should be continuous and embedded into the company's regular communication efforts.

Stafford, S. L. (2006). Rational or confused polluters? Evidence from hazardous waste compliance. *The B.E. Journal of Economic Analysis & Policy*, 5(1). <https://doi.org/10.2202/1538-0645.1623>

- Type of research: Causal (quasi-experimental design)
- Summary: This study examined the roles that rationality and complexity have in environmental compliance using hazardous waste regulations. The author used a **quasi-experimental design** to analyze **2006–2007** data from 13,128 large quantity hazardous waste generators and management facilities in the **United States**. Results suggested that (1) factors that increase the cost of compliance increase the probability of violations, (2) factors that increase the likeliness of inspections and detection decrease the probability of a violation, (3) larger facilities and facilities of multiplant companies are less likely to have violations, and (4) nonmanagement violations look to be driven more by the complexity of regulations than rational costs and benefits.

Stafford, S. (2012). Do carrots work? Examining the effectiveness of EPA's compliance assistance program. *Journal of Policy Analysis and Management*, 31(3), 533–555.  
<https://doi.org/10.1002/pam.21633>

- Type of research: Causal (quasi-experimental design)
- Summary: This study examined the effects of federal regional compliance assistance programs administered by the EPA on compliance with hazardous waste regulations, as well as the relationship between traditional deterrence and compliance assistance. Using **nationwide data on hazardous waste generators in the United States**, the author used a **quasi-experimental design** to estimate impacts. Compliance assistance programs were associated with increased compliance with hazardous waste regulations, particularly for facilities with relatively small quantities of hazardous waste, but not for larger firms. Additional findings suggested that compliance assistance complements traditional enforcement rather than substitutes for it.

Weppel, S. (2012, June). *Designing SAFE instruction: The use of 3D animation for safety training in a forklift safety module*.

[https://www.researchgate.net/publication/293071131\\_Designing\\_SAFE\\_instruction\\_The\\_use\\_of\\_3D\\_animation\\_for\\_safety\\_training\\_in\\_a\\_forklift\\_safety\\_module](https://www.researchgate.net/publication/293071131_Designing_SAFE_instruction_The_use_of_3D_animation_for_safety_training_in_a_forklift_safety_module)

- Type of research: Other (policy brief)
- Summary: This article discusses how to develop Scenario, Activity, Feedback, and Evaluation (**SAFE**) **instruction in eLearning modules** for forklift safety in the **United States**. The article stated that the SAFE design method can engage learners in an authentic, online experience for safety training. The author found that using 3D animation to simulate the environment can engage the learner with interactive scenarios and provide feedback to the learners.

### 3. Self-monitoring programs

Alquist, J. S., & Mosley, L. (2020). Firm participation in voluntary regulatory initiatives: The Accord, Alliance, and US garment importers from Bangladesh. *The Review of International Organizations*, 16, 317–343. <https://doi.org/10.1007/s11558-020-09376-z>

- Type of research: Causal (other regression methods)
- Summary: This study examined factors that impact the willingness of a firm to participate in the Accord on Building and Fire Safety and the Alliance for Worker Safety in **Bangladesh**. These two initiatives were established in the aftermath of a high-profile disaster that impacted the ready-made garment (RMG) sector in Bangladesh. The authors used data from three time windows: **August 15–October 31 2011; July 1–November 30, 2012; and March 1 2013–August 31 2015**, reflecting periods of peak arrivals for the key U.S. holiday retail season, allowing researchers to capture both the most active periods as well as variation over time. Using a **logistic regression design**, the authors found that firms were more likely to sign up for the Accord and the Alliance if they were consumer-facing, publicly traded, or those importing more RMG product from Bangladesh. Firms headquartered in the United States were much less likely to sign up for these initiatives, especially the Accord.

Anderson, A. R., & Russell, E. O. (2011, July). Self-regulation: A strategic alternative for small firms? *Journal of Business Strategy*, 32(4), 42–47. <https://doi.org/10.1108/02756661111150963>

- Type of research: Descriptive (case study)
- Summary: This article discussed how small firms face difficulties complying with regulations, and how self-regulation—as opposed to legislation—could offer a better option for compliance. The article noted that self-regulated organizations match the needs of customers and ability of the firm because they are created within the industry. The authors argued, **through a case study of the auto industry** in the **United Kingdom**, that self-financed regulatory organizations offer an effective policing system to ensure that compliance is in line with industry codes of conduct.

de Jong, A., DeJong, D. V., Mertens, G., & Wasley, C. E. (2005). The role of self-regulation in corporate governance: Evidence and implications from the Netherlands. *Journal of Corporate Finance*, 11(3), 473–503. <https://doi.org/10.1016/j.jcorpfin.2004.01.002>

- Type of research: Causal (interrupted time series)
- Summary: This study examined the impact of a self-regulation initiative, The Peters Committee, on corporate governance practices in the **Netherlands'** private sector. The initiative provided recommendations designed to increase the effectiveness of management, supervision, and accountability to investors in Dutch corporations. This was to be achieved through voluntary compliance and monitoring, but no enforcement related to codes of conduct. Using **data covering both the pre- and post-Peters Committee periods**, the authors conducted tests to assess the impact of the Committee's recommendations on the corporate governance variables outlined in the initiative. The sample consisted of **all nonfinancial firms listed on Euronext Amsterdam from 1992 to 1999**. **Event study analysis** of firm data before and after the Peters Committee suggested that the initiative had no effect on corporate governance practices.

Finger, S. R., & Gamper-Rabindran, S. (2013). Testing the effects of self-regulation on industrial accidents. *Journal of Regulatory Economics*, 43(2), 115–146. <https://doi.org/10.1007/s11149-012-9201-8>

- Type of research: Causal (quasi-experimental design)
- Summary: This study examined the impact of self-regulation on industrial accidents, specifically, the effects of Responsible Care (RC) on the chemical manufacturing sector in the **United States**. Using a **quasi-experimental design**, the authors compared plants owned by RC-participating firms and plants owned by non-RC-participating firms. The authors constructed a database of 1,867 firms that owned 2,963 plants **between 1988 and 2001**. The study suggested that firms that participated in RC reduced the chances of accidents by 2.99 accidents per 100 plants (or by 69.3 percent) in a given year. Firms that participated in RC also had fewer safety accidents related to processes and violations of RC codes—a difference of 5.75 accidents per 100 plants (or by 85.9 percent) in a given year.

Khanna, M., & Brouhle, K. (2009). The effectiveness of voluntary environmental initiatives. In M. A. Delmas, & O. R. Young (Eds.), *Governance for the Environment: New Perspectives* (pp. 142–182). [https://doi.org/10.1111/j.1467-9299.2011.01935\\_3.x](https://doi.org/10.1111/j.1467-9299.2011.01935_3.x)

- Type of research: Other (literature review)
- Summary: This paper reviewed the **literature on the effectiveness of voluntary environmental initiatives (VEI) on firms' environmental performance**. The VEIs discussed in the paper sought to reduce emissions by a specific numerical goal, adopted certain practices or principles for reducing emissions, or made other efforts for improving environmental performance. The authors suggested, based on previous study findings, that VEIs are a more appealing strategy than mandatory regulations because they reduce administrative burden on regulatory agencies and encourage collaborative relationships between firms and the regulatory agencies. However, the authors acknowledged that the emissions reductions reported by VEIs were likely exaggerated in some instances, as overall emissions were decreasing during the studied time period.

Li, H., & Khanna, N. (2018). Does voluntary self-regulation provide regulatory relief? A lesson from the Responsible Care program in the United States. *The Journal of Law and Economics*, 61(1), 63–96. <https://www.journals.uchicago.edu/doi/abs/10.1086/698105>

- Type of research: Causal (instrumental variables)
- Summary: This study investigated whether organizations are rewarded for self-regulation by examining whether companies participating in the RC program experienced fewer OSHA inspections in the **United States**. The authors used **an instrumental variable approach** to study RC participation data to determine if voluntary reporting leads to fewer mandated inspections. Study findings showed that organizations that self-regulate experienced reduced government enforcement pressure.

- Li, H., Khanna, N., & Vidovic, M. (2018). The effects of third party certification on voluntary self-regulation of accidents in the U.S. chemical industry. *Journal of Regulatory Economics*, 53(3), 327–356. <https://doi.org/10.1007/s11149-018-9355-0>
- Type of research: Causal (difference-in-differences)
  - Summary: This study examined the impact of mandatory third-party certification under the RC program on accidents in participating facilities in the chemical industry in the **United States**. The study used a database of 10,315 **observations** from 1,136 facilities owned by 566 RC and non-RC firms from **1996 to 2010**. It estimated the average treatment effect of imposing mandatory third-party certification of voluntary self-regulation in 2005 and found no significant differences, using a **difference-in-differences** approach. The evidence suggested that self-regulation combined with independent verification by auditors did not reduce accidents.
- Pfaff, A., & Sanchirico, C. W. (2004). Big field, small potatoes: An empirical assessment of EPA's self-audit policy. *Journal of Policy Analysis and Management*, 23(3), 415–432. <https://doi.org/10.7916/D8FJ2V0P>
- Type of research: Descriptive (case study)
  - Summary: This study examined EPA's Self-Audit Policy in the **United States**. The policy lowers punitive fines when firms disclose and fix their own environmental violations. Using **data from case records involving violations of environmental laws from EPA from 1994 to 1999**, the authors concluded that, while the policy has encouraged firms to self-audit, the typical self-audit violation is relatively minor. The findings call into question the significance of the self-audit policy.
- Rablen, M. D., & Samuel, A. (2021, February 25). Self-reporting and market structure. *Economica*, 88, 782–808. <https://doi.org/10.1111/ecca.12365>
- Type of research: Descriptive (economic models)
  - Summary: This study used economic models to examine how **self-reporting policies** vary when industries are operated in a limited market (oligopoly) and the circumstances under which self-reporting leads to increased compliance. The author's model assumed a negative outcome of production (e.g., environmental pollution) and then varied whether the auditor chose self-reporting or no reporting and whether the auditing costs were fixed or variable. Based on their model, the authors concluded that the level of competition in the market plays an important role on whether self-reporting leads to compliance. They concluded that it may not be appropriate to evaluate the effectiveness of self-reporting by examining whether compliance rises or falls post-implementation.
- Sam, A. G. (2010). Impact of government-sponsored pollution prevention practices on environmental compliance and enforcement: evidence from a sample of US manufacturing facilities. *Journal of Regulatory Economics*, 37(3), 266–286. <https://doi.org/10.1007/s11149-009-9103-6>
- Type of research: Causal (quasi-experimental design)
  - Summary: This study examined the impact of government-sponsored pollution prevention practices on environmental compliance and enforcement in manufacturing sector firms in the

**United States operating between 1991 and 2004.** Data were obtained from the **EPA Toxic Release Inventory**, the **Integrated Data for Enforcement Analysis**, the **Sierra Club**, the **Bureau of Labor Statistics**, the **EPA website**, and a survey conducted by the **Investor Research Responsibility Center**. The study used a **quasi-experimental design** to investigate the impact of 43 EPA-sponsored pollution prevention (P2) practices on compliance and enforcement. P2 adoption appeared to reduce environmental violations in three industries but increased violations in two industries. The author suggested that firms with P2 practices that involved operating procedure changes were effective in reducing violations, while firms with P2 practices that involved equipment or material changes did not reduce violations. The author also reported that firms with P2 practices that involved changes in operating procedures or equipment were rewarded with more cooperative treatment of environmental infractions and had fewer enforcement actions.

Short, J. L., & Toffel, M. W. (2008). Coerced confessions: Self-policing in the shadow of the regulator.

*The Journal of Law, Economics, & Organization*, 24(1), 45–71.

[https://repository.uchastings.edu/cgi/viewcontent.cgi?article=2190&context=faculty\\_scholarship](https://repository.uchastings.edu/cgi/viewcontent.cgi?article=2190&context=faculty_scholarship)

- Type of research: Causal (quasi-experimental design)
- Summary: This study examined how regulatory enforcement activities influence facilities' decisions to self-disclose violations of environmental laws and regulations. The authors used data on manufacturing and other facilities in pollution-intensive industries gathered from **EPA's Toxic Release Inventory program between 1997 and 2003** to determine whether specific deterrence measures increased the probability of a facility self-disclosing a violation. Based on a **quasi-experimental design**, the study suggested that an additional Resource Conservation Recovery Act inspection increased the probability of self-reporting the next year by 14 percent, and being subject to at least one enforcement action doubled the likelihood of self-reporting in the next year. Additionally, the authors found that facilities targeted by an EPA Compliance Incentive Program were more likely to self-disclose violations, and facilities targeted by both a Compliance Incentive Program and a National Priority Sector were nearly 3 times more likely to self-disclose a violation that year compared to facilities not targeted by either program. They also reported that facilities targeted by only a Compliance Incentive Program were more than 20 times more likely to self-disclose a violation. The study suggested that regulatory oversight is an important component of self-monitoring policies.

Short, J. L., & Toffel, M. W. (2010). Making self-regulation more than merely symbolic: The critical role of the legal environment. *Administrative Science Quarterly*, 55(3), 361–396.

<https://doi.org/10.2189/asqu.2010.55.3.361>

- Type of research: Causal (other regression methods)
- Summary: This study examined the impact of federal regulations on corporate organizations' ability to self-regulate, looking specifically at whether government regulations promoted effective corporate self-regulation. Using **data from United States industrial facilities subject to the Clean Air Act from 1993 to 2003**, the authors used **regression analysis** to assess

impacts. The study suggested that regulations set forth by governing bodies play a significant role in organizations' ability to self-regulate, noting that facilities that disclosed regulatory violations without facing prior regulatory threats showed improved regulatory outcomes. The study also noted that historically poor compliers are less likely to follow through with their commitments to self-regulate.

Smirnow, D. E. (2020). *Do voluntary disclosure standards work? Evidence from the GRI in the extractive sector* [Doctoral dissertation, University of Alberta]. <https://doi.org/10.7939/r3-hbhq-hd82>

- Type of research: Causal (other regression methods)
- Summary: The Global Reporting Initiative (GRI) is a corporate voluntary disclosure standard for disclosures of environmental, social, and governance (ESG) information. It is one of the most commonly adopted standards by corporations for ESG disclosures. However, a corporation or firm's claim of GRI adoption is not subject to any mandatory enforcement or verification. Given the popularity of the standard and the absence of formal enforcement, the author investigated whether GRI is an effective standard (i.e., whether firms that claim to adopt the GRI demonstrate stronger ESG disclosure quality and ESG performance). ESG disclosure quality is a score that measures the amount of transparency in a firm's ESG disclosures, where points are awarded based on industry-relevant metrics and whether firms disclose on the metrics that are considered material to the industry. ESG performance is another score composed of measures across 10 categories: resource use, emissions, innovation, workforce, human rights, community, product responsibility, management, shareholders, and CSR strategy. Data **spanning 2009–2018** were obtained from the **Corporate Register** and **GRI's Sustainability Disclosure Database**, **Thomson Reuters ASSET4 ESG Scores**, and **Bloomberg ESG Disclosure Scores** for **Canadian and United States firms**. Based on **statistical regression models**, this study found that a firm's adoption of GRI was positively associated with disclosure quality and ESG performance. The author also found evidence that a firm's compliance is associated with higher disclosure quality as a result of applying a more stringent level of GRI. Overall, the results indicate that firms comply with the different GRI application-level requirements even without mandatory enforcement.

Stafford, S. L. (2007). Should you turn yourself in? The consequences of environmental self-policing. *Journal of Policy Analysis and Management*, 26(2), 305–326. <https://doi.org/10.1002/pam.20249>

- Type of research: Causal (quasi-experimental design)
- Summary: This study discussed the effects of EPA's Audit Policy disclosures on enforcement. The author used data on self-disclosures and enforcement activity from **EPA's Resource Conservation and Recovery Act** database and data from **EPA's Office of Enforcement and Compliance Assistance** on **United States** hazardous waste facilities and applied a **quasi-experimental design** to examine the impact of disclosure in **2001** on facility inspection in **2002**. The study found that facilities that self-disclose under EPA's Audit Policy had a lower probability of future inspection. Facilities that were inspected frequently were also more likely to self-disclose, potentially to lower the probability of future inspections.



Stretesky, P. B., & Lynch, M. J. (2009). Does self-policing reduce chemical emissions? *The Social Science Journal*, 46(3), 459–473. <https://doi.org/10.1016/j.soscij.2009.02.009>

- Type of research: Causal (quasi-experimental design)
- Summary: This study examined the impact of EPA’s Self-Policing Policy (also known as the Audit Policy) on changes in Toxic Release Inventory emissions in the **United States**. The study examined **178 chemical or allied product industry facilities**. The study used **ordinary least squares regression** to analyze the data and found that facilities that used the Audit Policy had similar emission trends as facilities that did not use it.

Toffel, M. W., & Short, J. L. (2011). Coming clean and cleaning up: Does voluntary self-reporting indicate effective self-policing? *Journal of Law and Economics*, 54(3), 609–649.

[https://repository.uchastings.edu/cgi/viewcontent.cgi?article=2257&context=faculty\\_scholarship](https://repository.uchastings.edu/cgi/viewcontent.cgi?article=2257&context=faculty_scholarship)

- Type of research: Causal (other regression methods)
- Summary: This study examined whether corporate voluntary self-reporting of regulatory compliance issues leads to effective self-policing. Using a **nationwide sample of facilities subject to the United States Clean Air Act spanning 1991–2003**, the authors used **regression analysis** to discuss the impact of self-reporting on self-policing outcomes. Data were obtained from the **Aerometric Information Retrieval System** and the **Toxics Release Inventory** database. The study provided evidence that self-reporting can reliably lead to improved regulatory compliance and environmental performance. Further, the study asserted that regulators shifted enforcement resources away from those that voluntarily disclosed environmental violations, implying that firms might strategically take advantage of self-disclosure policies to receive fewer inspections.

Vidovic, M., Delgado, M. S., & Khanna, N. (2019). Third-party certification and the effectiveness of voluntary pollution abatement programs: Evidence from Responsible Care. *Economic Inquiry*, 57(4), 1751–1770. <https://doi.org/10.1111/ecin.12818>

- Type of research: Causal (difference-in-differences)
- Summary: This article considered whether third-party certification improved the effectiveness of voluntary pollution abatement in the chemical industry in the **United States** through the RC program. The authors used **Toxic Release Inventory emissions data from 821 chemical plants between 1996 and 2010** to conduct a **difference-in-differences analysis** comparing the performance of RC versus non-RC firms before and after the introduction of mandatory third-party certification. The article reported no significant relationship between certification and emissions, suggesting that third-party certification may not be an effective way of enhancing voluntary abatement programs.

#### **4. Other citations supporting the synthesis**

Hawkins, D. (2020). Differential occupational risk for COVID-19 and other infection exposure according to race and ethnicity. *American Journal of Industrial Medicine*, 63(9), 817–820. <https://doi.org/10.1002/ajim.23145>

Rho, H. J., Brown, H., & Fremstad, S. (2020). *A basic demographic profile of workers in frontline industries*. Center for Economic and Policy Research. <https://cepr.net/wp-content/uploads/2020/04/2020-04-Frontline-Workers.pdf>

Steege, A. L., Baron, S. L., Marsh, S. M., Menéndez, C. C., & Myers, J. R. (2014). Examining occupational health and safety disparities using national data: A cause for continuing concern. *American Journal of Industrial Medicine*, 57(5), 527–538. <https://doi.org/10.1002/ajim.22297>

## About the Rapid Review

CLEAR’s rapid review of evidence on strategies related to targeted or remote compliance assistance and enforcement was initially developed by Mathematica Policy Research under a contract with the U.S. Department of Labor (DOL), Chief Evaluation Office (CEO). The review was subsequently updated by ICF Incorporated. It covers publications between January 1, 2000, and October 15, 2021. The contents of the review do not represent the views or policies of DOL.

Due to the rapid turnaround for this review, the evidence scan did not follow CLEAR’s documented systematic approach. The evidence scan for this review had three components. First, CLEAR conducted a literature search using Google Scholar and a large abstract and citation database of peer-reviewed literature (Scopus) published from January 2000 to October 2021. The search terms used in Scopus and Google Scholar are provided in Table 1. Less complex search terms were used for Google Scholar due to character constraints. CLEAR also reached out to four experts in the compliance and enforcement fields to seek input on programs and studies to be included in the review. CLEAR also used citations from relevant studies to identify additional studies for review.

**Table 1. Keywords used in database searches by remote compliance strategy**

Topic	Topic search terms using Scopus	Topic search terms using Google Scholar
Targeted inspections	("remote compliance" OR "remote enforcement" OR "compliance assistance" OR "compliance training" OR "compliance information" OR "compliance material*") AND (employer* OR firm* OR employee* OR worker* OR safety OR requirement* OR regulation* OR regulatory)	Targeted AND (inspections OR enforcement) AND (employers OR firms OR employees OR workers OR workplace)
Compliance assistance	(inspect* OR comply* OR compliance OR enforc* OR investigation) AND (employer* OR firm* OR employee* OR worker* OR safety OR "work* requirement*" OR "work* regulation*" OR violation OR sanction) AND target* WHERE this is within 2 words of (inspect* OR comply* OR compliance OR enforc* OR investigation)	("compliance assistance" OR "compliance training") AND (employers OR firms OR employees OR workers OR workplace)
Self-monitoring programs	(inspect* OR comply* OR compliance OR enforc* OR investigation) AND (employer* OR firm* OR employee* OR worker* OR safety OR "work* requirement*" OR "work* regulation*" OR violation OR sanction) AND target* WHERE this is within 2 words of (inspect* OR comply* OR compliance OR enforc* OR investigation) ("remote compliance" OR "remote enforcement" OR "compliance assistance" OR "compliance training" OR "compliance information" OR "compliance material*") AND (employer* OR firm* OR employee* OR worker* OR safety OR requirement* OR regulation* OR regulatory)	("self-monitoring" OR "self-disclosure" OR "self-regulation" OR "self-policing" OR "voluntary disclosure" OR "self-reporting") AND (compliance OR enforcement) AND (employers OR firms OR employees OR workers OR workplace)

<p>("self-monitoring" OR "self-disclosure" OR "self-regulation" OR "self-policing" OR "self-inspection*") AND (employer* OR firm* OR employee* OR worker* OR safety OR "work* requirement*" OR "work* regulation*" OR industr* OR facilit*) AND (comply* OR compliance OR enforc*)</p>	
--	--

CLEAR project staff screened the abstracts of studies identified by the search to consider whether they investigated relevant strategies that took place in [OECD](#) countries. Forty publications were screened into the review and summarized.

Due to the rapid nature of this review, studies identified for review were not assessed according to CLEAR’s causal evidence guidelines. Instead, reviewers used a short rubric to summarize information for each study. Each citation was classified by study type: causal, descriptive, or other. **Causal** research can assess the effectiveness of a strategy—in other words, whether there is a cause-and-effect relationship between the strategy and the results or impacts. High-quality causal research (impact studies) can produce the most credible type of evidence. **Descriptive** research does not determine cause-and-effect relationships but uses quantitative methods to identify trends, correlations, projections, and costs and benefits of actions taken. CLEAR also categorized qualitative studies under the descriptive category for the purposes of this rapid review. CLEAR’s rapid reviews also summarize **Other** types of evidence and research that describe how, where, and why strategies are implemented, and includes opinion pieces by subject matter experts. This type of research does not aim to identify cause-and-effect relationships or use quantitative or qualitative methods but can be useful to identify emerging strategies potentially worthy of future replication and additional study. For more information on how CLEAR reviews and rates different types of studies, see CLEAR’s reference documents at <https://clear.dol.gov/about>.