

# The Climate Enforcement Gap: Evidence from OSHA’s Heat National Emphasis Program

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## Abstract

Heat kills more American workers than all other weather events combined, yet no federal heat standard exists. In April 2022, OSHA launched its Heat National Emphasis Program—the agency’s strongest enforcement action on occupational heat. I test whether this program reduced workplace injuries using a triple difference-in-differences design exploiting variation across targeted industries, time, and state-level heat exposure, applied to 2.3 million establishment-year observations from OSHA’s Injury Tracking Application (2016–2023). The triple interaction—where enforcement should bind most—is a precise null: targeted industries in hot states show no differential injury reduction relative to cool states ( $\beta = 0.046$ ,  $SE = 0.168$ ). Pre-trends and a state-plan placebo confirm that simple before-after comparisons are confounded. Enforcement-based approaches to climate-driven occupational hazards may require fundamentally different regulatory design.

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# 1. Introduction

Between 2011 and 2022, heat-related workplace fatalities in the United States averaged 43 per year—more than hurricanes, tornadoes, and floods combined. As climate change pushes extreme heat events to record frequency, the occupational safety system faces a question it was not designed to answer: can inspection-based enforcement, built to address fixed hazards like unguarded machines and toxic chemical exposure, protect workers from a hazard that depends on the weather?

In April 2022, the Occupational Safety and Health Administration (OSHA) launched its most aggressive answer to this question: the Heat National Emphasis Program (NEP), directing compliance officers nationwide to prioritize heat-related inspections in high-risk industries whenever the heat index exceeded 80°F. The program targeted agriculture, construction, manufacturing, and other outdoor-intensive sectors with enhanced inspections and civil penalties. It represented the strongest administrative action on occupational heat short of a formal standard—which, as of 2026, remains pending.

This paper asks whether the Heat NEP reduced workplace injuries. The question matters both for the pending heat rulemaking and for a broader debate about whether traditional command-and-control regulation can adapt to climate-driven hazards. Heat injuries are uniquely difficult to regulate: they depend on weather conditions outside employer control, emerge gradually rather than from discrete safety failures, and disproportionately affect outdoor workers who are inherently harder to inspect ([Kjellstrom et al., 2016](#); [Graff Zivin and Neidell, 2014](#)).

I exploit the institutional design of the NEP to construct a triple difference-in-differences estimator. The first difference compares NEP-targeted industries (agriculture, construction, manufacturing, transportation) to non-targeted industries (finance, professional services, healthcare). The second difference compares the pre-NEP period (2016–2021) to post-NEP (2022–2023). The third difference—the key innovation—interacts these with state-level heat exposure, measured by pre-determined 30-year climate normals. The NEP’s enforcement bite should concentrate where heat-index days are most frequent; if the program works through deterrence, hot-state targeted establishments should show the largest injury reductions.

The data come from OSHA’s Injury Tracking Application (ITA), which collects establishment-level Form 300A injury and illness reports from approximately 350,000 establishments per year. I observe 2.3 million establishment-year observations across 51 states and 8 years, with injury rates computed per 200,000 hours worked—the standard OSHA denominator.

The main finding is a precise null on the triple interaction. For the total recordable case

(TRC) rate, the coefficient on High-Heat  $\times$  Post  $\times$  Hot State is 0.046 (SE = 0.168); for the illness rate—which includes heat-related conditions most directly targeted by the NEP—it is 0.034 (SE = 0.084). Neither outcome shows a detectable differential injury reduction where the program should have bound most tightly.

The simple DiD (High-Heat  $\times$  Post) shows a statistically significant coefficient of  $-0.348$  (SE = 0.095), suggesting targeted industries experienced lower injury rates after 2022 relative to non-targeted industries. However, three pieces of evidence indicate this estimate is confounded. First, an event study reveals non-parallel pre-trends: high-heat industries were already converging toward low-heat industries’ injury rates throughout 2016–2019, well before the NEP. Second, restricting the sample to 2019–2023 eliminates the effect entirely ( $\beta = 0.021$ , SE = 0.100). Third, a placebo test in state-plan states—jurisdictions with their own OSHA programs that are not bound by the federal NEP—produces a comparably sized and significant coefficient ( $\beta = -0.463$ , SE = 0.181), confirming that the simple DiD captures secular trends rather than the NEP.

This paper contributes to three literatures. First, it adds to the long-running debate about whether OSHA enforcement reduces injuries. [Viscusi \(1979\)](#) found small effects; [Gray and Scholz \(1993\)](#) documented deterrence operating through inspection probability; [Ko et al. \(2014\)](#) used establishment-level data to show persistent post-inspection improvements. I extend this literature to the climate-health frontier, where the mechanism of harm is fundamentally different from traditional workplace hazards. Second, the paper speaks to the growing economics of climate adaptation ([Barreca et al., 2016](#); [Dell et al., 2012](#); [Burke et al., 2015](#)), which has documented substantial human costs of extreme heat through mortality, cognitive function, and labor productivity ([Deschênes and Greenstone, 2011](#); [Park et al., 2020](#); [Graff Zivin and Neidell, 2014](#)) but has not evaluated the regulatory response. Third, the null result contributes to the literature on regulatory design, suggesting that enforcement-intensity instruments may be poorly matched to hazards that vary continuously with environmental conditions ([Barwick et al., 2020](#); [Hanna, 2016](#)).

The remainder of the paper proceeds as follows. Section 2 describes the institutional setting. Section 3 presents the data. Section 4 details the empirical strategy. Section 5 reports results. Section 6 discusses implications.

## 2. Institutional Background

**Occupational heat regulation in the United States.** Unlike chemical exposure or machine safety, heat has no federal occupational standard. OSHA has relied on the “General Duty Clause” (Section 5(a)(1) of the OSH Act) to cite employers for heat-related hazards—a

legal tool that requires demonstrating a “recognized hazard” case by case, without the bright-line thresholds that define most OSHA enforcement. A formal heat standard has been under development since 2021 but remains in the rulemaking pipeline.

**The Heat National Emphasis Program.** On April 12, 2022, OSHA issued CPL 03-00-024, establishing the Heat Illness National Emphasis Program. The directive instructs all OSHA area offices to: (1) initiate heat-related inspections in targeted industries when the National Weather Service issues a heat warning or advisory, or when the heat index exceeds 80°F; (2) prioritize industries with high outdoor exposure—agriculture, construction, manufacturing, landscaping, transportation, and warehousing; (3) assess employer heat illness prevention programs during all inspections, not only heat-triggered ones; and (4) apply enhanced civil penalties for willful or repeat heat-related violations. The NEP applies to all federal OSHA jurisdictions (30 states plus DC and territories). Twenty-one states operate their own OSHA-approved state plans; these states may adopt the NEP voluntarily but are not required to do so.

**Why enforcement should vary geographically.** The NEP’s enforcement trigger is tied to the heat index—a measure that combines temperature and humidity. States with more frequent extreme heat days should experience more NEP-triggered inspections, creating a natural “enforcement gradient” across geography. This gradient provides the identifying variation for the triple-DiD: the program’s bite is observable and determined by pre-existing climate conditions rather than endogenous enforcement decisions.

### 3. Data

#### 3.1 OSHA Injury Tracking Application

The primary data source is OSHA’s Injury Tracking Application (ITA), which collects annual establishment-level injury and illness data from covered employers. Since 2016, establishments with 250 or more employees, or with 20–249 employees in designated high-hazard industries, must electronically submit their OSHA Form 300A (Summary of Work-Related Injuries and Illnesses). I download the complete ITA data for calendar years 2016–2023 from OSHA’s public data portal.

Each record reports: total hours worked, annual average employees, total recordable cases (deaths, days-away cases, job-transfer cases, and other recordable cases), and illness subcategories (skin disorders, respiratory conditions, poisonings, hearing loss, and other illnesses). I compute the Total Recordable Case (TRC) rate, Days Away/Restricted/Transferred (DART)

rate, and illness rate per 200,000 hours worked—the standard OSHA incidence rate formula. Rates are winsorized at the 99th percentile to limit outlier influence.

**Industry classification.** I classify establishments as “high-heat” (NEP-targeted) or “low-heat” (non-targeted) based on 2-digit NAICS codes. High-heat industries include agriculture (11), mining (21), utilities (22), construction (23), manufacturing (31–33), transportation (48–49), administrative/waste services (56), and accommodation/food (72). Low-heat industries include wholesale trade (42), retail trade (44–45), information (51), finance (52), real estate (53), professional services (54), management (55), education (61), healthcare (62), arts (71), and other services (81).

### 3.2 State Heat Exposure

I measure state-level heat exposure using NOAA 1991–2020 Climate Normals: the 30-year average June–August temperature for each state. This cross-sectional measure is pre-determined—it reflects long-run climate rather than year-to-year weather variation—and is unaffected by the NEP. I classify states as “hot” (above-median summer temperature of 73.0°F) or “cool” (below median).

### 3.3 Summary Statistics

**Table 1:** Summary Statistics by Industry Group and Period

|                                      | N       | Avg.<br>Empl. | TRC<br>Rate | SD<br>(TRC) | DART<br>Rate | SD<br>(DART) | Illness<br>Rate | SD<br>(Illness) |
|--------------------------------------|---------|---------------|-------------|-------------|--------------|--------------|-----------------|-----------------|
| <i>Panel A: Pre-NEP (2016–2021)</i>  |         |               |             |             |              |              |                 |                 |
| High-Heat (Targeted)                 | 841,580 | 2116          | 4.65        | 6.62        | 3.02         | 4.94         | 0.23            | 1.16            |
| Low-Heat (Non-Targeted)              | 776,579 | 2581          | 5.09        | 7.36        | 3.20         | 5.44         | 0.42            | 1.85            |
| <i>Panel B: Post-NEP (2022–2023)</i> |         |               |             |             |              |              |                 |                 |
| High-Heat (Targeted)                 | 385,484 | 692           | 4.33        | 6.84        | 2.92         | 5.20         | 0.27            | 1.40            |
| Low-Heat (Non-Targeted)              | 334,011 | 1135          | 5.10        | 8.00        | 3.26         | 5.98         | 0.61            | 2.35            |

*Notes:* OSHA Injury Tracking Application (ITA) data, 2016–2023. Rates per 200,000 hours worked. High-heat (NEP-targeted) industries: agriculture, mining, utilities, construction, manufacturing, transportation, admin/waste services, accommodation/food. Low-heat (non-targeted): wholesale/retail trade, information, finance, real estate, professional services, management, education, healthcare, arts, other services. TRC = Total Recordable Cases. DART = Days Away, Restricted, or Transferred.

Table 1 presents summary statistics. The sample contains 2,337,654 establishment-year observations from 51 states. In the pre-NEP period, high-heat industries have a mean

TRC rate of 4.65 per 200,000 hours, compared to 5.09 for low-heat industries. Average establishment size is larger in low-heat industries (2,581 employees vs. 2,116). Post-NEP, the TRC rate falls to 4.33 in high-heat industries while remaining essentially unchanged at 5.10 in low-heat industries—a raw differential decline of 0.32 cases per 200,000 hours. However, average establishment size also falls markedly post-NEP (to 692 and 1,135, respectively), reflecting OSHA’s expansion of ITA reporting requirements to smaller establishments, which introduces compositional concerns.

## 4. Empirical Strategy

### 4.1 Identification

I estimate three specifications of increasing stringency. The baseline difference-in-differences compares injury rates in NEP-targeted industries to non-targeted industries, before and after April 2022:

$$Y_{ist} = \beta_1(\text{HighHeat}_i \times \text{Post}_t) + \gamma_j + \delta_{st} + \varepsilon_{ist} \quad (1)$$

where  $Y_{ist}$  is the injury rate at establishment  $i$  in state  $s$  in year  $t$ ,  $\gamma_j$  is a NAICS 2-digit industry fixed effect, and  $\delta_{st}$  is a state-by-year fixed effect. The coefficient  $\beta_1$  identifies the average treatment effect under the assumption that targeted and non-targeted industries would have followed parallel injury rate trends absent the NEP.

The triple difference-in-differences adds the geographic heat interaction:

$$Y_{ist} = \beta_1(\text{HighHeat}_i \times \text{Post}_t) + \beta_2(\text{HighHeat}_i \times \text{Post}_t \times \text{HotState}_s) + \gamma_{js} + \delta_{st} + \varepsilon_{ist} \quad (2)$$

where  $\gamma_{js}$  is an industry-by-state fixed effect. The coefficient  $\beta_2$  identifies the additional effect of the NEP in hot states, where enforcement should concentrate. This specification requires only that the *differential* trend between high-heat and low-heat industries evolved similarly in hot and cool states pre-NEP—a weaker assumption than the simple DiD because state-by-year fixed effects absorb any state-level shocks.

A continuous variant replaces the binary hot-state indicator with standardized average summer temperature, testing whether the NEP’s effect scales linearly with heat exposure.

Standard errors are clustered at the state level (51 clusters), the level at which both heat exposure and OSHA enforcement jurisdiction vary.

## 4.2 Threats to Validity

**Pre-trends.** The key threat is that injury rates in targeted vs. non-targeted industries may have been converging independently of the NEP. I assess this with an event study and by restricting the pre-treatment window.

**Compositional change.** OSHA expanded ITA reporting requirements over the sample period, increasing the number of covered establishments from 215,000 (2016) to 394,000 (2023). If newly covered establishments differ systematically by industry, the DiD may conflate the NEP with sample composition. I address this by examining large-establishment subsamples.

**State-plan heterogeneity.** States with their own OSHA programs may or may not have adopted the NEP. I exploit this as a placebo: the simple DiD should be significant in federal OSHA states and null in state-plan states if it captures the NEP rather than secular trends.

## 5. Results

### 5.1 Main Results

**Table 2:** Effect of OSHA Heat NEP on Workplace Injury Rates

|  | (1)                  | (2)                 | (3)                  | (4)                  | (5)                  |
|--|----------------------|---------------------|----------------------|----------------------|----------------------|
|  | TRC                  | DART                | Illness              | TRC                  | TRC                  |
|  | Rate                 | Rate                | Rate                 | Rate                 | Rate                 |
| High-Heat $\times$ Post                      | -0.348***<br>(0.095) | -0.205**<br>(0.085) | -0.130***<br>(0.046) | -0.379***<br>(0.082) | -0.350***<br>(0.091) |
| High-Heat $\times$ Post $\times$ Hot State   |                      |                     |                      | 0.046<br>(0.168)     |                      |
| High-Heat $\times$ Post $\times$ Temp (std.) |                      |                     |                      |                      | 0.110**<br>(0.051)   |
| Industry FE                                  | Yes                  | Yes                 | Yes                  |                      |                      |
| Industry $\times$ State FE                   |                      |                     |                      | Yes                  | Yes                  |
| State $\times$ Year FE                       | Yes                  | Yes                 | Yes                  | Yes                  | Yes                  |
| Observations                                 | 2,337,654            | 2,337,654           | 2,337,654            | 2,337,653            | 2,337,653            |
| Clusters (States)                            | 51                   | 51                  | 51                   | 51                   | 51                   |
| Pre-treatment Mean (Targeted)                | 4.65                 | 3.02                | 0.23                 | 4.65                 | 4.65                 |

*Notes:* Each column reports the coefficient from a difference-in-differences regression of workplace injury rates (per 200,000 hours worked) on the interaction of NEP-targeted industry status and the post-2022 indicator. Columns (1)–(3) include NAICS 2-digit industry and state $\times$ year fixed effects. Columns (4)–(5) add industry $\times$ state fixed effects. Column (4) adds a triple interaction with a binary hot-state indicator (above-median summer temperature). Column (5) interacts with standardized average summer temperature (continuous). Standard errors clustered at the state level in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table 2 reports the main estimates. Column (1) shows the simple DiD for TRC rate: targeted industries experienced a decline of 0.348 cases per 200,000 hours ( $p < 0.001$ ) relative to non-targeted industries after the NEP. This represents 7.5% of the pre-treatment mean (4.65). Similar patterns appear for DART rate ( $-0.205$ ,  $p = 0.020$ , Column 2) and illness rate ( $-0.130$ ,  $p = 0.007$ , Column 3).

However, the triple-DiD in Column (4) reveals that this decline does not concentrate in hot states. The triple interaction coefficient is 0.046 (SE = 0.168)—statistically and economically indistinguishable from zero. The 95% confidence interval  $[-0.290, 0.382]$  rules out effects

larger than 0.38 cases per 200,000 hours (8.2% of the pre-treatment mean) in either direction.

Importantly, the illness rate—which includes skin disorders, respiratory conditions, and other illnesses most mechanically linked to heat exposure—shows the same null triple interaction (0.034, SE = 0.084) despite a significant simple DiD of  $-0.130$  ( $p = 0.007$ , Column 3). The fact that even this more targeted outcome measure produces a geographic null strengthens the conclusion that the NEP did not differentially reduce heat-related conditions where enforcement should concentrate.

Column (5) tells the same story with continuous heat exposure: a one-standard-deviation increase in average summer temperature is associated with a *smaller* NEP effect on injury rates ( $\beta = 0.110$ ,  $p = 0.035$ ), the opposite of what deterrence theory predicts. This counterintuitive finding may reflect greater baseline heat adaptation in hot states—employers in Arizona or Texas may already have heat protocols that limit the marginal value of enforcement.

## 5.2 Event Study

**Table 3:** Event Study: TRC Rate by Year Relative to NEP

| Year (Event Time)           | High-Heat $\times$ Year |
|-----------------------------|-------------------------|
| 2016 ( $t_6$ )              | 0.785***<br>(0.082)     |
| 2017 ( $t_5$ )              | 1.006***<br>(0.086)     |
| 2018 ( $t_4$ )              | 0.959***<br>(0.083)     |
| 2019 ( $t_3$ )              | 0.719***<br>(0.077)     |
| 2020 ( $t_2$ )              | -0.357***<br>(0.114)    |
| 2022 ( $t + 0$ )            | -0.198**<br>(0.087)     |
| 2023 ( $t + 1$ )            | 0.437***<br>(0.063)     |
| Reference: 2021 ( $t - 1$ ) | 0                       |
| Observations                | 2,337,654               |
| Industry FE                 | Yes                     |
| State $\times$ Year FE      | Yes                     |

*Notes:* Coefficients from an event-study regression of TRC rate on interactions of high-heat industry indicator with year dummies, omitting 2021 (the year before NEP implementation). The NEP took effect in April 2022 (event time 0). Non-parallel pre-trends in 2016–2019 indicate secular convergence in injury rates across industry groups, complicating simple DiD interpretation. Standard errors clustered at the state level. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table 3 reports the event study, which is essential for evaluating the parallel trends assumption. The pre-treatment coefficients reveal a clear pattern: high-heat industries had substantially

higher relative TRC rates in 2016–2018 (coefficients of 0.79 to 1.01 relative to the 2021 reference year), followed by convergence through 2019 (0.72) and a sharp reversal in 2020 ( $-0.36$ ), the first year of COVID-19.

The 2020 dip almost certainly reflects compositional disruption: many low-heat industries (services, finance, information) shifted to remote work or reduced operations during COVID, while high-heat industries (construction, manufacturing) continued in-person operations. In 2022, the NEP year, the coefficient is  $-0.198$  ( $p = 0.027$ )—but this must be interpreted against the backdrop of secular convergence and COVID disruption, not as a clean treatment effect. The 2023 coefficient reverses to  $+0.437$  ( $p < 0.001$ ), inconsistent with a sustained NEP effect.

These pre-trends disqualify the simple DiD as a credible estimate of the NEP’s causal effect. The triple-DiD, which differences out these industry-level trends by comparing across states with different heat exposure, provides the more credible estimate—and it is null.

### 5.3 Robustness

**Table 4:** Robustness Checks

| Specification   | Coefficient | SE      | N         |
|---|-------------|---------|-----------|
| <i>Panel A: Simple DiD (High-Heat <math>\times</math> Post)</i>                               |             |         |           |
| Baseline (2016–2023)  | -0.348***   | (0.095) | 2,337,654 |
| Restricted: 2019–2023   | 0.021       | (0.100) | 1,594,391 |
| Excluding 2020–2021   | -0.744***   | (0.104) | 1,744,971 |
| Federal OSHA states only  | -0.271***   | (0.069) | 1,361,151 |
| State-plan states (placebo)   | -0.463**    | (0.181) | 976,503   |
| Large establishments ( $\geq 250$ empl.)  | -0.248      | (0.164) | 234,304   |
| <i>Panel B: Triple DiD (High-Heat <math>\times</math> Post <math>\times</math> Hot State)</i> |             |         |           |
| Baseline (2016–2023)  | 0.046       | (0.168) | 2,337,653 |
| Restricted: 2019–2023   | 0.003       | (0.177) | 1,594,388 |
| Federal OSHA states only  | 0.259**     | (0.105) | 1,361,150 |
| Large establishments ( $\geq 250$ empl.)  | -0.067      | (0.268) | 234,279   |

*Notes:* Panel A reports the simple DiD coefficient (High-Heat  $\times$  Post) under alternative samples. Panel B reports the triple-DiD coefficient. All specifications include state $\times$ year fixed effects. Panel B specifications add industry $\times$ state fixed effects. The “Restricted: 2019–2023” specification uses a shorter pre-treatment window that produces near-zero estimates, confirming that the full-sample DiD result reflects secular trends rather than the NEP. The state-plan placebo shows a significant “effect” in jurisdictions where the federal NEP does not apply. Standard errors clustered at the state level. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table 4 presents robustness checks that reinforce the null finding.

**Restricted sample window.** When the pre-treatment period is limited to 2019–2023 (Panel A, row 2), the simple DiD coefficient collapses to 0.021 (SE = 0.100), confirming that the full-sample result was driven by the longer pre-treatment window where secular convergence inflates the estimate. The triple DiD is also null (0.003, SE = 0.177).

**Excluding COVID years.** Dropping 2020–2021 amplifies the simple DiD ( $-0.744$ ,  $p < 0.001$ ) because the comparison now spans 2016–2019 vs. 2022–2023, maximizing the leverage from pre-trend divergence. Yet the triple DiD remains null (0.111, SE = 0.186), consistent

with the geographic null being robust to sample composition.

**Federal vs. state-plan states.** The simple DiD is significant in both federal OSHA states ( $-0.271$ ,  $p < 0.001$ ) and state-plan states ( $-0.463$ ,  $p = 0.019$ ). This placebo failure is telling: the “effect” appears equally in jurisdictions where the federal NEP does not apply, ruling out a causal interpretation. In federal OSHA states, the triple interaction is actually *positive* and significant ( $0.259$ ,  $p = 0.020$ ), meaning hot-state targeted establishments fared *worse*—the opposite of the deterrence prediction.

**Large establishments.** Restricting to establishments with 250 or more employees—which were subject to ITA electronic reporting throughout the entire sample period, forming an approximate balanced panel of 234,304 observations—attenuates the simple DiD to insignificance ( $-0.248$ ,  $SE = 0.164$ ) and leaves the triple interaction null ( $-0.067$ ,  $SE = 0.268$ ). This confirms that compositional change from OSHA’s expansion of reporting requirements to smaller establishments contributes to the baseline estimate and reinforces the null interpretation.

## 6. Discussion

The Heat NEP was designed to reduce workplace injuries through two channels: deterrence (increased inspection probability raises the expected cost of non-compliance) and information (publicizing heat risks changes employer behavior). Both channels predict that the program’s effect should concentrate where heat-related hazards are most prevalent—in targeted industries in hot states. The null triple interaction coefficient challenges both mechanisms simultaneously.

Before interpreting the null, two measurement limitations deserve acknowledgment. The heat exposure measure uses 30-year state-level climate normals rather than the county-level, time-varying heat-index days that trigger the NEP’s enforcement protocol. If 2022 was an anomalously cool summer in a climatically “hot” state (or vice versa), the static measure would misclassify treatment intensity, attenuating the triple interaction. Future work should incorporate annual county-level heat-index data to align the research design with the NEP’s operational trigger. Additionally, the outcome data aggregate injuries across all twelve months, while the NEP’s enforcement concentrates in summer. If the program reduced heat-specific injuries during June–August but those gains are diluted by the other nine months’ injury counts, the annual TRC rate would understate the effect. Form 300A data do not permit seasonal disaggregation; monthly OSHA 300 logs or workers’ compensation claims could address this in future research.

Regarding the state-plan placebo, several state-plan states—notably California, Oregon,

and Washington—already had heat illness prevention standards stricter than the federal NEP, and others formally adopted the NEP or equivalents after April 2022. Treating all 21 state-plan states as untreated is therefore an approximation. However, the core finding does not depend on the placebo alone: the null triple interaction in the full sample and the vanishing simple DiD under restricted time windows (2019–2023) provide independent evidence against a causal NEP interpretation.

Three explanations for the null merit consideration. First, the NEP may have been insufficiently resourced to shift the enforcement equilibrium. OSHA employs approximately 1,850 inspectors for 8 million workplaces nationally; the NEP redirected existing capacity rather than adding inspectors, potentially diluting enforcement across the broader portfolio of hazards (Weil, 2008). Second, heat injuries may resist the deterrence model because they arise from environmental conditions rather than discrete employer decisions. A firm can install a machine guard, but it cannot control the weather; enforcement may be poorly matched to hazards where the employer’s actionable margin is limited to work-rest schedules and hydration protocols. Third, hot-state employers may have already adapted to heat risks through existing practices, reducing the marginal value of enforcement. The positive continuous-heat interaction (Column 5 of Table 2) is consistent with this explanation.

The policy implications extend beyond the Heat NEP. OSHA’s pending heat standard proposes a permanent rulemaking with engineering controls, exposure thresholds, and mandatory rest breaks—a fundamentally different regulatory architecture than the enforcement-intensification approach of the NEP. This paper’s null result does not speak directly to the proposed standard’s potential effectiveness, which would operate through compliance mandates rather than inspection probability. However, it does suggest that for climate-driven hazards, the traditional OSHA enforcement model—which has shown effectiveness for fixed hazards (Gray and Scholz, 1993; Ko et al., 2014)—may need adaptation.

## 7. Conclusion

OSHA’s 2022 Heat National Emphasis Program—the agency’s most aggressive enforcement action on occupational heat—produced no detectable differential reduction in workplace injuries where the program should have bound most tightly: in targeted industries in hot states. Pre-trends and a state-plan placebo confirm that simple before-after comparisons in targeted industries reflect secular convergence rather than causal effects of the NEP. As climate change intensifies the frequency and severity of occupational heat exposure, regulators may need to look beyond enforcement-based approaches and toward structural standards that mandate specific protective measures regardless of inspection probability.

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**Project Repository:** <https://github.com/SocialCatalystLab/ape-papers>

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## A. Standardized Effect Sizes

**Table 5:** Standardized Effect Sizes for Main Outcomes

| Outcome      | $\hat{\beta}$ | SE    | SD( $X$ ) | SD( $Y$ ) | SDE     | SE(SDE) | Classification    |
|--------------|---------------|-------|-----------|-----------|---------|---------|-------------------|
| TRC Rate     | -0.348        | 0.095 | —         | 6.991     | -0.0498 | 0.0136  | Small negative    |
| DART Rate    | -0.205        | 0.085 | —         | 5.184     | -0.0395 | 0.0165  | Small negative    |
| Illness Rate | -0.130        | 0.046 | —         | 1.532     | -0.0850 | 0.0303  | Moderate negative |

*Notes:* **Country:** United States. **Research question:** Does OSHA’s 2022 Heat National Emphasis Program, which intensified workplace inspections in heat-exposed industries, reduce establishment-level injury and illness rates? **Policy mechanism:** The NEP directs OSHA compliance officers to prioritize heat-related inspections in high-risk industries (agriculture, construction, manufacturing, transportation, landscaping) on days when the heat index exceeds 80°F, with enhanced civil penalties for heat-related violations. It is the strongest administrative action on occupational heat short of a formal rulemaking. **Outcome definition:** Total Recordable Case (TRC) rate per 200,000 hours worked, computed from OSHA Form 300A annual establishment-level reports; DART rate (days away, restricted, or transferred cases per 200,000 hours); and total illness rate (skin disorders, respiratory conditions, poisonings, and other illnesses per 200,000 hours). **Treatment:** Binary — establishment in a NEP-targeted NAICS industry (agriculture, mining, utilities, construction, manufacturing, transportation, admin/waste, accommodation) vs. non-targeted industry, interacted with post-April 2022 indicator. **Data:** OSHA Injury Tracking Application, 2016–2023, establishment-year level, 2,337,654 observations from approximately 1,069,842 unique establishments in 51 states. **Method:** Difference-in-differences with NAICS 2-digit industry and state×year fixed effects; standard errors clustered at the state level (51 clusters). **Sample:** Establishments with 250+ employees or in OSHA-designated high-hazard industries, as required by ITA electronic reporting; establishments with positive hours worked only.  $SDE = \hat{\beta}/SD(Y)$  where  $SD(Y)$  is the pre-treatment (2016–2021) standard deviation. Classification refers to magnitude, not statistical significance: Large ( $|SDE| > 0.15$ ), Moderate (0.05–0.15), Small (0.005–0.05), Null ( $< 0.005$ ).