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# Environmental injustice in Clean Water Act enforcement: racial and income disparities in inspection time

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**Environmental injustice in Clean Water Act enforcement: Racial and income disparities in inspection time**

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Abstract:

Decades of research has documented that people of color and low-income experience disproportionate environmental burdens, with recent empirical studies showing these burdens are exacerbated by disparities in government regulatory enforcement. Scholars' attention to enforcement disparities as a source of environmental injustice highlights that government behavior may contribute to ongoing inequities in environmental outcomes. To date, studies analyzing enforcement disparities have employed statistical models to either estimate the probability that a federal or state agency performs an enforcement action or the total number of such actions over some duration of time. In this study, we adopt an alternative approach that analyzes the duration of time it takes for government officials to inspect a facility to determine if there is a difference based on the demographics of the host community. Specifically, we study administrative data from state implementation of the U.S. Clean Water Act (CWA), which we couple with demographic information around large, regulated facilities to analyze the relationship between response time and community characteristics. Estimating event history models, we find that state regulators' inspection response time is slower toward noncompliant facilities located in communities that have higher percentages of poor and Hispanic citizens. With respect to Black communities, state regulators' response time to noncompliant facilities is no different than compliant facilities. Collectively, these results indicate that state regulators are not prioritizing CWA facilities that violate performance requirements when they are in environmental justice communities.

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## Introduction

Decades of interdisciplinary research has documented that people of color and low-income in the United States experience disproportionate environmental burdens. The foundational work in this "environmental justice" literature focuses on the siting of noxious facilities, such as hazardous waste landfills (Been et al. 1997, Bullard 1990; Mohai and Saha 2006; Pellow 2004; UCC 1987; Taylor 2014). Systematic reviews of these studies have found that race is the most important correlate of siting outcomes, although not to the exclusion of other factors such as income (Brulle and Pellow 2006; Mohai et al. 2009; Ringquist 2005). Explanations for siting disparities include discriminatory practices of firms, redlining and historical biases in local land use and zoning decisions, and neighborhood demographic transitions (Banzhaf et al. 2019, Mohai and Saha 2015, Taylor 2014). Beyond disproportionate patterns in siting outcomes, scholars have also demonstrated race and income-based disparities in pollution exposure. Studies, for example, have found that people of color are more likely to experience higher exposure to air pollutants (Collins et al. 2016; Ash and Boyce 2018; Hird and Reese 1998; Li et al. 2019; Mikati et al. 2018; Pastor et al. 2004), more negative health impacts of air pollution (Jorgenson et al. 2020), and to not have benefited equally from long-term improvements in air quality (Colmer et al. 2020). Studies of disparities in drinking water have also found evidence of poorer quality in communities of color and low income (Balazs et al. 2011; Schaider et al. 2019; Stillo and MacDonald Gibson 2017).

Another recent stream of research pertains to disparities in implementation of environmental laws, specifically regulatory enforcement, which may exacerbate inequitable spatial patterns of pollution sources and exposures. Although many U.S. federal pollution control laws impose uniform, national standards, enforcing these standards varies across the country. This variation is amplified by the differential effort exhibited by state governments, which typically play the leading role in enforcement (Konisky and Woods 2018; Ringquist 1993). Empirical studies have demonstrated race and income-based disparities in enforcing air pollution standards (Konisky 2009; Konisky and Reenock 2013, 2018), water pollution and drinking water standards (Konisky and Schario 2010; Switzer and Teodoro 2018), and hazardous waste handling and disposal standards (Opp 2012; Spina 2015). Findings from this scholarship are not homogenous, but collectively they suggest meaningful disparities in environmental enforcement.

Scholars' attention to disparities in regulatory enforcement is important, since it highlights government behavior as a contributor to ongoing inequities. Moreover, enforcement is an area of environmental policy where government agencies have wide discretion to act. Unlike setting performance standards where agencies are constrained by underlying statutory authority, agencies have more freedom in enforcement to set priorities, invest resources, and adjust stringency. Perhaps most importantly, regulatory enforcement has been demonstrated both to reduce the incidence and duration of environmental violations (Nadeau 1997) and to serve as an effective deterrent for directly targeted facilities as well as nearby facilities (Gray and Shimshack 2011; Shimshack 2014).

To date, studies analyzing enforcement disparities have employed statistical models to estimate either the probability that a federal or state agency performs an enforcement action (e.g., conducts an inspection, issues a notice of violation) (e.g., Konisky and Reenock 2013) or the

total actions over time (e.g., Konisky 2009; Liang 2016; Spina 2015). In this study, we adopt an alternative approach that analyzes the *duration of time* before government officials inspect a facility to determine if there is a difference based on a facility's surrounding community demographics.

Studies in other contexts have adopted similar strategies to measure government responsiveness. For example, in some cases, race and income-based disparities have been found in the speed and depth of disaster recovery assistance efforts and government responsiveness for voting information and service provision (Bolin and Bolton 1986; Bullard and Wright 2009; Hartman et al. 2006; Butler and Broockman 2011; White et al. 2015; Einstein and Glick 2017). In the area of health care, the race of the patient has been associated with longer wait times in emergency rooms (James et al. 2005). There is also mixed evidence for the association between emergency vehicle response times and demographics of the neighborhood (David and Harrington 2010; Hsia et al. 2018, Seim et al. 2018).

We take a similar approach in the context of environmental enforcement. Government inspectors face constraints over resources for performing compliance monitoring and choices have to be made about where to invest effort. We posit that there is likely to be more time between inspections for facilities located in Black, Hispanic, and high-poverty areas as compared to White and lower-poverty areas. More specifically, we analyze the relationship between communities and response times, conditional on a facility's compliance status. In this way, we test for two distinct forms of disparity or bias. First, response times may vary between environmental justice and non-environmental justice communities, regardless of the compliance status of regulated facilities. Second, response times may also vary between compliant and noncompliant facilities within communities. For example, regulators may respond to noncompliant facilities faster than compliant ones, but only in whiter and wealthier communities. This second focus is novel and especially important. Slower response toward facilities that are failing to meet their performance standards means diminished environmental quality, which may create risks to human and ecological health. Also, to the extent that these disparities are based on race or income, they generate environmental injustice concerns.

We anticipate slower response in environmental justice communities because these communities tend to have fewer political resources to mobilize government attention and prioritization (Konisky and Reenock 2013), though we cannot rule out other types of systemic bias such as discrimination. An alternative explanation altogether is of "sympathetic bureaucrats," that use discretion and normative reasoning to modify their actions in a manner to achieve social equity goals (Maynard-Moody and Musheno 2012). If inspection officials use their discretion to shield overburdened communities from overzealous enforcement and potentially severe financial burdens connected to noncompliance (Balazs and Ray 2014; Ranganathan and Balazs 2015), this too might explain less frequent inspections. For two reasons, we think this explanation is less likely in our application. First, our focus is on an early phase of enforcement; while inspections may uncover violations, sympathetic bureaucrats concerned about imposing financial burdens on communities will focus their efforts on minimizing costly penalties or corrective actions after a violation is found. Second, our study is limited to NPDES major sources; large facilities which generally are not resource-constrained (as compared, for example, to small community water systems that must meet federal drinking water standards). Moreover, it is not necessarily the case

that facilities in under resourced communities are themselves resource constrained (e.g., an industrial polluter located in a low-income community).

Here we study state enforcement of the U.S. Clean Water Act (CWA). This setting is appropriate because there are thousands of major water pollution sources throughout the United States and because the U.S. Environmental Protection Agency (EPA) maintains detailed data on both these sources' compliance records and the dates on which states conduct compliance inspections. We couple this administrative data with demographic information around CWA facilities' locations to analyze the relationship between response time and community characteristics. Estimating event history models, we find that state regulators respond slower to noncompliant facilities located in communities that have higher percentages of poor and Hispanic citizens. With respect to Black communities, state regulators' response time to noncompliant facilities is no different than compliant facilities. Collectively, these results indicate that state regulators are not prioritizing CWA facilities that violate performance requirements when they are in environmental justice communities.

This study has both theoretical and applied importance. Theoretically, to our knowledge, our study is the first to empirically examine "delay" as an environmental injustice mechanism. Prior work asserts political mobilization as a resource that advantages certain communities over others (Hamilton 1995; Konisky and Reenock 2013), but often cannot point to a specific mechanism by which political mobilization may change outcomes. This study suggests delay as such a mechanism. Communities with more political resources might nudge government officials to prioritize facilities that are failing to meet their performance standards (i.e., reduce the time elapsed between inspections), producing disparities in enforcement. The practical contribution is that once policymakers understand the mechanisms of regulatory bias they can seek institutional design changes to reduce or eliminate such biases from policy delivery.

The balance of the article is organized as follows. In the next section, we provide more information on the data we study and the statistical methods we use. The subsequent section presents the analysis itself, which is followed by a discussion of the study's implications for understanding the ongoing challenges of environmental injustice in the United States.

## Data and Methods

The CWA requires all facilities that discharge pollution into U.S. waterways to first acquire a permit as part of the EPA's National Pollution Discharge Elimination System (NPDES) program. The NPDES program is mostly administered by state environmental agencies, except in a few states (Massachusetts, New Hampshire, New Mexico) that have not been delegated authority by the EPA (in these cases, the EPA manages the program). Under the NPDES program, facilities are designated as either "major" or "minor" sources, depending on the scale of their discharges. This study focuses on approximately 6,700 major NPDES sources in operation between early 2001 and early 2017,[1] which include publicly owned treatment works (i.e., municipal utilities),

[1] More precisely, we include facility-inspections observations that occur from the period of the start of the George W. Administration term (January 20, 2001 through the end of the Obama Administration term (January 18, 2017).

federal facilities, and industrial sources such as factories and power plants. NPDES majors thus are large point sources of pollution dischargers. By definition, major municipal wastewater facilities are those with flows greater or equal to one million gallons or facilities with pretreatment programs, while major industrial wastewater facilities are determined through a combination of metrics such as flow scale, pollutants, and geographic location.

EPA's Integrated Compliance Information System for the NPDES program (ICIS-NPDES) (U.S. EPA 2020) includes detailed records about major NPDES facilities and their operations (e.g., location, permit history, self-monitoring of pollution discharges) and actions taken by government officials related to compliance and enforcement (e.g., compliance status, inspections, notices of violations, etc.). From the EPA's ICIS-NPDES data, we construct a facility-level dataset, where each observation represents a state-led compliance monitoring inspection (excluding facilities in states where the EPA runs the NPDES program). Over the course of the study period, there are over 123,368 inspections.[2] The primary variable of interest is the duration of days that have passed since the last inspection at the same facility. Although EPA enforcement guidance states that major NPDES are to receive at least one inspection every two years (U.S. EPA 2014), in practice, the amount of time that occurs between inspections varies considerably. In our data, the mean time between inspections is 313 days (the standard deviation is 485 days).

A second important indicator we use from the ICIS-NPDES data is a facility's compliance status. Regulatory officials rely on different information to determine the compliance of NPDES permit holders, including facility self-reported, discharge monitoring reports and compliance monitoring inspections. A facility's compliance status is a regulatory decision – that is, a facility's violation of a requirement in its NPDES permit may or may not translate into an official determination that a facility is noncompliant with the CWA. The ICIS-NPDES data provide a quarterly indicator of the compliance status of major NPDES permit holders. To classify a facility's starting compliance status, we used the nearest quarterly compliance designation to determine the status at the time of the facility's prior inspection. Of the 123,368 inspection windows that constitute our data, 55.96% of facilities began their inspection window in compliance, while 44.04% started their window in noncompliance.

To measure the community characteristics surrounding CWA facilities, we use an areal apportionment approach, a common strategy employed in the environmental justice literature (Konisky and Reenock 2018; Mohai and Saha 2006). For this study, for each of the approximately 6,700 major NPDES facilities, we used GIS software (QGIS 3.10) to draw a 1-mile circular buffer around each facility, and then intersected this new shapefile with U.S. Census Bureau cartographic files for census tracts. For each facility, we computed a value using decennial census tract information for 2000 and 2010, and census tract information for 2016 using the American Community Survey 2014-2018 5-year estimates, and then used linear interpolation to estimate the inter-census years.

[2] The number of inspections analyzed is smaller due to missingness in some of the control variables and because facilities in Nebraska are omitted from the analysis because of its unicameral nonpartisan legislature.

The demographic measures we generated from this process include: total population, and the percentage of the population that is Black, Hispanic, and below the poverty line.[3] In these data, the mean population within 1-mile of NPDES major facilities is 3,282 people with a standard deviation of 6,934, which indicates considerable variation in population density around these facilities. In terms of race, ethnicity, and income, the 1-mile "neighborhoods" around facilities on average had 10% Black population, 9% Hispanic population, and 13% population below the federal poverty line. Table A1 in the Appendix shows summary statistics for each of these measures.

To analyze the relationship between inspection response time and neighborhood demographics, we employ an event history approach. Specifically, we estimate a proportional hazards parametric event history model, first entering the key demographic and compliance variables additively, and then considering their conditional relationships with inspection response time.

We begin with a hazard function $h(t_j) = h_0(t)\ g(\mathbf{x}_j) = h_0(t) \exp(\mathbf{x}_j\mathbf{b})$, where $h_0(t)$ is the baseline hazard rate and $\mathbf{x}_j$ is the standard vectors of covariates and their estimated coefficients **b**. We parameterize the baseline hazard as a Weibull distribution, $h_0(t)= pt^{p-1}$, where p is the estimated shape parameter, or duration parameter for our data. This parameter suggests whether the baseline hazard is monotonically increasing ($p>1$), decreasing ($p<1$), or constant in time ($p=1$). Our approach is a multiple failures analysis, such that facilities can re-enter the risk set after an exit. This approach accommodates our data since most CWA facilities experience multiple inspections during the study period. The median number of spells that a given facility appeared in the data was 18.9 with a standard deviation of 23.6 and a median of 11, suggesting that most facilities in our 16 years of data are inspected at a rate consistent with EPA policy guidance.

We report the results of the analysis as hazard ratios, which can be interpreted to increase the relative odds of an inspection occurring. We also report the results of our conditional expectations with the assistance of expected duration figures, which display the durations between inspections, conditioned on a set of covariates. In addition to our controls, to account for unobserved heterogeneity within facility between episodes, or frailty, we estimate a Weibull model with shared frailty that includes an unobservable multiplicative effect, a, on the hazard rate $h(t_j)$. We use a Gamma-distributed frailty function, g(a). Our models report an estimated parameter, q, which reflects the magnitude of the frailty present. When $q=0$, the frailty model reduces to the non-frailty hazard model referenced in the paragraphs above.

To address endogeneity due to omitted variable bias and the possibility that our main independent variables, facility compliance and community demographics, are not randomly assigned, we include a large suite of control variables to cover theoretically-important factors that may incentivize firm location choice, regulatory strategy, and firm compliance decisions. These control variables include factors that may contribute to non-random distribution in agency design and state politics, and their correlation to environmental enforcement.

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[3] In other analysis, we also included a variable for the percentage of the population that is foreign born but removed it from the models reported here since it is highly colinear with the percentage of the population that is Hispanic.

The controls include variables measuring a community's population per 1,000 citizens, which is calculated using the areal apportionment method described above. At the facility level, we include two dichotomous variables to distinguish between federally owned facilities, *Federal*, and publicly owned treatment works *POTW*s (the excluded category is industrial sources), given past work showing differences in enforcement targeted at government and privately-owned facilities (Konisky and Teodoro 2016). We also include a variety of political controls to account for the expectation that regulatory agencies respond to the political control of key elected institutions. Stronger Democratic or politically liberal (compared to Republican or politically conservative) state governments have been associated with greater regulatory activity (Davis and Davis 1999; Hunter and Waterman 1996; Scholz and Feng-Heng 1986; Scholz et al. 1991), and unified control should enhance a political party's policy agenda. Accordingly, we include *Democratic Governor*, a dummy variable when the chief executive is occupied by a Democrat, *Democrats per Legislature,* which is the percentage of Democrats averaged across both state legislative chambers, as well as the Berry et al. (1998) updated measure of *Government Ideology* to control for the ideology of the state government, where higher scores reflect more liberal government officials. We also include two dummy variables to capture the effect of unified government: *Unified Democrat* and *Split Party*, with the excluded reference category *Unified Republican*. Last, to differentiate Presidential administrations in our data, we include a dummy variable for the *Bush Presidency*. Last, we also include *Distance*, to account for the time and resources required to travel to a facility. This variable measures the straight line distance between a facility and the closest state regional office in tens of kilometers.

**Results**

We first present the estimates from an additive model for our key independent variables (complete estimates of all models are displayed in Table A2 in the Appendix). Figure 1 displays hazard coefficients for a facility's compliance status as well as our three demographic variables. The demographic variables have been standardized for ease of interpretation.

Estimates from the additive model indicate that, on average, state regulatory agencies increase the speed with which they inspect noncompliant facilities. The figure suggests a 12% increase in the hazard of experiencing an inspection if a facility began the episode not in compliance. With respect to the expected duration difference, this model suggests that, with all other variables set at their mean or mode, noncompliant facilities will be visited about 21 days sooner than compliant ones.

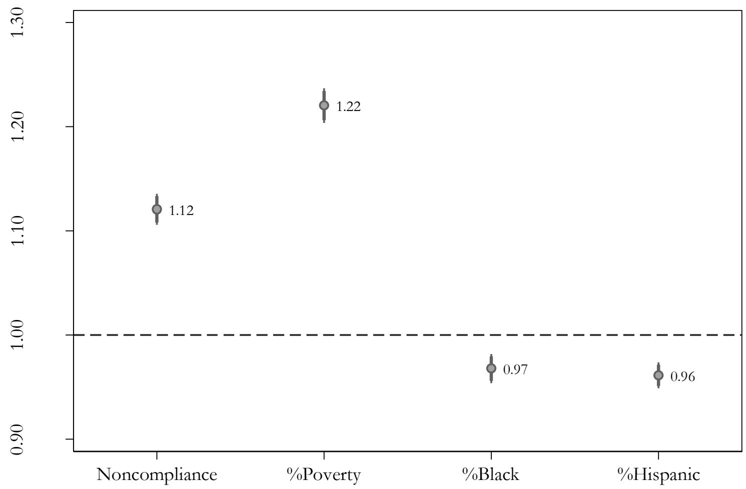


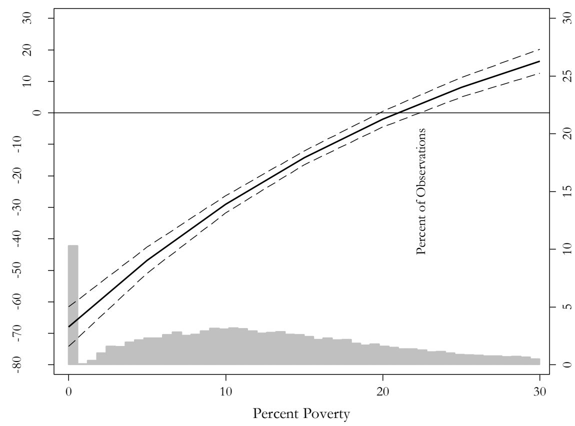

*Figure 1 Hazard Ratios from Additive Model*

In terms of the main demographic variables of interest, facilities in poor neighborhoods that are one standard deviation above the mean are estimated to experience a greater hazard of inspection with a 22% increase. Compared to a neighborhood with average poverty levels, facilities in poor communities one standard deviation above the mean, are expected to experience an inspection approximately 13 days earlier. Facilities in Black and Hispanic neighborhoods both see reductions in the hazards of an inspection. Facilities in Hispanic neighborhoods that are one standard deviation above the mean experience a 4% decrease and wait an average of ~11 days more for an inspection. Facilities in Black neighborhoods that are one standard deviation above the mean experience a 3% decrease in the hazard of an inspection and those facilities will wait on average, 2 days longer, for their next inspection.

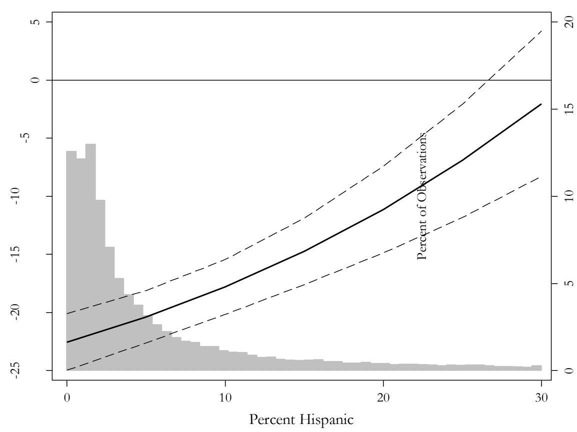
With respect to the control variables, the time between inspections is shorter, all else equal, for CWA facilities in places with higher population density and higher rates of unemployment. In addition, response time is faster for older and public facilities (as compared to privately-owned and operated facilities). The findings regarding state politics push in different directions. Facilities in states with more Democratic representation and divided government are inspected less rapidly, while those in states with more liberal ideology have shorter durations between inspections. Disentangling these mixed findings is beyond the scope of this article.

Next, we consider the findings from a conditional model in which we estimate separate coefficients for noncompliance when interacted with neighborhood characteristics. We display these estimates with the aid of an illustration that plots the marginal effect of a facility being noncompliant (relative to compliant) over each relevant demographic measure's range

*Panel A. Poverty in Communities*




*Panel B. Hispanics in Communities*




*Panel C. Blacks in Communities*

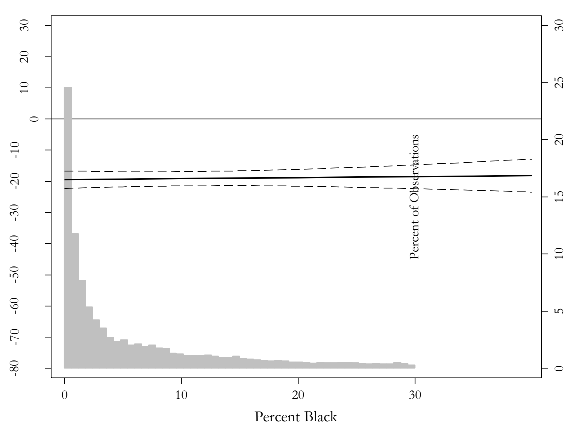



*Figure 2 Marginal Effects of Noncompliance on Inspection Duration across Neighborhood Demographics*

Note: 95% confidence intervals displayed with dashed lines. Percent Demographic displayed as bars.

The results shown in Panel A of Figure 2 suggest that state regulatory agencies respond to noncompliance differently across communities that vary by poverty. In communities where the percentage of poverty is near zero (at the extreme left of the plot), agencies inspect noncompliant CWA facilities more rapidly. The model estimates suggest that, compared to facilities that are compliant, non-compliant ones are visited nearly 70 days sooner. This response wains, however, as poverty increases until around 20% of the neighborhood lives in poverty. Beyond this threshold, agencies wait *longer* to inspect noncompliant facilities.

A similar dynamic exists with respect to Hispanic communities. Panel B in Figure 2 shows that where the percentage of Hispanics is near zero, state agencies inspect noncompliant CWA facilities more rapidly, around 22 days sooner. Agency responsiveness, however, attenuates as the percentage of Hispanics increases up to approximately 27% of the community, at which point agencies no longer appear to distinguish between facilities based on their compliance status. That is, in heavily Hispanic neighborhoods, noncompliant facilities wait the same amount of time for their next inspection as compliant ones.

Last, Panel C of Figure 2 displays the marginal effect of noncompliance on the duration between inspections across communities with different compositions of Blacks. The results are dissimilar to those reported for poverty and Hispanic communities. The interaction term between *Noncompliance* and *Percent Black* in the model does not achieve statistical significance, suggesting that state agencies do not differentiate between compliant and noncompliant CWA facilities when planning inspections in Black communities. This pattern is reflected in the nearly flat line shown in the figure.

**Conclusion**

The environmental justice literature has increasingly turned toward examining disparities in regulatory enforcement of major pollution control laws, many finding evidence that compliance monitoring and punitive sanctions are less likely to occur or are fewer in number when facilities are located in communities of color and/or communities with low income. Although prior research has not reached definitive conclusions, evidence points to a relationship between community demographic attributes and variations in the enforcement of U.S. federal laws such as the Clean Air Act, the CWA, the Safe Drinking Water Act, and the Resource Conservation and Recovery Act.

In this study, we consider a related question. We analyze the extent of differences in the response of government agencies as measured by the time that passes in between inspections for large facilities regulated by the CWA. Employing an event history analysis approach, we find that, on average, state agencies take longer – on the order of a couple weeks – to inspect facilities in Black and Hispanic neighborhoods. By contrast, CWA facilities in neighborhoods with large poor populations are likely to be targeted by state inspectors more rapidly.

We further find that these response times are conditional on the compliance status of CWA facilities. In the case of poor neighborhoods, agencies give more priority to noncompliant facilities – that is, they inspect them more quickly. However, this relationships wanes as the level of poverty in a neighborhood increases; when a neighborhood reaches about 20 percent poverty, states agencies wait longer to inspect facilities that are violation of their water discharge

obligations. For Hispanic neighborhoods, a similar relationship holds. In the most Hispanic neighborhoods, state agencies do not treat noncompliant and compliant firms differently when deploying their inspection efforts. But, as the percentage of Hispanics increases, state regulatory officials take longer to inspect noncompliant CWA facilities. The implication of these findings is that there is a potentially problematic prioritization of limited inspection resources for CWA facilities; state agencies are not giving priority to noncompliant facilities in more heavily poor and Hispanic neighborhoods. This is a form of bias that has not previously been identified in the literature.

Our study's findings for Black neighborhoods differ. The analysis finds that state agencies do not prioritize CWA facilities that are noncompliant over those that are compliant. This finding does not lend itself to a definitive interpretation. On the one hand, this result may suggest that state regulators do not consider the Black composition of a neighborhood when triaging facilities for inspection, which could be interpreted as a sign of race-blind enforcement. Past work has suggested that this might reflect a downstream benefit from decades of calls for political mobilization to address environmental injustice in Black communities (Konisky and Reenock 2013, 2018). On the other hand, another plausible interpretation of this finding is that state regulators, presumably charged to prioritize their enforcement efforts between noncompliant and compliant facilities, are neglecting to do so in Black communities. That is, they are not targeting their limited resources to facilities that are violating their performance standards. This pattern could well be interpreted as policy negligence toward Black communities, especially when considered with our finding that states are slower to inspect CWA facilities in Black communities in general.

We argue that slower response times, and in the case of Black communities, the lack of targeting of noncompliant facilities, is likely explained by how state enforcement officials prioritize limited inspection resources. We note, however, that this finding is observationally consistent with an alternative explanation that officials are wary of burdening environmental justice communities with "excessive" punishment (Balazs and Ray 2014). Although we cannot rule out this explanation completely, we think the research design we employ—particularly our focus on early stage enforcement efforts (inspections rather than sanctions) directed at large regulated facilities—makes it less likely. That said, we encourage future inquiry, with different research designs, to investigate these competing explanations thoroughly. In addition, our findings do not diminish important findings elsewhere of overzealous environmental enforcement targeted toward vulnerable individuals (Carrera 2014; Carrera and Flowers 2018; Flowers 2020).

This study argues that a meaningful way to understand enforcement disparities is to consider the time between government conducted compliance monitoring inspections. As a measure of government responsiveness, it provides a useful indicator of how government officials prioritize their enforcement efforts. In this way inspection response time might be considered by scholars and agencies alike as an important metric of performance. More research studying this metric would help clarify the mechanisms through which implementation inequities occur. Although the findings here are limited to the case of major sources under the CWA, we think the general approach is a compelling way for scholars to evaluate inequities in other areas, such as air pollution and safe drinking water, with respect to other types of facilities, and in policy areas

beyond the environmental context. Future work might expand our study to other policy outputs where differential delay may appear, such as in the issuing of licenses or permits.

The findings here are also informative for public policy. One of the difficult hurdles with addressing environmental inequities is that policy solutions to disproportionate siting and unequal pollution burdens are the legacy of historical practices. In this sense, there are no quick or easy fixes. Regulatory enforcement, however, is an area where government agencies already possess the necessary levers. That is, by changing priorities and facility targeting, government agencies can better mitigate disparities in environmental outcomes through changes in their internal enforcement practices.

**Appendix**

Table A1 Summary Statistics for Demographic Characteristics around Major NPDES Facilities

| | Mean | Standard Deviation | Minimum | Maximum |
|---|---|---|---|---|
| Total population | 3,282 | 6,934 | 0 | 208,218 |
| % Black | 0.10 | 0.17 | 0 | 0.98 |
| % Hispanic | 0.09 | 0.14 | 0 | 0.98 |
| % Poverty | 0.13 | 0.10 | 0 | 0.70 |

Table A2 Duration Analysis Estimates for Time between Inspections

| | Model 1 | | Model 2 | | Model 3 | |
|---|---|---|---|---|---|---|
| | Additive Model | | Conditional Model | | Conditional Distance Model | |
| Noncompliance | 0.1139*** | 0.0068 | 0.1224*** | 0.0068 | 0.1190*** | 0.0069 |
| % Poverty | 0.1992*** | 0.007 | 0.2614*** | 0.0079 | 0.2641*** | 0.008 |
| % Black | -0.0325*** | 0.0074 | -0.0279*** | 0.0082 | -0.0325*** | 0.0083 |
| % Hispanic | -0.0393*** | 0.0065 | -0.011 | 0.0073 | -0.0153** | 0.0074 |
| Noncompliance X % Poverty | | | -0.1432*** | 0.0082 | -0.1417*** | 0.0083 |
| Noncompliance X % Black | | | -0.0087 | 0.008 | -0.0088 | 0.0081 |
| Noncompliance X % Hispanic | | | -0.0604*** | 0.0068 | -0.0622*** | 0.0068 |
| Population per 1000 | 0.0097*** | 0.0015 | 0.0103*** | 0.0015 | 0.0086*** | 0.0014 |
| Unemployment | 0.0663*** | 0.0021 | 0.0654*** | 0.0022 | 0.0655*** | 0.0022 |
| Democratic Governor | -0.2877*** | 0.0155 | -0.2972*** | 0.0155 | -0.3004*** | 0.0156 |
| Federal Facility | -0.0158 | 0.0931 | -0.0072 | 0.0928 | -0.034 | 0.0957 |
| Public Owned Facility | 0.3689*** | 0.0207 | 0.3664*** | 0.0207 | 0.3642*** | 0.0208 |
| Facility Age | 0.0072*** | 0.0008 | 0.0072*** | 0.0008 | 0.0068*** | 0.0008 |
| Democrats per State Legislature | -0.0064*** | 0.0006 | -0.0068*** | 0.0006 | -0.0077*** | 0.0006 |
| Unified Democratic State Government | -0.0635*** | 0.0151 | -0.0665*** | 0.0151 | -0.0547*** | 0.0152 |
| Divided State Government | -0.2612*** | 0.0175 | -0.2624*** | 0.0175 | -0.2450*** | 0.0177 |
| Bush | 0.5829*** | 0.0086 | 0.5767*** | 0.0087 | 0.5779*** | 0.0087 |
| State Government Ideology, 1960-2017 | 0.0123*** | 0.0006 | 0.0129*** | 0.0006 | 0.0131*** | 0.0007 |
| Distance to Regional Office | | | | | -0.0111*** | 0.0017 |
| Constant | -7.5014*** | 0.0423 | -7.5021*** | 0.0423 | -7.3843*** | 0.0452 |
| Duration Parameter, p | 0.0645*** | 0.0023 | 0.0655*** | 0.0023 | 0.0665*** | 0.0023 |
| Frailty Parameter, q | -0.6710*** | 0.02 | -0.6773*** | 0.0201 | -0.6920*** | 0.0203 |
| log Likelihood (Null) | -192474 | | -192474 | | -189398 | |
| log Likelihood (Model) | -186799 | | -186458 | | -183472 | |
| AIC | 373634 | | 372957 | | 366987 | |
| BIC | 373809 | | 373161 | | 367200 | |
| N | 122,097 | | 122,097 | | 120,280 | |

Note: * p<0.10, ** p<0.05, *** p<0.01. Coefficients, or the ln(Hazard Rates), are reported in table. Standard errors adjusted for frailty within facility.

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