# The Politics of Pollution in America's Most Vulnerable Communities

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## *Abstract*

Throughout the history of the United States, corporate facility polluters have been targeting low socioeconomic status and high minority communities across the country. This has been displayed through countless studies including this thesis and accompanying literature, *Environmental Justice: The Economics of Race, Place, and Pollution*; a 2019 article by Banzhaf, Ma, and Timmins. Yet, there is only little information about the relationship between corporate facility pollution and governmental actions. This thesis individually and collectively compares the correlation between the change in corporate pollution from 2016 to 2020 with minority and poverty rates in 2016. This time period was chosen to represent the Trump presidency's abolishment of hundreds of environmental laws and policies. It was found at the county level that changes in pollution emissions between 2016 and 2020 are positively correlated with counties of high minority status and negatively correlated with counties of high poverty status. It is difficult to estimate if either of these relationships were completely associated with the modification in environmental policies during the Trump presidency, but it is deemed a reasonable suspect.

# *Introduction*

## A. The Problem Statement

Before the United States environmental justice movement in the early 1980s, thousands of communities of low socioeconomic status or highly populated by minorities were targeted by corporate polluters (Skelton & Miller, 2021). One of the many examples comes from Times Beach, Missouri, which was once a highly populated city outside of the state's capital, St. Louis. In the 1960s, the Northeastern Pharmaceutical and Chemical Company began discarding chemical waste around the city (Little, 2022). Less than a decade later, many unexplainable deaths caused the Centers for Disease Control and Prevention (CDC) to investigate and later evacuate the entire city (Little, 2022). Since then, Times Beach has held a population of zero and turned into a state park (Little, 2022). People who lived in the surrounding area during that time are still experiencing adverse health effects, such as cancer diagnosis, to this day (Little, 2022).

As illustrated by this example and others, there is ample evidence that corporate polluters tend to overlook human life to produce hazardous waste to gain profit (Skelton & Miller, 2021). These practices lead to inadequate health conditions and negative economic impacts in many vulnerable communities (Skelton & Miller, 2021). After environmental protection protests began in the 1980s, they exposed these unjustifiable actions to the world (Skelton & Miller, 2021). Governmental policies were then implemented to reduce environmental degradation in the United States.

While many government leaders continue to design and implement legislation that protects the environment in vulnerable communities, others do not, with some even deregulating controls (Popovich et al., 2020). As seen in the past decade, the Trump presidency abolished hundreds of environmental laws and policies (Popovich et al., 2020). Some examples of laws with the most considerable impact include weakening controls on toxic pollutants and deregulating sections of the Clean Air Act (Popovich et al., 2020). Along with this the officeholders "revised a program designed to safeguard communities from increases in pollution … to make it easier for facilities to avoid emissions regulations," among others (Popovich et al., 2020).

## B. Research Objectives

This thesis aims to examine if the relaxation of governmental regulations leads to higher environmental degradation, such as toxic waste or pollution emissions, and if so, whether this degradation is specifically concentrated within communities of low socioeconomic or high minority status. The analysis of this relationship could give notice to a crisis in the United States that is constantly overlooked.

## C. Hypothesis

It is hypothesized that if environmental protection policies are removed then there will be an increased amount of pollution in areas of low socioeconomic or high minority

status. The research was conducted by examining corporate pollution before, during, and after the Trump presidency. This hypothesis is assumed accurate due to the Trump administration's abolishment of hundreds of environmental laws and policies, which would seemingly increase corporate facility pollution (Popovich et al., 2020).

## *Review of Literature*

The primary background of this thesis is derived from *Environmental Justice: The Economics of Race, Place, and Pollution*; a 2019 article by Banzhaf, Ma, and Timmins. The article discusses the environmental justice movement, originating in rural North Carolina, and a current examination of the topic. The paper discusses patterns of corporate facility pollution, demographics, and discriminatory laws passed within vulnerable communities (Banzhaf et al., 2019).

Within the literature, it is discovered that despite the environmental justice movement, environmental injustice is still an issue in these communities around the United States (Banzhaf et al., 2019). A recent example of this comes from Flint, Michigan. In 2014, the state of Michigan's treasury department switched the city's water to come from the Flint River, a knowingly polluted river, to save money (Ray, 2022). After months of brown water coming from the faucets, residents hired outside resources to test their water and found high levels of carcinogens and lead (Ray, 2022). It took this underrepresented community over two years to acquire clean water again (Ray, 2022). Mistreatment like this has led to higher illness rates, a weakened economy, and an unenjoyable lifestyle in many communities (Banzhaf et al., 2019).

Utilizing the latest pollution and demographic data will allow this thesis to provide an up-to-date representation of this environmental issue that exists today. In addition, this thesis plans to explore the relationship between corporate facility pollution and governmental actions, which no known report examines.

## *Methodology*

### A. Data Collection

Environmental datasets were collected from the United States Environmental Protection Agency's (EPA) Toxic Release Inventory (TRI). "TRI tracks the management of certain toxic chemicals that may pose a threat to human health and the environment. United States facilities in different industry sectors must report annually how much of each chemical is released to the environment and/or managed through recycling, energy recovery, and treatment." (EPA, 2023). Data ranging from 2012 to 2021 was utilized to best showcase pollution change before, during, and after the Trump presidential campaign.

Demographic data was collected from the United States Census Bureau and the American Community Survey (ACS). Datasets obtained from the United States Census included income and race datasets by county. These datasets were collected from the 2020 Census and the 2016 ACS.

### B. Variable Definitions

The primary TRI variable used in this study was on-site release total. This includes all on-site releases including fugitive air, stack air, water, underground, landfills, land treatment, surface impoundment, and others (EPA, 2023). Specifically, fugitive air includes air pollution releases that are not from a secure air release system such as leaks or

outdoor streams (EPA, 2023). Stack air includes air pollution releases that are from a secure air release system such as pipes or vents (EPA, 2023). Surface impoundment includes uncovered areas that hold liquid pollution, prior to proper disposal of the waste (EPA, 2023).

Toxicity-weighted emission measurements were created as discussed in the literature *Environmental Justice: The Economics of Race, Place, and Pollution* (Banzhaf et al., 2019). Utilizing the TRI data and toxicity weight measurements from the EPA's Risk Screen Environmental Indicators model (RSEI) allows researchers to see how harmful the pollution is to humans within the surrounding area. RSEI information was obtained from the EPA's website (EPA, 2023).

Several distinct variables were utilized from the United States Census, specifically from income and race datasets. The income dataset includes total households, percentage of households income less than $9,999, percentage of households income between $10,000 and $14,999, percentage of households income between $15,000 and $24,999, and percentage of households income between $25,000 and $34,999. According to the United States Census Bureau in 2020, a household's income is considered under the poverty threshold when under $35,000 (United States Census Bureau). A new variable was created by summing all variable percentages of households with income less than $35,000. This variable showed which counties had a high percentage of households under the poverty threshold.

The race dataset variables includes total population, total Hispanic or Latino, total White, total Black or African American, total American Indian or Alaska native, total

Asian, total native Hawaiian or other pacific islanders, and total other race. A minority is a “culturally, ethnically, or racially distinct group that coexists with but is subordinate to a more dominant group.” (Editors of Encyclopedia Britannica). Since White is the largest race of size in the United States, all other races were classified as the minority (United States Census Bureau). A new variable, the percentage of the population considered a minority, was created by subtracting total White alone from the total population, then dividing it by the total population and multiplying by 100 to obtain a percentage.

## C. Analysis of the data

### i. Descriptive Analysis

Figures 1 through 6 illustrate the spatial distribution of pollution, minority, and poverty rates across United States counties from 2012 to 2021. Figures 1 through 4 below illustrate the sum of all TRI on-site pollution within the given United States county for the described years. Light gray depicts that the county’s sum of facility pollution is in the lowest 20% of all United States counties. As the red darkens, the sum of the county pollution increases by 20%. 2012 and 2016 maps represent pre-Trump administration, 2018 represents the Trump administration term, and 2021 represents the most recent data, post-Trump administration.

*Figure 1*: On-site total factory pollution releases by United States County, 2012

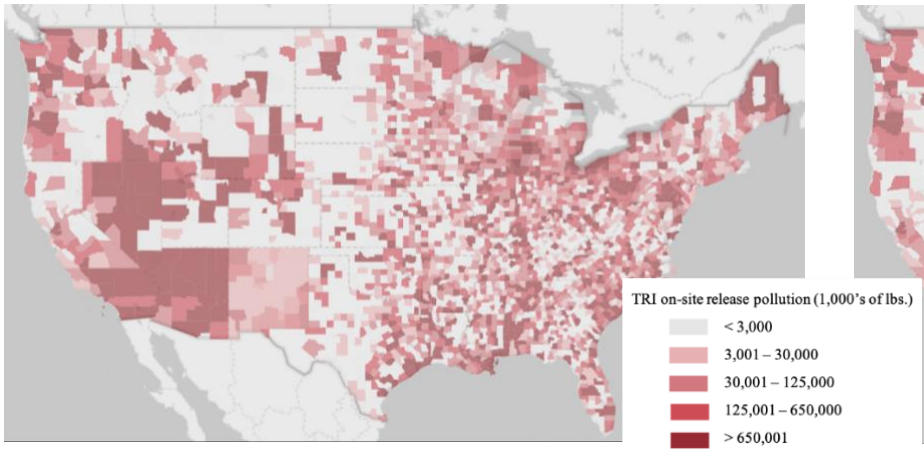



*Figure 2*: On-site total factory pollution releases by United States County, 2016

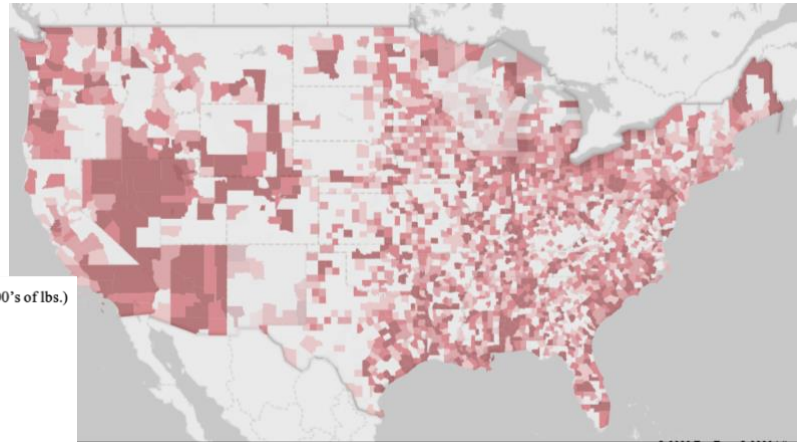


*Figure 3*: On-site total factory pollution releases by United States County, 2018

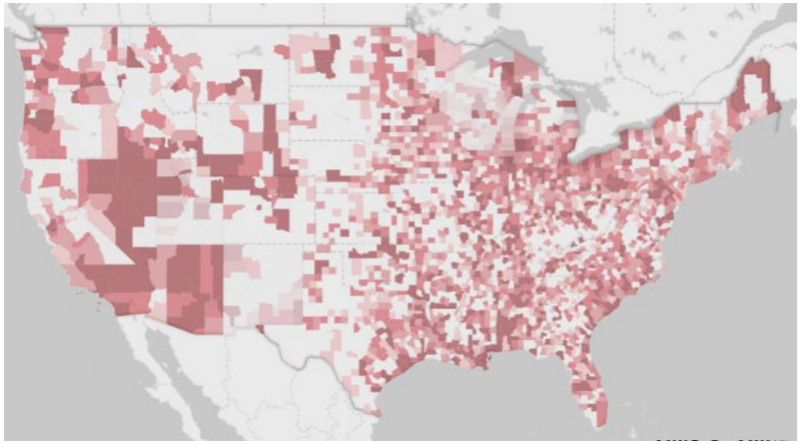
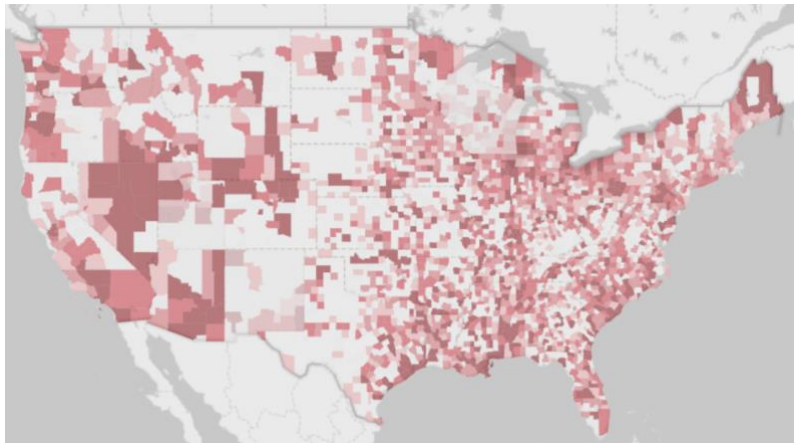


*Figure 4*: On-site total factory pollution releases by United States County, 2021



Figures 1 through 4 show that the United States as a whole is getting lighter in color, with less pollution per county each year. As shown in Table 1 below, when comparing the percent change per year between 2016 and 2020, more of the observations are negative, with less pollution per county each year. Table 1 also shows that the mean of these observations and log of these observations is positive, meaning the counties that are increasing in pollution each year are increasing at a positive rate.

*Table 1:* TRI Statistics - Percent Change from 2016 to 2020

| **Statistic** | Count | Percentage of Total |
|---|---|---|
| Total Observations | 2,149 | -- |
| Total Negative Observations | 1,360 | 63.29% |
| Total Positive Observations | 784 | 36.48% |
| Mean of Total Observations | 519,343.06 | -- |
| Mean of Log of Total Observations | 1.56 | -- |

Figure 5 below illustrates the 2016 ACS data for minority status. Light gray depicts that the county's minority percentage is in the lowest 20% of all United States counties. As the red darkens, the percentage of the population that is considered a minority increases by 20%. Figure 5 shows which United States counties have the highest percentage of the population considered a minority.

*Figure 5:* Percentage of the population with minority status by United States county, 2016

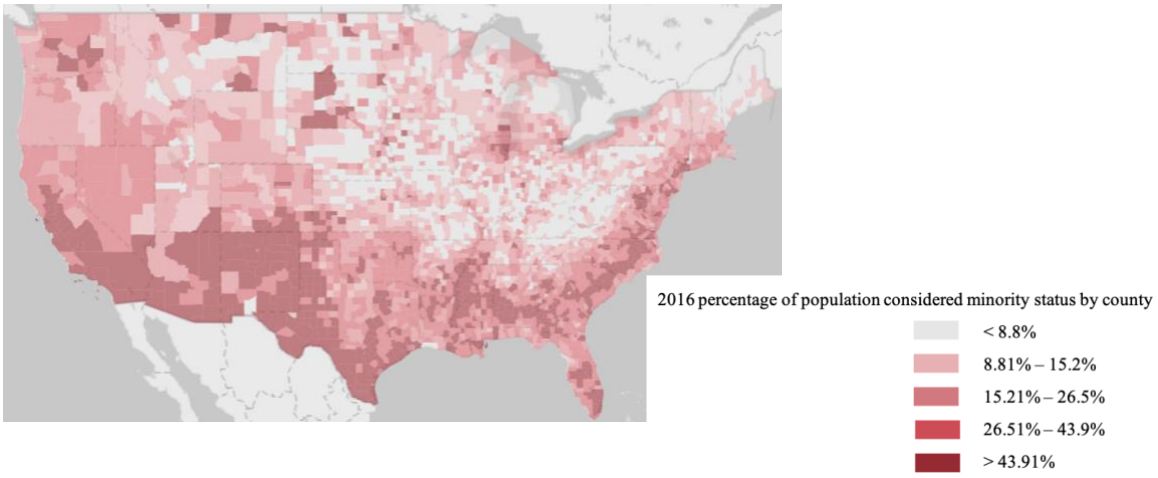



Figure 6 below illustrates the 2016 ACS data for poverty status. Light gray depicts that the county has the lowest percentage of households with an income under $35,000 of all United States counties. As the red darkens, the percentage of households under the poverty threshold increases by 20%. Figure 6 shows which United States counties have the highest percentage of the population under the poverty threshold.

Figure 6: Percentage of the population under poverty threshold by United States county, 2016

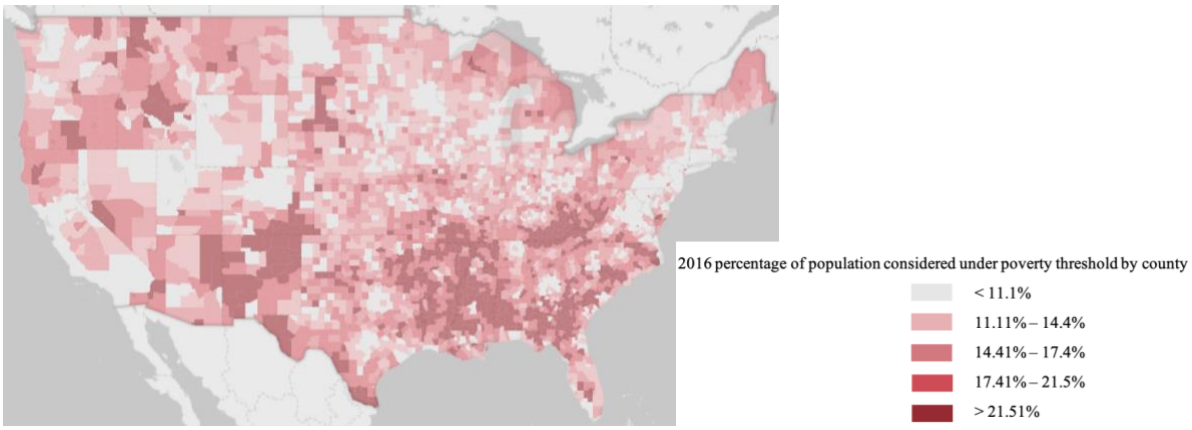


Table 2 below displays the descriptive statistics of pollution and demographic data in 2016, 2020, and the percent change between the two years. The number of observations (N), average ($\bar{x}$), and standard deviation ($\sigma$) can give more information about each dataset in the observed years. Table 2 confirms that the most common race in the United States in 2016 is white at 73.044%. After making all other races a minority, Table 2 shows that 26.956% of the United States population in 2016 was considered a minority. Table 2 also shows that the Median Household Income in the United States increased by 17.096% between 2016 and 2020. As for pollution measures, Table 2 confirms that the toxicity total from 2016 to 2020 decreased overall.

*Table 2:* Dataset Descriptive Statistics

| | 2016 | | | 2020 | | | Percent Change | | |
|---|---|---|---|---|---|---|---|---|---|
| | N | $\bar{x}$ | $\sigma$ | N | $\bar{x}$ | $\sigma$ | N | $\bar{x}$ | $\sigma$ |
| **Pollution Data** | | | | | | | | | |
| Toxicity Total | 2386 | 6203245 | 6.49E+07 | 2376 | 4537297 | 5.02E+07 | -0.419 | -26.856 | -22.650 |
| **Racial Composition** | | | | | | | | | |
| Percent Black | 2386 | 12.778 | 12.738 | 2376 | 12.75 | 12.568 | -0.419 | -0.219 | -1.335 |
| Percent Minority | 2386 | 26.956 | 16.357 | 2376 | 29.861 | 16.705 | -0.419 | 10.777 | 2.128 |
| Percent White | 2386 | 73.044 | 16.357 | 2376 | 70.139 | 16.705 | -0.419 | -3.977 | 2.128 |
| **Income Measures** | | | | | | | | | |
| Median Household Income | 2386 | 60715.05 | 16326.32 | 2376 | 71095.06 | 18876.03 | -0.419 | 17.096 | 15.617 |

ii. Regression Analysis

The main analysis is based on regression models of the following form…

$$y_i = \beta_0 + \beta_1 X_i + \beta_2 Z_i + \varepsilon_i \quad (1)$$

Within this formula, $y_i$ represents the dependent variable or outcome for the given county *i*. The betas ($\beta$) denote the change in the dependent variable for every one-unit change in

the independent variable. The variable $X_i$ includes regressors of interest and $Z_i$ contains control variables. The error term ($\varepsilon_i$) represents the effect of omitted variables from the regression.

Regressors of interest include the fraction of the county population below the poverty threshold and that is considered a minority. Analyses were run that considered these regressors both individually and collectively. Table 3 of the Presentation of Results section shows the relationship between poverty and minority status when a county endures a change in pollution. The correlation between the changes in pollution compares the weighted toxicity emissions from 2016 to 2020. Control variables within the regression includes the log of county population and state-fixed effects such as state-level environmental policies. These allow to control for fixed differences across the states and counties such as size.

## *Presentation of Results*

Table 3 showcases the regression analysis as mentioned in the Regression Model section of the Methodology. The first column of Table 3 shows the individual correlation between the Percentage of the Population Considered Under the Poverty Threshold in 2016 with the Percentage Point Change in Toxicity Weighted Emissions from 2016 to 2020. This relationship is negative as shown by the regression and confirmed by Figure 8 below. The second column of Table 3 shows the individual correlation between the Percentage of the Population Considered a Minority in 2016 with the Percentage Point Change in Toxicity Weighted Emissions from 2016 to 2020. This relationship is positive as shown by the regression and confirmed by Figure 7 below. The third column of Table 3 shows the combined correlation of the two variables mentioned in columns one and two. This still shows a negative relationship between poverty and a positive relationship between minority status.

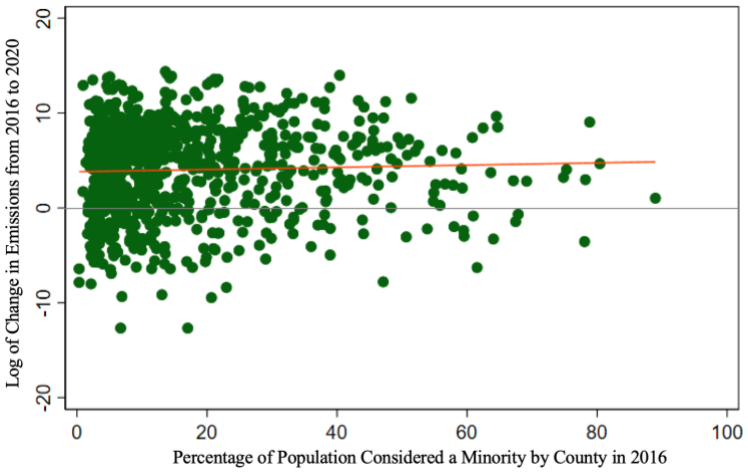
*Table 3:* Percentage Point Change in Pollution and Demographics

| | **Percent Change in Toxicity Weighted Emissions 2016 to 2020** | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| Percentage of Population Considered Under Poverty Threshold in 2016 | -1104.5<br>(12865.6) | | -2352.7<br>(14904.3) |
| Percentage of Population Considered a Minority in 2016 | | 459.9<br>(4596.5) | 884.0<br>(5324.9) |
| Constant | 122906.2<br>(210369.7) | 98066.9<br>(108623.3) | 126745.3<br>(211684.0) |
| Observations | 2169 | 2169 | 2169 |

Standard errors in parentheses * p<0.1, ** p<0.05, *** p<0.01

Using the same data in Figures 1 through 5, a scatter plot was created to visualize the change in pollution in areas of high minority status. Figure 7 below illustrates the Percentage of Population Considered a Minority by County in 2016 on the horizontal axis and the Log of Change in Emissions from 2016 to 2020 on the vertical axis. The log of the change was taken to keep the results symmetrical. The dots represent each individual United States county and showcases the county's relationship between the two axes. The red line represents the regression line, and the gray line represents zero log change in emissions.

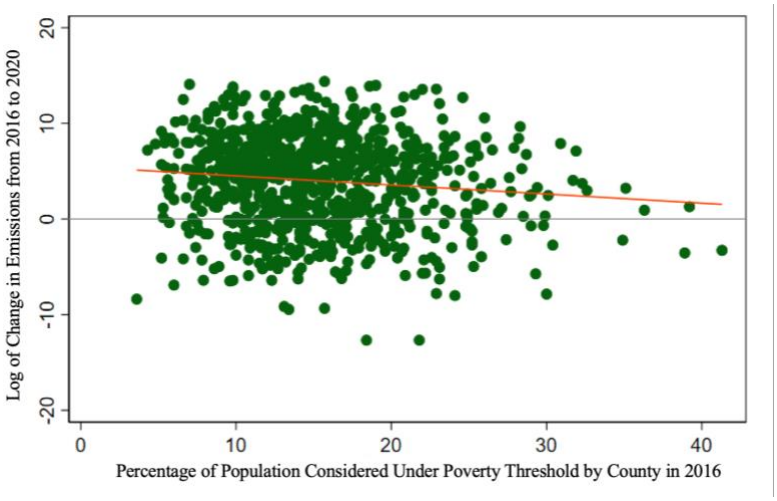
*Figure 7:* Comparison of Percentage of Population Considered a Minority and Log Change in Emissions




As shown by Figure 7 and Table 3, as a county increases in the amount of the population that is considered a minority, the log of the change in emissions from 2016 to 2020 increases.

Using the same data in Figures 1 through 4 and 6, a scatter plot was created to visualize the change in pollution in areas of high poverty status. Figure 8 illustrates this with the Percentage of Population Considered Under Poverty Threshold by County in 2016 on the horizontal axis and the Log of Change in Emissions from 2016 to 2020 on the vertical axis. The dots represent each individual United States county and showcases the county's relationship between the axes. The red line represents the regression line, and the gray line represents zero log change in emissions.

*Figure 8:* Comparison of Percentage of Population Considered Under Poverty Threshold and Log Change in Emissions




As shown by Figure 8 and Table 3, this relationship is negative. Therefore, as a county increases in the amount of the population that is considered under the poverty threshold, the log of the change in emissions from 2016 to 2020 decreases. It is important to note that since the regression line is in the positive area, there is still a majority of counties with a positive log change in emissions.

## *Conclusions*

Demonstrated by the regression results, it was found that pollution change and minority status have a positive relationship. Therefore it can be concluded that facility polluters target areas of high minority status, as assumed by the hypothesis. Another conclusion from the regression results states that pollution change and poverty status have a negative relationship. It is important to note that although the relationship between pollution change and poverty status is negative, there is still a majority of counties with high poverty status that are enduring an increasing amount of pollution each year. This can be shown in Figure 8, with a majority of the data points or counties being above the zero log change in emissions line. Due to this, it can be concluded that polluters target areas of low socioeconomic status, as assumed by the hypothesis.

It is difficult to estimate if the defined relationships are completely associated with the Trump administration's change of policies. But it is deemed a reasonable suspect due to the Trump administration’s abolishment of hundreds of environmental laws and policies within the researched time frame (Popovich et al., 2020).

Protesters have been trying to stop environmental injustice since the mid-1900s. This thesis suggests that this is still a serious problem across the United States. The most reasonable solution is for lawmakers to protect the environment, especially in vulnerable communities. It is evident that these communities need to be protected from corporate polluters as they do not have a voice for themselves.

### *Implications and Limitations*

Although the TRI is very cautious when collecting data from facilities, there have been instances of companies illegally dumping waste. This is a possible limitation as pollution data could be unknowingly higher in some areas. Along with this, the COVID-19 pandemic lessened pollution since there was a halt in many businesses and facilities. This may impact the data from 2020 to the present.

Within the writing, it is noted that it is difficult to perceive if the results were directly related to the Trump administration's abolishment of environmental protection laws and policies. This is due to a large number of other factors that may affect factory pollution rates including a change of facility operations, and number of facilities, among other corporate business decisions.

## *Bibliography*

Angrist, J., & Krueger, Al (2020). The Economics of Education. Retrieved November 09, 2022, from https://www.sciencedirect.com/topics/economics-econometrics-and-finance/difference-in-differences

Banzhaf, S., Ma, L., & Timmins, C. (2019). Environmental justice: The economics of race, place, and pollution. Journal of Economic Perspectives, 33(1), 185–208. https://doi.org/10.1257/jep.33.1.185

Editors of Encyclopedia Britannica. Minority | Definition & Facts. Encyclopedia Britannica. Retrieved March 05, 2023, from https://www.britannica.com/topic/minority

Environmental Protection Agency (EPA). (2023, January 20). Toxic Release Inventory (TRI) Program. EPA. Retrieved February 16, 2023, from https://www.epa.gov/toxics-release-inventory-tri-program

Little, J. (2022, January 4). A Town, a Flood, and Superfund: Looking Back at the Times Beach Disaster Nearly 40 Years Later. EPA. Retrieved November 09, 2022, from https://www.epa.gov/mo/town-flood-and-superfund-looking-back-times-beach-disaster-nearly-40-years-later

Popovich, N., Albeck-ripka, L., & Pierre-louis, K. (2020, October 16). The Trump administration rolled back more than 100 environmental rules. here's the full list.

The New York Times. Retrieved November 09, 2022, from https://www.nytimes.com/interactive/2020/climate/trump-environment-rollbacks-list.html

Ray, M. (2022, December 10). Flint water crisis. Encyclopædia Britannica. Retrieved February 16, 2023, from https://www.britannica.com/event/Flint-water-crisis

Skelton, R., & Miller, V. (2021, February 24). The Environmental Justice Movement. NRDC. Retrieved November 09, 2022, from https://www.nrdc.org/stories/environmental-justice-movement

United States Census Bureau. (2023, January 30). How the Census Bureau Measures Poverty. United States Census Bureau. Retrieved March 05, 2023, from https://www.census.gov/topics/income-poverty/poverty/guidance/poverty-measures.html#:~:text=Step%201%3A%20Determine%20the%20family's,threshold%20(below)%20is%20%2435%2C801.