

The Great Decline: Toxic Air Pollution and Neighborhood Dynamics

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Abstract

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Recent research on environmental inequality has found evidence for racial disparities in exposure to air pollution with communities of color more likely to live in more highly-polluted neighborhoods. Additionally, during the period 1990 to 2010, both national levels of air pollution have steadily and dramatically declined *and* neighborhoods in the United States have become more racially and ethnically diverse. Given these simultaneous and complex processes this study seeks to determine to what extent the improvements in neighborhood air quality have benefitted neighborhoods of color. Using cross-sectional and change models this research finds that race was predictive of greater improvements in air quality for neighborhoods of color between 1990 and 2000, but not for 2000 to 2010. Furthermore, race is significantly predictive of toxic air emissions for all years in the cross-sectional analyses. In other words, despite a narrowing in racial disparities between 1990 and 2010, communities of color are still disproportionately exposed to higher levels of toxic air emissions in their residential neighborhoods.

Introduction

Environmental justice (EJ) literature, which grew out of the social movement of the same name, has documented the existence of neighborhood racial disparities in exposure to environmental hazards in the United States. Specifically, evidence has shown that both African American and Hispanic communities are more likely to live in neighborhoods with higher levels of air pollution, among other environmental burdens. During this same time period, however, national levels of air pollution have been steadily, and dramatically, decreasing. Additionally, the racial and ethnic composition of many U.S. neighborhoods has been changing with increasing diversity emerging as one of the more significant patterns. Given these trends, this study seeks to gain a better understanding of the impact these air quality improvements have had on the racial disparities in neighborhood exposure to air pollution. Utilizing tract-level census data, merged with data on toxic air releases and enforcement and compliance from the Environmental Protection Agency, I find that the largest improvements in air quality have occurred in neighborhoods with higher proportions of African Americans and Hispanics from 1990 – 2010. This suggests that, while race still remains a significant predictor of exposure to air pollution, the gap between whiter neighborhoods and those composed largely of African Americans and/Hispanic residents has narrowed during the period 1990 to 2010. Additionally, despite the increasing diversity of U.S. neighborhoods over this time period, from 2000 to 2010 neighborhoods that increased their share of white residents had greater improvements in air quality relative to other racial/ethnic groups.

Previous Literature

Environmental Inequality & Justice

The environmental justice movement that emerged during the 1980s, which seeks to advocate for the equitable distribution of environmental benefits and ills, helped spur an entirely new literature within the social sciences investigating the relationship between the environment

and society, through the lens of social justice. Local community awareness and activism surrounding the issue of environmental racism was the result of a number of cases in the late 20th century in which toxic substances were dumped in neighborhoods predominantly composed of people of color. As Dorceta E. Taylor describes in her book *Toxic Communities: Environmental Racism, Industrial Pollution, and Residential Mobility*, the contamination of local waterways with the pesticide DDT (diphenyltrichloroethane) in Trina, Alabama in 1978, the dumping of PCB-laced (polychlorinated biphenyl) soil in Warren County, North Carolina, and the spotlight by The Washington Post in 1987 on “Cancer Alley” in Louisiana all served to highlight the issue of environmental discrimination in the national discourse and galvanized a new group of activists personally affected by these injustices. The attention these and other cases garnered propelled an interest in more systematic investigations of the issue by activists, policymakers, and academics alike.

This work started gaining traction in the 1990s and has continued through the 2000s with researchers first attempting to show evidence of environmental discrimination along various social and economic dimensions including race, ethnicity, and income. One of the earliest and most influential studies conducted in the United States examining this relationship was commissioned by the United Church of Christ (UCC) in 1987. Titled “Toxic Wastes and Race: A National Report on the Racial and Socio-Economic Characteristics of Communities With Hazardous Waste Sites,” this research found evidence for disproportionate siting of commercial hazardous waste facilities in communities with higher proportions of residents of color. Additionally it found that racial composition was the most significant variable tested, more so than socioeconomic status, in the siting of these facilities.

Following this, the 1990s saw an academic, social, and political surge in interest on the topic of environmental inequality and environmental justice. Robert D. Brullard’s 1990 book, *Dumping in Dixie: Race, Class, and Environmental Equity* supported the findings of the UCC report and highlighted the activism occurring in communities of color around issues of

environmental justice. This interest eventually resulted in national political action with the issuance of an executive order by President Bill Clinton in 1994, which required every federal agency to “make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low income populations in the United States” (Executive Order 12898, 1994). Furthermore, this order was building on the creation of the EPA’s Office of Environmental Justice in 1992 whose mission it is to integrate “environmental justice into all EPA programs, policies, and activities” (EPA; About OECA).

The years following the publication of these groundbreaking works sought to determine to what extent these results were reproducible for other environmental ills, at finer levels of geography, and with the addition of variables unaccounted for in the previous analyses. Initial critiques of the UCC report highlighted the use of zip codes as an inappropriately large level of geography and also challenged the assertion that discriminatory intent was the cause of the racial differences in facility siting (Anderson, Anderton, and Oakes, 1994; Anderton, Oakes, and Egan, 1997; Anderton et al., 1994a,b; Baden and Coursey, 1997; Been 1995; Been and Gupta, 1997; Downey, 2003, 2005; Glickman, Golding, and Hersh, 1995; Hamilton, 1995; Oakes, Anderton, and Anderson, 1996; Pollock and Vittas, 1995; Sheppard et al. 1999). While this set off a debate within the literature regarding the temporal dynamics of siting decisions relative to residential occupancy, the structural and institutional nature of racism means that whether there was overt racial discrimination or whether siting decisions were the product of economic or political incentives, the result has been marked disparities in the location of environmental ills vis-a-vis communities of color (Adeola, 1994; Boer et al., 1997; Boone and Modarres, 1999; Bowen et al., 1995; Bullard et al., 2007, 2008; Goetz and Kemlage, 1996; Hird and Reese, 1998; Lejano and Iseki, 2001; Mennis and Jordan, 2005; Mohai, 1995; Mohai and Saha 2007; Morello-Frosch and Jesdale, 2006; Morello-Frosch and Lopez, 2006; Neumann, Forman, and

Rothlein, 1998; Pastor, Sadd, and Morello-Frosch 2004; Pastor, Morello-Frosch, and Sadd, 2006; Stretesky and Hogan, 1998; USGAO, 1995; Wang and Feliberty, 2010). While the debate over the mechanisms is important for policymakers and communities hoping to create a more equitable society, the presence of the pattern itself speaks to the racialized nature of environmental inequality in the United States, particularly at the level of the neighborhood (Mohai et al. 2009).

Environmental Policy & State Variation

In 1990 the United States Congress passed amendments to the Clean Air Act (1970) which established National Ambient Air Quality Standards (NAAQS) for six criteria pollutants deemed harmful to human health (Clean Air Act 1990). These standards were far more stringent on air pollution emissions than the 1970 version of the bill and while states were tasked with implementing their own laws and enforcement mechanisms to comply with this federal statute, there was now one unifying standard that all states were expected to meet. In the subsequent two decades since the passage of these amendments the United States has seen large improvements in national air quality and visibility, including areas of nonattainment (those counties which failed to meet the NAAQS). Additionally, according to the EPA, unhealthy air quality days are trending down as are air toxics levels.

The passage of these amendments was meant to strengthen the regulatory standards for air pollution emissions, in an effort to improve air quality for all Americans, regardless of racial or ethnic identity. However, given the inequitable distribution of pollution in neighborhoods of color and the emerging focus on environmental justice by the EPA, this could also have been achieved through a more targeted approach, focusing on reducing racial disparities in exposure. While these amendments are often hailed as a major success in the country's effort to reduce air pollution and its associated risks to human health and wellbeing (Burns et al. 2011; US EPA 2011; US EPA 2015), given the evidence that communities of color have disproportionately

been exposed to air pollution (Perlin, Wong, and Sexton, 2001; Mennis and Jordan, 2005; Morello-Frosch and Jesdale, 2006; Morello-Frosch and Lopez, 2006; Pastor, Sadd, and Morello-Frosch 2004; Pastor, Morello-Frosch, and Sadd, 2006; Stretesky and Hogan, 1998), there has yet to be an investigation into what effect this overall improvement in air quality has had on minimizing racial and ethnic disparities on the burden of exposure. In other words, to which neighborhoods are the lion's share of these benefits going?

An important component of this investigation, however, must account for the state-level variation in enforcement of the CAA emissions standards. While the NAAQS were nationally defined by the EPA, the bill leaves it up to each individual state to determine its own methods for enforcement and compliance through the submission of a state implementation plan (SIP) which outlines the "manner in which the NAAQS will be achieved, maintained, and enforced" (Domike and Zacaroli, 2011). Due to differences in political leadership, industry, population density, geography, as well as numerous other factors, states can and do vary quite a bit in their approaches to, and success in, enforcing the NAAQS (Gray and Shimshak, 2011). This has direct implications for issues of environmental justice as these community characteristics play a role in the debate surrounding the explicit discriminatory intent in siting decisions. While the findings are somewhat mixed, and many authors do not fall squarely on one side of the debate, evidence has shown that neighborhoods of color generally have lower levels of political power and thus may serve as attractive areas for polluting industries (Bullard and Wright, 1987; Pastor et al., 2001; Saha and Mohai, 2005). Additionally, more populated regions with higher levels of industrialization are more likely to house facilities due to the availability of cheap labor and access to infrastructure (Anderton et al. 1994; Been and Gupta 1997; Mohai and Bryant 2002; Downey 1998). Therefore, it is important to take these underlying state differences into account in any assessment of more specific neighborhood dynamics.

Additionally, the research on environmental regulatory policy at the state level has found support for a relationship between monitoring and enforcement and a reduction in overall

emissions (Potoski and Woods, 2002), fewer new facilities (Gray 1997), and general compliance with the law (Ringquist, 1993). However, there is also evidence that federal intervention and enforcement play a significant role in helping states achieve national standards (Lester et al. 1983; Ringquist, 1993; Gray, 1997). Given these findings it is important to understand whether these state-level differences in enforcement and compliance help to explain any of the racial differences in the reduction of exposure to air pollution. It may be the case that leaving monitoring and enforcement decisions up to the states plays a role in the magnitude of the reduction of racial disparities at the neighborhood level. Alternatively, given the evidence supporting the significance of federal standards and enforcement, the introduction of the NAAQS may overshadow state-level differences with respect to racial differences in exposure to air pollution.

Neighborhood Change

In addition to the trends mentioned above, neighborhood racial and ethnic composition has also been in flux over the last several decades. White residential segregation, while significantly declining between 1980 and 2010, is still a prominent feature of U.S. metropolitan areas with whites tending to live in predominately white neighborhoods¹ (Iceland and Sharp, 2013). Despite similar declines, blacks continue to be the most segregated group² (Iceland and Sharp, 2013) and both white and black populations remain largely segregated from the growing number of Asian and Hispanic communities (Iceland 2009; Logan, Stults, Farley 2004). One of the most significant trends during this time period, however, has been the rising number of multi-racial and -ethnic neighborhoods in which two or more groups comprised the majority of population (Fasenfest, Booza, and Metzger 2004). These changes in neighborhood racial and ethnic composition, occurring simultaneously with national reductions in air pollution and the

¹ Whites, in other words, are the most isolated of all racial groups when measuring segregation using the isolation index.

² When utilizing the index of dissimilarity as the measure of segregation.

proliferation of studies substantiating claims of environmental inequality, are important to acknowledge when considering claims regarding environmental justice. It may be the case that many of the mixed findings from the environmental justice literature were a result of these changing neighborhood racial dynamics. Therefore, this study seeks to account for changes in neighborhoods over time that cannot be captured by a purely cross-sectional analysis.

Research Objectives

From 1990 to 2010 air quality has improved nationally in the United States while the evidence for racial disparities in exposure to air pollution has increased as has neighborhood diversity. While the environmental literature has tended to focus on the mechanisms through which disproportionate exposure is created, there has yet to be an investigation into whether the documented racial disparities in air pollution exposure have decreased over this time period and what role changing neighborhood racial composition has played, if any. This study seeks to understand whether an overall reduction in air pollution emissions helped to create a more equitable distribution of air pollutants within U.S. neighborhoods, while accounting for general state variation, state variation with respect to enforcement and compliance of the law, and changing patterns of neighborhood racial and ethnic diversity. In so doing, the following questions are explored:

- Are neighborhoods with larger proportions of non-white populations receiving larger reductions in air pollution emissions over time?
- Does state variation in enforcement and compliance help to explain these reductions?
- Given the increasing diversity in U.S. neighborhoods from 1990 to 2010, do neighborhoods that are becoming “whiter” over time see greater reductions in air pollution than other neighborhoods?

Data

Data for this study come from three different sources: the Neighborhood Change Database (NCDB) created by Geolytics (2006), the EPA's Toxics Release Inventory (TRI), and the EPA's Enforcement & Compliance History Online (ECHO) Database. Since the research questions are focused on neighborhood-level changes, the primary unit of analysis is the census tract. The time period of interest is 1990 to 2010, given the passage of the CAA amendments at the start of this period and the availability of census, air pollution, and enforcement data for 1990, 2000, and 2010. The geographic scope of this study is the entire United States, including Washington D.C. in the years for which data are available (2000 and 2010). Census tracts that had a population of zero were excluded from the final dataset which resulted in a sample size of 72,235 for 1990, 72,642 for 2000, and 72,001 for 2010³.

Outcome variable

Air pollution data come from the EPA's TRI dataset which consists of emissions reports for large industrial facilities in sectors including mining, utilities, manufacturing, wholesalers, publishing, hazardous waste, and federal facilities. Facilities in these sectors that have at least ten full time employees and that produce, process, or use any of the 690 chemicals or chemical categories deemed harmful to human health and/or the environment are required to report these activities to the EPA. From this dataset information about facility location, reporting year, and total pounds of emissions was extracted.

Much of the early literature on environmental inequality used the presence or absence of a polluting facility as the outcome measure. However, this approach was critiqued as being too

³ There were 287 tracts in 2010 for which the poverty rate was coded -999 but there was a positive population. Upon further inspection of these tracts, it was determined that they were all census tracts that encompassed government-owned land (i.e. military bases, prisons, public universities, etc.). According to the U.S. Housing and Urban Development website (<https://www.huduser.gov>) through which the nature of these tracts was determined, they technically have a poverty rate of 0.00% due to their institutionalized nature. Therefore, these tracts were recoded with a value of 0 for the poverty rate. This recoding did not substantively change the results of any descriptive statistics or models versus simply excluding these tracts from the overall analysis.

crude and potentially misleading since the location of a facility near the boundary of a census tract would not accurately reflect the exposure to pollution for those living near the facility but not located within the same arbitrary administrative borders. Therefore, rather than the presence or absence of a polluting facility in a census tract, a more refined measure of “exposure” was created using a methodology developed by Liam Downey (2006).

Using Geographic Information Systems (GIS) software a vector map of each TRI facility that reported air emissions was overlaid on a vector map of every census tract in the United States. Using the Heatmap plugin a raster map was created from the facilities data which created 400 foot by 400 foot cells in a 1.5 mile radius around each facility using a kernel density decay function. These cells also were weighted by the pounds of emissions each facility released. In this way, cells were weighted more if they were located near highly polluting facilities and/or more than one facility. These cell values were then summed and averaged within each census tract to arrive at a relative air pollution “exposure” measure for each tract. This process was carried out for the years 1990, 2000, and 2010.

It should be noted that due to the arithmetic involved in creating the heat map and translating it back into a tract-level measure, the actual value of this “exposure” variable is not in any discernible units such as pounds of emissions. However, it is a relative measure of toxic releases from these polluting facilities and since the objective of this research is to understand how air pollution varies by the racial/ethnic composition of neighborhoods, a relative, albeit unit-less, measure is an appropriate outcome of interest.

Focal explanatory variables

The Neighborhood Change Database provided census measures for the proportions of a neighborhood that were non-Hispanic White, non-Hispanic Black, non-Hispanic American Indian/Alaskan Native, non-Hispanic Asian/Native Hawaiian/Pacific Islander, non-Hispanic other race, and Hispanic for the years 1990, 2000, and 2010. Due to the small size of their

populations, the proportions for non-Hispanic American Indian/Alaska Native, non-Hispanic Asian/Native Hawaiian/Pacific Islander, and non-Hispanic other race were collapsed into one category: non-Hispanic Other race. This resulted in four mutually exclusive proportions: non-Hispanic White, non-Hispanic Black, non-Hispanic Other race, and Hispanic. For brevity these measures will henceforth be referred to as White, Black, Other, and Hispanic.

Additionally, as is evident from some of the statistics presented in Appendix A, due to Geolytics' census boundary normalizing procedures, many of the ranges for proportional measures exceed the bounds of 0 to 1 for years other than 2010. Therefore, these measures were standardized to fall between 0 and 1 so they truly reflected proportions.

The EPA's ECHO database was used in order to determine the extent to which state-level variation played a role in the tract-level racial differences in exposure to air pollution. This database includes a variety of measures related to enforcement and compliance including evaluations, violations, and penalties. These data are available for a number of different EPA datasets but only the data pertaining to the TRI facilities in the years 1990, 2000, and 2010 were used. From these data the following variables were extracted or created: total facilities, total evaluations, total high priority violations, total formal actions, total informal actions, total stack tests, total passed stack tests, and total failed stack tests.

The literature on state-level air pollution enforcement did not give much indication as to which of these measures might be the most, or more, salient than others in reflecting the level of a state's environmental policy aggressiveness. Therefore, a principal component analysis was run on all eight variables to reduce the data down to one measure of state-level variation with respect to enforcement and compliance. All eight of the original variables loaded positively and around the same magnitude (between 0.28 and 0.39) on this first component and it captured 52.89% of the total variation with an eigenvalue of 4.23. Again, this process was carried out for each year in the data so each state has an ECHO measure for 1990, 2000, and 2010 with the only exception being Washington D.C. which did not have any ECHO data for 1990. This

variable is best understood as the overall degree of enforcement and compliance in a given state, for the given year. Therefore, higher levels can be interpreted as a greater magnitude of enforcement and compliance. Figure 1 shows the distribution of this variable for all states across the years of this study.

Other explanatory variables

A number of control variables that have been used in prior research on environmental inequality were also derived from the Neighborhood Change Database to reduce the potential for omitted-variable bias. These include tract-level measures of median family income, proportion of high school graduates, proportion of college graduates, poverty rate, proportion employed in manufacturing, and population density. These variables are important controls due to the fact that they are potentially independently associated with both the main outcome variable (air pollution emissions) as well as the main explanatory variables (racial/ethnic representation in neighborhoods). Excluding them from the analysis would bias the results of our analyses by either under- or over-estimating the strength and significance of the focal relationship.

Methods

Cross-sectional Models

In order to answer the research questions for this study, two separate sets of analyses were undertaken. First, cross-sectional models for 1990, 2000, and 2010 were estimated to assess the degree to which racial/ethnic composition significantly predicts exposure to higher levels of air pollution through the time period of this study. Additionally these models seek to understand the degree to which state variation, both contextual and in terms of enforcement and

compliance, plays a role in moderating the effect of race/ethnicity on levels of air pollution emissions. As previously described, state differences in terms of politics, geographic location, population density, industry, and various other dimensions help to create contextual environments that may contribute to the variability in differing levels of air pollution emissions as well as the racial and ethnic composition of neighborhoods.

These analyses start with a pooled linear regression model to establish a baseline for the main explanatory race/ethnicity variables as well as the other explanatory controls. The second model adds in state random effects to account for variation in state context that may contribute to differences in the outcome and explanatory variables. Lastly, the third model adds in the other main explanatory variable: the level of state enforcement and compliance. This is added to see if the level of state enforcement has any effect on racial/ethnic differences in exposure, which could be suggestive of a more targeted environmental justice approach to pollution reduction.

Change Models

State policy literature on enforcement, however, has found that states that have higher levels of pollution tend to have high levels of enforcement and those states with higher levels of enforcement see reductions in air pollution (Potoski and Woods, 2002). Therefore, to reduce the possibility that any relationship between level of air pollution “exposure” and state-level enforcement was due to endogeneity, a set of change models for 1990-2000 and 2000-2010 were also estimated. These models allow for an assessment of whether the main explanatory variables of interest (both race/ethnicity and state enforcement/compliance) are predictive of larger declines of air pollution between decades. Additionally, these models allow for a test of the third research question, whether an increase in the proportion White in a neighborhood results in better air quality over time.

The change models required a reformatting of the data and the calculation of two new variables to capture the change over time in air pollution and the neighborhood racial composition. The dependent variable for these models was the difference between time₁ and time₂ for air pollution exposure. Therefore, for the set of 1990-2000 models the exposure in 1990 was subtracted from the exposure in 2000 for each census tract. To make the results more interpretable, these values were then reverse coded so that a positive value for this variable can be interpreted as a reduction in air pollution emissions (i.e. improvement in air quality). Similarly, a variable for the proportion of White change in a neighborhood was calculated by subtracting the proportion White at time₂ from the proportion White at time₁. Therefore, a positive value of this variable indicates growth of the white population in said neighborhood.

The first of these models includes state random effects to account for state context, the main racial/ethnic explanatory variables at time₁, and the other explanatory controls at time₁. Model 2 adds the level of enforcement and compliance at time₁ to understand its effect, if any, on the relationship between racial/ethnic composition on change in pollution while Model 3 adds the level of emissions at time₁ instead, to account for any potential floor effect (i.e. the fact that neighborhoods with higher starting levels of pollution will have a larger potential value for the outcome variable). Model 4 includes both the level of enforcement and compliance as well as the level of emissions at time₁. Lastly, Model 5 includes the proportion White change in a neighborhood to assess whether race, in this case a growing share of white residents in a community, leads to greater improvements in air quality relative to other racial groups.

Data Descriptives

Descriptive statistics are presented in tables 1 - 3 corresponding to the years 1990, 2000, and 2010. From these statistics it is clear that there is an overall downward trend in air pollution emissions from 1990 to 2010 with the mean level declining from almost 10 to just

under 3 (median level saw same magnitude of decline but from a high of 1 in 1990 to about 0.05 by 2010). Additionally, the variation in this variable has declined over this time period as well with a reduction from 19 to 8 over the intervening 20 years.

The changes in the racial composition of neighborhoods is reflective of the literature discussed previously, with the median proportion of whites declining by about 0.14, a slight increase in proportion black from 0.02 to 0.04, a tripling of the proportion Hispanic to about 0.06 in 2010, and a doubling of other race to about 0.03 by 2010. This speaks to the increasing diversity among U.S. neighborhoods during these two decades though whites are still the overwhelming majority in most neighborhoods.

The level of enforcement and compliance of air polluting TRI facilities during this time period doubled from a median of 1.4 to about 3, reflecting the increased level of enforcement and compliance after the passage of the amendments to the Clean Air Act in 1990. Particularly noteworthy was the quadrupling of the standard deviation in this measure from 1990 to 2010, which speaks to state variation displayed in Figure 1.

All other variables included in the following analyses increased slightly over this time period. These include: median household income (in \$1000s), proportion graduated high school, proportion graduated college or professional/graduate school, poverty rate, proportion employed in manufacturing, and population density.

<Insert Tables 1 - 3 here>

Additionally, figures 2 through 4 provide a visual representation of the correlations between the outcome variable of interest (Emissions) and the key racial/ethnic explanatory variables for each of the years 1990, 2000, and 2010. These matrices have also been reordered

in order to help identify patterns. It is clear from this reordering that the proportion of a neighborhood that is White is negatively correlated with Emissions as well as all other measures of neighborhood racial/ethnic proportion, which is consistent with previous literature on both environmental inequality and neighborhood racial segregation. Furthermore, all racial/ethnic groups excluding Whites have a positive association with Emissions in 1990. These patterns remain for the years 2000 and 2010 (figures 3 and 4 respectively) but the correlations decline in magnitude, even switching direction in the case of Emissions and Other race. These figures suggest that there are racial and ethnic differences in exposure to air pollution though they are declining from 1990 to 2010.⁴

<Insert Figures 2 - 4 here>

Findings

Cross-sectional Analyses

1990:

Starting with the first model in Table 4, relative to the proportion White in a census tract the proportion Black and proportion Hispanic are significantly positively associated with a higher

⁴ To corroborate these correlations, a set of multivariate regressions were also run with “emissions” as the outcome and the full set of race proportion variables (excluding whites) as predictors (Appendix Tables 1 - 3). These regressions support the evidence provided by the correlations with proportion black and proportion Hispanic being significantly positively predictive of exposure to higher levels of air emissions. Proportion other race is not significantly different from proportion white in 1990 and, in fact, is predictive of lower exposure relative to whites in 2000 and 2010. Overall these supplementary analyses are evidence that race is still a significant predictor of air pollution exposure but the gap between white and black neighborhoods and white and Hispanic neighborhoods is decreasing from 1990-2010.

level of neighborhood air pollution while the proportion Other is predictive of a significant negative association, potentially due to lower exposure in Asian neighborhoods which has been found in previous literature (Ash and Fetter 2004). When state random effects are added in the second model the magnitude of the positive relationships between Proportion Black and Proportion Hispanic increase and retain their significance at the $p < .001$ level. Proportion Other changes signs to a positive association but loses its statistical significance. The addition of these random effects, therefore, supports the supposition that state variability is an important component in assessing the relationship between race/ethnicity and levels of air pollution in a neighborhood. In other words, the levels of emissions in a neighborhood vary considerably depending upon state and therefore, to accurately assess the relationship between emissions and the racial composition of a neighborhood, state random effects were included. With the addition of state enforcement and compliance in the third model it is clear that higher levels of enforcement predict higher levels of emissions as demonstrated in previous research. However, the addition of this explanatory variable does not substantively change the race/ethnicity explanatory variables. This suggests that higher levels of enforcement and compliance in 1990 do not help to explain the association between race and exposure to air pollution.

(Table 4 About Here)

2000:

For the pooled model in 2000, reported in Table 5, the proportion Black and proportion Hispanic remain positive and significantly associated with higher levels of air pollution and proportion Other is once again significantly negative. The addition of state random effects has little influence on proportion Black but their addition in model 2 does increase the magnitude of the coefficient for proportion Hispanic while proportion Other becomes significant and positively predictive of higher levels of emissions. Once again, the addition of levels of state enforcement

and compliance in the third model, while remaining positive and significant, does not have any impact on the race/ethnicity coefficients.

(Table 5 About Here)

While neighborhoods with higher proportions of Black, Hispanic, and Other race are still associated with being exposed to higher levels of emissions, it should be noted that the coefficients of these variables have declined substantially⁵. Comparing the full models from 1990 and 2000, the intercept is reduced by a factor of seven and for neighborhoods with larger proportions of Black and Hispanic residents, the association with higher levels of air pollution is also reduced by about two-thirds and one-half respectively.

2010:

Lastly, in terms of the cross-sectional analyses, Table 6 reveals a similar pattern for Black, Hispanic, and Other as observed for the 2000 models: Black, Hispanic, and Other race are all significantly positively associated with air emissions relative to whiter neighborhoods. State random effects increase the magnitude of the coefficient for proportion Black, while making Hispanic and Other both significant and positive. The addition of state enforcement and compliance, however, is not significant in the third model and again, does not have an effect on the other explanatory variables of interest.

(Table 6 About Here)

⁵ In a pooled set of models with the addition of a *year* term and *year x neighborhood racial composition* interaction terms, the effect of racial composition over time was statistically significant at the $p < .001$ level for *proportion black* and *proportion Hispanic*. Results not presented here/available upon request.

While the magnitude of the coefficients for the set of race and ethnicity variables have declined between 2000 and 2010, the declines are not as large as the previous decade and all coefficients are still statistically significant and positive. This indicates that race and ethnicity remain significant predictors of air pollution emissions at the neighborhood level and that the reductions in pollution between 2000 and 2010 may not have redounded to communities of color relative to whites in the ways the reductions between 1990 and 2000 did.

The explanatory controls for the cross-sectional analyses support findings from previous research on environmental inequality and exposure to air pollution. Economic class is mixed with median family income predicting statistically significantly lower levels of emissions for all years (though the magnitude of this relationship is slight) whereas neighborhood poverty rate is positively predictive of higher levels of exposure for all years. Residing in a neighborhood with a higher proportion of high school and/or college graduates is predictive of lower exposure levels, though the magnitude of this effect diminishes for each subsequent decade. The higher the rate of employment in manufacturing in a neighborhood is associated with higher exposure to emissions for all years though, again, the magnitude of this effect diminishes over the decades. Lastly, the population density of a neighborhood, while statistically significant and predictive of greater emissions in 1990, fails to achieve statistical significance in 2000 or 2010 and actually switches signs in 2010. This likely reflects the improvement of air quality programs in cities (Parrish et al. 2016) and potentially the relocation of many industrial polluting activities to the suburbs.

Change Models

The cross-sectional analyses allow for a comparison of the associations between neighborhood racial composition and exposure to air pollution emissions over time and quantifying the potential effect, if any, state variation in enforcement and compliance had on

these associations. However, given the simultaneous nature of the processes on which this research is focused, two sets of change models (1990 - 2000 and 2000 to 2010) were also carried out to account for endogeneity.

1990 - 2000:

Starting with the change models for 1990 – 2000 reported in Table 7, neighborhoods with higher proportions of Blacks, Hispanics, and Other race are associated with a greater decline in toxic air emissions, with this having the largest effect for neighborhoods with larger Hispanic populations. The addition of state enforcement and compliance is not significant and it does not change the coefficients of the race/ethnicity variables in any model in which it is present. This indicates that higher levels of enforcement did not help to reduce levels of air pollution emissions. As expected, including the level of emissions in 1990 reduces the magnitude of the main racial/ethnic predictor variables due to the aforementioned floor effect of the outcome variable. However, model 4 indicates that neighborhoods with higher proportions of Black and/or Hispanic residents in 1990 did experience greater declines in emissions by 2000 than did whiter neighborhoods. Additionally, neighborhoods that became whiter over this time period (model 5) did not see significant improvements in air quality over and above other neighborhood types. This suggests a possible trending towards a more equitable distribution of air pollution emissions during the period 1990 to 2000.

(Table 7 About Here)

2000 - 2010:

The evidence presented in Table 8 suggests no association between neighborhood racial composition and the decline in emissions during 2000 - 2010 once emissions in 2000 are accounted for, which seems to reflect the large decreases in average emissions for these

neighborhoods in the previous decade. Again, the inclusion of state enforcement and compliance does not substantively change the story and is not significant once the starting level of emissions is accounted for. Again, emissions in 2000 is significant and positive in all specifications in which it is included meaning that neighborhoods with higher levels of emissions in 2000 saw greater declines in air pollution by 2010. Additionally, inclusion of this variable renders the magnitude of the racial predictors insignificant for 2000 - 2010. Contrasting with the 1990 - 2000 models, however, the change in proportion White a neighborhood experiences between 2000 and 2010 is significantly positively associated with greater reductions in toxic air emissions. This seems to suggest that, despite both the large reductions in emissions and the decline in homogeneously White neighborhoods in the country over the previous decade, neighborhoods that became whiter from 2000 to 2010 were associated with greater improvements in air quality compared to neighborhoods of color.

(Table 8 About Here)

Conclusion

This research has sought to better understand the ways in which overall reductions in air pollution emissions in the United States from 1990 to 2010, in conjunction with changing racial and ethnic compositions of neighborhoods, has affected the inequitable distribution of air pollution in communities of color. Additionally, despite state variability in numerous factors central to the debates within the environmental justice literature, it was unclear how much this contributed to explanations of racial and ethnic difference in environmental burden. Using the EPA's Toxic Release Inventory and the Enforcement and Compliance History Online, linked to data from three censuses, I find that the largest improvements in air quality occurred between 1990 and 2000 in neighborhoods with higher proportions of Blacks and Hispanics. Whiter neighborhoods at this time, however, also saw improvements, and benefitted from a dramatic

decline in the range of emissions to which they were exposed. State-level variation in enforcement and compliance did not seem to play a role in explaining these improvements, though state-level contextual variation did.⁶

Between the years 2000 to 2010, race was no longer predictive of greater improvements to air quality at the neighborhood level. Part of this may be due to the sheer volume of reductions that occurred in the previous decade, leaving much less variation in emissions exposures by 2000. However, it is noteworthy that despite this reduction in variation, and with the increasing diversity of neighborhoods through 2010, this decade did see air quality improvements for neighborhoods with increasing shares of White residents. This indicates one of two processes is occurring: either air pollution is declining in a neighborhood which then attracts greater numbers of White residents or a neighborhood that is getting whiter makes improvements with respect to air quality. Future research, particularly focusing on issues such as gentrification, should examine the ways in which environmental inequality plays into other neighborhood change processes. For the purposes of this study, this finding, in conjunction with the continued positive significance of race in the 2010 cross-sectional models, speaks to the continued importance of race in predicting exposure to air pollution. In other words, despite dramatic improvements in the reduction of toxic air emissions, and the narrowing of the racial/ethnic gap in pollution exposure, race and ethnicity are still significantly predictive of exposure to higher levels of air pollution emissions.

While much of the prior literature on environmental inequality has been cross-sectional in nature, this research attempted to understand the changes in racial differences in exposure to toxic air releases over the course of two decades. This was important to better understand the trend in exposure for different racially and ethnically composed neighborhoods and to determine if there were any racial disparities in improvements to air quality. Additionally, it appears from

⁶ Though not specifically tested in this study, potential state contextual variables that may have played a role in explaining state differences in improvements include types of industry, state political affiliation (gubernatorial and legislative), and history of racial/ethnic inequality.

this work that the national standards set by the CAA in 1990 had the most significant effect on improvements to air quality for all neighborhoods, with no effects seen for state-level enforcement and compliance. This suggests that the federal statute overshadowed any differences in state-level approaches and, as prior literature suggests, the aid of federal-level enforcement mechanisms in all states may have enhanced their ability to comply with the federal standards regardless of their own regulatory structure.

Though not explicitly tested in this study, it is also worth mentioning that the political context changed during the timeframe of this study. While President Clinton sent clear signals that environmental justice was an important aspect of his administration, the same could not be said of President Bush. Therefore, it may be the case that from 1990 to 2000 a more targeted approach was taken by the federal enforcement agencies which would help to explain why race was predictive of improved air quality from 1990 to 2000 but not from 2000 to 2010.

Future research on this topic would benefit from a more precise measure of air pollution. While appropriate for this study on relative exposure, the method used to create the average tract-level emissions meant that coefficient sizes in the models were unit-less and therefore, it is unknown what real-world implications these levels may have. Using measures of the actual criteria pollutants monitored by the EPA would enable researchers to have a better understanding of the racial disparities in exposure and also tie those implications to known health effects for the various pollutants. While the TRI is an appropriate proxy for air pollution exposure, it is unable to capture smaller-scale facilities as well as mobile polluting sources such as car emissions. Therefore, it does not represent the total air emissions. Additionally, while the focus of this research was on understanding the neighborhood racial dynamics of air pollution exposure, the use of individual-level data would allow for stronger causal claims to be made regarding the exact degree to which certain populations are exposed to environmental ills. Finally, local context and history of neighborhoods are important considerations when looking at the inequitable distribution of environmental ills. This study attempted to gain a zoomed-out look

at the trends occurring in U.S. neighborhoods from 1990 to 2010 but was limited in its ability to account for local variation and neighborhood-specific contexts that are important for understanding why and/or how a neighborhood is changing. Future work should incorporate these factors to gain better insight into the neighborhood dynamics of environmental inequality.

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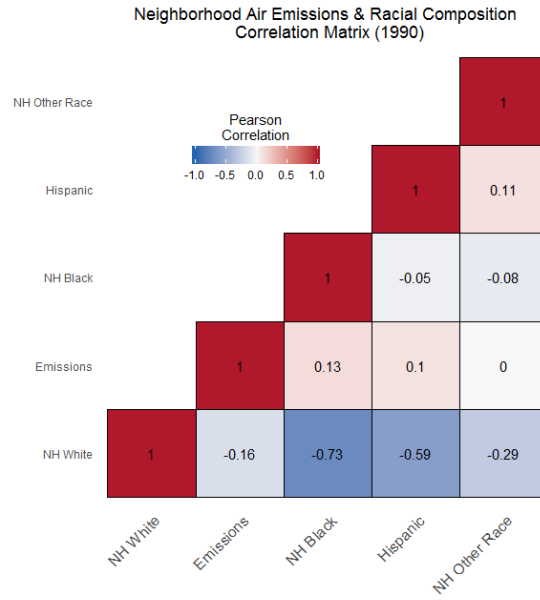


Figure 2

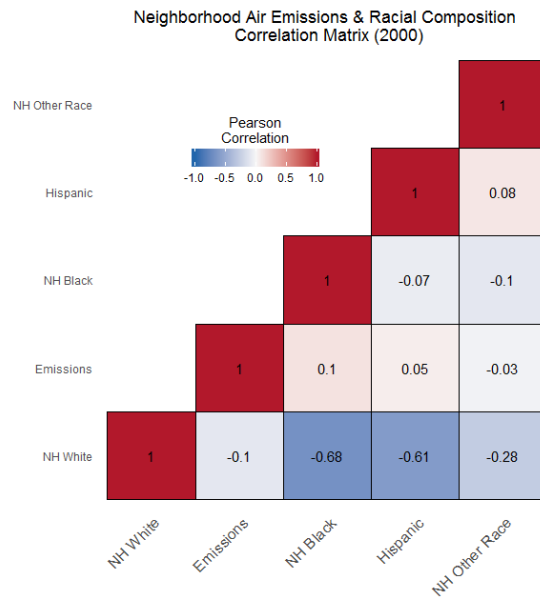


Figure 3

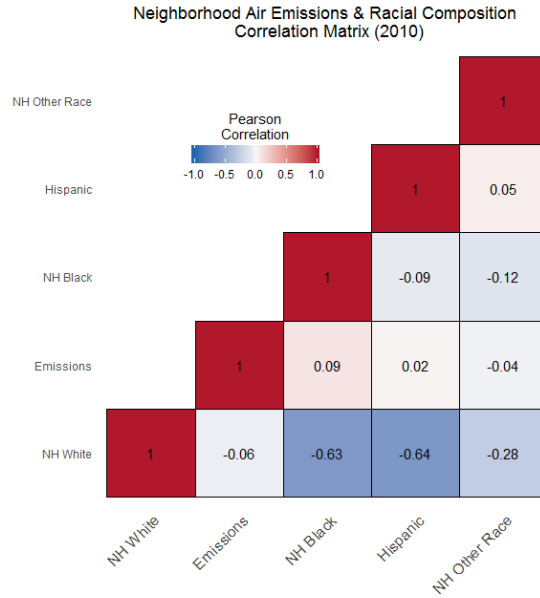


Figure 4

Tables

Table 1: Descriptive Statistics (1990)

Statistic	Mean	St. Dev.	Min	Median	Max
Emissions	9.681	18.828	0.000	1.022	540.452
Proportion White	0.766	0.276	0.000	0.887	1.000
Proportion Black	0.113	0.216	0.000	0.021	1.000
Proportion Hispanic	0.085	0.164	0.000	0.020	1.000
Proportion Other	0.035	0.078	0.000	0.014	1.000
Median Family Income (\$1000s)	36.739	15.636	0.000	34.076	150.001
Proportion High School	0.249	0.077	0.000	0.253	1.000
Proportion College	0.200	0.147	0.000	0.154	1.000
Poverty Rate	0.133	0.119	0.000	0.096	1.000
Proportion Manufacturing	0.133	0.046	0.000	0.131	1.000
Population Density	0.002	0.004	0.000	0.001	0.081
Enforcement/Compliance	1.386	0.903	0.000	1.434	4.099

Number of observations: 72,235

Table 2: Descriptive Statistics (2000)

Statistic	Mean	St. Dev.	Min	Median	Max
Emissions	5.363	12.749	0.000	0.205	264.765
Proportion White	0.701	0.297	0.000	0.821	1.000
Proportion Black	0.131	0.225	0.000	0.033	1.000
Proportion Hispanic	0.118	0.191	0.000	0.037	1.000
Proportion Other	0.050	0.092	0.000	0.021	1.000
Median Family Income (\$1000s)	52.085	23.031	0.000	47.382	200.001
Proportion High School	0.287	0.101	0.000	0.293	1.000
Proportion College	0.238	0.169	0.000	0.187	1.000
Poverty Rate	0.129	0.110	0.000	0.096	1.000
Proportion Manufacturing	0.231	0.085	0.000	0.225	1.000
Population Density	0.002	0.004	0.000	0.001	0.084
Enforcement/Compliance	2.679	1.667	0.000	2.309	5.899

Number of observations: 72,642

Table 3: Descriptive Statistics (2010)

Statistic	Mean	St. Dev.	Min	Median	Max
Emissions	2.813	8.006	0.000	0.055	223.793
Proportion White	0.643	0.303	0.000	0.746	1.000
Proportion Black	0.142	0.223	0.000	0.044	1.000
Proportion Hispanic	0.153	0.209	0.000	0.062	1.000
Proportion Other	0.062	0.103	0.000	0.028	1.000
Median Family Income (\$1000s)	65.139	31.591	0.000	58.861	250.001
Proportion High School	0.294	0.111	0.000	0.301	1.000
Proportion College	0.268	0.182	0.000	0.218	1.000
Poverty Rate	0.148	0.123	0.000	0.115	1.000
Proportion Manufacturing	0.201	0.082	0.000	0.195	1.000
Population Density	0.002	0.005	0.000	0.001	0.196
Enforcement/Compliance	4.833	4.142	0.000	3.083	15.019

Number of observations: 72,001

Table 1: Cross-sectional models for 1990

	Linear Regression	State Random Effects (REs)	State REs and Enforcement
Intercept	-10.20*** (0.69)	2.39* (1.00)	0.74 (1.15)
Prop. NH Black	2.92*** (0.40)	3.87*** (0.41)	3.85*** (0.41)
Prop. Hispanic	3.56*** (0.54)	4.83*** (0.61)	4.82*** (0.61)
Prop. Other Race	-4.00*** (0.90)	1.70 (1.08)	1.75 (1.08)
Median Family Income (\$1000s)	-0.01 (0.01)	-0.07*** (0.01)	-0.07*** (0.01)
Prop. HS Graduate	-10.90*** (1.28)	-34.44*** (1.42)	-34.45*** (1.42)
Prop. College Graduate	-2.29* (0.98)	-9.80*** (1.02)	-9.81*** (1.02)
Poverty Rate	15.65*** (0.93)	9.92*** (0.94)	9.91*** (0.94)
Prop. Employed in Manufacturing	81.23*** (1.64)	71.15*** (1.79)	71.05*** (1.79)
Population Density	470.81*** (17.55)	227.07*** (19.63)	226.83*** (19.63)
State enforcement/compliance			2.00** (0.75)
R ²	0.08		
Adj. R ²	0.08		
Num. obs.	72235	72235	72235
RMSE	18.08		
AIC		620012.28	620007.71
BIC		620122.53	620127.15
Log Likelihood		-309994.14	-309990.85
Num. groups: STUSAB		50	50
Var: STUSAB (Intercept)		22.25	19.42
Var: Residual		311.73	311.73

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Table 2: Cross-sectional models for 2000

	Linear Regression	State Random Effects (REs)	State REs and Enforcement
Intercept	-9.35*** (0.50)	-3.05*** (0.64)	-3.94*** (0.71)
Prop. NH Black	1.53*** (0.26)	1.51*** (0.27)	1.50*** (0.27)
Prop. Hispanic	0.99** (0.35)	2.73*** (0.39)	2.71*** (0.39)
Prop. Other Race	-2.34*** (0.53)	1.34* (0.62)	1.37* (0.62)
Median Family Income (\$1000s)	-0.01** (0.00)	-0.02*** (0.00)	-0.02*** (0.00)
Prop. HS Graduate	4.49*** (0.94)	-7.69*** (1.07)	-7.69*** (1.07)
Prop. College Graduate	3.82*** (0.71)	-2.11** (0.76)	-2.12** (0.76)
Poverty Rate	15.63*** (0.66)	13.30*** (0.67)	13.30*** (0.67)
Prop. Employed in Manufacturing	23.39*** (0.64)	18.58*** (0.70)	18.54*** (0.70)
Population Density	82.79*** (11.53)	10.62 (13.06)	10.50 (13.06)
State enforcement/compliance			0.58** (0.22)
R ²	0.05		
Adj. R ²	0.05		
Num. obs.	72642	72642	72642
RMSE	12.44		
AIC		570789.66	570785.14
BIC		570899.98	570904.66
Log Likelihood		-285382.83	-285379.57
Num. groups: STUSAB		51	51
Var: STUSAB (Intercept)		5.24	4.62
Var: Residual		150.95	150.94

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Table 3: Cross-sectional models for 2010

	Linear Regression	State Random Effects (REs)	State REs and Enforcement
Intercept	-2.80*** (0.27)	-1.30*** (0.33)	-1.40*** (0.37)
Prop. NH Black	0.67*** (0.15)	1.20*** (0.16)	1.20*** (0.16)
Prop. Hispanic	-0.38* (0.18)	1.82*** (0.21)	1.81*** (0.21)
Prop. Other Race	-0.99** (0.31)	1.13** (0.35)	1.13** (0.35)
Median Family Income (\$1000s)	-0.01*** (0.00)	-0.00* (0.00)	-0.00* (0.00)
Prop. HS Graduate	1.42** (0.49)	-1.83*** (0.52)	-1.82*** (0.52)
Prop. College Graduate	0.31 (0.39)	-1.58*** (0.41)	-1.58*** (0.41)
Poverty Rate	7.33*** (0.33)	6.19*** (0.34)	6.19*** (0.34)
Prop. Employed in Manufacturing	8.50*** (0.40)	5.66*** (0.42)	5.65*** (0.42)
Population Density	21.02** (7.13)	-7.43 (8.02)	-7.39 (8.02)
State enforcement/compliance			0.04 (0.06)
R ²	0.03		
Adj. R ²	0.03		
Num. obs.	72001	72001	72001
RMSE	7.88		
AIC		500359.53	500361.15
BIC		500469.75	500480.55
Log Likelihood		-250167.77	-250167.57
Num. groups: STUSAB		51	51
Var: STUSAB (Intercept)		1.58	1.57
Var: Residual		60.88	60.88

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Table 5: Full Change Models 1990-2000

	Full Model	ECHO	1990 Emissions	ECHO & 1990 Emissions	White Change
Intercept	7.97*** (0.85)	6.97*** (0.98)	0.31 (0.44)	0.52 (0.45)	0.51 (0.45)
Prop. Black 1990	3.99*** (0.42)	3.97*** (0.42)	0.72** (0.27)	0.74** (0.27)	0.74** (0.27)
Prop. Latino 1990	6.59*** (0.61)	6.59*** (0.61)	2.33*** (0.39)	2.34*** (0.39)	2.35*** (0.39)
Prop. Other 1990	2.75* (1.11)	2.81* (1.11)	1.25 (0.68)	1.13 (0.68)	1.15 (0.68)
Median Income (\$1000s) 1990	-0.05*** (0.01)	-0.05*** (0.01)	0.00 (0.01)	0.00 (0.01)	0.00 (0.01)
HS Educ 1990	-26.41*** (1.32)	-26.43*** (1.32)	-2.30** (0.85)	-2.23** (0.85)	-2.19* (0.86)
College Educ 1990	-5.33*** (1.02)	-5.35*** (1.02)	1.09 (0.65)	1.13 (0.65)	1.15 (0.66)
Poverty Rate 1990	2.64** (0.94)	2.62** (0.94)	-6.45*** (0.61)	-6.43*** (0.61)	-6.43*** (0.61)
Manufacturing 1990	24.37*** (0.92)	24.32*** (0.92)	-4.34*** (0.59)	-4.26*** (0.59)	-4.26*** (0.59)
Pop Den 1990	185.15*** (20.32)	184.82*** (20.32)	1.94 (13.08)	3.04 (13.08)	3.27 (13.11)
Enforcement/Compliance 1990		1.21 (0.63)		-0.30 (0.15)	-0.30 (0.15)
Emissions 1990			0.79*** (0.00)	0.79*** (0.00)	0.79*** (0.00)
Prop. White Change					0.14 (0.45)
AIC	627191.15	627189.56	564229.29	564227.65	564229.55
BIC	627301.45	627309.05	564348.77	564356.32	564367.42
Log Likelihood	-313583.58	-313581.78	-282101.64	-282099.82	-282099.78
Num. obs.	72475	72475	72475	72475	72475
Num. groups: STUSAB	50	50	50	50	50
Var: STUSAB (Intercept)	14.43	13.36	0.71	0.66	0.66
Var: Residual	334.66	334.66	140.57	140.56	140.56

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Table 6: Full Change Models 2000-2010

	Full Model	ECHO	2000 Emissions	ECHO & 2000 Emissions	White Change
Intercept	2.07*** (0.54)	1.37* (0.60)	-0.08 (0.27)	-0.11 (0.29)	-0.04 (0.29)
Prop. Black 2000	1.06*** (0.24)	1.05*** (0.24)	0.02 (0.13)	0.02 (0.13)	-0.00 (0.13)
Prop. Latino 2000	2.16*** (0.35)	2.14*** (0.35)	0.30 (0.19)	0.30 (0.19)	0.32 (0.19)
Prop. Other 2000	0.89 (0.55)	0.90 (0.55)	-0.19 (0.30)	-0.19 (0.30)	-0.10 (0.30)
Median Income (\$1000s) 2000	-0.02*** (0.00)	-0.02*** (0.00)	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)
HS Educ 2000	-8.27*** (0.92)	-8.27*** (0.92)	-1.85*** (0.50)	-1.85*** (0.50)	-1.85*** (0.50)
College Educ 2000	-1.88** (0.66)	-1.88** (0.66)	0.10 (0.36)	0.10 (0.36)	0.06 (0.36)
Poverty Rate 2000	9.12*** (0.59)	9.12*** (0.59)	-0.60 (0.32)	-0.61 (0.32)	-0.78* (0.33)
Manufacturing 2000	14.17*** (0.62)	14.14*** (0.62)	0.49 (0.34)	0.48 (0.34)	0.46 (0.34)
Pop Den 2000	-6.22 (11.61)	-6.29 (11.61)	-13.39* (6.33)	-13.43* (6.34)	-13.83* (6.34)
Enforcement/Compliance 2000		0.46* (0.18)		0.02 (0.06)	0.03 (0.06)
Emissions 2000			0.74*** (0.00)	0.74*** (0.00)	0.74*** (0.00)
Prop. White Change					1.10*** (0.26)
AIC	554158.01	554153.83	466506.32	466508.23	466492.15
BIC	554268.33	554273.35	466625.84	466636.94	466630.06
Log Likelihood	-277067.00	-277063.91	-233240.16	-233240.11	-233231.07
Num. obs.	72680	72680	72680	72680	72680
Num. groups: STUSAB	51	51	51	51	51
Var: STUSAB (Intercept)	3.34	2.96	0.35	0.35	0.36
Var: Residual	119.60	119.60	35.83	35.83	35.82

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Appendix

Table 1: Association between emissions and race (1990)

	<i>Dependent variable:</i>
	emissions
Proportion Black	11.678*** (0.321)
Proportion Hispanic	12.650*** (0.423)
Proportion Other	0.691 (0.898)
Constant	7.255*** (0.092)
Observations	72,235
R ²	0.029
Adjusted R ²	0.029
Residual Std. Error	18.556 (df = 72231)
F Statistic	711.031*** (df = 3; 72231)
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01

Table 2: Association between emissions and race (2000)

	<i>Dependent variable:</i>
	emissions
Proportion Black	5.924*** (0.210)
Proportion Hispanic	3.636*** (0.247)
Proportion Other	-2.684*** (0.513)
Constant	4.289*** (0.068)
Observations	72,642
R ²	0.014
Adjusted R ²	0.014
Residual Std. Error	12.661 (df = 72638)
F Statistic	336.803*** (df = 3; 72638)
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01

Table 3: Association between emissions and race (2010)

	<i>Dependent variable:</i>
	emissions
Proportion Black	3.026*** (0.135)
Proportion Hispanic	1.023*** (0.143)
Proportion Other	-2.206*** (0.291)
Constant	2.364*** (0.047)
Observations	72,001
R ²	0.009
Adjusted R ²	0.009
Residual Std. Error	7.971 (df = 71997)
F Statistic	211.826*** (df = 3; 71997)
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01