To: Andrew Wheeler, Administrator of the Environmental Protection Agency
From: Rohan Oprisko, A12793490, Associate at the Center for Health, Environment & Justice
Subject: The Continuing Importance of the Pursuit of Environmental Justice
Date: March 13th, 2019

Abstract

Defined as, "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, with respect to the development, implementation and enforcement of environmental laws, regulations and policies,"(EPA, 2019), environmental justice is an ever present issue. As our economy continues to largely run off fossil fuels, there should be no reason why certain groups should be specifically constrained to dealing with this issue. Using a dataset comprised of the Environmental Protection Agency (EPA) air quality index values (AQI) merged with U.S. Census Data by county level, I assessed whether belonging to a minority group or a specific income bracket implied a causal relationship with high air pollution levels across the nation. Through running my two final models, I came across three main conclusions. The first, that the manner in which the EPA collects data is not representative of the issue itself, as within a county there could be exist disparities in terms of environmental justice. The second, that the percentage of people living in poverty in a specific county is not statistically significant in determining whether they will face higher AQI values. Lastly the third, that belonging to a minority group increases one's chances of facing higher AQI values to a statistically significant degree.

Examining the Data Set

I began constructing my models through first analyzing my dataset. The unit of observation was the county itself, and the dataset was comprised of 990 counties in 48 of the 50 U.S. states. After checking the necessary conditions of both linearity in parameters, and the absence of collinearity, I then had a clearer picture of what variables I could use to give the most representative distribution. Additionally, as the data collected came from the EPA and the U.S. Census, I had no worries about encountering random sampling bias as these are both almost full representative surveys.

Once these conditions were satisfied, I selected the variables for my regressions. I say regressions, because after checking for collinearity I realized that a several of my variables were collinear. As I had data from the U.S. Census, many questions group individuals in many of the same variables. With that being said, I decided that I wanted to create two regression models with each one including the collinear terms of the number of total households in a county, and the number of people without a college degree. This is mainly because excluding these variables would raise concerns of omitted variable bias, as one can make the simple intuition that where more people live there will be more pollution. Lastly, while both these variables are representative of population, I wanted to include the variable concerning college degrees, as college degrees are also indicative of socioeconomic levels (Haggard, 2018).

The other variables I selected for my regressions were median age as well as average household size, in addition my variables of interest---percent of individuals in poverty, and

percent minority makeup. After selecting my variables I then ran my representative regressions, again ensuring that no collinearity appeared. Following my development of two complete regression models, I then checked and corrected them of outliers, as well as ensured that they in fact were heteroskedastic.

Findings from the Data Set and Implications of the Model

To give a basic view to see if there was any substance to my initial theory, I created a scatter plot analyzing the relationship between air pollution levels and the percentage of minority residents in a county. I realized that I should further investigate the link between the percent of minority residents and the level of air pollution in a specific county, because as seen in Figure 1 there appeared to be a causal relationship. Through running my initial regressions seen in Table 1, I came to the conclusion that the percent of residents in poverty in fact had a negative effect on median AQI values, while the percent of minority residents in a county had a positive effect, both at a statistically significant levels. I then ran the regressions including the variables representing both total households and total number of individuals without college degrees, largely affecting the model as both brought in aspects related to population. Although this was the case, the percentage of minority residents in a county still displayed a statistically significant positive effect. However, this effect is quite small, but can be observed in both Figure 2 and Figure 3. The realization concerning the percentage of minority residents even when encountered with the effect of population represents that there are real world ramifications to environmental justice.

Limitations to the Model

While there was a relative strength to my model, there exists several limitations to this model, primarily found in regards to both the scope of measurement and how AQI values are determined in the EPA dataset. In my model I used median AQI, which I believe if changed to mean AQI would much more representative of the what this variable is trying to capture. Secondly, I find great issue in how the data was assessed by county level as there is a high possibility that there exists a disparity in terms of environmental justice at this level. This could be quite telling and reveal a greater relationship concerning several of the variables used. In terms of my actual model itself, I was limited by which variables I could use forcing me to use variable representative of population which in practice definitely skewed aspects of my graph, but because of the fear of omitted variable bias could not be excluded. Lastly there are several variables that could provide a better predictor model such as segregation.

Conclusion

Environmental Justice is an important issue for all citizens, as specific groups should not have to face the brunt of societies carbon dependent habits. As there exists a causal relationship between the percent of minority residents in a county and the AQI value it is of the upmost importance that you continue to create and promote strategies that promote environmental justice.

Items

Figure 1 (Relationship between Air Pollution and Percentage of Minority Residents in a County)
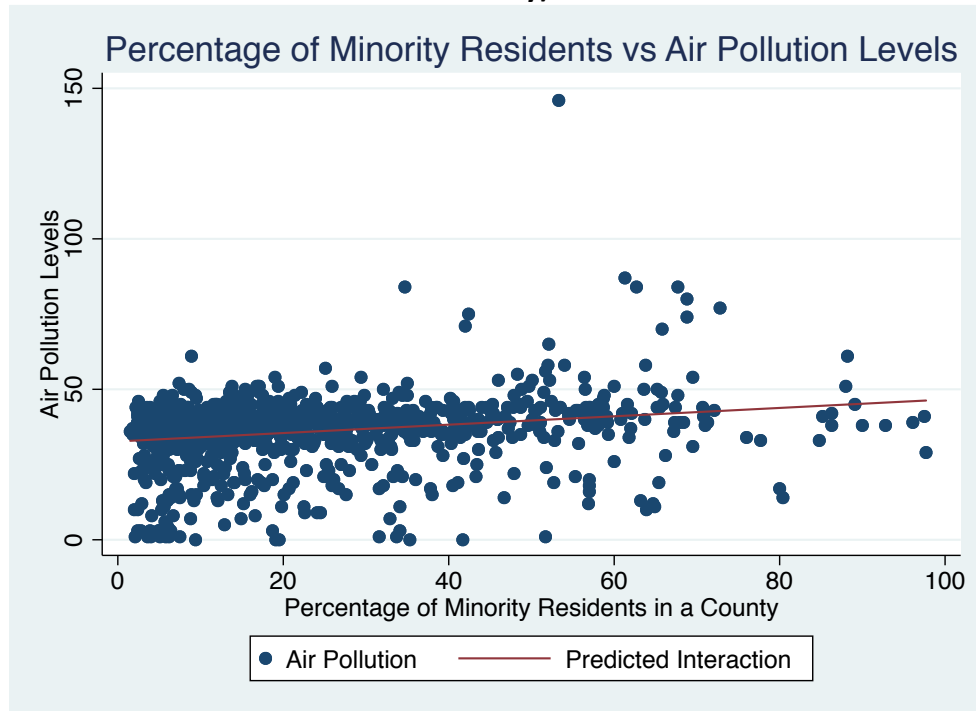
Table 1 (Multiple Regressions Comparing Four Models)

	Regression 1 Median AQI	Regression 2 Median AQI	Regression 3 Median AQI	Regression 4 Median AQI
Percent of Minority Makeup	0.173***	0.122***	0.0505	0.0575
	(7.99)	(4.51)	(1.41)	(1.63)
Percent of Individuals in Poverty	-0.300***	-0.273**	0.0209	-0.0635
	(-3.32)	(-2.99)	(0.17)	(-0.54)
Average Household Size		1.848	3.940	2.373
		(1.00)	(1.55)	(0.94)
Median Age		-0.276**	0.0949	0.0462
		(-3.00)	(0.84)	(0.42)

Logged Total Households			2.614***	
			(7.39)	
Logged No College Degree				2.709***
				(7.42)
Constant	35.02***	42.02***	-6.546	-1.318
	(38.45)	(6.03)	(-0.59)	(-0.12)
Observations	990	990	857	857
Adjusted R^2	0.059	0.071	0.123	0.123

t statistics in parentheses
$^{*} p < 0.05$, $^{**} p < 0.01$, $^{***} p < 0.001$

Table 2 (Outlier Statistics of the Dataset)

Outlier Statistics	Values
Student Residual>2	52
Student Residual>3	16
Leverage	133
Cook's Distance	72
DFIT	102
Total	**375**

Figure 2 (Margins Plot of Regression 3)

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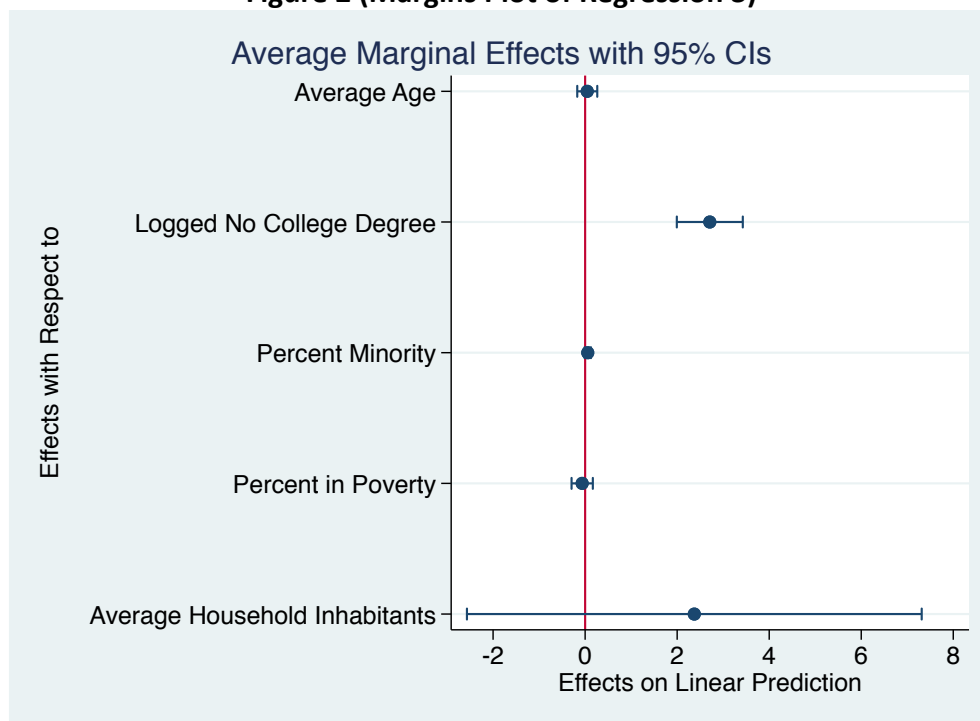
figure 3 (Margins Plot of Regression 4)

Average Marginal Effects with 95% CIs
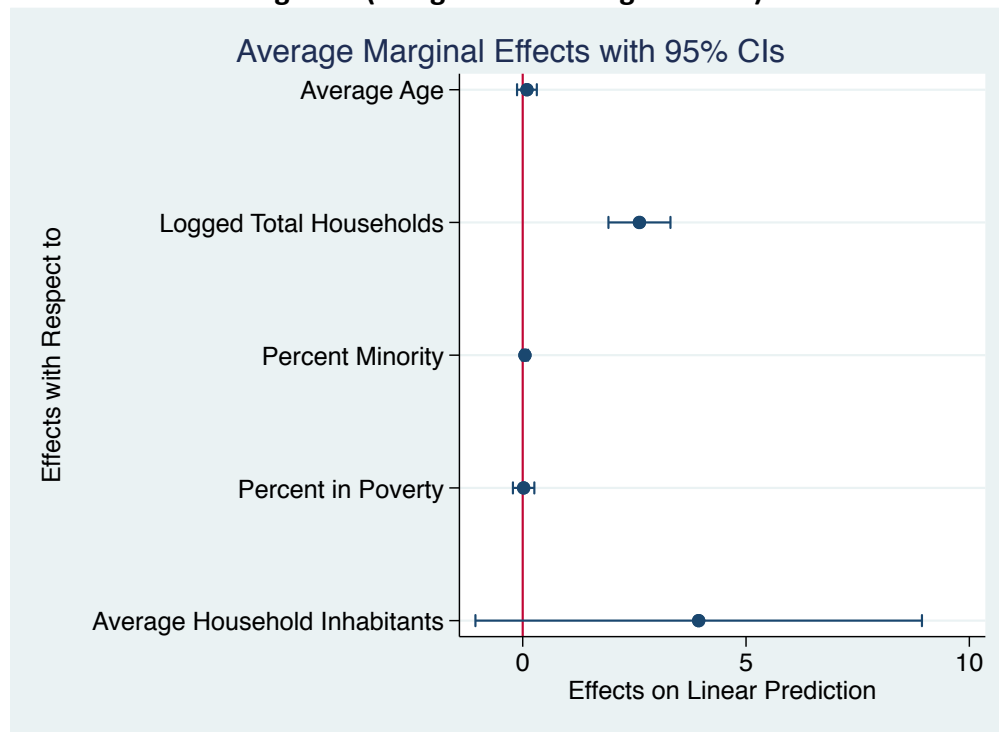
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