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RACE, ETHNICITY, AND NOXIOUS FACILITIES: ENVIRONMENTAL RACISM RE-EXAMINED

Alvaro L. Nieves

Wheaton College, Wheaton, IL
and
Argonne National Laboratory, Argonne, IL

and

Leslie A. Nieves

Argonne National Laboratory, Argonne, IL

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ABSTRACT

The charge has been made that hazardous facilities tend to be located in proximity to minority populations. This study uses a facility density measure for three categories of noxious facilities to examine the relationship between facilities and minority population concentrations. County-level data are used in a correlation analysis for African Americans, Hispanics, and Asians in the four major regions of the U.S. Even controlling for income and housing value, and limiting the data set to urban areas, consistent patterns of moderate to strong association of facility densities with minority population percentages are found.

INTRODUCTION

The past decade has witnessed the rise of terms like environmental racism (UCC, 1987), eco-racism (Rees, 1992), and environmental inequities (Bullard, 1987; Mohai and Bryant, 1992) to characterize a disproportional distribution of environmental hazards among minority communities. The issue surfaced earlier in the work of Berry (1977) on five types of urban hazards and in air pollution studies by Freeman (1972) and the Council on Environmental Quality (1971). Much of the literature supports the contention that racial and ethnic minorities and low-income groups bear a disproportional burden of risk from hazardous activities and substances in the environment.

However, most studies addressing the distribution of disamenities across racial/ethnic or income groups are limited in scope, typically applying a case study approach to one environmental hazard, such as air pollution, in a limited geographical area. This provides depth, but does not develop findings that are generalizable to other areas or to the U. S. as a whole. For example, the U.S. Government Accounting Office (GAO) study (1983) examines the concentration of minority population at four waste facilities in the South (1983) and McCaull (1976) analyzes air pollution patterns in the Washington, D.C. area. Air pollution and, to a lesser extent, hazardous waste facilities have been the main focus of such studies since

1970.

Eleven of the fifteen studies that Mohai and Bryant (1992) summarize dealt only with air pollution, (Council on Environmental Quality, 1971; Freeman, 1972; Harrison, 1975; Kruvant, 1975; Zupan, 1975; Burch, 1976; Handy, 1977; Asch and Seneca, 1978; Gianessi, et al., 1979; Gelobter, 1986, 1989), one dealt only with solid waste (Bullard, 1983) and two dealt only with hazardous waste (U.S. GAO, 1983; UCC, 1987). One of the studies dealt with toxic fish consumption (West et al., 1992) as a hazard and only one of the fifteen dealt with multiple hazards (Berry, et al., 1977). In the fifteen studies examined, Mohai and Bryant found that ten supported the contention that the burden of environmental hazards appeared inequitable across income groups. Similarly, eleven showed inequitable distribution by race. In addition, they found that race was more important than income in six of the fifteen studies. The distribution of geographical areas covered in the studies is as follows: a single urban area (6), multiple urban areas (5), a region (1), a state (1) or the nation (4). The loci total more than 15 because of overlaps within studies.

The United Church of Christ, Commission for Racial Justice (UCC) commissioned the most comprehensive analysis of hazardous waste site locations to date (1987). It is national in scope, disaggregated to the zip code area, and covers 27 commercial hazardous waste facilities and about 10,000 uncontrolled hazardous waste sites. Though this study is more broadly-based,

it's conclusions with regard to the charge of racism have been contested because "of the twenty-seven areas with commercial hazardous waste landfills surveyed . . . twenty-one (78 percent) were populated by a greater percentage of whites than minorities" (Rees, 1992).

The GAO and UCC studies cited above were used as the basis for an article titled "Toxic Waste and the African American Community," (Bullard and Wright, 1989). In the GAO study, the percentage of African Americans in the host communities, located in North and South Carolina and Alabama, ranged from 38 to 90 percent. While African Americans comprised over 50 percent in 3 of the 4 communities, in absolute terms the total population of these communities was only 3,007. In the case of the UCC study sites discussed by Bullard and Wright, only 3 of the 9 sites had majority African American populations and one of the sites had a majority of Latino residents. The actual population numbers are not provided, with the exception of Emelle, AL at 626 (duplicated in the GAO study). Thus, the scope of the "African-American community" examined is actually very limited.

The argument is made that a majority of the hazardous landfill capacity of the South is represented by the "4 landfills in minority zip code areas." The implication seems to be that negative effects are restricted to narrow geographic (zip code) areas and thus minority populations bear a disparate burden. In reality, noxious facilities, including disposal sites, affect wider areas. This can occur physically through release of toxic

substances or economically through stigmatization of the area. While serious equity issues are suggested by these findings, there is room for questions.

THEORETICAL FRAMEWORK.

A framework for the relevant questions can be found within the broad literature of stratification, especially that relating to "structured social inequalities" (Heller, 1987). The phenomenon of residential differentiation or segregation is more narrowly applicable but still within this context of mainstream stratification literature. Kraus states that "underlying residential differentiation is the fact that grade of dwelling, meaning type and condition of lot, condition of structure, number of rooms, and the condition and use of adjoining properties generally rises with occupational rank" (1976, p. 169). That race and ethnicity are also linked with spatial distribution and residential segregation is seen clearly in works by Denton and Massey (1988). It seems clear that "residential location affects the cost and quality of housing" and "the level of exposure to unhealthy and unsanitary conditions," (Beeghley, 1989, p. 286).

Additionally, there is room for consideration of the relationship of race/ethnicity and power (Weber, 1920; Lenski, 1966). Weber, in discussing class, status, and power also introduced the concept of "life chances" which incorporates a sense of the probabilistic nature of outcomes. Dahrendorf

expanded on this notion, building on Weber's concepts of "future chances," and "preferential chances" toward the concept of "life chances" (Dahrendorf, 1979). Wilson concluded further that "class has become more important than race in determining black life chances in the modern industrial period" (Wilson, 1980). If the claims of environmental racism are true, then della Fave's argument that "The meek shall not inherit the earth" (1980, p.955) might more appropriately be restated as "The meek shall not inherit an unpolluted, non-toxic earth." At least one question that may legitimately be raised is whether or not the "meek" shall be defined in terms of class or race and ethnicity.

SCOPE OF THE STUDY

We propose to go beyond the scope of prior studies by employing county-level data for the entire nation and including a broad range of facility types representing environmental disamenities. In addition, we will address the issue of the distribution of noxious facilities among white and non-white populations in an attempt to determine the relative exposure to risk among different racial and ethnic groups, thus addressing the question of whether the data support the claims of environmental racism: ". . . minorities are shouldering an unequal share of the burdens of hazardous waste" (Godsil, 1991, p.396). In addition, we will also explore the relative

importance of nonurban versus urban residence.

In systematically approaching our task we will first describe the distribution of noxious facilities in the U.S. Second, we will examine the relationship of a standard measure of facility concentration to socio-demographic variables, including race and ethnicity. Third, we will attempt to isolate the role of race and ethnicity, by controlling for income and housing value.

METHODS

Data Sources

This section presents a brief summary of the data and their origins. The facility types included range from manufacturing plants to toxic waste sites to electricity generating plants, all of which are located in the 48 contiguous states. Information on the location of chemical manufacturing plants, petroleum production and petroleum refining facilities, plastics and rubber manufacturing plants, pulp mills, smelters, and incinerators is taken from the 1985 National Acid Precipitation Assessment Program Inventory. Chemical weapons storage site locations are from Rouse (1988) and locations of radiation-related research facilities, radioactive waste disposal and inactive industrial sites, and uranium mill tailings sites are from the Department of Energy 1991 Annual Report on environmental restoration activity.

Electric generating plant locations are developed from various Energy Information Administration forms and documents, and liquefied natural gas storage sites and terminal locations are from an Institute of Gas Technology listing. Commercial hazardous waste disposal sites and National Priorities List/Superfund site locations are taken from U.S. Environmental Protection Agency listings. Demographic data used in our analysis are from the 1983 County and City Data Book which consists of data originally collected for the 1980 decennial census.

Variables

Unit of Analysis. The unit of analysis for this study is the county. We include 3,109 counties and independent cities in the contiguous United States. One county is omitted because it is a new county for which some data items are not available.

Facility density. The number of facilities of a particular type per square mile is used to standardize the facility measure since county size varies by several orders of magnitude. For analysis, the facilities are divided into three broad categories: production, energy, and disposal. The PRODUCTION category consists of facilities that typically contribute substantially to the economic base in their local area. Most are also major sources of air emissions that reduce ambient air quality, contributing both to acid precipitation and exposure to airborne

toxics. The ENERGY category includes all types of electric generating plants, plus liquefied natural gas storage sites. These facilities represent a form of economic infrastructure, but most also generate emissions that diminish air quality. The third category, DISPOSAL, is composed of active facilities or inactive sites that contain or dispose of hazardous waste, including radioactive materials. These may pose risks to the public through either air- or water-borne contaminants. Of the 4,410 facilities, almost half are in the production category, with the remainder split about equally between energy and disposal facilities.

Minority Concentrations. Minority concentrations are measured as the percentage of the total population of each county that are African American, Latino, or Asian. Native Americans are not included because of the relatively small population size of this group.

MSA Status. Because of the potential influence of urban location we distinguish between counties which are located within the boundaries of Metropolitan Statistical Areas (MSAs) and those that lie outside the MSA. The MSA is a Bureau of the Census designation.

Median Household Income. This measure is taken from the County and City Data book and is the midpoint in the distribution of household incomes within each county.

Median Housing Value. Also taken from the County and City Data book, this is the midpoint of the distribution of owner-

estimated values of owner-occupied housing.

Description of the Data

Distribution of Facilities. The numbers of facilities included in this analysis are listed by type in Table 1. The distribution of these categories of facilities among the U.S. Bureau of Census Regions is also shown in Table 1. More than a third of the facilities are located in the South, which contains a high proportion of both the production and energy facilities. In the case of disposal facilities, the North East has the largest proportion of the total and since it is the region with the smallest land area, the disposal sites density is highest there.

The distribution of facilities also varies considerably within regions and is highly skewed. Nationwide, 57% of counties do not have any facilities which means that all 4,410 facilities are located in just 1,336 counties. The majority of the counties with facilities have just one or two. Less than 2% of counties have ten or more facilities, of all types combined, but some have more than 50.

(Table 1 about here)

Distribution of Minority Populations. Table 2 shows that minority populations are also distributed unequally among, and

within, the Census Regions. More than half of the U.S. population of 26.5 million African Americans resided in the South in 1983. Only 8% were located in the West, with the remainder of the population split between the North Central and North East Regions. Hispanics, with a total population of 14.5 million in 1980, were concentrated in the West, where 42.5% lived. The North Central Region contained the smallest proportion of the Hispanic population, 8.7%. Asians were also concentrated in the West where about half of the Asian population resided, and the rest of the over 3 million total Asian population was split nearly equally among the remaining three regions. Almost half of all Native Americans also lived in the West and only about 6% in the North East, giving that region the lowest percentage of the Native American population. Native Americans constitute the smallest of these population subgroups, with just over a million persons. For this reason, Native Americans are excluded, as a separate group, from the subsequent analysis.

(Table 2 about here)

In addition to the variation in minority populations as a percentage of the U.S. and regional totals discussed above, there are differences in the way minority subgroups are distributed as a percentage of each region's population and as a percentage of the populations of MSA counties. Table 3 presents the regional distribution of U.S. total and minority populations. It then

presents the minority population as a percentage of the total for each region and the nation, and the minority population as a percentage of the urban population. The last column shows the percentage of the total minority population in each region that is urban. Over 98% of the minority population in the North East lives within an MSA, while only 72% of Southern minorities are urban.

(Table 3 about here)

Analysis

Test of Differences Between Counties With and Without Facilities. As previously stated, 57% of the counties initially included in this study have none of the 4,410 facilities. If an inequitable or disproportionate exposure to hazardous facilities exists, based on race or ethnicity, then mean percent minority and the mean percentage of each of the subgroups should be significantly larger in those counties with facilities than in those counties without facilities. To test these we used the t-test for differences between means testing first for homogeneity of variance and calculating the t-test and degrees of freedom appropriately. This allowed us to test a series of hypotheses of the form Ho: $\mu_1 = \mu_2$, Ha: $\mu_1 > \mu_2$. Where μ_1 is the percent minority in counties with facilities and μ_2 is the percent minority in the counties without facilities. A significant t-

test allows the rejection of the null hypothesis suggesting that the relationship of the alternative hypothesis is valid.

The results for the U.S. as a whole and each of the four regions are summarized in Table 4. In all but two cases we reject the null hypothesis that the percentages of minority population in counties with and without facilities are equal; for Hispanics in the North East and African Americans in the South we cannot reject the null hypothesis at alpha <= .05. In the North East about three quarters of the counties have facilities have facilities, while the Hispanic population is relatively concentrated. In the South there is a tendency for the minority populations to be more dispersed than in other regions (with the possible exception of fairly dispersed population of Hispanics in the West).

(Table 4 about here)

The evidence is considerable, if not overwhelming, for a finding of environmental inequities based on race/ethnicity from the preliminary testing of mean differences. Given these results, we proceed with the analysis of those counties which contain hazardous facilities.

Correlation Analysis of relationships between key variables. Consistent with Wilson's earlier work (1978) which suggests a "declining significance of race," some have asked whether the

inequitable distribution of environmental disamenities or hazards is not more appropriately explained by economic factors such as poverty, income, wealth and property values. Our attempt to answer such questions begins with an examination of the zero order correlations between facility density in each of the facility categories, the population percentage of minorities and the percentage of minority subgroups within all counties in which facility density is greater than zero. Similarly, we examine the correlations involving the percentage of families below the poverty line, the median household income and the median value of owner-occupied housing.

Table 5 presents the zero order correlations for the U.S. as a whole and for each region. Examining the correlations for the U.S. as a whole first, we see that although the majority of the values are significant at $p < .01$, the magnitude of the correlation is generally small. The one possible exception ($r = .3481$) is between percent Asian and energy facility density. The correlations, including the relationship between density and percent poverty seem to be inconclusive, at best.

(Table 5 about here)

At the regional level we see an immediate increase in the correlation for percent African American in every facility category, with r values ranging from .44 to .59. This, as is the case with other minority groups in other (but not all) regions

suggests that the relationship between race/ethnicity and facility density is masked when measured at the national level.

Correlations between the percent of families below the poverty level and the facility density categories are nonsignificant at the national level. At the regional level, the relationships are stronger, but the direction of the relationship varies among the regions. In the West, Midwest, and South, facility density is generally negatively related to the percent of poverty families. However, in the North East the relationships are positive and relatively strong for production (.28, $p < .05$) and energy (.49, $p < .01$) facilities.

The last two columns in Table 5 present the relationship between regional and national facility densities, median household income and median housing value of owner-occupied housing. As in the earlier case, correlations at the national level are small, though sometimes significant. The strength of the relationship increases at the regional level, but not in a very consistent pattern; and, in most cases, not very dramatically. However, overall, the correlations of facility density with housing value are stronger and more consistently positive than those with income. This is an anomalous finding if noxious facilities are, in fact, attracted to sites with low land values as has been suggested by some authors (c.f. Mohai and Bryant 1992).

Economic studies, using hedonic estimation techniques that control for variation in labor and housing quality, have

generally supported Roback's (1982) model of the complex interaction of local labor and land market prices. Roback found that environmental disamenities or hazards, that do not increase local productivity, increase local wage rates and decrease residential land values. As a result, local residents are compensated for disamenities by the net adjustment of the local economy, reducing the monetary cost of living there. A recent study by Nieves, Clark, and Hemphill (1992) confirmed this effect for several types of noxious facilities. Based on our understanding of the interaction of wage and housing value levels, we employ both, simultaneously as controls in analyzing the relationship of facility density with percent minority.

Table 6 presents the correlations between facility density and racial/ethnic proportions by regions and facility categories for counties with noxious facilities controlling for income and housing value. A comparison of these correlations with the zero order correlations suggests that when coefficients change by .01 or more, it is most frequently a reduction in the strength of the relationship. The exceptions to this pattern occur for African Americans in the South where there is an increase from r = .11 to r = .19 in the production category, and smaller increases from a non-significant .10 to .14, ($p < .05$) in the disposal category, and .09 to .10 in the energy category. The other exception to the predominant pattern is a shift from a non-significant -.03 to a significant + .16 for production and from -.00 to .02 in the disposal category for Hispanics in the West.

(Table 6 about here)

The predominant pattern of decline in the strength of the relationships is supportive of the previously noted suggestions (Wilson, 1978) that there is a declining salience of race and ethnicity, since statistically controlling for class-related variables diminishes the apparent relationships. This would indicate that class is more important than race if the reductions moved the relationships from significant to non-significant, but in most cases they do not. In the North East, the relationships for all minority groups remain in the range of .40 to .72 and all are significant. The increased coefficients for Hispanics in the West, and African Americans in the South seem to indicate that the relationship between race/ethnicity and facility density was being masked by the variability in these class variables. Holding them constant thus results in revealing an underlying effect of race. Yet, even with the increase, the relationship is a weak one.

In order to explore possible intervening factors further, and recognizing the apparent importance of urban residence, we selected urban counties which contained at least one noxious facility and repeated the correlation analysis, controlling for income and housing value. This eliminates the effect of rural/urban variation in residential patterns. As shown in Table 7, the relationship between facility density and percentage of

African Americans increased to a range of .19 to .29 in the South for all three categories, and in the Midwest to .66 for production and to .42 for energy, but decreased for disposal. For Hispanics, correlation increases occurred mainly in the Midwest and the coefficients for the production (.16) and energy (.27) categories became significant. For Asians the picture in regard to the urban effect is less clear; there are almost as many increases in coefficients as decreases.

(Table 7 about here)

Considering only urban residents, the picture for African Americans is consistent across all four regions; there are generally moderate correlations between facility density and population percentage, and all are statistically significant. For Hispanics, the relationship is moderate and significant for production and energy facilities in the Midwest and stronger for disposal and energy facilities in the North East. Strong and significant ($p < .01$) correlations for percent Asian are found for disposal and energy facilities in the West (.63 and .81) and for all facility types in the North East (.54 to .67). Thus, even when the urban/rural effect is eliminated, there is evidence of inequities for African Americans in all regions, for Hispanics and Asians in the North East, Asians in the West, and, to a lesser degree, Hispanics in the Midwest.

Conclusions

We have attempted to explore the issue of environmental inequity in this study, considering the major minority population subgroups, a broad range of hazardous facilities, and four U.S. regions. In the West, North Central and North East regions, it appears clear that the relationship between the proportion of African Americans and facility density remains moderate to strong and always significant, at $p < .05$ or better, regardless of the controls applied. This suggests that, at least in these regions, the inequities in hazardous facility proximity cannot be explained in terms of class or urban/rural differences in population distribution. For Hispanic Americans, the high and significant correlations occur only in the North East and they are highest for disposal and energy facilities with correlations of .71 and and .57, respectively. Asian Americans have the highest correlations in the West and North East. In the West the correlation is highest for energy facilities with $r = .81$, but with a strong (.63) and significant correlation for disposal facilities. In the North East, correlations for all facility categories are relatively high, ranging from .54 to .67.

Several surprising findings resulted from this analysis. First, the fact that, though significant ($p < .05$), the correlations for the relationship between percent Black and facility density in the South were weak, ranging from .19 to .29 in the second order correlations for urban counties. Considering

the prior extensive work by Bullard (1983), Bullard and Wright (1989), the GAO (1983), and the UCC (1987), this finding appears anomalous. One possible explanation involves the rural nature of much of the South with a dispersed minority population and the fact that 59% of Southern counties have no hazardous facilities as defined in this study. At the same time, the South has the lowest percentage of its minority population living within MSAs (72.8%). A similar anomaly exists for Hispanics in the West. This is a region with a high percentage of Hispanics, but one in which this population subgroup is also somewhat dispersed.

The high correlations between facility density and percent Asian in the West and in the North East were another surprise. We have not encountered discussion of the exposure of Asians to environmental hazards anywhere in the literature and yet the highest correlation in this study was between percent Asian and energy facility density ($r = .81$) in the West. This pattern may result from the urban concentration of Asians. As previously indicated in Table 3, nearly 90% of all minorities in the West are located within MSAs.

The most consistent pattern of environmental inequity seems to exist in the North East where the correlations are moderately high and significant for all population subgroups and all hazardous categories except one (percent Hispanic and production facility density). This is understandable considering that the North East has the highest percentage of counties with at least one noxious facility (74%) and the highest percentage of

minorities living within MSAs (98.47%).

While this study has examined the issue of racial inequities in potential exposure to environmental hazards on a national and regional basis, a number of questions remain. There are regional differences in the effects of the control variables and of analysing the urban counties separately that are not explained within the study framework. Further exploration of these factors is recommended with a more complete and detailed set of economic controls. In addition, the use of county-level data leaves some questions unresolved. It is possible that a similar analysis of data for census tracts or zip codes might provide evidence of inequities in some of the regions where they are not apparent using county-level data. Such an analysis could shed additional light on the issues.

TABLE 1 Number of U.S. Facilities by Category and Percentage by Region

FACILITY TYPE	NUMBER	PERCENT OF FACILITIES BY REGION			
		WEST	NORTH CENTRAL	NORTH EAST	SOUTH
Chemical manufacturing plants	609				
Military chemical weapons storage sites	7				
Petroleum production	323				
Petroleum refining	310				
Plastics and rubber manufacturing	132				
Pulp mills	272				
Radiation-related research facilities	26				
Smelters	382				
TOTAL PRODUCTION:	2061	17.6	24.4	11.5	46.6
Coal-fired generating plants	458				
Gas-fired generating plants	241				
Geothermal generating plants	4				
Liquefied natural gas storage sites	78				
Nuclear generating plants	119				
Other generating plants	13				
Petroleum-fired generating plants	170				
TOTAL ENERGY:	1083	12.6	31.5	17.1	38.9
Commercial hazardous waste disposal	27				
Incinerators	53				
National Priorities List/Superfund sites	1129				
Radioactive waste disposal	7				
Radioactively contaminated inactive industrial sites	29				
Uranium mill tailings sites	21				
TOTAL DISPOSAL:	1266	18.9	27.2	31.2	22.8
TOTAL FACILITIES:	4410	16.7	26.9	18.5	37.8

* U.S. Bureau of Census Regions

Table 2. Distribution of Minority Population Subgroups by U.S. Census Region, 1980
(Thousands of Persons and Percentage of U.S. Subgroup Population)

REGION	AFRICAN AMERICAN		HISPANIC		ASIAN		NATIVE AMERICAN	
	1000s	%	1000s	%	1000s	%	1000s	%
West	2229	8.4	6177	42.5	1580	50.5	699	47.7
North Central	5333	20.2	1270	8.7	435	13.9	271	18.5
East	4850	18.3	2608	18.0	599	19.2	89	6.1
South	14039	53.1	4468	30.8	513	16.4	407	27.8
TOTAL	26451	100.0	14523	100.0	3127	100.0	1099	100.1

Note: Percentages may not sum to 100 due to rounding.

Source: 1983 County and City Data Book

Table 3. Total and Minority Population Distribution by Region; Minority Population Percentage of Total and of Urban Regional Population; and Percentage of Minority Population that is Urban

REGION	TOTAL POPULATION (1000s)	TOTAL MINORITY POPULATION (1000s)	MINORITY % OF		URBAN % OF MINORITY POPULATION
			REGION TOTAL	REGION URBAN	
West	41,805	10,684	25.6	27.3	89.4
North Central	58,865	7,309	12.4	16.2	92.1
North East	49,135	8,146	16.6	18.4	98.5
South	75,372	19,427	25.8	27.2	72.2
Total U.S.	225,179	45,568	20.3	22.3	84.1

Table 4. Differences in Percent Minority Population Between Counties With and Without Facilities for the U.S. and Regions.

Area: US

GROUP	FACILITY STATUS	MEAN %	STD. DEV.	T	DF
Black	With	9.21	13.56	1.88 *	3011
	Without	8.24	15.07		
Hispanic	With	4.40	10.38	2.97 **	2823
	Without	3.30	10.03		
Asian	With	0.56	1.01	10.31 **	1684
	Without	0.25	0.42		
Area: West					
Black	With	1.59	2.74	6.42 **	212
	Without	0.28	0.73		
Hispanic	With	10.77	12.98	1.72 *	409
	Without	8.33	15.77		
Asian	With	1.35	2.22	4.85 **	227
	Without	0.53	0.77		
Area: North Central					
Black	With	2.82	5.38	7.64 **	505
	Without	0.66	2.35		
Hispanic	With	1.21	1.76	5.13 **	645
	Without	0.70	1.21		
Asian	With	0.40	0.41	8.80 **	568
	Without	0.20	0.23		
Area: North East					
Black	With	4.15	6.36	3.93 **	143
	Without	1.17	4.26		
Hispanic	With	2.06	3.59	1.32 #	81
	Without	1.19	4.46		
Asian	With	0.65	0.74	6.13 **	213
	Without	0.25	0.22		
Area: South					
Black	With	17.61	16.30	1.11	1329
	Without	16.58	18.34		
Hispanic	With	5.20	12.87	1.66 *	1140
	Without	4.10	11.43		
Asian	With	0.38	0.47	6.79 **	1081
	Without	0.22	0.39		

# $p < .1$ * $p < .05$ ** $p < .01$

Table 5. Zero Order Correlations for Facility Density and Racial/Ethnic Proportions by U.S. and Regions for Counties with Noxious Facilities

REGION	CATEGORY	% AFRIC. AMERICAN	% HISPANIC	% ASIAN	% MINORITY	% FAMILIES <POVERTY	MEDIAN HOUSEHOLD INCOME	MEDIAN HOUSE VALUE
U.S.	Product	.1747 **	-.0278	.1196 **	.1179 **	.0012	.0716 *	.0614
U.S.	Disposal	.1748 **	.0453	.2803 **	.1615 **	-.0681	.1891 **	.1722 **
U.S.	Energy	.1204 **	.0592	.3481 **	.1395 **	.0223	.0453	.2276 **
West	Product	.4497 **	.0448	.4491 **	.0844	-.2237 *	.4047 **	.4928 **
West	Disposal	.4447 **	-.0001	.6875 **	.1305	-.1257	.2027 *	.2841 **
West	Energy	.5872 **	-.0127	.8435 **	.1487	-.0260	.0174	.3890 **
Central	Product	.6299 **	.1002	.1942 **	.5915 **	.1410 *	.0174	.0908
Central	Disposal	.2705 **	.1951 **	.3736 **	.2748 **	-.2398 *	.3869 **	.3404 **
Central	Energy	.4077 **	.1299	.1341 *	.3667 **	-.1188	.2719 **	.1935 **
N.East	Product	.4161 **	.2521 *	.4933 **	.4107 **	.2808 *	-.0816	.0386
N.East	Disposal	.5669 **	.7261 **	.7133 **	.7135 **	.1485	.2140 *	.3524 **
N.East	Energy	.4945 **	.7322 **	.7078 **	.6692 **	.4855**	-.1720	.3249 **
South	Product	.1124 *	-.0674	.1254 **	.0458	-.1073 *	.2161 **	.1823 **
South	Disposal	.1041	-.0469	.1081	.0675	-.1007	.1300	.1130
South	Energy	.0863	-.0865	.3181 **	.0153	-.1389 *	.2323 **	.3828 **

* p < .05 ** p < .01

Table 6. Second Order Partial Correlations for Facility Density and Racial/Ethnic Proportions by Region for Counties with Noxious Facilities, Controlling for Median Household Income and Median Housing Value

REGION	FACILITY CATEGORY	% AFRIC. AMERICAN	% HISPANIC	% ASIAN	% MINORITY
West	Product	.3561 **	.1584 *	.2003 *	.2179 *
West	Disposal	.4067 **	.0240	.6605 **	.1848 *
West	Energy	.4608 **	-.0521	.8130 **	.1494
Central	Product	.6374 **	.0969	.1592 *	.5949 **
Central	Disposal	.2702 **	.0741	.2785 **	.2553 **
Central	Energy	.3891 **	.0763	.1018	.3438 **
N.East	Product	.3954 **	.2035 *	.5553 **	.3902 **
N.East	Disposal	.5328 **	.7177 **	.6736 **	.6904 **
N.East	Energy	.4322 **	.6094 **	.6239 **	.5715 **
South	Product	.1909 *	-.0610	.0507	.1127 *
South	Disposal	.1392 *	-.0441	.0608	.1003
South	Energy	.0977	-.0392	.1212 *	.0566

* $p < .05$ ** $p < .01$

Table 7. Second Order Partial Correlations for Facility Density and Racial/Ethnic Proportions by Region for Urban Counties with Noxious Facilities, Controlling for Median Household Income and Median Housing Value

REGION	FACILITY CATEGORY	% AFRIC. AMERICAN	% HISPANIC	% ASIAN	% MINORITY
West	Product	.3548 **	.0872	.1026	.2087
West	Disposal	.3218 *	-.1204	.6302 **	.1727
West	Energy	.4399 *	-.2149	.8111 **	.0683
Central	Product	.6619 **	.1638 *	.1120	.6153 **
Central	Disposal	.2388 *	.0884	.3534 **	.2407 *
Central	Energy	.4194 **	.2682 **	.1223	.4143 **
N.East	Product	.3575 **	.1584	.5396 **	.3511 **
N.East	Disposal	.4989 **	.7066 **	.6659 **	.6758 **
N.East	Energy	.3883 **	.5709 **	.6442 **	.5416 **
South	Product	.2891 **	-.0496	.0640	.1985 **
South	Disposal	.1840 *	-.0778	.0200	.1193
South	Energy	.2133 **	-.0478	.1551 *	.1232

* $p < .05$ ** $p < .01$

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