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Environmental Equity in Illinois: A County-Level Comparison of Toxic Releases

Ted Richards

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Introduction

Background

- In 2008, 21,695 industrial facilities reported releasing 3.86 billion pounds of toxic chemicals into the environment
 - Bloomington, IL: Cargill factory released 166,754 lbs of n-hexane in 2009
- U.S. Environmental Protection Agency (EPA) requires polluting entities to report emissions of hazardous waste to the Toxic Release Inventory
 - 1986 Community Right to Know Provision

Environmental Justice

- Is the burden of environmental pollution shared equally by individuals and communities of different race or income level?
- Burden of hazardous waste is not shared equally among society - some US counties have no TRI facilities, others have hundreds

Hypothesis

- In Illinois there is an inequitable spatial distribution of facilities that produce hazardous wastes.
- Emissions of hazardous wastes are more prevalent in Illinois counties with higher proportions of minority and low income residents



The U.S. EPA's TRI Program requires manufacturing establishments to report both on-site and off-site releases of hazardous waste. These wastes can be gaseous, solid, or liquid - like the hazardous waste being handled in the photograph.

Theoretical Model

- Minorities/low income residents have less understanding of environmental harms
 - Educational levels
- Pollution is localized externality, reflected in home values
 - Lower demand for houses = lower prices
 - Lower prices draw lower income families
- Economic Development
 - Low income communities provide incentives for polluting industries to locate nearby
 - Theory of Collective Action - easier for firms to locate in high minority, low income areas

Data

2000 US Census
Race/ethnicity variables
Class variables

U.S. EPA's Toxic Release
Inventory Program
2000 Annual Report
2008 Annual Report

OSHA
1997 Survey
2007 Survey



This study focuses on hazardous air pollution. Compared to liquid or solid forms of hazardous waste, hazardous air pollution disperses much easier in the local environment. Local residents can be exposed to air pollution anytime they go outdoors.

Empirical Design

Test of Means (proportions)

$$H_0: p_{\text{low-black}} = \pi_{\text{state-black}}$$

$$H_a: p_{\text{low-black}} < \pi_{\text{state-black}}$$

Reject H_0 if $|Z_c| > 1.70$ ($\alpha = .05$)

Linear Regression

Table 1: OLS Regression for Total TRI Air Emissions

Independent Variable and Predicted Sign	Definition	Source
Black (+)	Proportion black residents in county	2000 US Census
Hispanic (+)	Proportion Hispanic residents in county	2000 US Census
Asian (+)	Proportion Asian residents in county	2000 US Census
Median Household Income (-)	Median household income in county	2000 US Census
Median Household Income Sq (-)	Median household income in county	2000 US Census
Manufacturing (+)	Number of manufacturing establishments in county	OSHA 1997, 2007

Results and Conclusions

Table 3: Descriptive Statistics (County Population %, 2008 Rank)

	State Average	Low	Medium	High
Black	16.425	1.8754* (2.2558)	4.1296* (1.9063)	19.338 (.4518)
Hispanic	12.184	1.247* (1.9208)	4.022 (1.4335)	14.198 (.3536)
Asian	3.107	.275 (.9376)	1.5895 (.5024)	3.531 (.1403)
Sample Size	102	34	34	34

*indicates sig at $\alpha = .05$

Table 2: Descriptive Statistics (County Population %, 2000 Rank)

	State Average	Low	Medium	High
Black	16.425	8.846 (1.175)	5.035* (1.766)	19.317 (.4484)
Hispanic	12.184	3.120 (1.592)	2.917 (1.628)	14.957 (.4870)
Asian	3.107	.9483 (.7147)	1.357 (.5794)	3.531 (.1403)
Sample Size	102	34	34	34

*indicates sig at $\alpha = .05$

Table 4: OLS Regression for Total TRI Air Emissions

	Model 2.1 lnAIR2000D	Model 2.2 lnAIR2008D	Model 2.2 lnAIR2000D	Model 2.2 lnAIR2008D	Model 3.1 lnAIR2000D	Model 3.2 lnAIR2008D
Constant	3.413*** (8.282)	2.327*** (5.429)	3.259*** (7.296)	2.457*** (5.452)	.958 (1.968)	1.348* (2.379)
% Black	4.042 (.841)	10.558* (2.112)	3.298 (.643)	14.077** (2.720)	8.266 (1.956)	15.089*** (3.030)
% Hispanic	15.469 (1.647)	20.130* (2.061)	18.506 (1.671)	9.480 (.849)	-4.339 (-.454)	-.957 (-.085)
% Asian	38.224 (1.244)	22.815 (.714)	52.722 (1.568)	23.776 (.701)	-23.593 (-.804)	-7.283 (-.213)
Median Household Income	--	--	.000 (-.983)	.000* (-2.169)	.000 (.602)	.000 (-1.524)
Median Household Income ²	--	--	3.072E-9 (1.079)	5.228E-9 (1.820)	-1.220E-9 (-.510)	3.373E-9 (1.194)
Manufacturing (logged)	--	--	--	--	1.088*** (7.103)	.535* (3.029)
Adjusted R ²	.075	.123	.069	.169	.385	.234
Sample Size	102	102	102	102	102	102

***significance at the .001 level

**significance at the .01 level

*significance at the .05 level

Conclusion

- Hypothesis is partially correct
 - Inequitable distribution of hazardous waste in Illinois
 - After controlling for class variables, black population still disproportionately exposed to higher levels of hazardous air emissions
- Could not prove that other minority populations or certain class levels in Illinois are disproportionately exposed to higher levels air pollution than other Illinois residents.

Future Research

- Use different geographical measure for dependent variable such as census tract
- Utilize a pollution emissions index to account for toxicity