

Sunbelt Toxins: Industrial Polluters in Phoenix, Arizona

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Abstract

We examine the spatial distributions of industrial facilities emitting toxic substances in the Phoenix, Arizona metropolitan region. The analysis relies on a geographic information system (GIS) mapping of hazardous facilities listed in the Environmental Protection Agency's Toxic Release Inventory (TRI) for 1999. We assess the spatial distribution of polluting industries in relation to the demographic composition of proximal neighborhoods. We utilize two different methodologies to determine patterns of environmental injustices in the metropolitan area. We first examine patterns of inequities in the location of TRI facilities based on the volume of atmospheric releases and on the toxicity of those releases for census tracts that host such facilities. Next we statistically compare the sociodemographic characteristics of host/non-host tracts to determine if there are inequalities by race and class in the emissions of hazardous industries. We then develop a spatial methodology that allocates hazards based on one kilometer radius circles around each point-source polluter. This technique, the Hazard Density Index (HDI), provides a spatially sensitive technique that allocates potential risks to portions of all tracts within 1 km of the polluting facility, and not just those that host the facility. Using the HDI methodology for both volume and toxicity of releases, we analyze the sociodemographic characteristics of census tracts. Findings on patterns environmental justice for volumes and toxicities of atmospheric releases using the two alternative methodologies are compared.

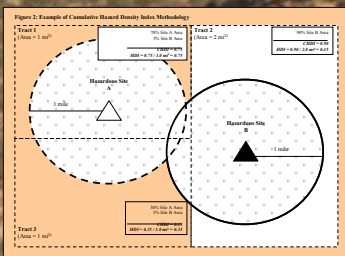


Research Questions

1. What is the relationship between neighborhood sociodemographic characteristics and the volume of air emissions reported in the Toxic Release Inventory?
2. Does this pattern change when the volume of emission is weighted by the toxicity of chemicals released?
3. How has the relationship between neighborhood sociodemographic characteristics and the volume and toxicity of emissions changed since 1996?
4. Is the Host/Non-Host or Hazard Density Index superior in explaining this relationship?

Data

1. Census of Population and Housing
2. Toxic Release Inventory (Environmental Protection Agency)



Correlations of Neighborhood Sociodemographic Characteristics and Toxic Air Releases Using Host/Non-Host and Hazard Density Index Methodology, 1996 and 1999

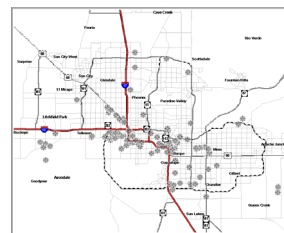
	1996		1999								
	Host/NonHost		Hazard Density Index (1 km circle)			Hazard Density Index (1 mile circle)					
	Ln Vol	Vol	Ln Vol	Vol	Tox	Ln Vol	Ln Tox	Vol	Tox	Ln Vol	Ln Tox
Income	-.379	-.142	-.280	-.122	-.093	-.297	-.134	-.122	-.111	-.258	-.155
White	-.374	-.208	-.403	-.167	-.094	-.401	-.239	-.173	-.146	-.436	-.345
Hispanic	.365	.139	.410	.118	.089	.384	.159	.145	.102	.412	.270
Black	.169	.297	.156	.266	.096	.169	.235	.199	.237	.225	.273
Native	.028	-.057	.018	-.033	-.023	.052	.068	-.017	-.022	.060	.104
n	47	59		147				202			

Bold = significant at .05 level or above

Conclusions

1. In general, neighborhoods that have higher proportions of non-white residents and lower median family incomes experience higher and more toxic levels of air releases.
2. This relationship was stable from 1996 to 1999. The correlations between sociodemographic variables and air emissions were stronger in 1999.
3. The Host/Non-Host method reveals a significant relationship between the volume of air releases and income, white and Hispanic residents. The HDI methods also picked up significance of percentage of black residents.
4. Use of 1-mile buffer zones exposes significance of income and race/ethnicity (except Native) in predicting toxicity of air emissions while use of 1-km zone reveals only significance of percent white and black residents.

Toxic Release Inventory Facilities, 1999



T-Tests for Difference of Means between Sociodemographic Characteristics and Toxic Air Releases Using Host/Non-Host and Hazard Density Index Methods, 1996 and 1999

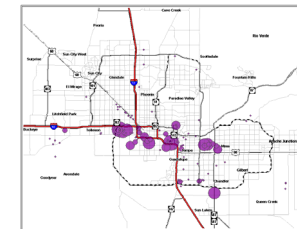
	1996			1999								
	Host/NonHost			Host/NonHost			Hazard Density Index (1 km circle)		Hazard Density Index (1 mile circle)			
	N≥1	N=0	t	N≥1	N=0	t	HDI=0	HDI=0	t	HDI=0	HDI=0	t
Income	30,800	37,000	-2.2	28,750	37,533	-3.5	30,268	39,165	-5.0	30,807	40,468	-5.9
White	58	72	-3.6	55	73	-5.3	57	77	-8.1	59	79	-9.2
Hispanic	32	20	3.8	33	20	4.8	32	17	7.0	30	15	7.9
Black	5	4	2.0	5.4	3.4	1.8	5.7	2.8	4.0	5.4	2.5	4.9
Native	2	2	.8	3.4	1.3	1.4	2.8	1	2.3	2.5	.8	3.0
n	54	411		59	406		145	319		196	269	

Bold = significant at .05 level or above

Conclusions

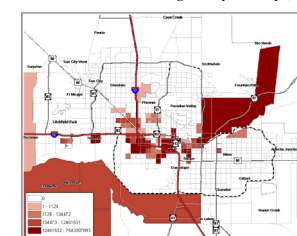
1. Neighborhoods with lower median family incomes and lower percentages of white residents had significantly higher air emissions.
2. This relationship remained stable from 1996 to 1999.
3. All three methods largely support this.
4. Use of HDI method reveals blacks and Native Americans also reside in neighborhoods significantly more exposed to toxic air emissions (in addition to Hispanics which is captured by Host/Non-Host method).

Volume of Air Emissions by Facility, 1999*



* Measured in tons

Volume of Air Emissions Weighted by Toxicity*, 1999



* Toxicity measured in pounds of toluene equivalents