Analyzing Environmental Justice in Independent School Districts in Dallas-Fort Worth Metroplex

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Objectives

- To classify pollutant zones for different exposure level in Dallas-Fort Worth, TX based on toxic site density at independent school district (ISD) level.
- To find out the correlation among socioeconomic and demographic parameters involving school children and pollution exposure in the metroplex.

Data and Data Sources

Spatial data

— Counties of DFW metroplex: Census Bureau
—TRI Sites : Environmental Protection Agency
— School Districts: Texas Education Agency

Attribute data

— Ethnicity of school children
— Economic status of school children
— Disability data of school children

] Texas Education Agency

Methodology

— Joining of spatial data for pollutant sites with spatial data of school districts in order to perform proximity analysis of the sites to districts, and to obtain a count of sites in a district.

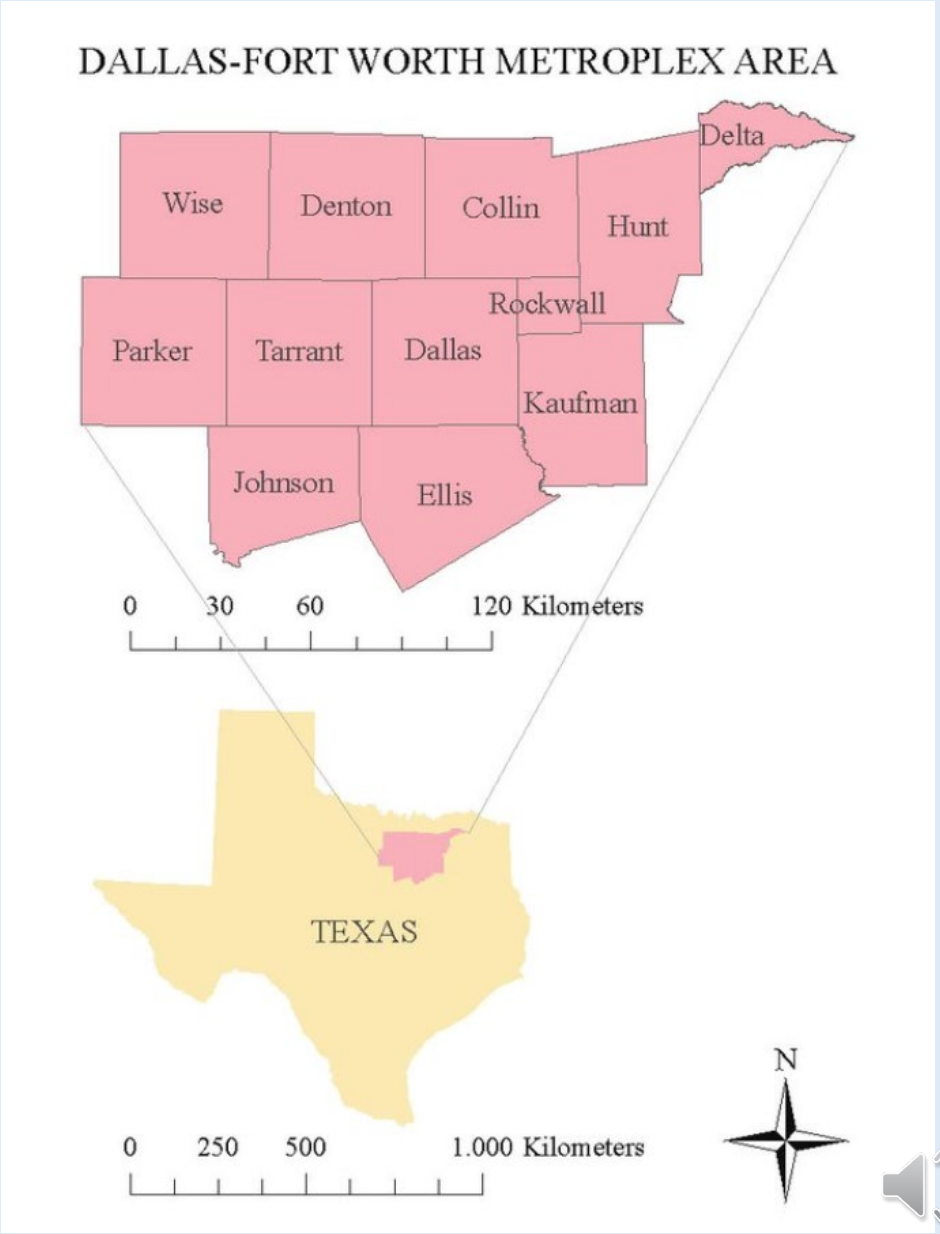
— Performing hot spot analysis to classify pollutant zones

— Joining spatial data of ISD with attribute data (ethnicity, economic status, disability data) involving school children

— Graphical and statistical exploration of the variables with respect to pollutant zones

Study Area

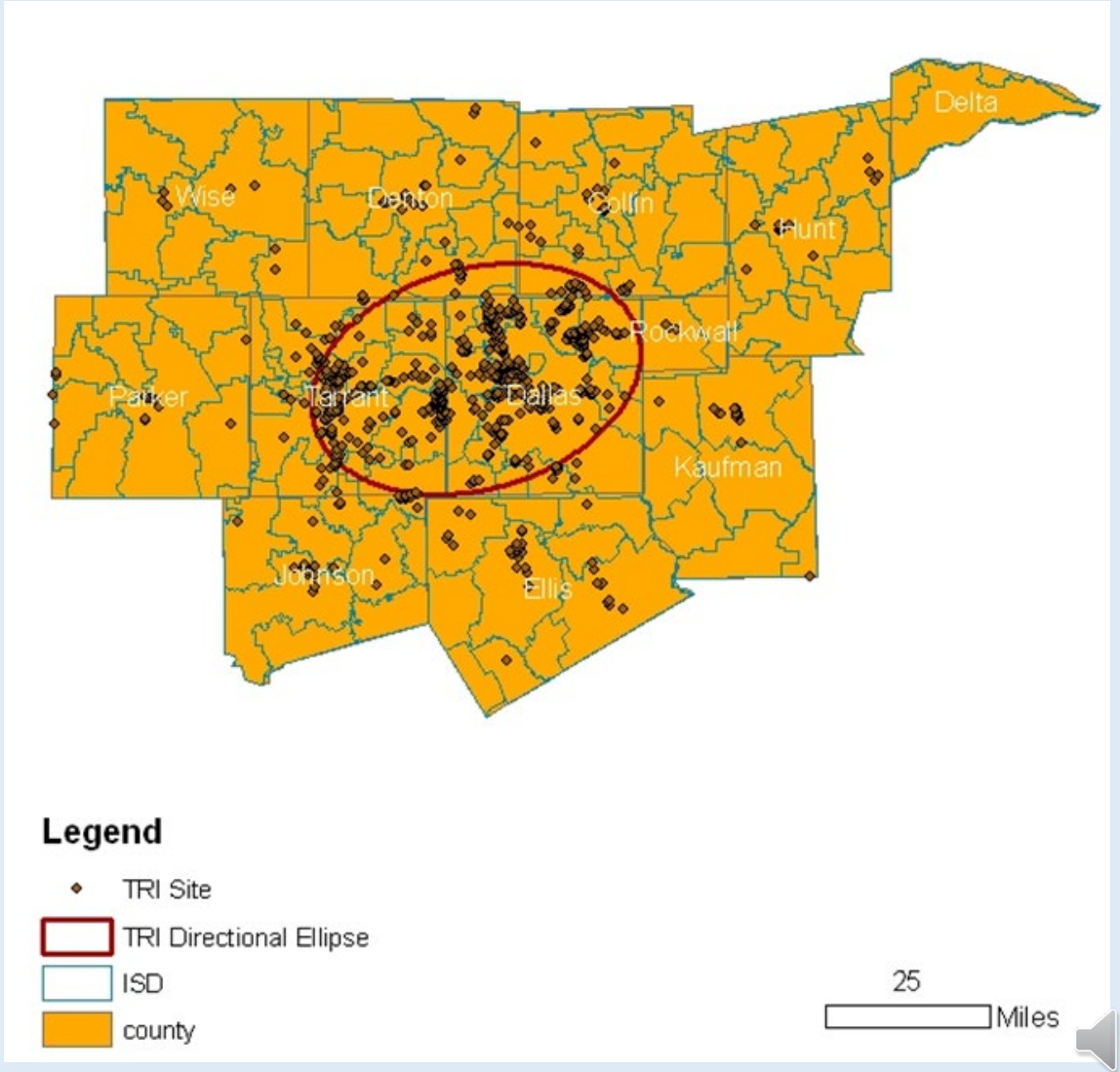
- Dallas-Fort Worth metroplex is the largest metroplex in the state of Texas
- It covers 12 counties and 111 school districts



Toxic Release Sites

Toxic Release Sites: 412

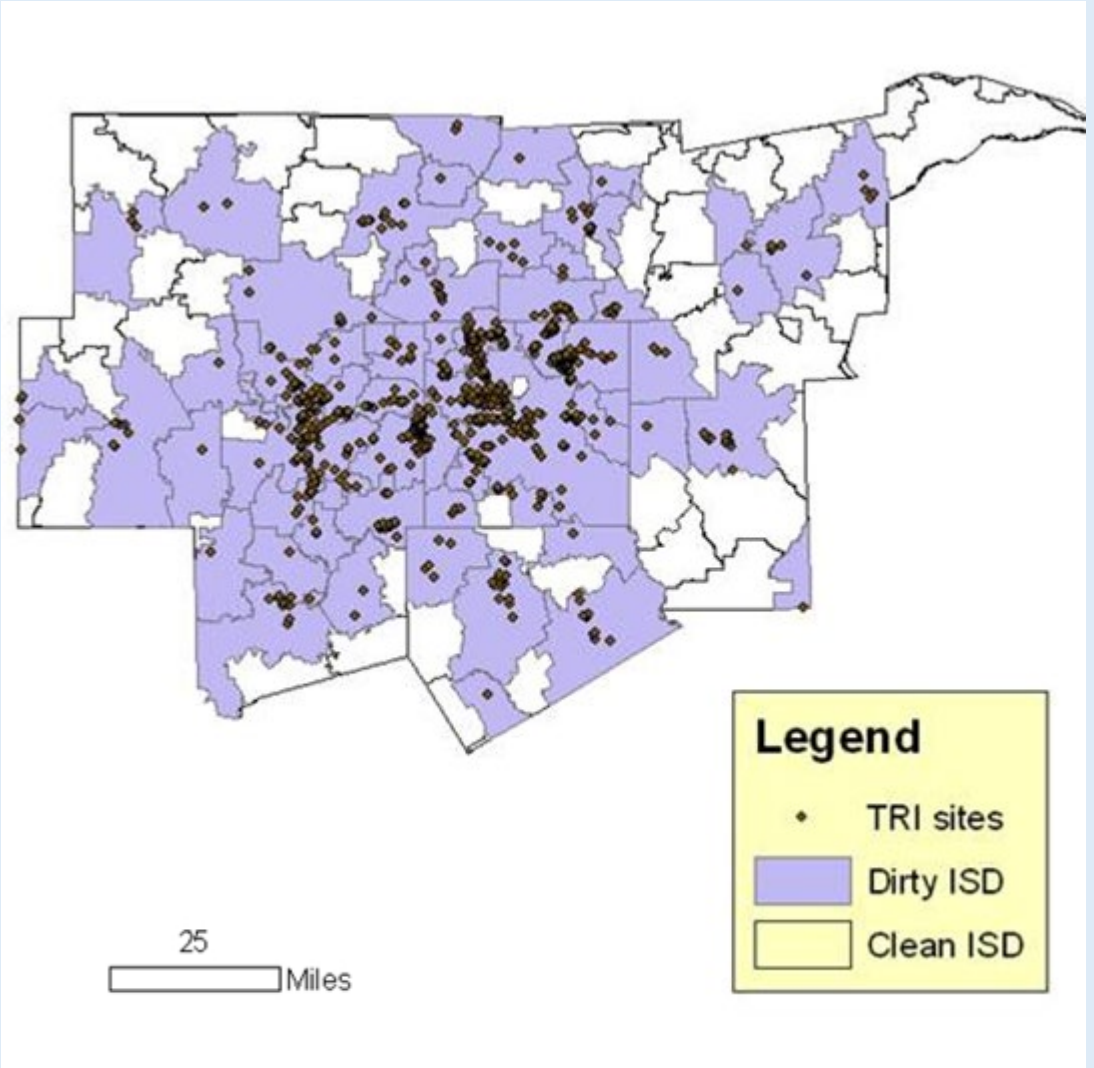
Concentrated mostly in Dallas and Tarrant Counties



Dirty and Clean Zones

—Dirty Zones : more than one toxic release sites

—Clean Zones: no toxic release sites

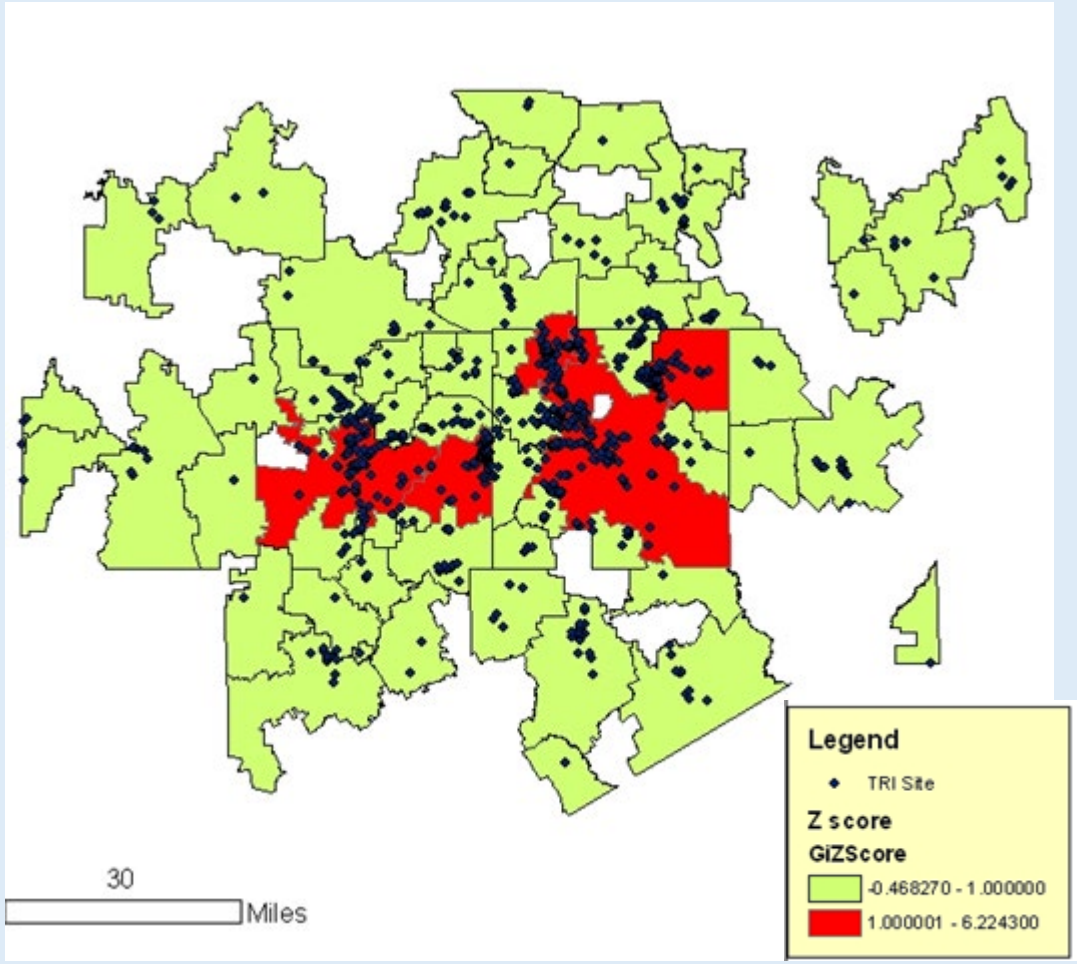


Hot Spot Analysis

Dirty Zones

Exposed Zones

Hazard Zones

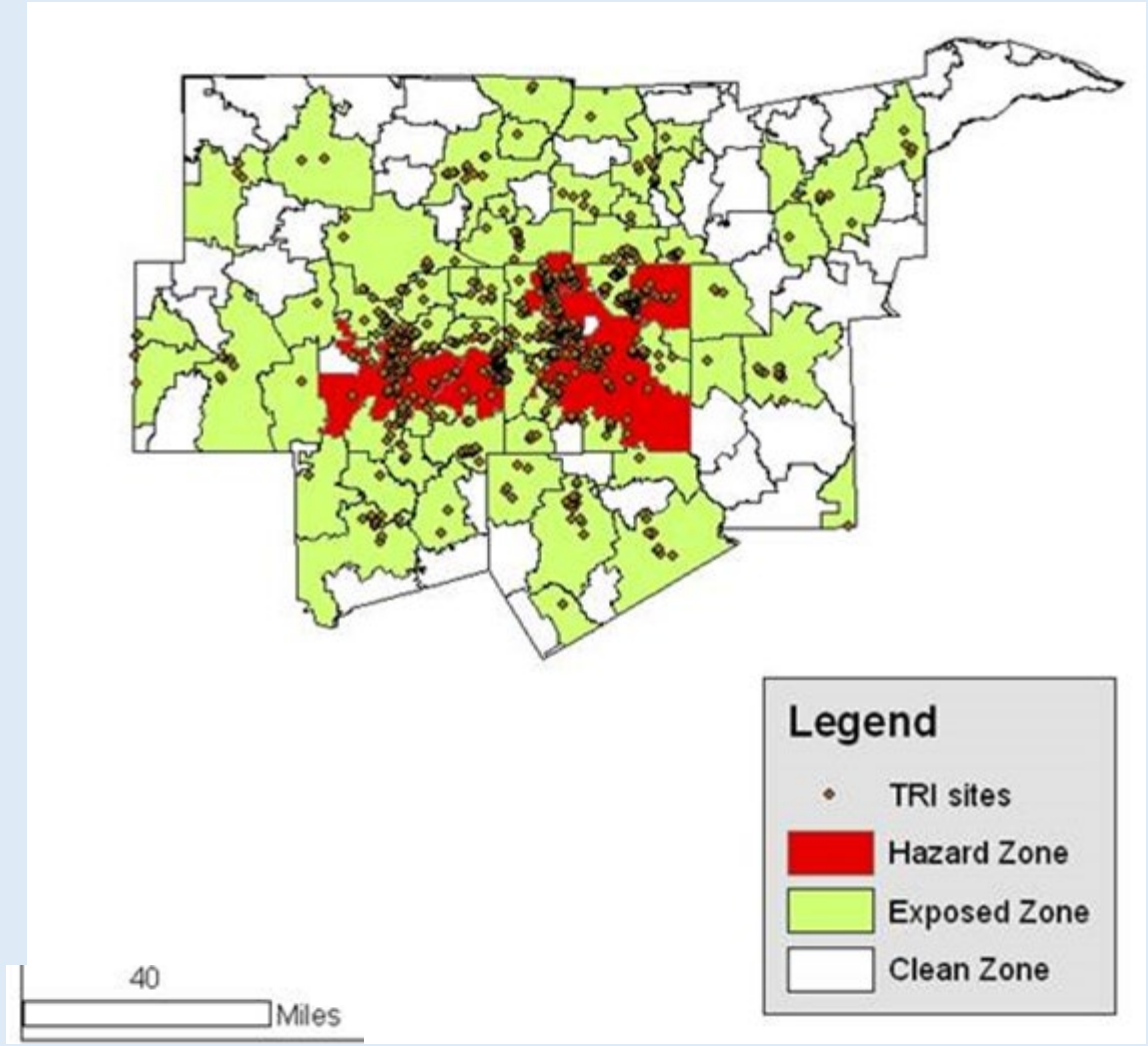


Classified Pollutant Zones

— Clean Zone: 45 districts

— Exposed Zone: 61 districts

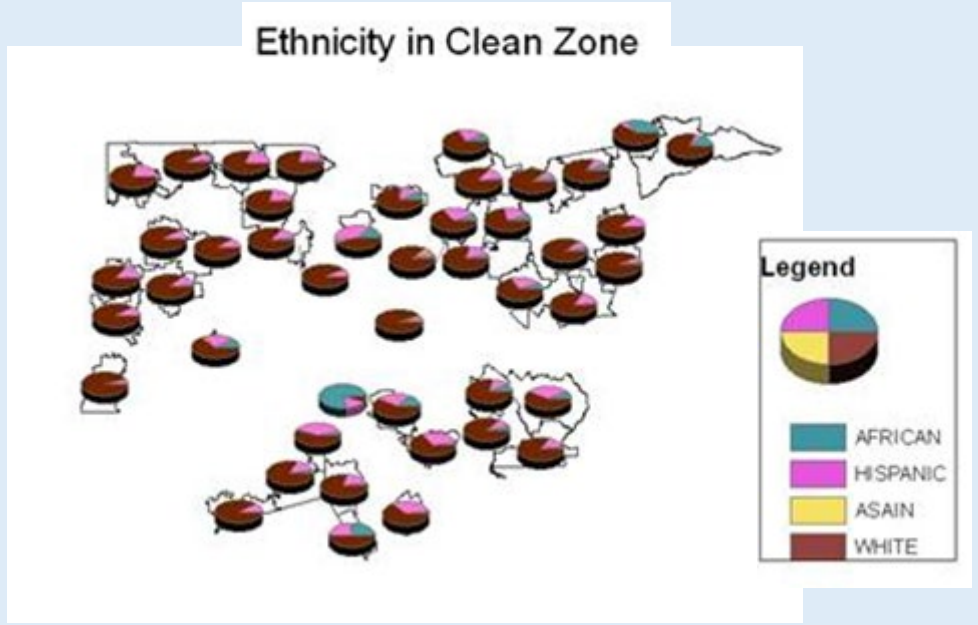
— Hazard Zone: 5 districts

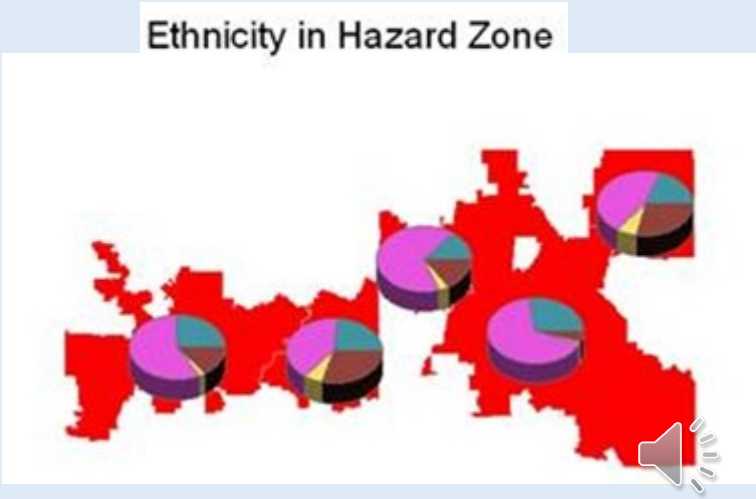


Choropleth Map (Ethnicity)

—Predominance of White population in clean districts

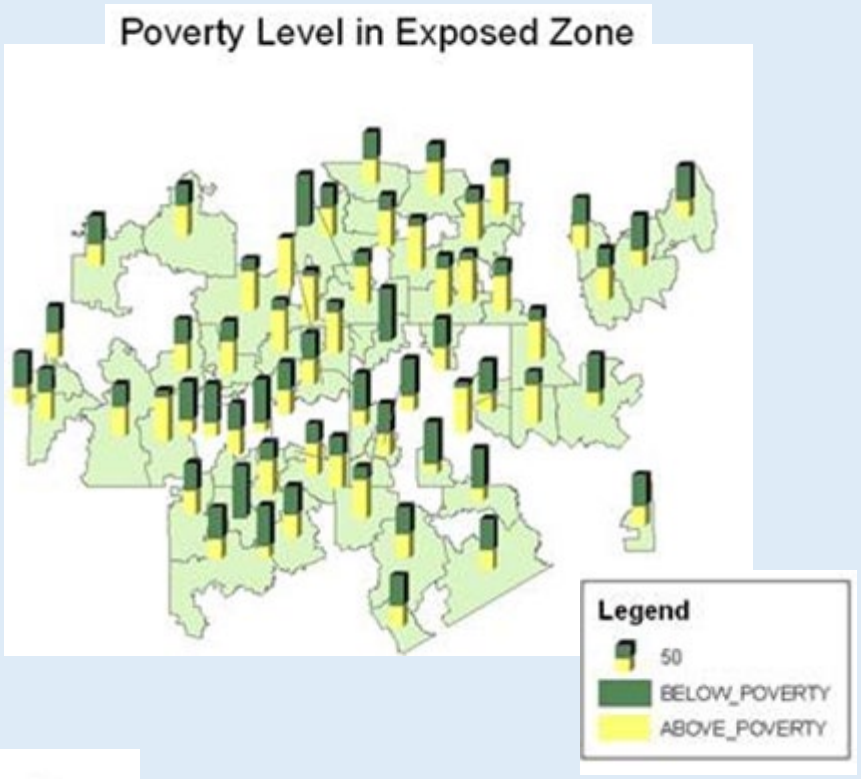
—Predominance of Hispanic population in hazard districts

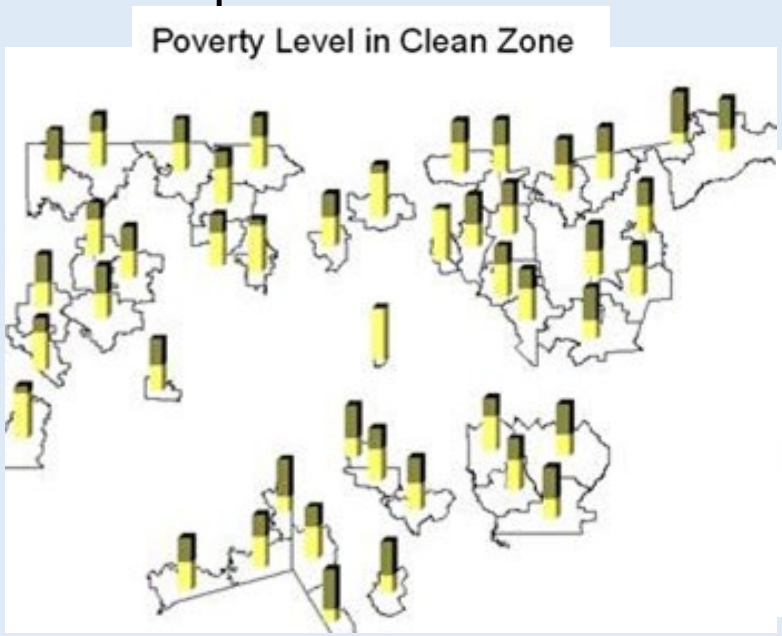




Choropleth Map (Poverty)

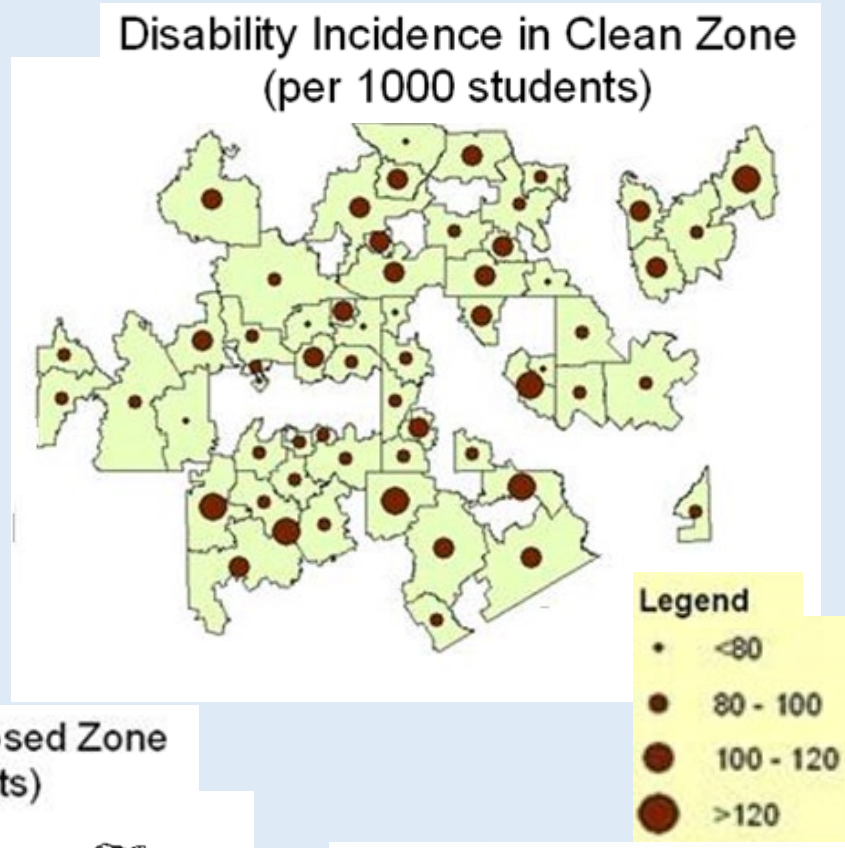
Economically disadvantaged school children reside in hazard districts

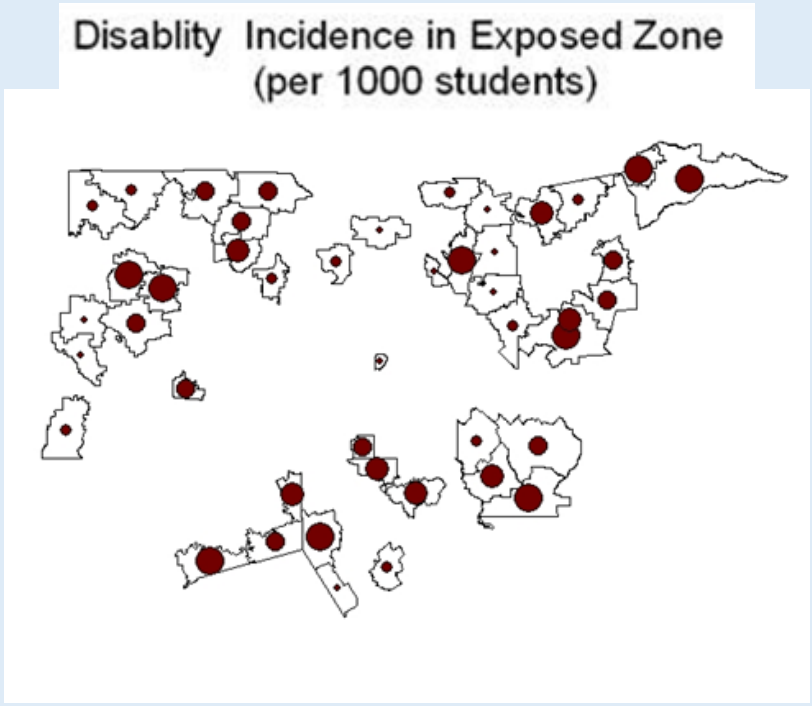


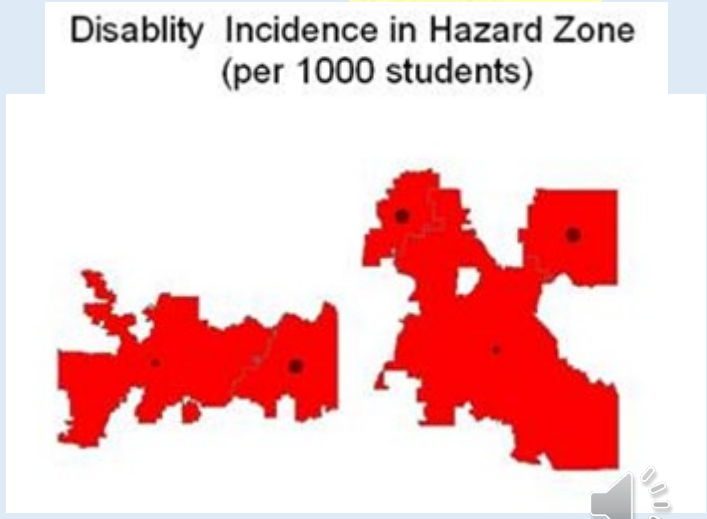


Choropleth Map (Disability)

No distinct trend in disability incidence in the pollutant zones

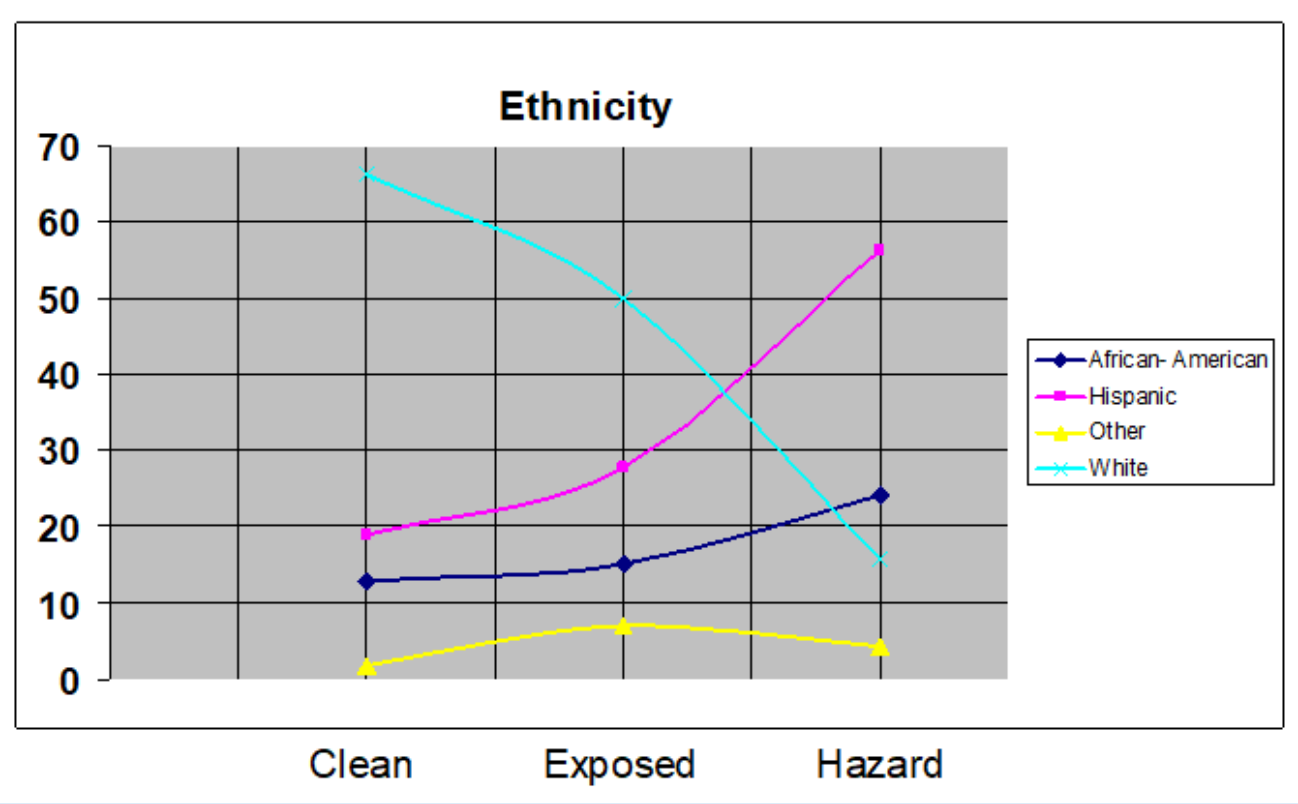






Ethnicity in Pollutant Zones

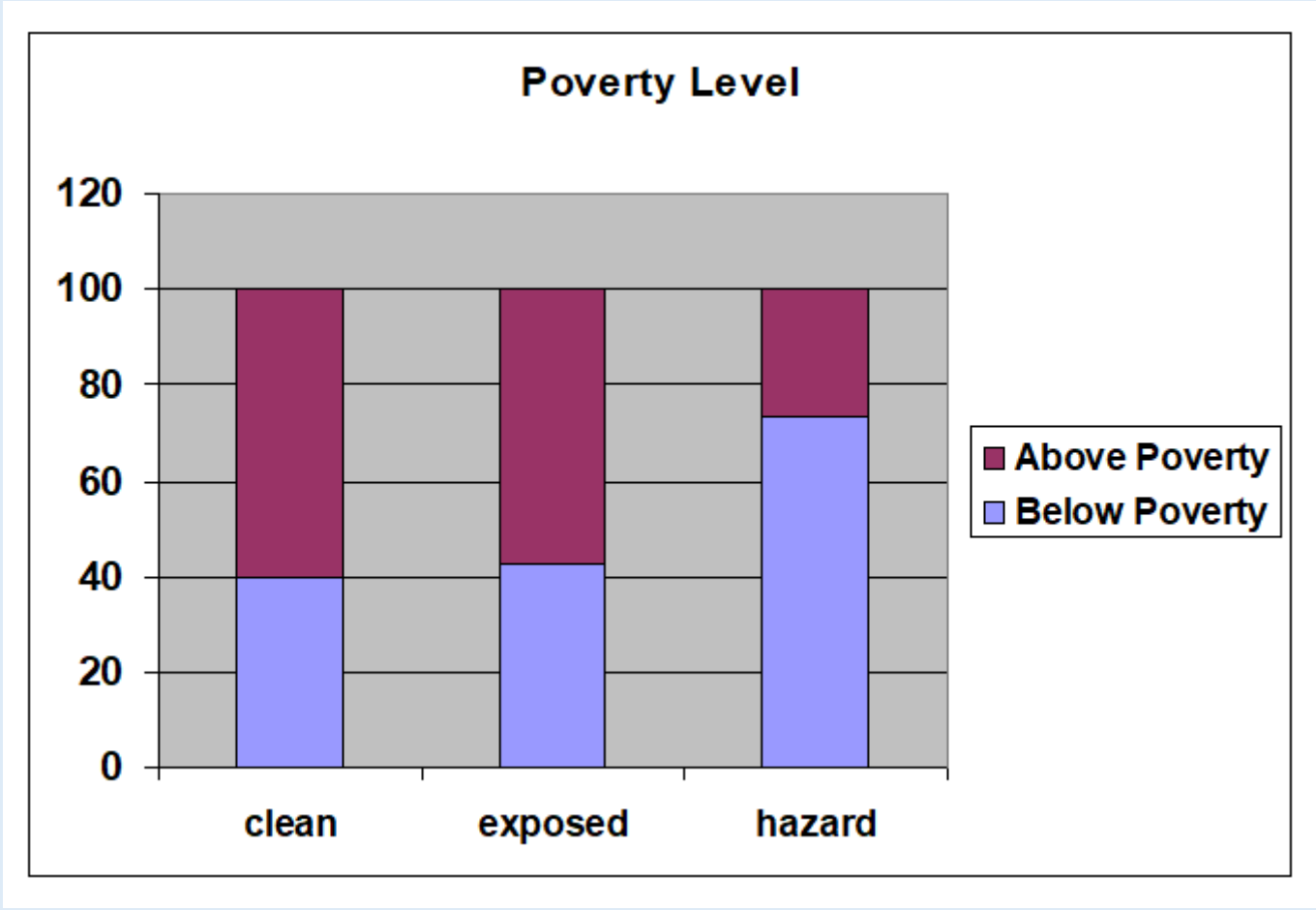
- Increasing trend of Hispanic and African American population from clean districts to hazard districts
- Decreasing trend of White population from clean to hazard districts



Poverty Level in Pollutant Zones

— Children belonging to economically disadvantaged class reside in hazard districts

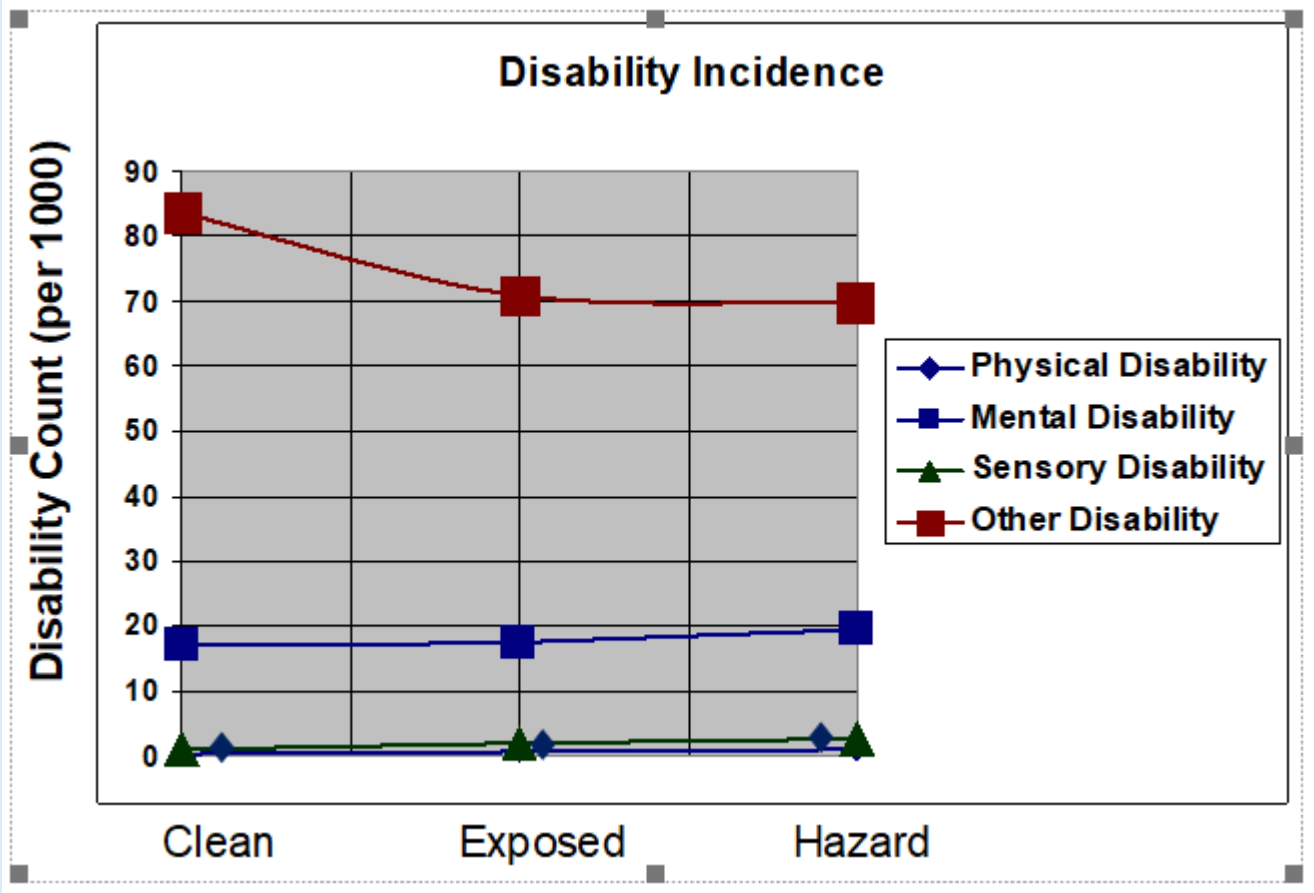
— No marked difference in poverty levels of school children in clean and exposed districts



Disability Count in Pollutant Zones

—Slight increasing trend of disability count for physical, mental and sensory disabilities from clean to hazard school districts

—Reverse trend for disability counts in others category.



Kruskal-Wallis Chi Square Analysis

— Socioeconomic and demographic variables significantly differ in three pollutant zones

Group	African-American	Hispanic	White	Other Race	Above Poverty	Mental Disability	Sensory Disability	Physical Disability	Other Disability
	count (in percent)					count (per 1000)			
Clean	12.9	18.9	66.2	2	60	17.1	0.9	0.9	81.1
Exposed	15.1	27.7	50.4	6.8	56.5	17.4	2	0.7	71
Hazard	24.2	56.2	15.8	3.8	26.5	19.3	2.5	1.1	70.6
H	20.01	24.47	31.16	2.45	4.29	7.17	21.63	22.05	14.07
Confidence Level	99.5	99.5	99.5	70	85	90	99.5	99.5	95
p value	0.01	0.01	0.01	0.3	0.15	0.1	0.01	0.01	0.05

Pearson Product Moment Correlation

- Negative correlation between White and Hispanic or African American school children
- Positive correlation between White and economically advantaged class of school children

District	AfAm	Hisp	White	Phys. Disability	Ment. Disability	Sensory Disability	Above Poverty Level
AfAm	1.00	0.99077	-0.99908	-0.96724	0.99824	0.85139	-0.97695
Hisp	◇	1.00	-0.9907	0.9772	0.9948	0.8731	-0.96688
White	◇	-0.9957	1.00	-0.99268	-0.9812	-0.91449	0.93912
Phys Disability	◇	◇	◇	1.00	◇	◇	-0.89076
Ment. Disabiltiy	◇	◇	◇	◇	1.00	◇	-0.98777
Sensory Disability	◇	◇	◇	◇	◇	1.00	-0.7198
Above Poverty Level	◇	◇	◇	◇	◇	◇	1.00

Summary

— School districts were classified into three pollutant zones (clean, exposed, and hazard zones) based on spatial analysis

— Graphical and statistical interpretation showed an overall good correlation between socioeconomic and demographic parameters (ethnicity, poverty level, and disability incidence) and pollutant zones at different exposure level. Ethnicity showed much stronger correlation with pollution exposure compared to other variables in this study