

# Examining the Links between Air Toxics Risk and Academic Performance in the Great Lakes Region Using the TRI



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# Air Pollution Around Schools Is Linked To Poorer Student Health And Academic Performance

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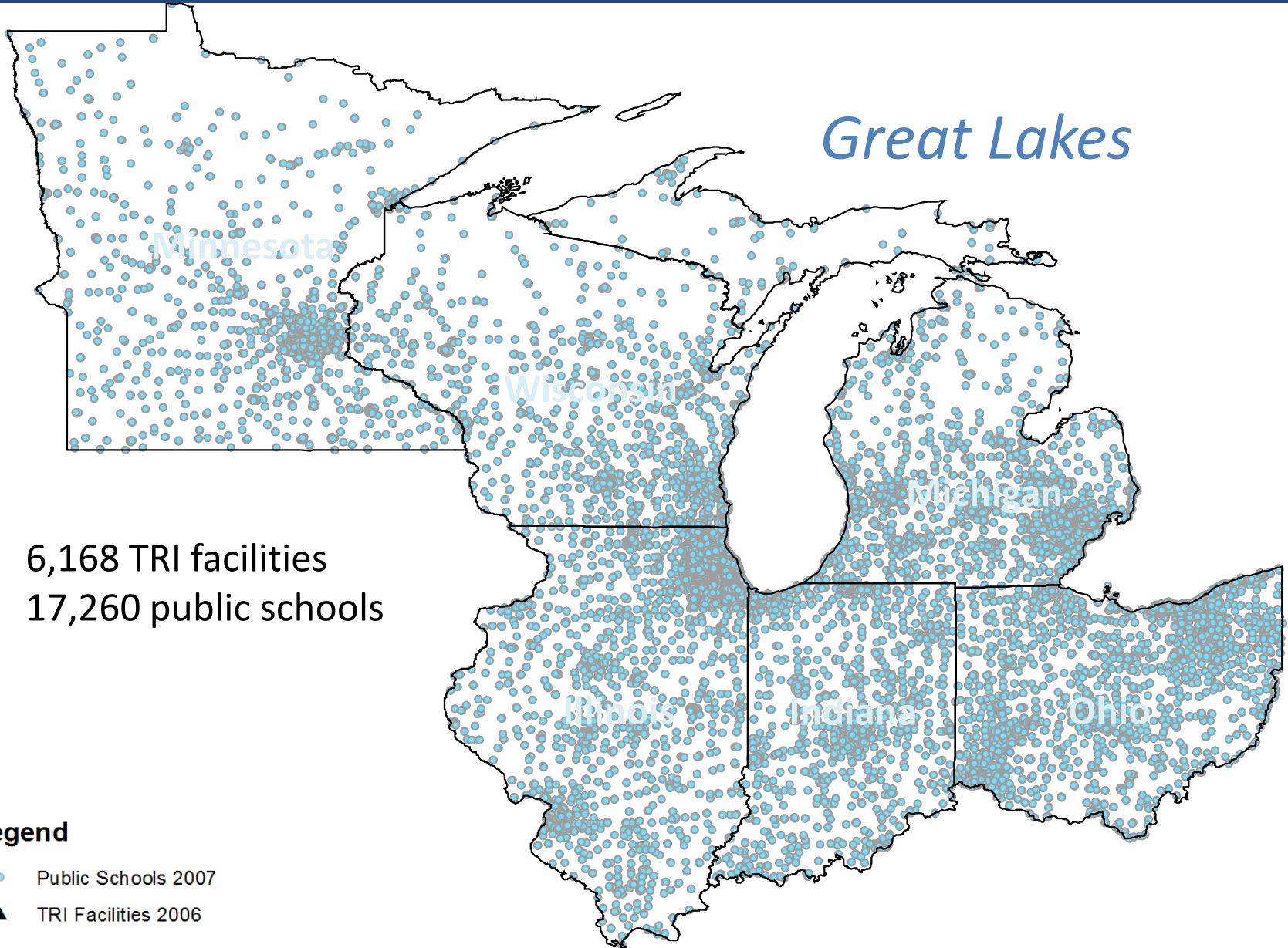
**Kerry Ard** is a graduate student in sociology and environmental policy at the University of Michigan.

**ABSTRACT** Exposing children to environmental pollutants during important times of physiological development can lead to long-lasting health problems, dysfunction, and disease. The location of children's schools can increase their exposure. We examined the extent of air pollution from industrial sources around public schools in Michigan to find out whether air pollution jeopardizes children's health and academic success. We found that schools located in areas with the highest air pollution levels had the lowest attendance rates—a potential indicator of poor health—and the highest proportions of students who failed to meet state educational testing standards. Michigan and many other states currently do not require officials considering a site for a new school to analyze its environmental quality. Our results show that such requirements are needed. For schools already in existence, we recommend that their environmental quality should be investigated and improved if necessary.

Article in *Health Affairs* available at:  
<http://content.healthaffairs.org/content/30/5.toc>

# Great Lakes Region

*Great Lakes*



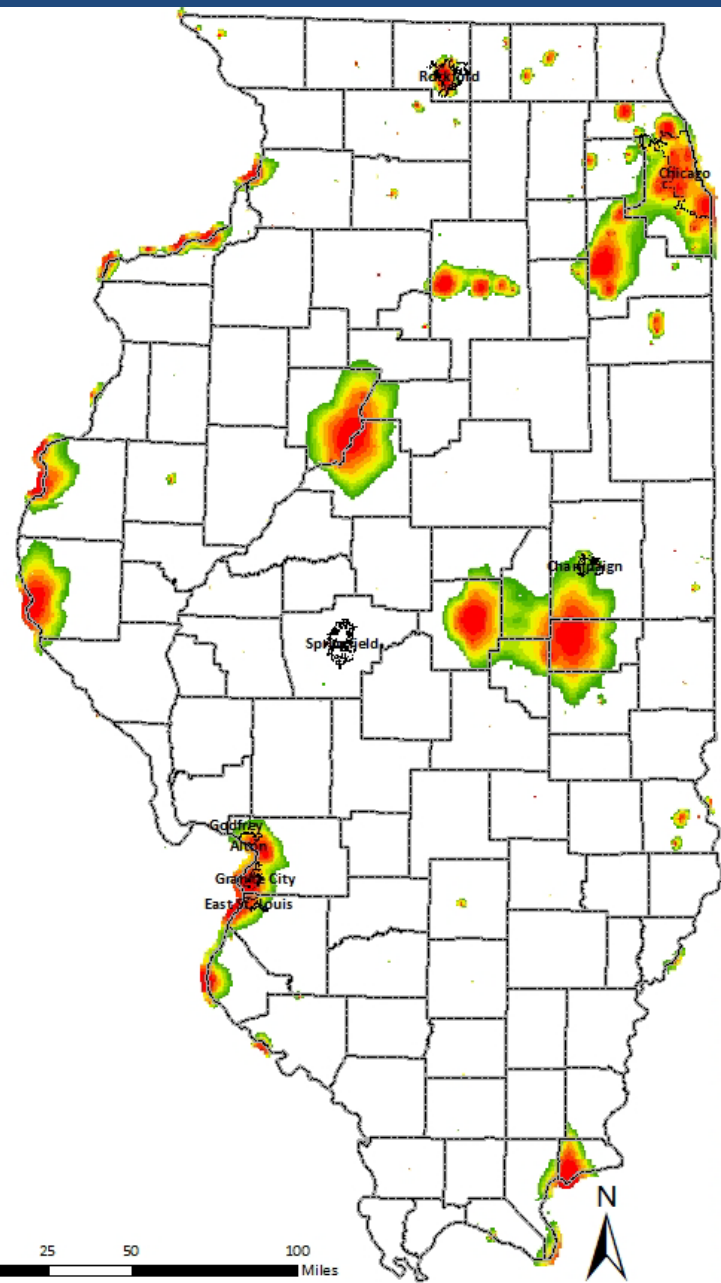
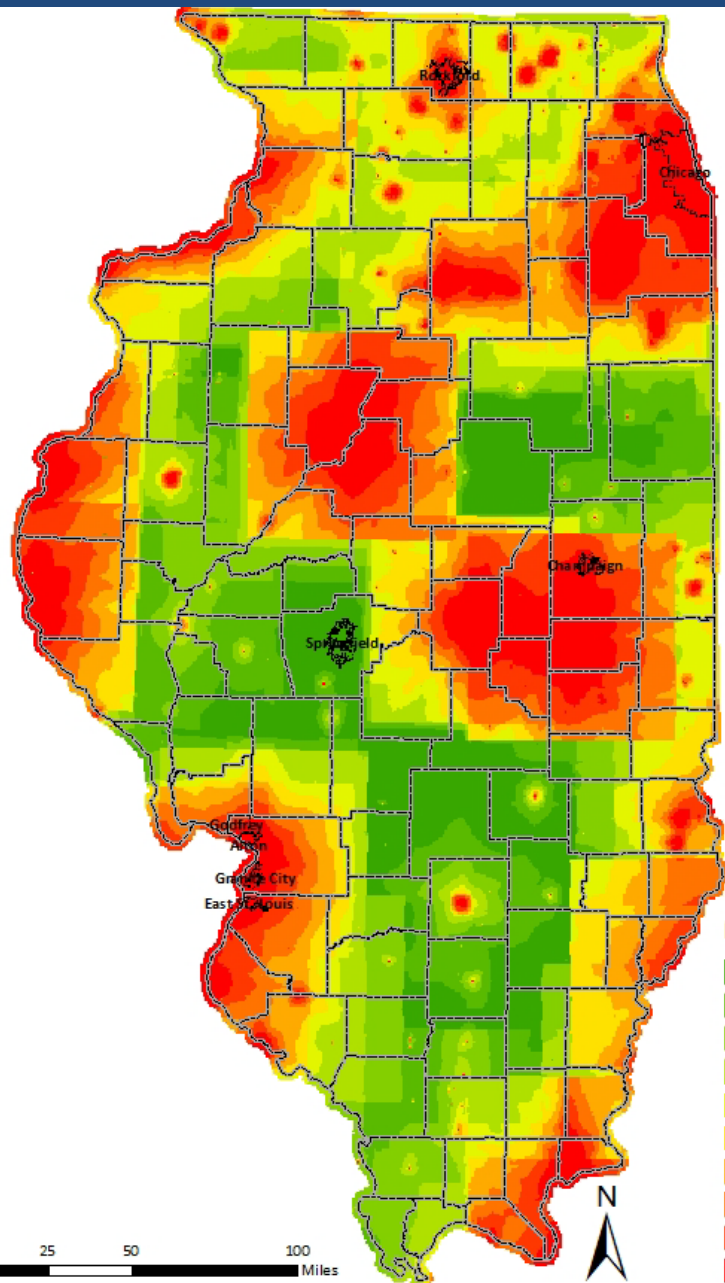
# Research Questions

- Do schools tend to be located in the more or less polluted parts of their school districts?
- Do pollution levels around schools tend to be higher where students of color and poor students are in greater numbers?
- Is there a link between pollution levels around schools and students' health and academic performance?

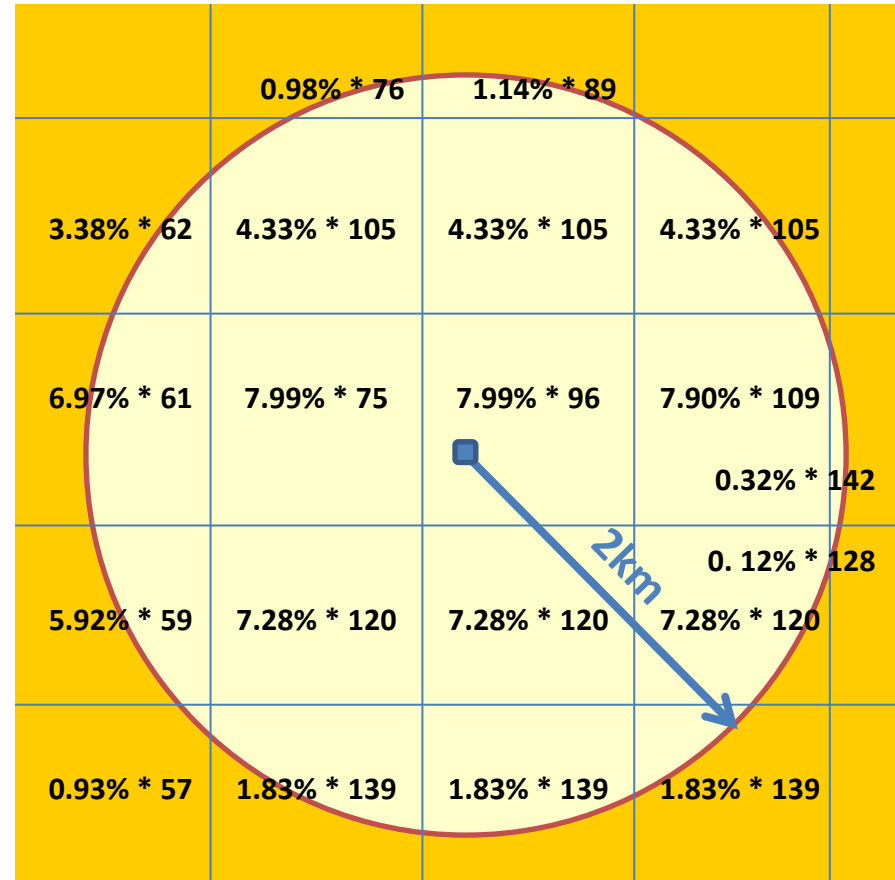
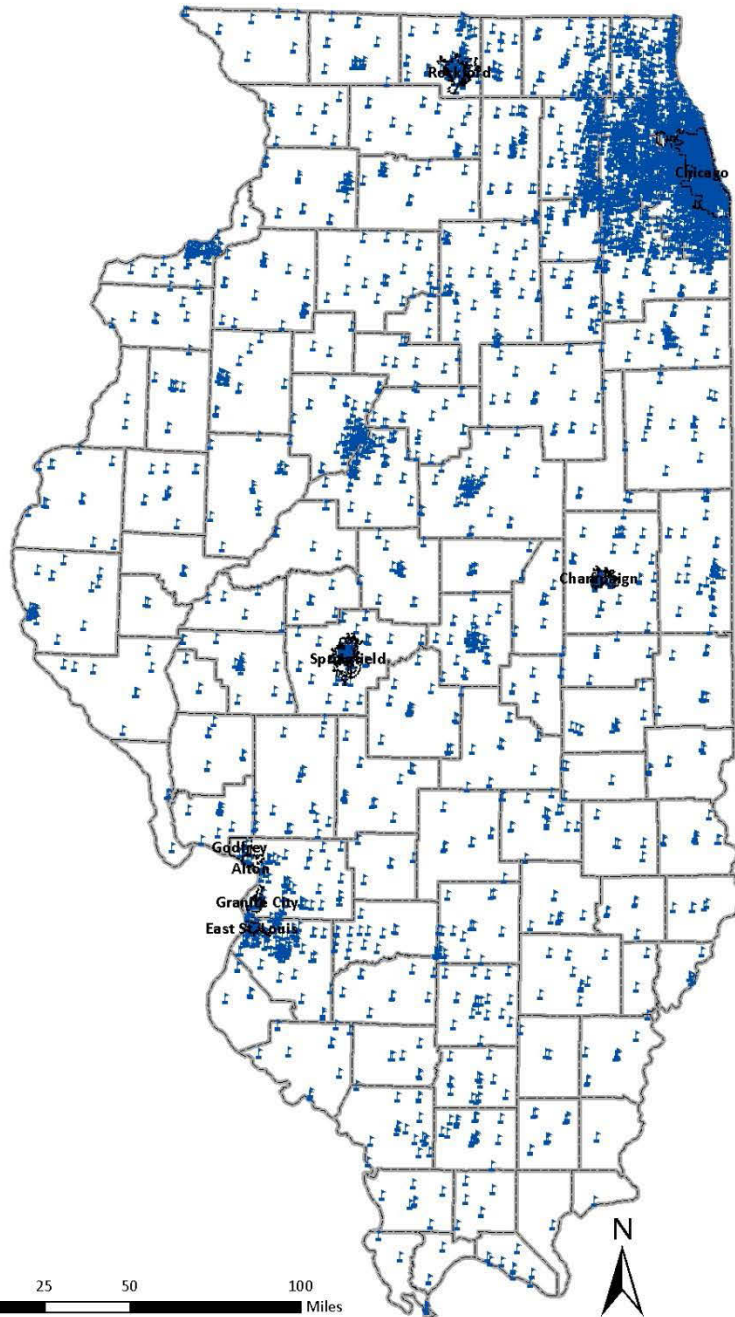
# Data and Methods

- Gathered all public school and TRI facility locations in the Great Lakes Region (Michigan, Ohio, Indiana, Illinois, Wisconsin, and Minnesota)
  - A total of 17,260 public schools (2007)
  - A total of 6,168 TRI facilities (2006)
- Applied GIS to estimate the nearest TRI facility to each school
- Estimated total toxic air concentrations based on TRI emissions data within 2.0 km radius of public schools. source: Risk Screening Environmental Indicators Geographic Microdata (RSEI-GM)

# Total air toxic concentration contours in Illinois (2006 RSEI)

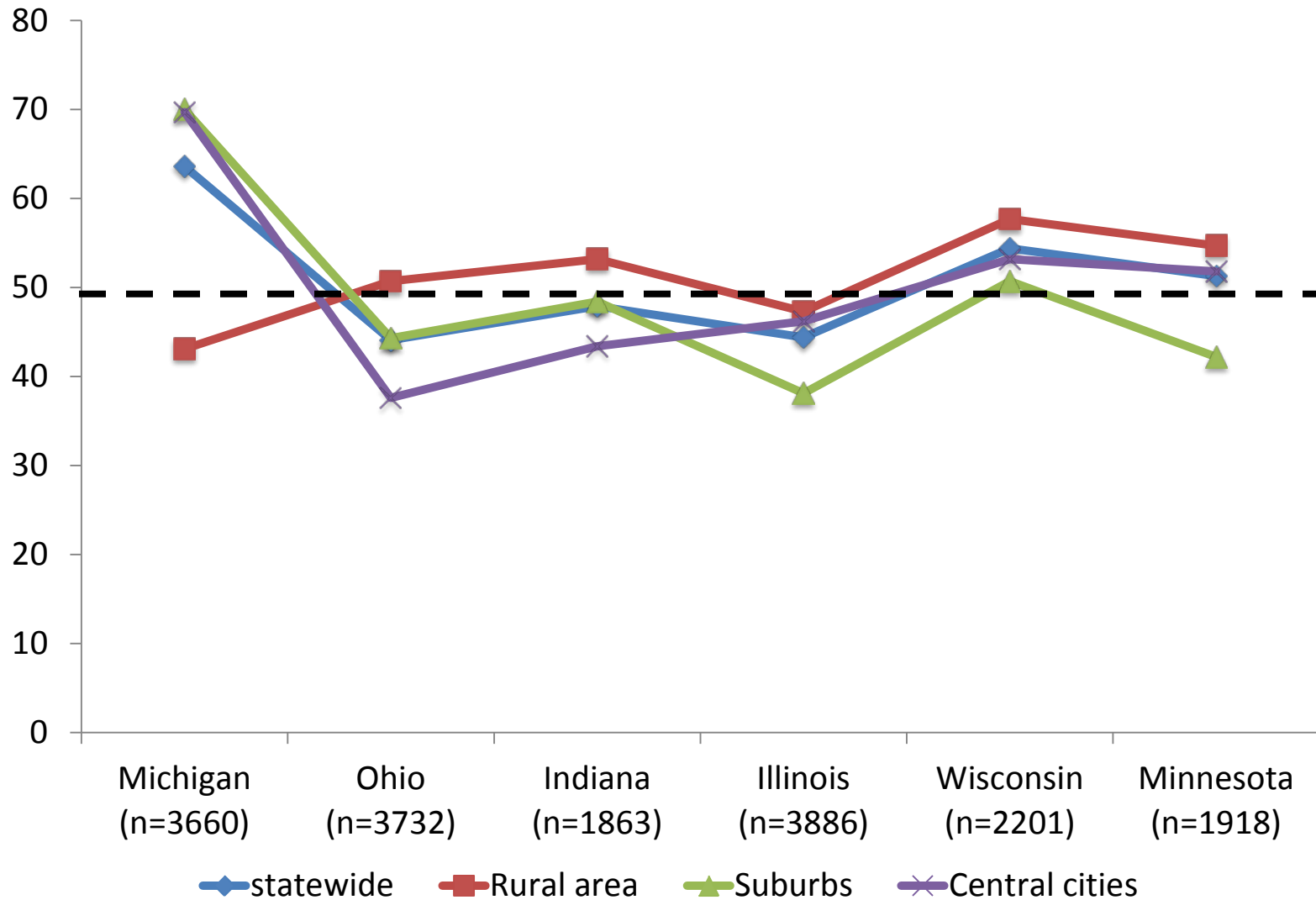


# Locations of 3886 public schools in Illinois



**Areal Apportionment Method:  
Calculating Toxic Air Concentrations  
within 2 km radius of schools**

# Percent of schools whose total air toxic concentration exceeds their districts'



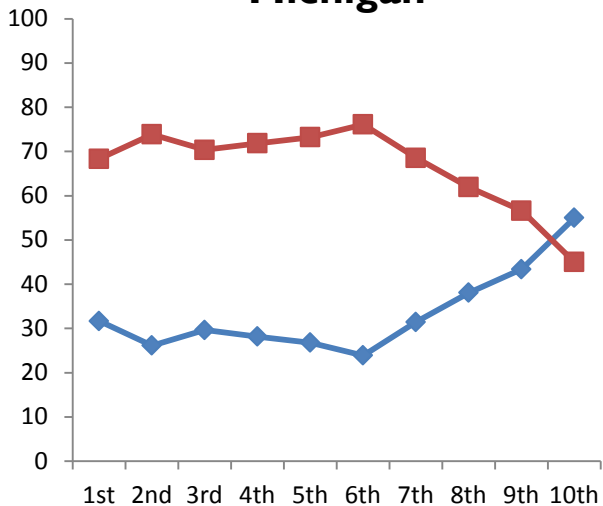


# Percent of economically disadvantaged vs. non-disadvantaged students in schools by RSEI 2006 total air toxic concentration deciles

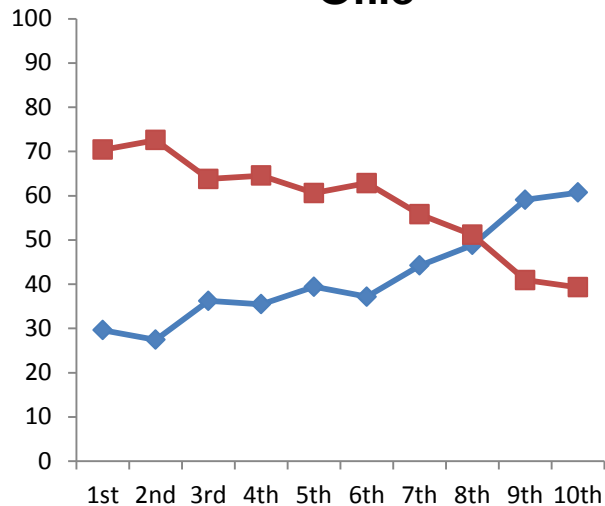
■ Economically Disadvantaged

■ Non-Disadvantaged

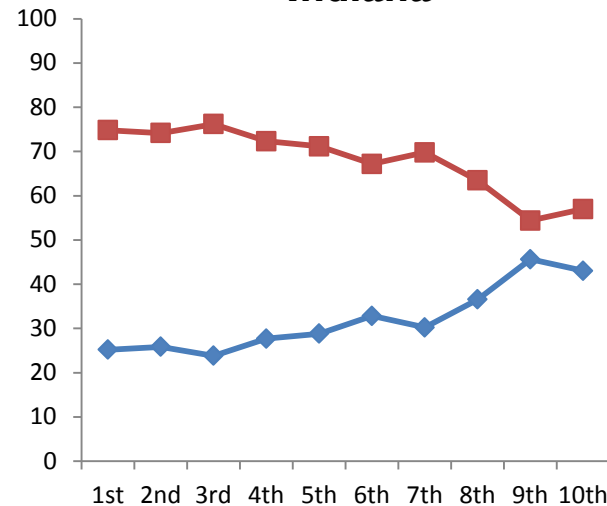
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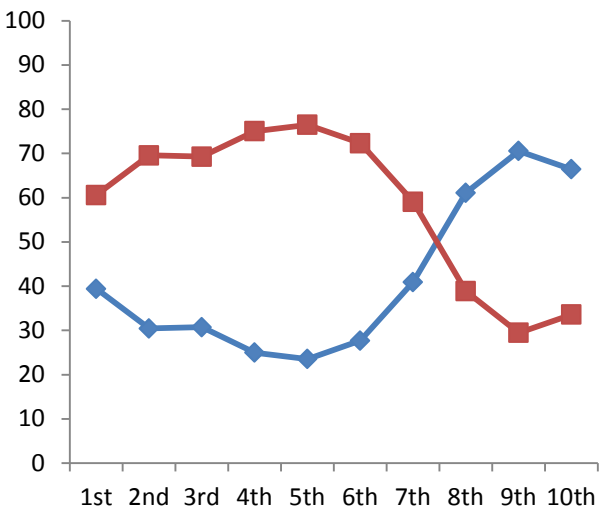
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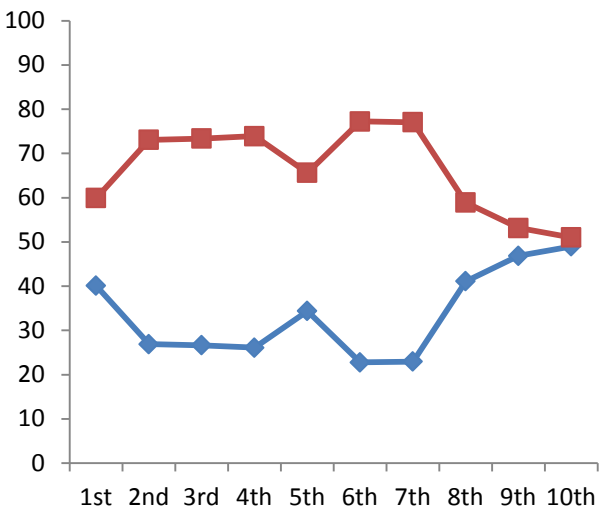
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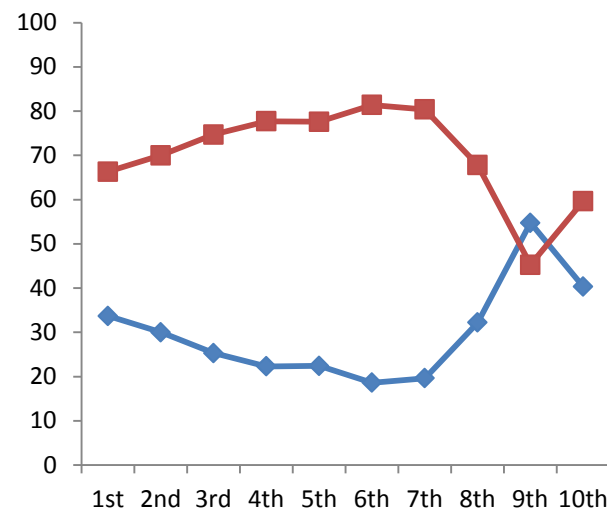
## Illinois



## Wisconsin

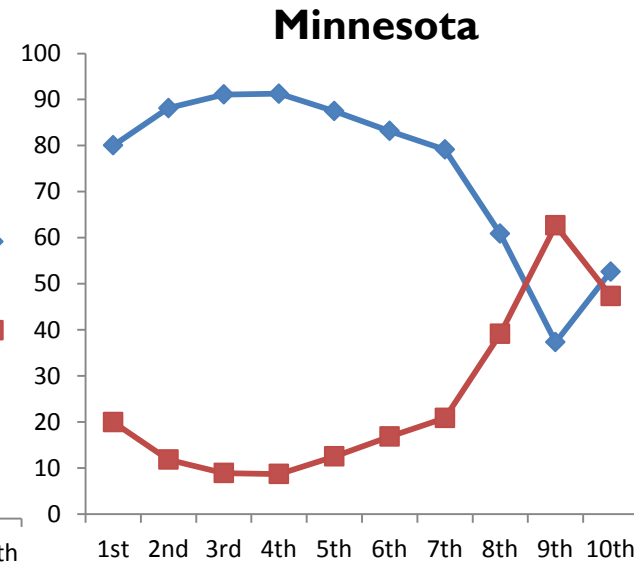
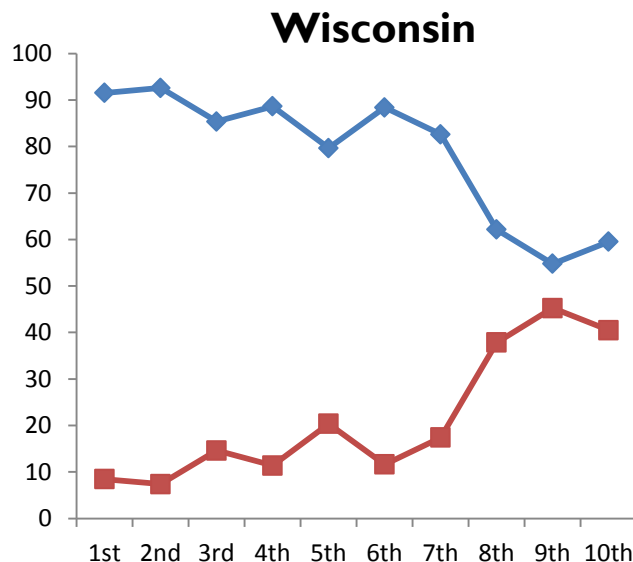
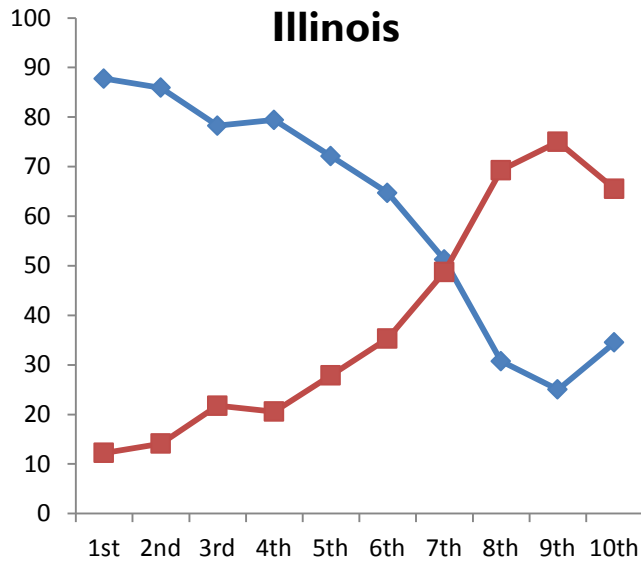
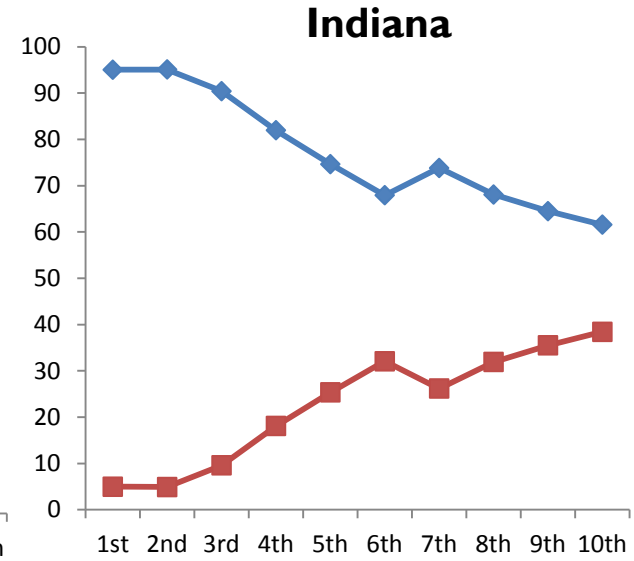
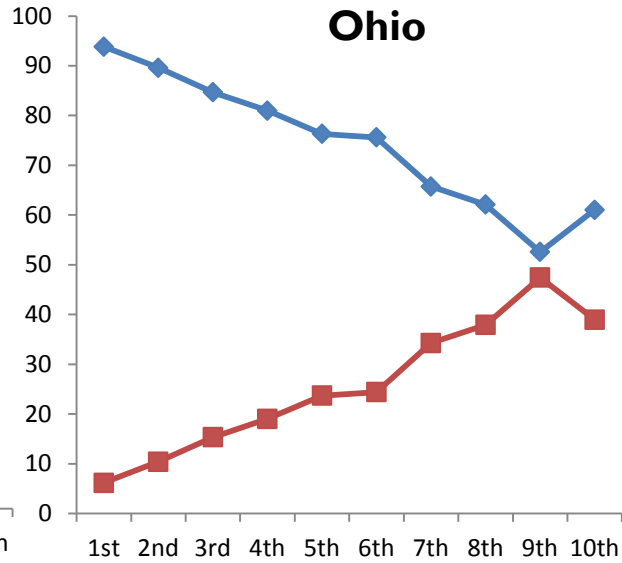
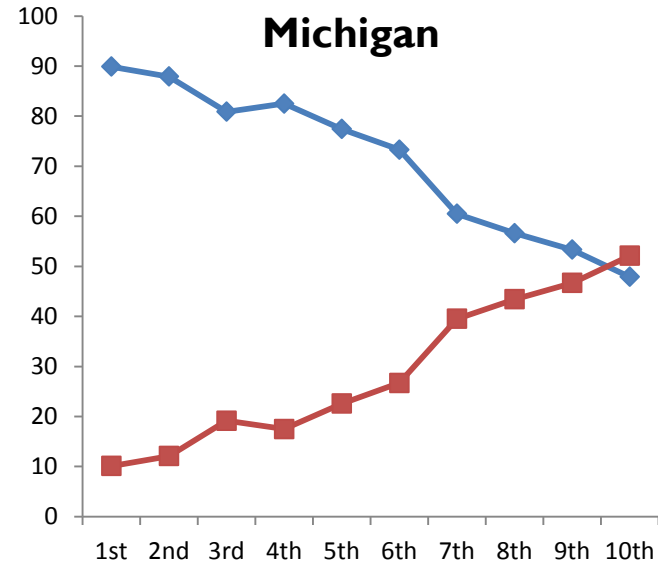


## Minnesota



# Percent of white vs. non-white students in schools by RSEI 2006 total toxic air concentration deciles

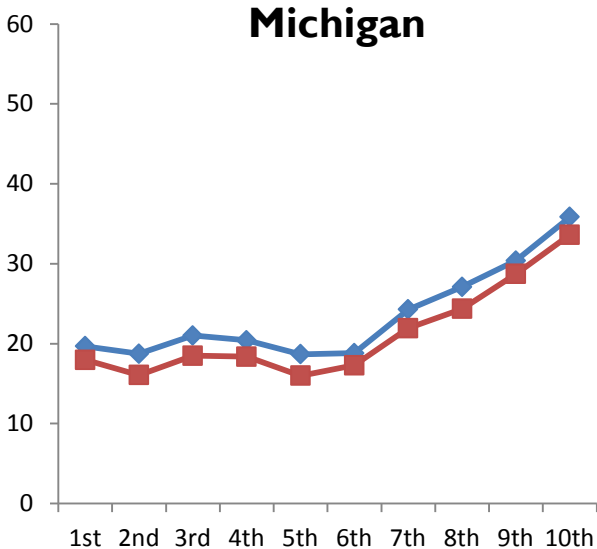
White Non-White



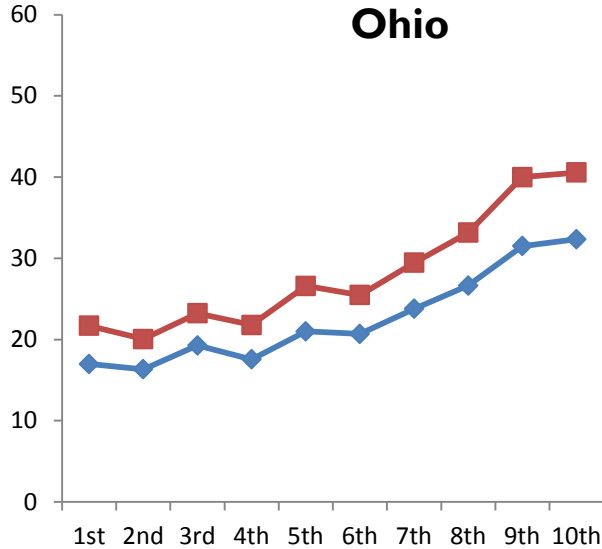
# Percent of students failing to meet reading/English and math standards in schools by RSEI 2006 total toxic air concentration deciles

■ Reading ■ Math

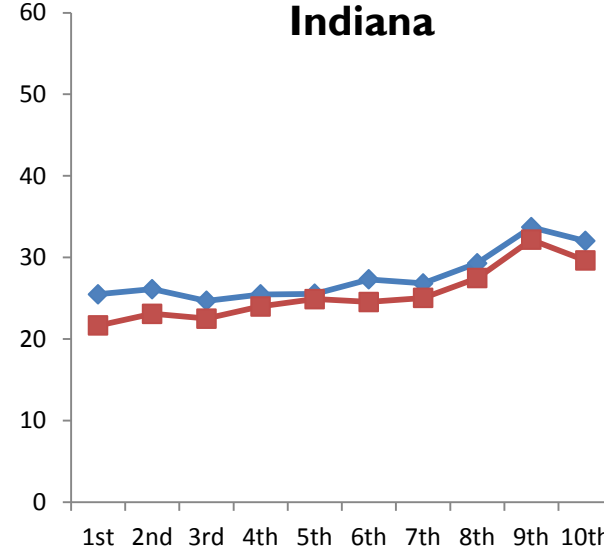
### Michigan



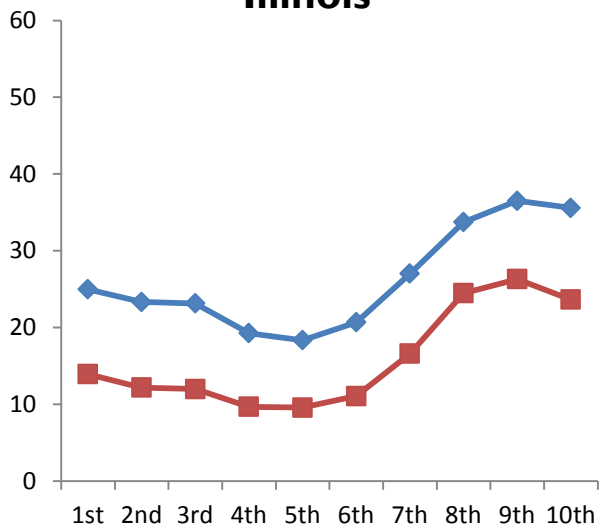
### Ohio



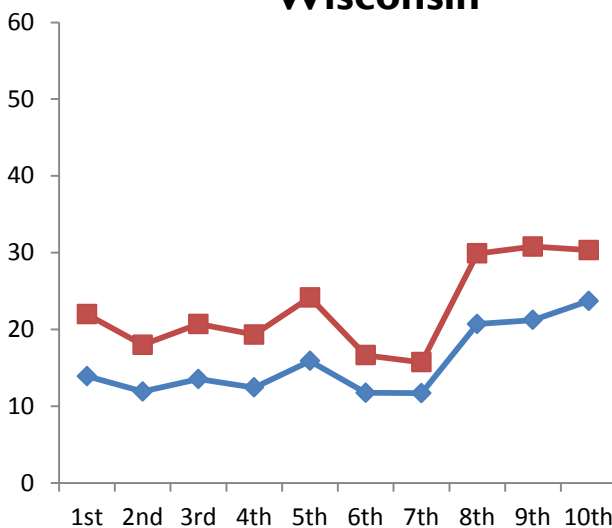
### Indiana



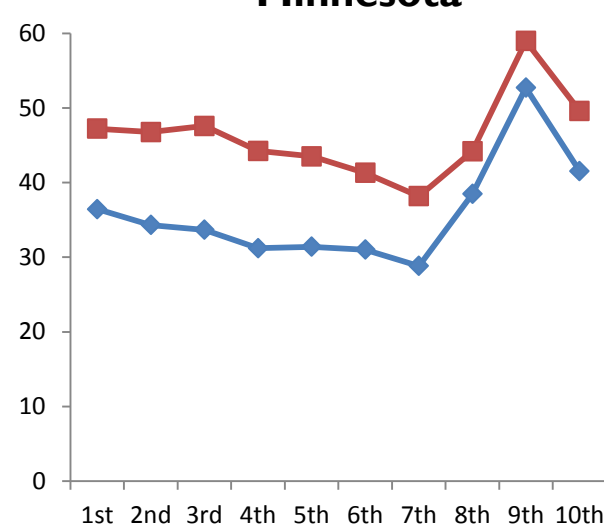
### Illinois



### Wisconsin



### Minnesota

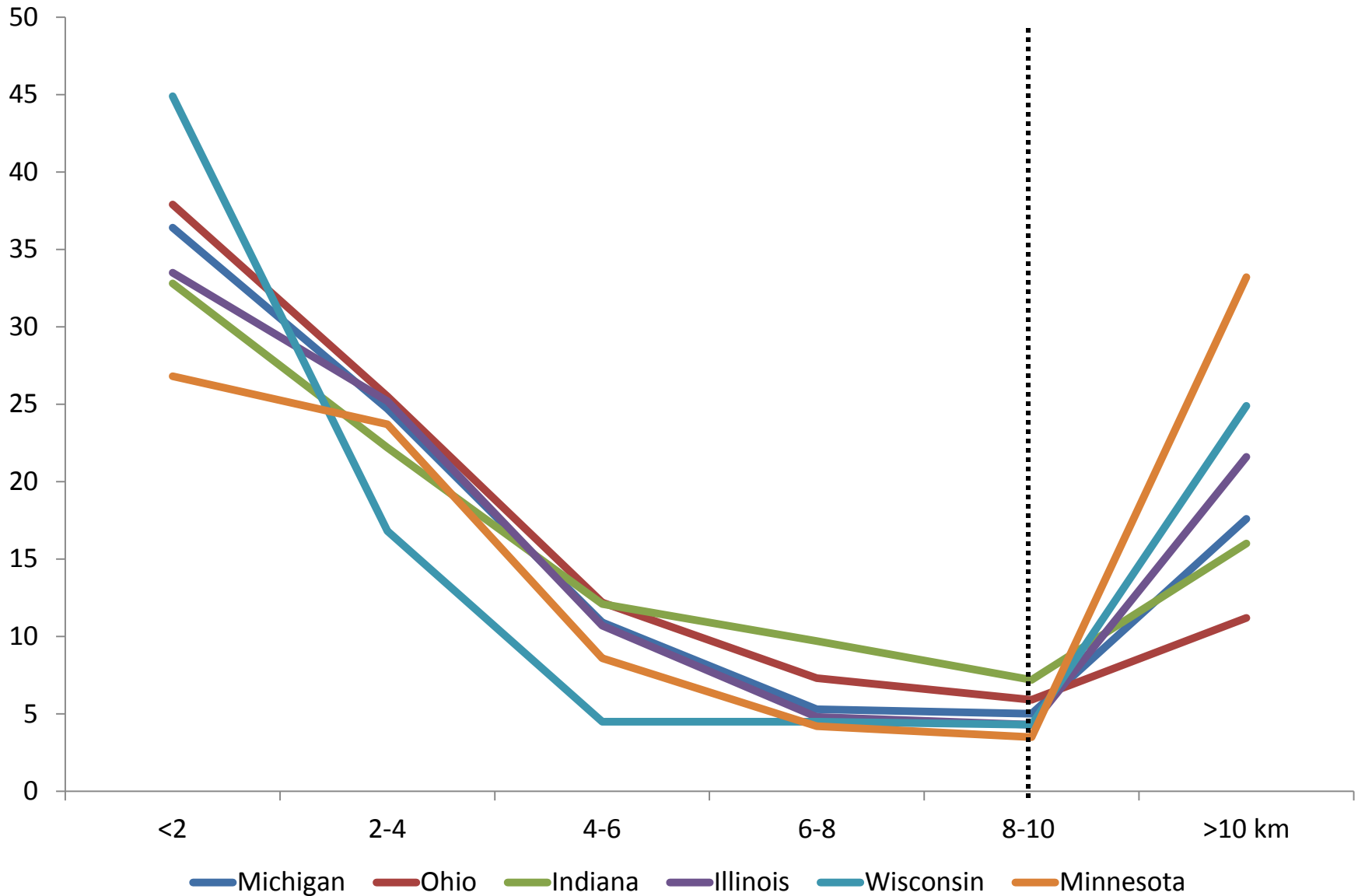


# Is Total Air Toxic Concentration a significant predictor (at $p < 0.05$ ) of the percent of students who fail to meet Reading/English and Math standards?

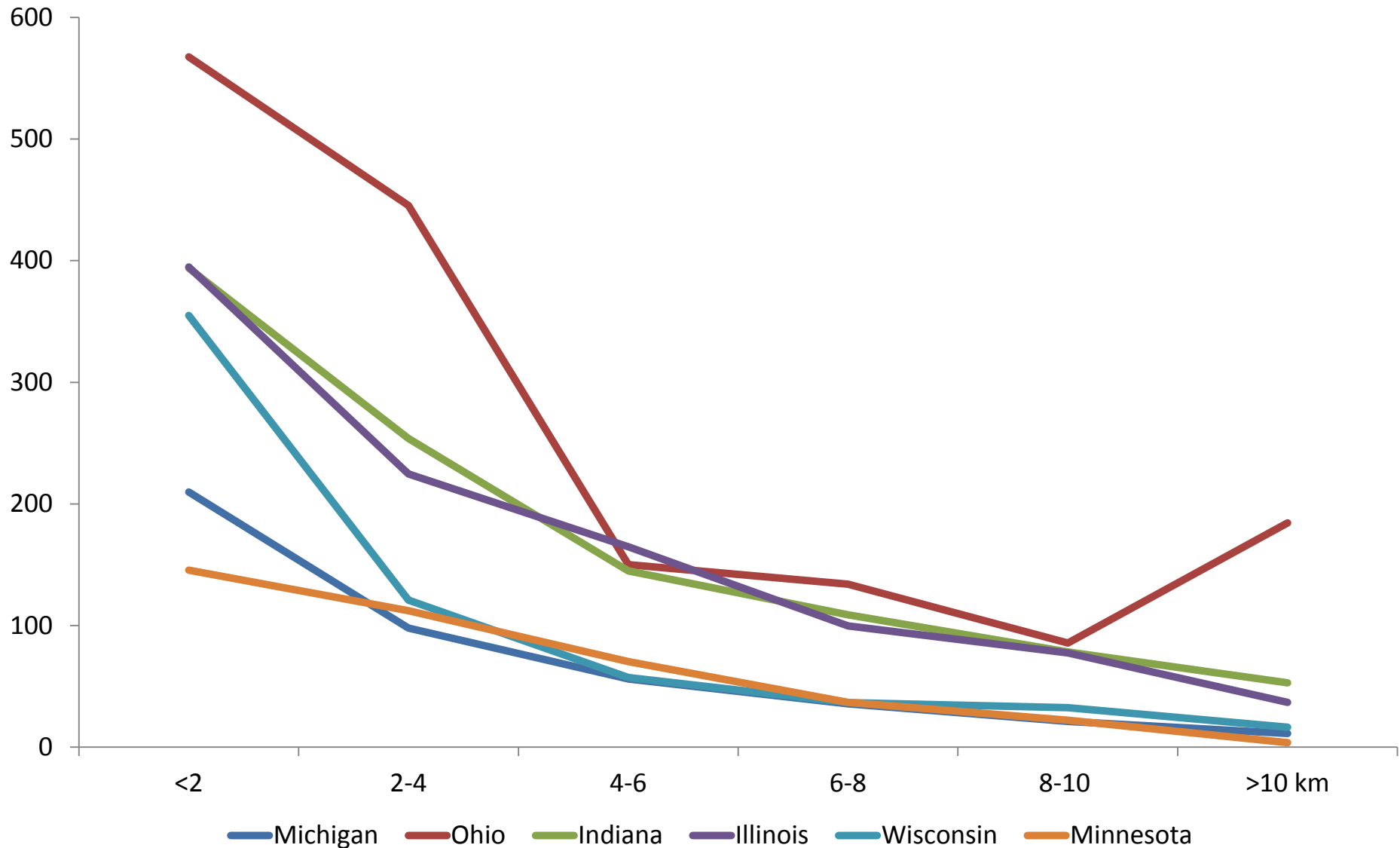
	Reading/English	Reading/English	Math	Math
	Without Controls	With Controls	Without Controls	With Controls
<b>Michigan</b>	Yes	Yes	Yes	Yes
<b>Ohio</b>	Yes	Marginally	Yes	Yes
<b>Indiana</b>	Yes	No	Yes	No
<b>Illinois</b>	Yes	No	Yes	No
<b>Wisconsin</b>	Yes	Yes	Yes	No
<b>Minnesota</b>	Yes	Yes	Yes	No

Controls include city, suburban, rural locations of schools, number of students in schools, student/teacher ratios, total expenditures per pupil, percent disadvantaged students, and attendance rates.

# Percent of schools by distance to nearest TRI facility



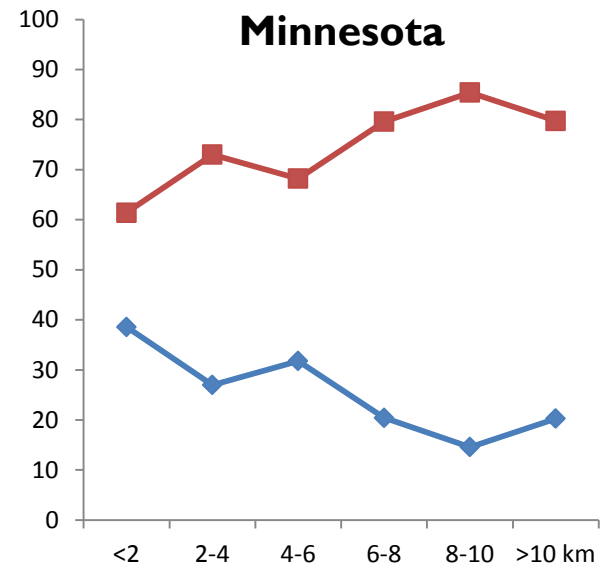
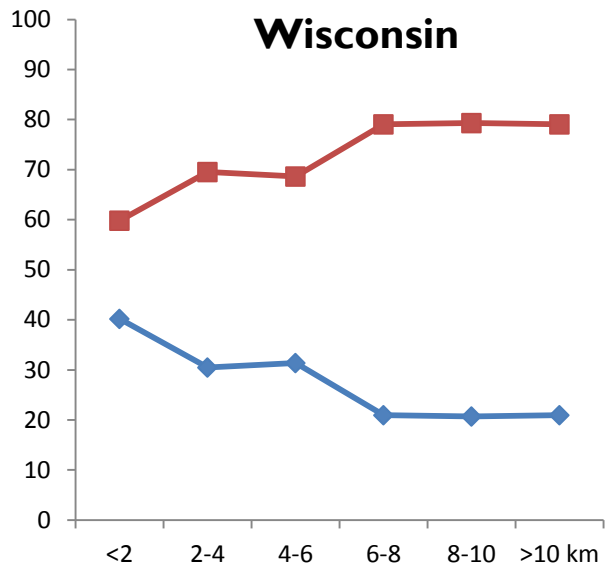
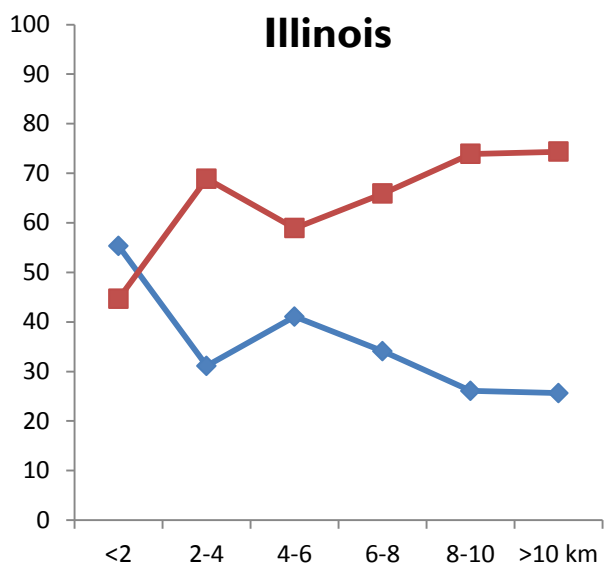
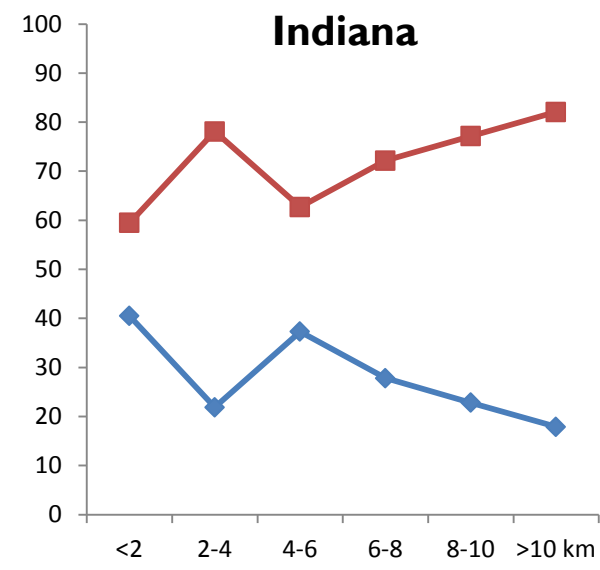
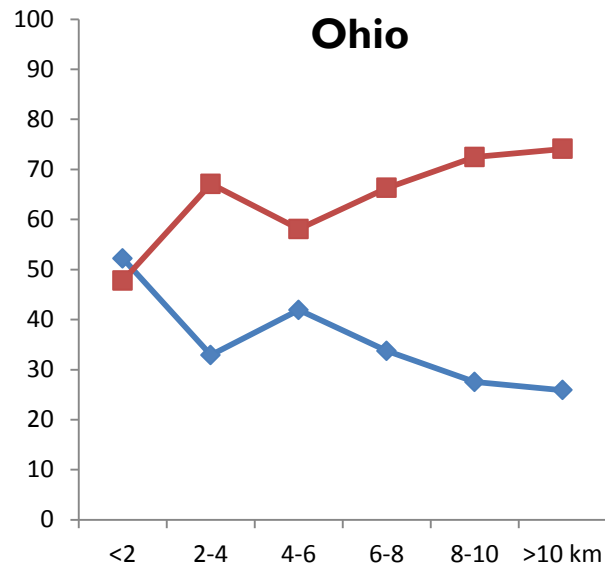
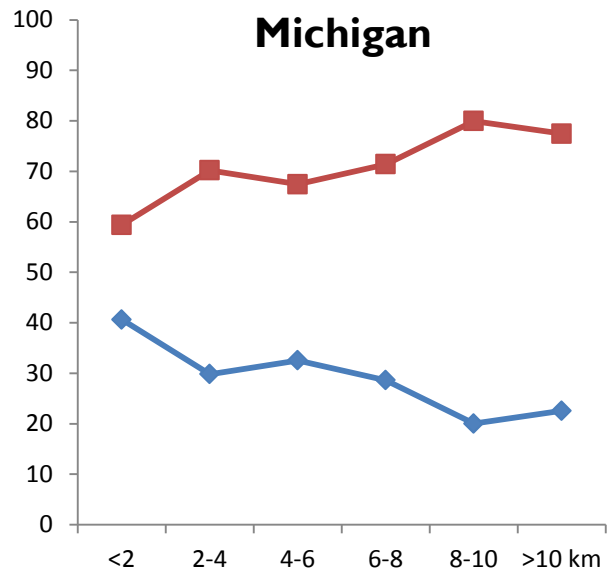
# RSEI 2006 total air toxic concentration vs. distance to nearest TRI facility



# Percent of economically disadvantaged vs. non-disadvantaged students in schools by school distances to nearest TRI facility

■ Economically Disadvantaged

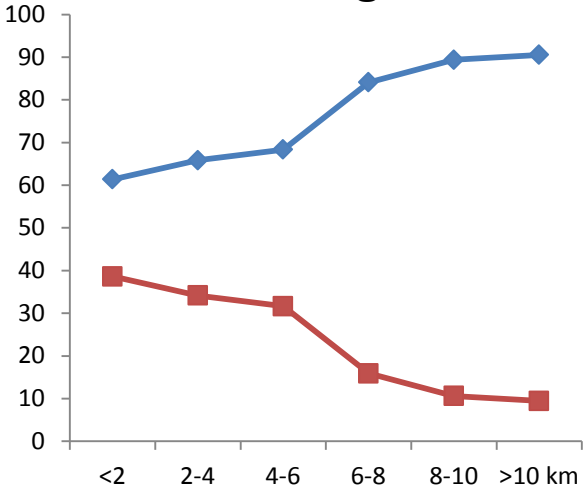
■ Non-Disadvantaged



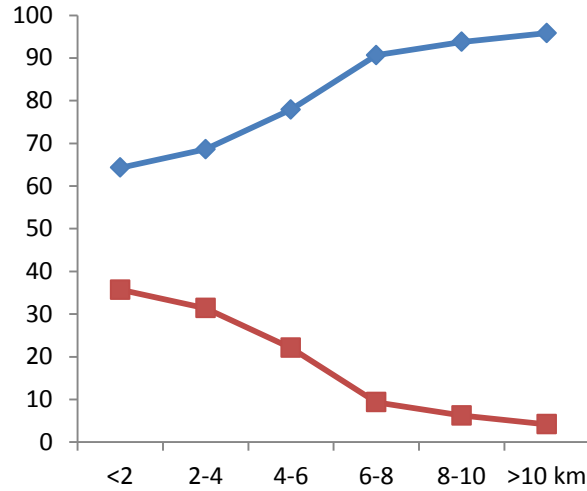
# Percent of white vs. non-white students in schools by school distances to nearest TRI facility

White Non-White

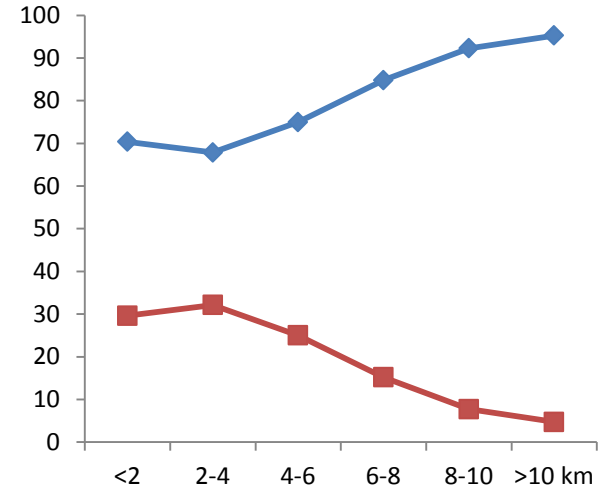
## Michigan



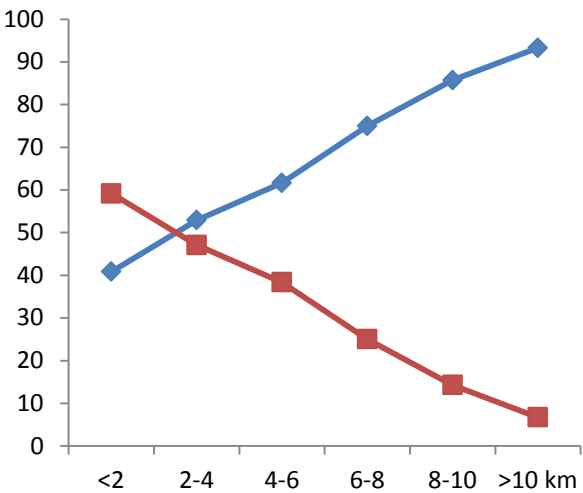
## Ohio



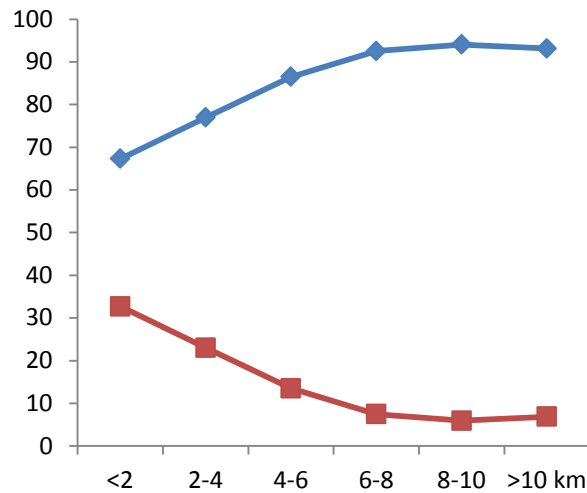
## Indiana



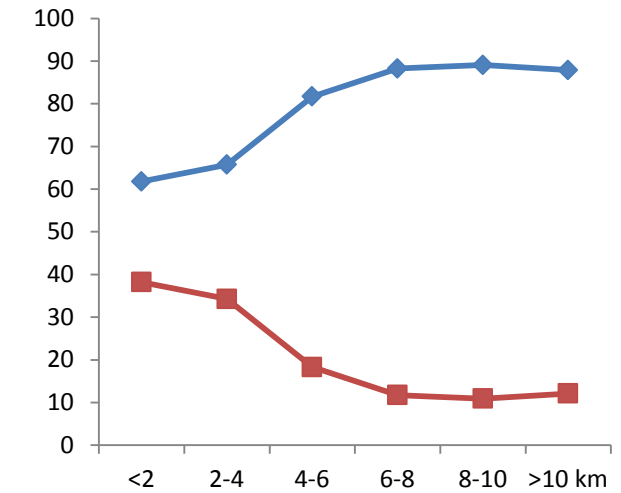
## Illinois



## Wisconsin



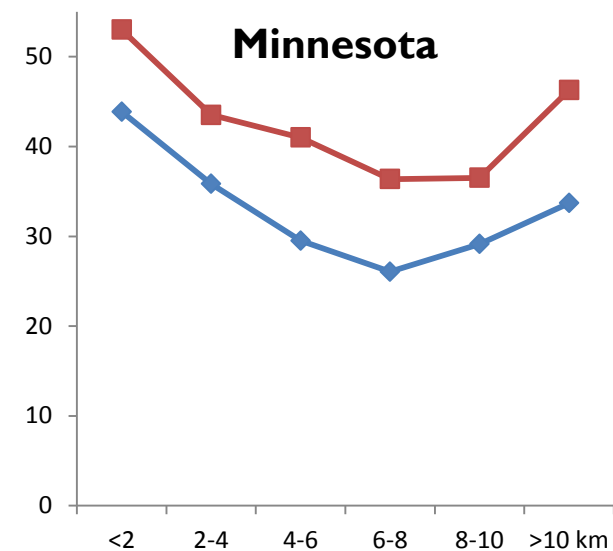
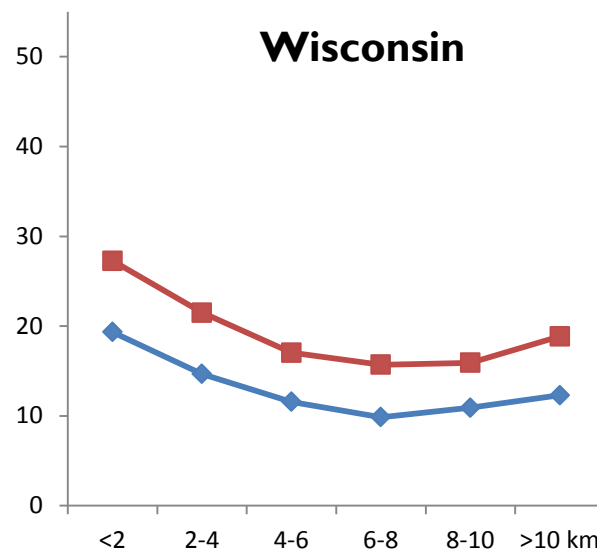
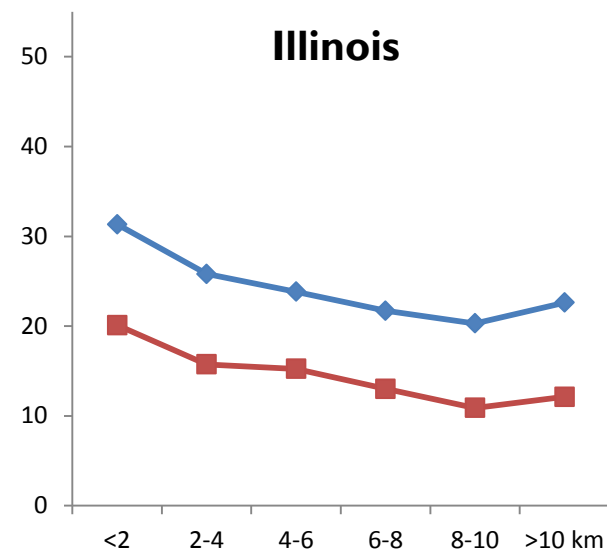
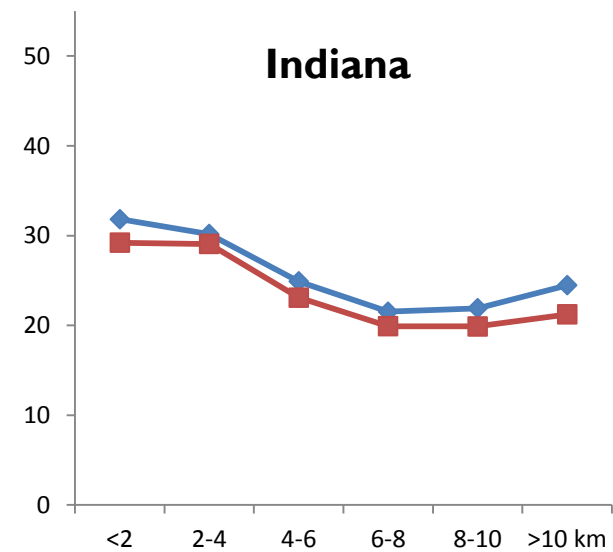
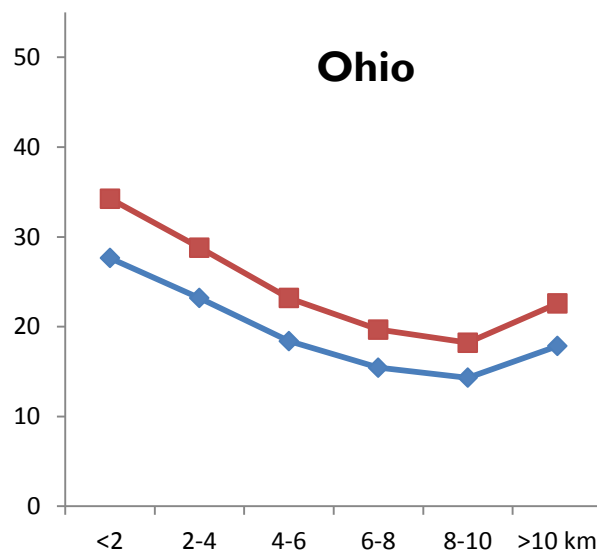
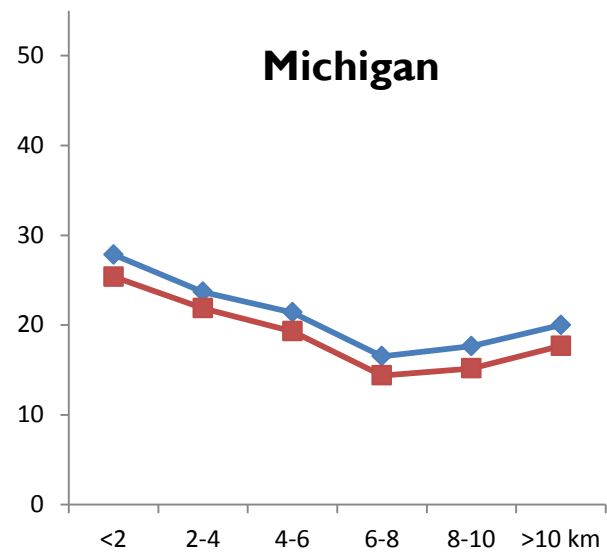
## Minnesota





# Percent of students failing to meet reading/English and math standards by school distances to nearest TRI facility

Reading Math



# Findings

- More than half of all public schools in the Great Lakes Region are located in the more polluted parts of their districts. Although not shown, the more pollution around the school, the more likely it is to be located in the more polluted parts.
- The more pollution around a school, the greater the concentration of economically disadvantaged students and students of color.
- The more pollution around a school, the greater the likelihood that large percentages of students in the school fail to meet standards in reading/English and math.

# Conclusions

- Environmental quality in and around schools is an important environmental justice issue that needs greater attention.
- Policies need to be in place to take into account environmental quality when siting new schools or closing existing schools.
- Policies also need to consider the location of existing schools when siting new industrial facilities and other potential sources of environmental risks.