# Student-led evaluation of air quality issues using the US EPA AirData website

Mary A. Williams
Deena Wassenberg

University of Minnesota College of Biological Sciences

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#### Outline

- Learning objectives
- > Context
- > Using the EPA AirData website
- > Examples of student work
- > Challenges
- > Student feedback
- Opportunities

# Learning Objectives

- Key concepts: air pollution, human health, environmental justice
- > Use authentic data
- Conduct potentially original research

#### Context discussion

#### Human health impacts

- Asthma
- Cardiovascular disease
- Cancer
- Fertility & pregnancy problems
- Growth delay

#### > Environmental justice

- Health Disparities
- Variation in air quality along socioeconomic lines

# Readings

TOXICOLOGICAL SCIENCES **120(S1)**, S8–S27 (2011) doi:10.1093/toxsci/kfq367 Advance Access publication December 8, 2010



# Air Pollution Toxicology—A Brief Review of the Role of the Science in Shaping the Current Understanding of Air Pollution Health Risks

Lindsay Wichers Stanek,\*,1 James S. Brown,\* John Stanek,\* Jeff Gift,\* and Daniel L. Costa†

\*National Center for Environmental Assessment, Office of Research and Development, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711; and †Office of Research and Development, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711

<sup>1</sup>To whom correspondence should be addressed at National Center for Environmental Assessment, Office of Research and Development, U.S. Environmental Protection Agency, MD B243-01, RTP, NC 27711. Fax: (919) 541-2985. E-mail: stanek.lindsay@epa.gov.

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## Readings

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SUSTAINABILITY

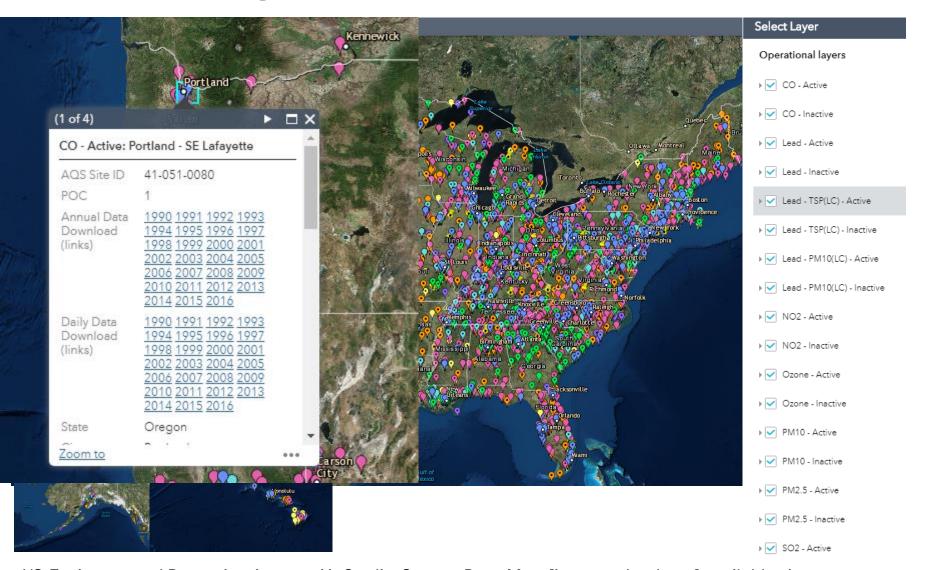
# Pollution, Poverty and People of Color: Asthma and the Inner City

Seven million children now suffer from asthma--and they are disproportionately poor

# Tutorial: The Phillips Neighborhood Minneapolis, MN



#### https://www.epa.gov/outdoor-air-quality-data

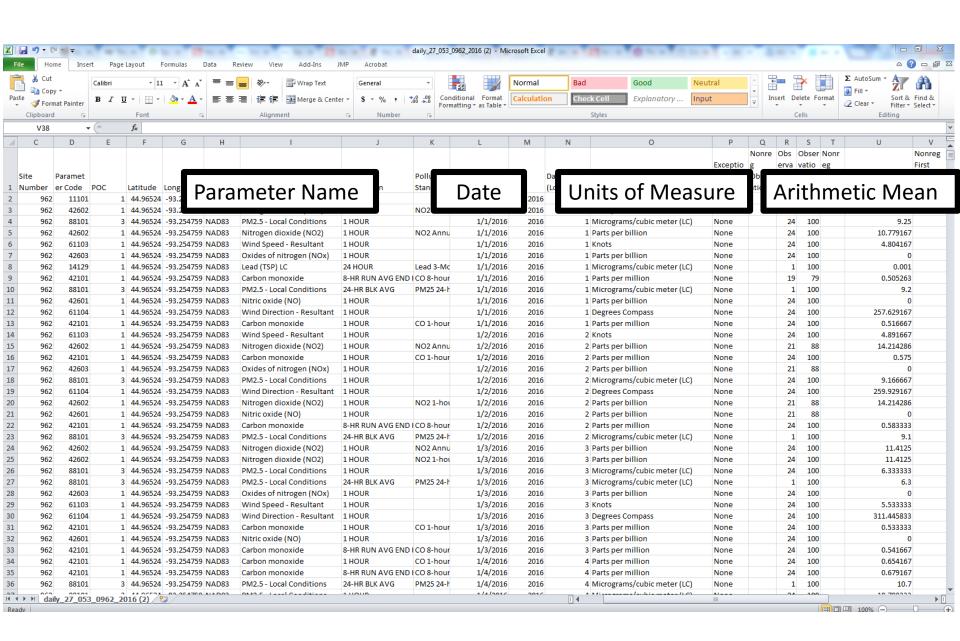


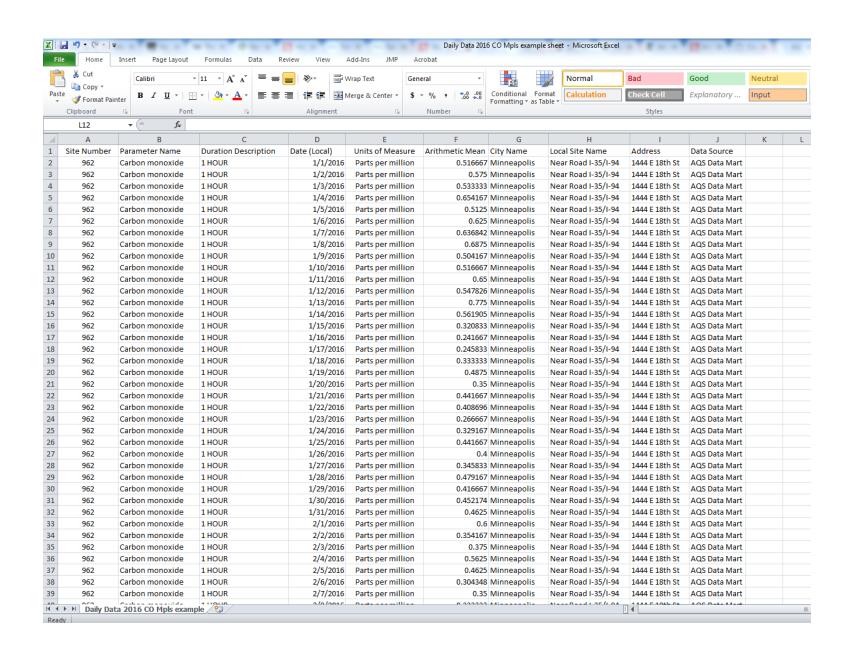
US Environmental Protection Agency. Air Quality System Data Mart [internet database] available via - https://www.epa.gov/airdata. Accessed July 29, 2017.

#### Student tasks

- Generate testable questions
- Mine EPA AirData website to gather relevant data
- Analyze data
- > Interpret data and draw conclusions
- Communicate results in scientific paper format

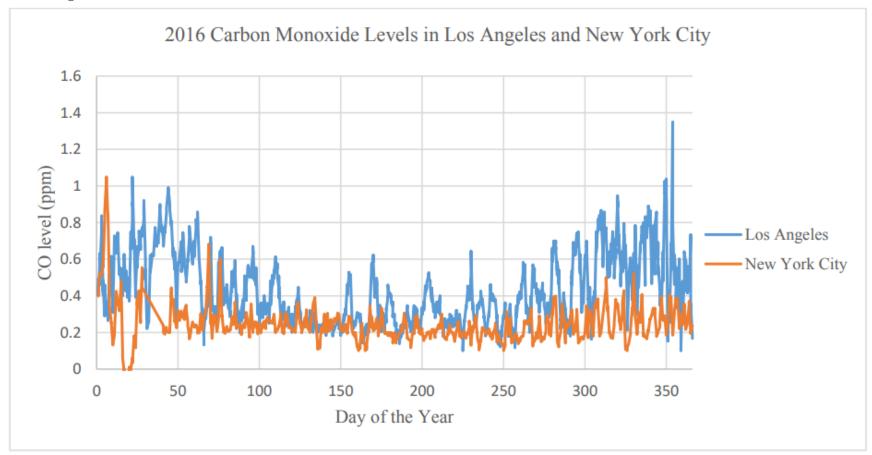
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		42602			-93.254759		Nitrogen dioxide (NO2)	1 HOUR	NO2 1-ho				1 Parts per b		None		24		10.779	
	962	88101			-93.254759		PM2.5 - Local Conditions	1 HOUR	.102 1110	1/1/2016				ns/cubic meter (LC)	None		24			9.25
		42602			-93.254759		Nitrogen dioxide (NO2)	1 HOUR	NO2 Ann				1 Parts per b		None		24		10.779	
		61103			-93.254759		Wind Speed - Resultant	1 HOUR		1/1/2016			1 Knots		None		24		4.804	
		42603			-93.254759		Oxides of nitrogen (NOx)	1 HOUR		1/1/2016			1 Parts per b	illion	None		24			0
		14129			-93.254759		Lead (TSP) LC	24 HOUR	Lead 3-M					ns/cubic meter (LC)	None		1		0.	001
	962	42101	1	44.96524	-93.254759	NAD83	Carbon monoxide	8-HR RUN AVG END	ICO 8-hou	r 1/1/2016	2016		1 Parts per n		None		19	79	0.505	263
	962	88101	3	44.96524	-93.254759	NAD83	PM2.5 - Local Conditions	24-HR BLK AVG	PM25 24-	l 1/1/2016	2016		1 Microgram	ns/cubic meter (LC)	None		1	1 100		9.2
	962	42601	1	44.96524	-93.254759	NAD83	Nitric oxide (NO)	1 HOUR		1/1/2016	2016		1 Parts per b	illion	None		24	1 100		0
	962	61104	1	44.96524	-93.254759	NAD83	Wind Direction - Resultant	1 HOUR		1/1/2016	2016		1 Degrees C	ompass	None		24	100	257.629	167
	962	42101	1	44.96524	-93.254759	NAD83	Carbon monoxide	1 HOUR	CO 1-hou	r 1/1/2016	2016		1 Parts per n	nillion	None		24	100	0.516	667
	962	61103	1	44.96524	-93.254759	NAD83	Wind Speed - Resultant	1 HOUR		1/2/2016	2016		2 Knots		None		24	100	4.891	667
		42602	1	44.96524	-93.254759	NAD83	Nitrogen dioxide (NO2)	1 HOUR	NO2 Ann				2 Parts per b	illion	None		21		14.214	
		42101	1	44.96524	-93.254759	NAD83	Carbon monoxide	1 HOUR	CO 1-hou				2 Parts per n	nillion	None		24		0.	575
		42603			-93.254759		Oxides of nitrogen (NOx)	1 HOUR		1/2/2016			2 Parts per b		None		21			0
	962	88101			-93.254759		PM2.5 - Local Conditions	1 HOUR		1/2/2016				ns/cubic meter (LC)	None		24		9.166	
		61104			-93.254759			1 HOUR		1/2/2016			2 Degrees Co	•	None		24		259.929	
		42602			-93.254759		Nitrogen dioxide (NO2)	1 HOUR	NO2 1-ho				2 Parts per b		None		21		14.214	
		42601			-93.254759		Nitric oxide (NO)	1 HOUR	LCO 0 b	1/2/2016			2 Parts per b		None		21		0.500	0
	962 962	42101 88101			-93.254759		Carbon monoxide	8-HR RUN AVG END					2 Parts per n		None		24		0.583	9.1
		42602			-93.254759 -93.254759		PM2.5 - Local Conditions	24-HR BLK AVG 1 HOUR	PM25 24- NO2 Ann					ns/cubic meter (LC)	None		24		11.4	
		42602			-93.254759 -93.254759		Nitrogen dioxide (NO2) Nitrogen dioxide (NO2)	1 HOUR	NO2 Ann				3 Parts per b 3 Parts per b		None None		24		11.4	
	962	88101			-93.254759 -93.254759		PM2.5 - Local Conditions	1 HOUR	NO2 1-110	1/3/2016				ns/cubic meter (LC)	None		24		6.333	
		88101			-93.254759		PM2.5 - Local Conditions	24-HR BLK AVG	PM25 24-					ns/cubic meter (LC)	None		1			6.3
		42603			-93.254759		Oxides of nitrogen (NOx)	1 HOUR	. 1412.5 24	1/3/2016			3 Parts per b		None		24			0.5
		61103			-93.254759		Wind Speed - Resultant	1 HOUR		1/3/2016			3 Knots		None		24		5.533	-
		61104			-93.254759			1 HOUR		1/3/2016			3 Degrees Co	ompass	None		24		311.445	
		42101			-93.254759		Carbon monoxide	1 HOUR	CO 1-hou				3 Parts per n		None		24		0.533	
		42601			-93.254759		Nitric oxide (NO)	1 HOUR		1/3/2016			3 Parts per b		None		24		31333	0
	962	42101			-93.254759		Carbon monoxide	8-HR RUN AVG END	I CO 8-hou				3 Parts per n		None		24		0.541	667
		42101			-93.254759		Carbon monoxide	1 HOUR	CO 1-hou				4 Parts per n		None		24		0.654	
		42101			-93.254759		Carbon monoxide	8-HR RUN AVG END					4 Parts per n		None		24		0.679	
	962	88101	3	44.96524	-93.254759		PM2.5 - Local Conditions	24-HR BLK AVG	PM25 24-					ns/cubic meter (LC)	None		1	1 100	1	10.7





# Question: Which large city – New York or Los Angeles – had higher levels of CO in 2016?

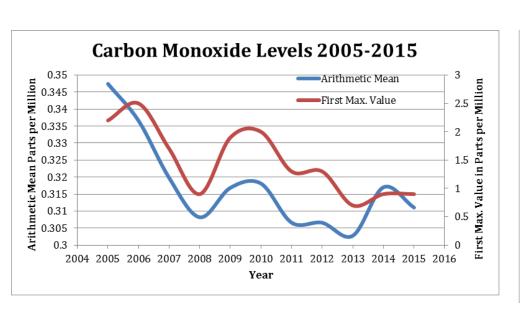
#### Daily Data:

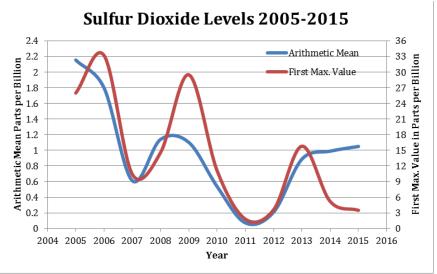


Credit: Thomas Armstrong, University of Minnesota, May 2017

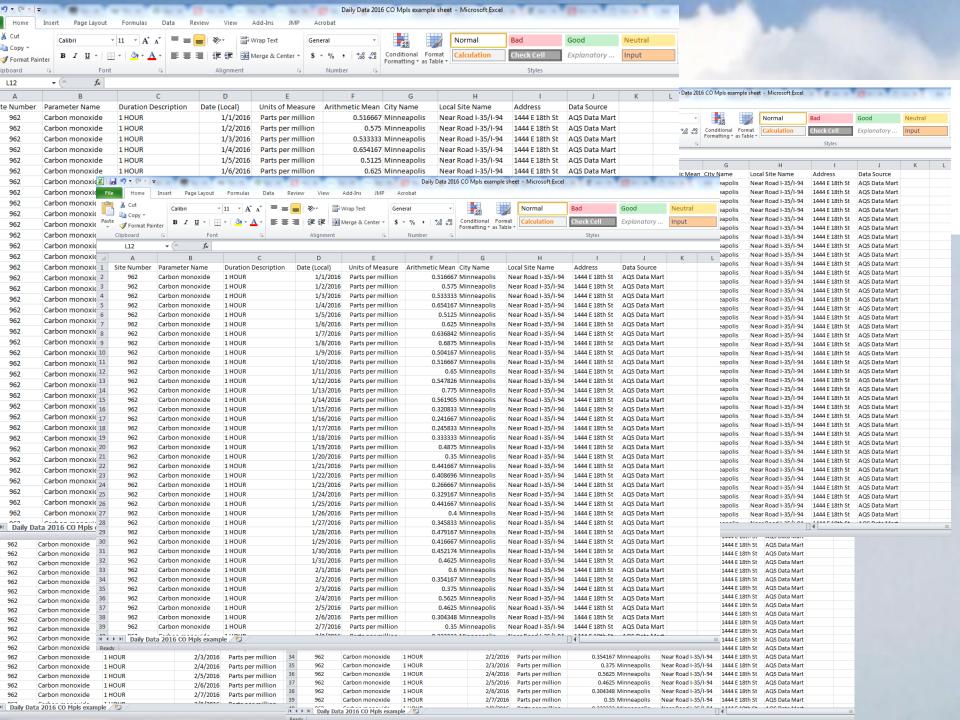
# Question: What is the difference in Carbon Monoxide and Sulfur Dioxide levels near Target Field between 2005 and 2015?

#### **Annual Data:**



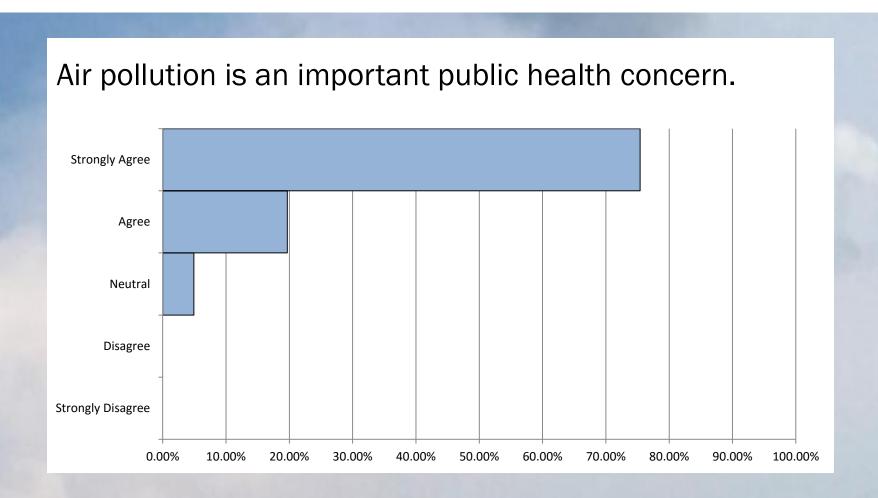


Credit: Deandra Bardell, University of Minnesota, December 2015

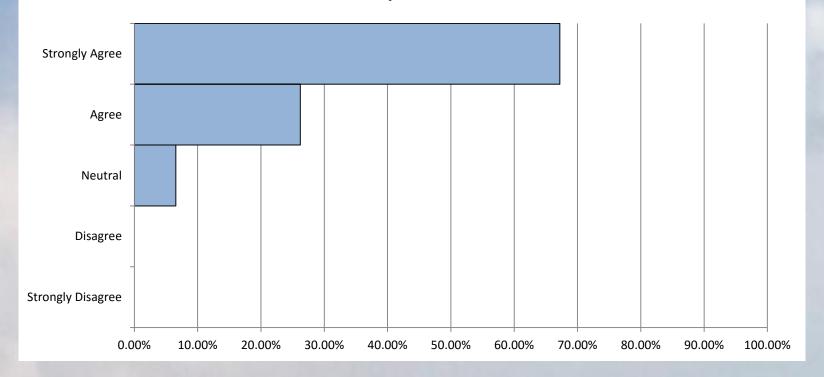


# Challenges

- Multiple large Excel spreadsheets
- Monitors may not have data needed to answer questions
- Determine the appropriate scope of the research
- No statistical analysis potential area for expansion.



It is important for the EPA air quality data to be collected and made available to the public.



What did you like least about the Air Quality Activity?

- "Writing a paper."
- > "Dealing with the data wasn't really fun."

# Do you think the Air Quality Activity was worthwhile? Why or why not?

Positive responses: 50

"I do think it was worthwhile because I think it is an important skill to be able to take large amounts of data and format it in a way such that you can draw conclusions from it. "

Negative responses: 5

"No because there was huge amounts of data which takes lots of processing to make anything useful out of it."

What did you like most about the Air Quality Activity?

- "Reviewing actual data from the EPA"
- > "Being able to create my own research question"
- "I liked graphing the data and realizing that there was a decrease in the pollutant we looked at."

# Opportunities

- Creativity
- > Ownership
- Originality
- > Authenticity
- Personal connections to real-world data: Deeper learning

# Acknowledgments

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