

Observational Analysis of Compliance with the PA Act 124 Anti-idling Legislation

A Dickinson College and Clean Air Board
Community-based Research Project



Ian Crimmins
Angela Guy
Kaitlyn Moore
Aleksandra Pyra
Caitlin Ruggeri
Chan Voong



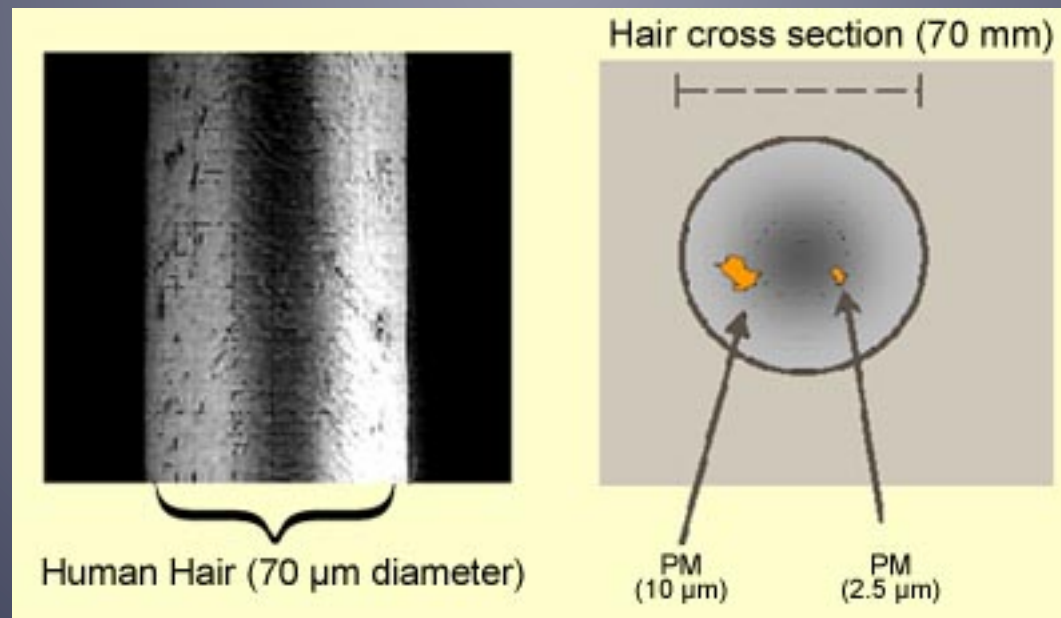
Anti-Idling

- PA Act 124
 - Prohibits idling of any diesel-powered motor vehicle for more than 5 out of every 60 minutes
- Buses, school buses and school vehicles may idle for 15 minutes in a continuous 60-minute period when passengers are aboard



What is PM 2.5?

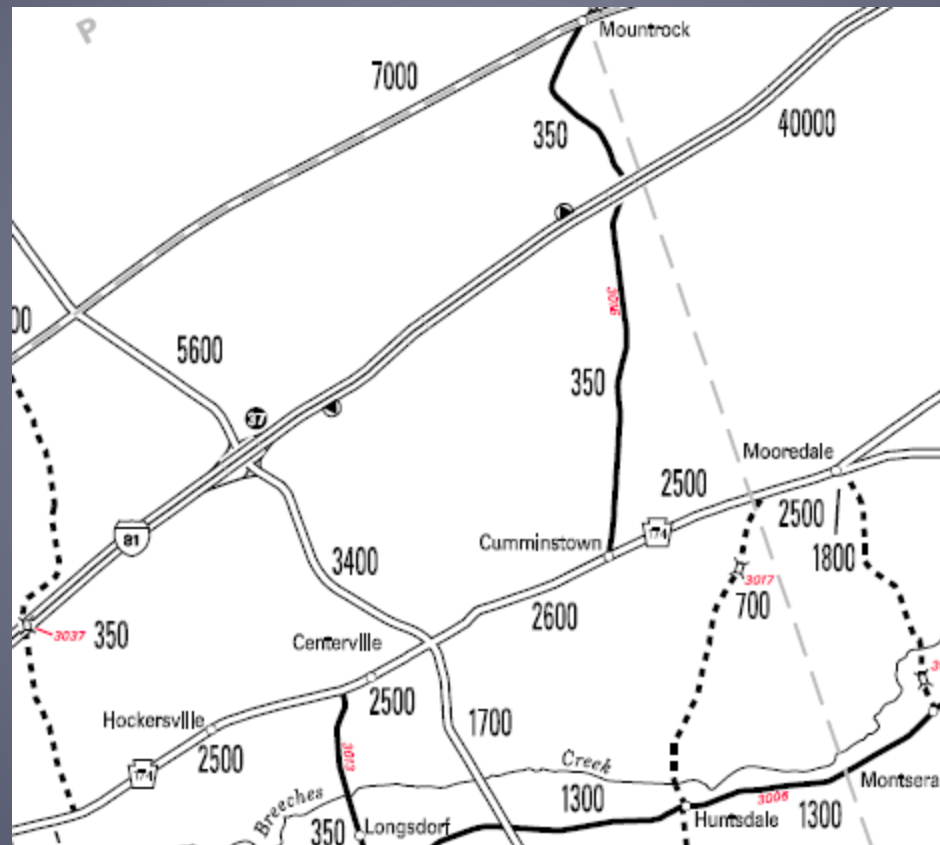
- Very small liquid and solid particles suspended in air.
 - Can be primary (soot, dust) or secondary (formed from reactions involving pollutants from diesel engine exhaust)



Why This is Important? PM 2.5 and Health

- Health effects can result from both short- and long-term exposure to PM 2.5
- PM 2.5 particles are carried deep into the alveoli of the lungs where they can't be expelled and they contain an array of toxic and carcinogenic constituents
- Diesel PM emissions are responsible for about 70 percent of the total risk from ambient air toxins
- Many studies have linked short-term exposure to PM to a series of significant health problems, including:
 - aggravated asthma
 - increases in respiratory symptoms like coughing and difficult or painful breathing
 - chronic bronchitis
 - decreased lung function
 - cardiovascular disease
 - premature death

Traffic Volume Map, Carlisle PA



Truck Idling Study: Purpose

- To monitor the number of trucks idling at the I-81 South and I-81 North rest-stops
- To determine what effect environmental factors have on the number of trucks idling
- To serve as a test run for a larger study that will monitor truck idling in the greater Carlisle area

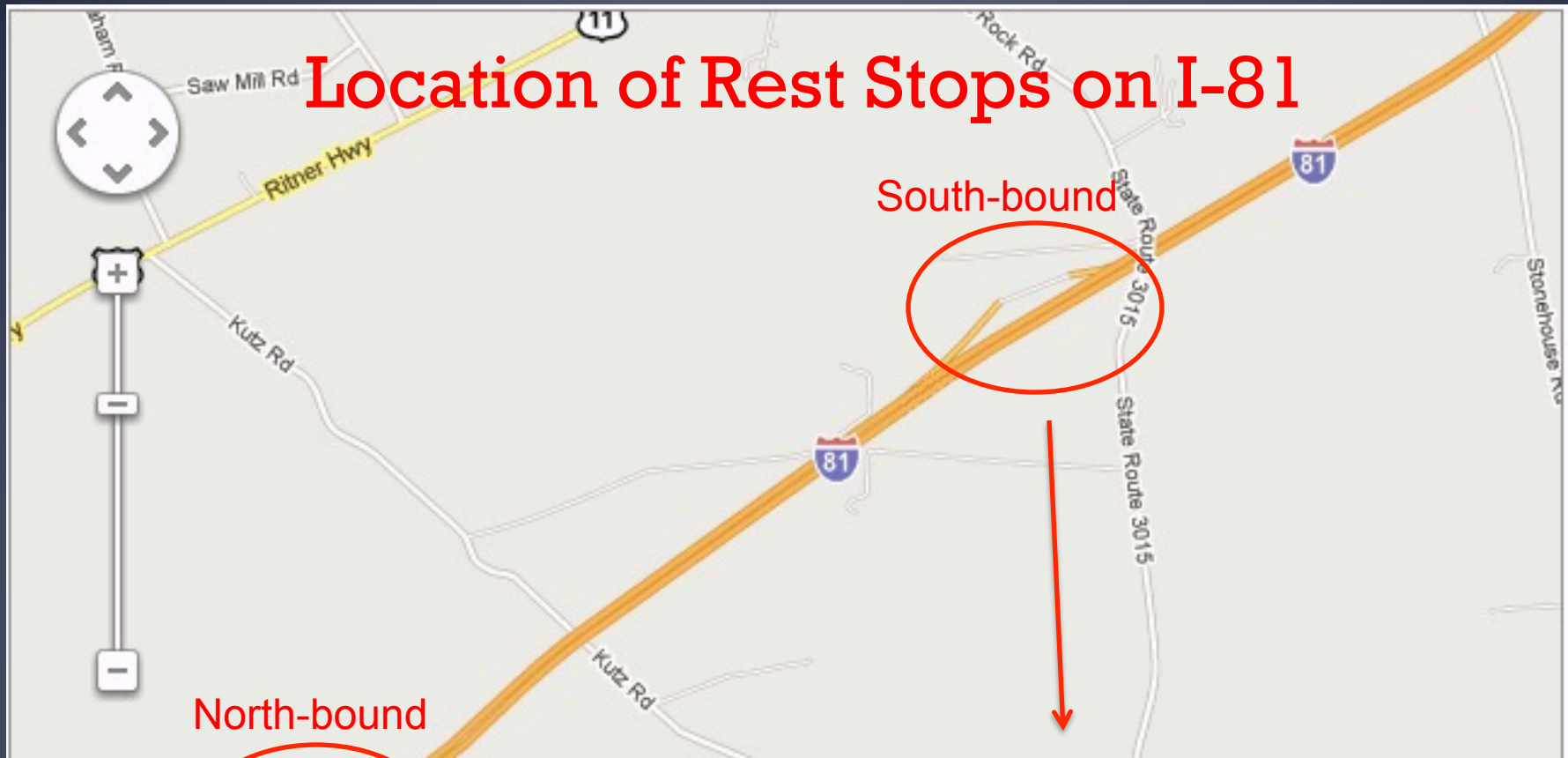
Truck Idling Study: Methods

- Research was conducted at two Carlisle area I-81 rest stops
 - South Bound (mile 39)
 - North Bound (mile 38)
- Two time points
 - Morning (before 7am)
 - Night (after 10pm)
- Two to three observers
- Observers noted the total number of trucks and the number of trucks idling for a period longer than 5 minutes
- Observers recorded temperature, time of day, date, and location.

Location of Rest Stops on I-81

South-bound

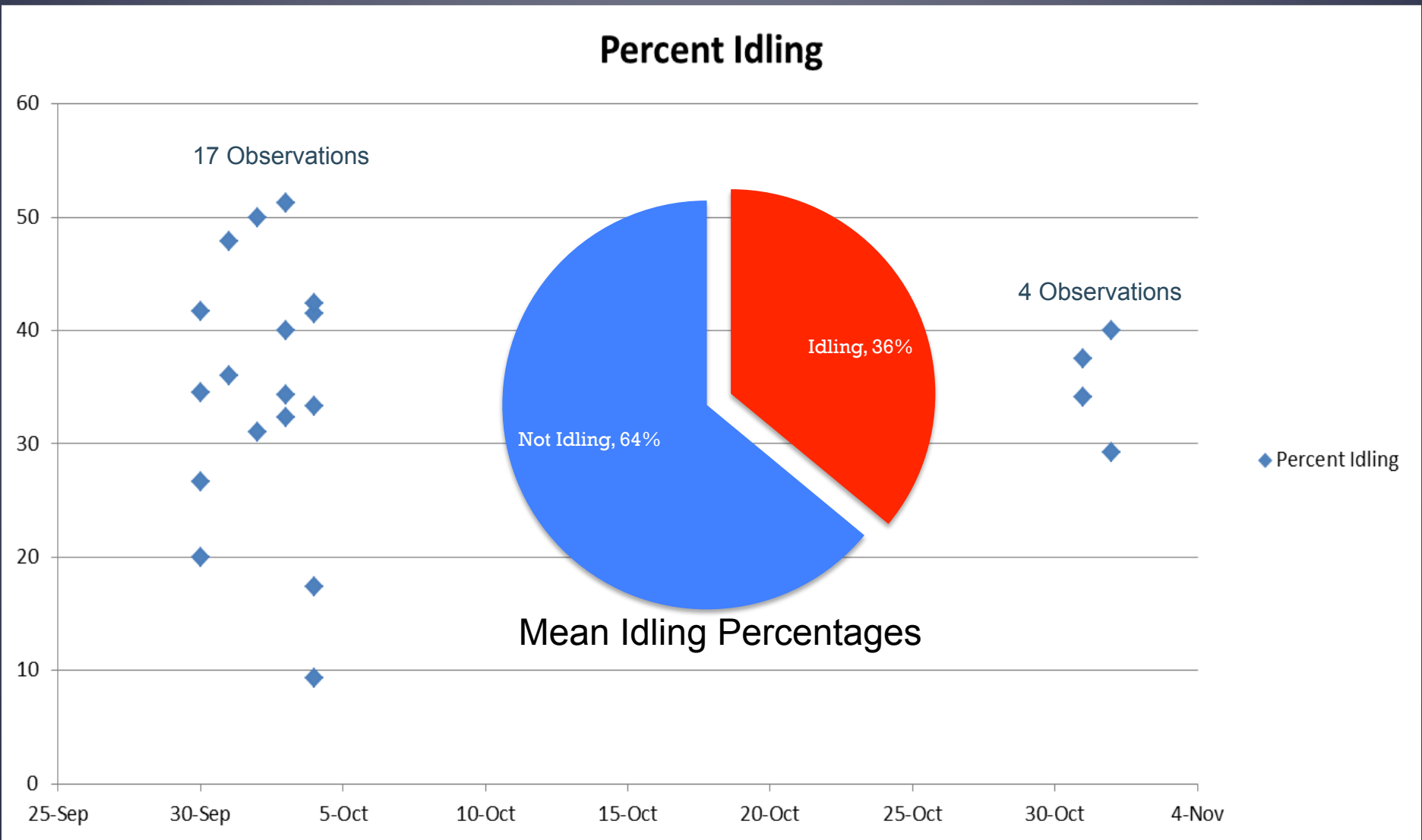
North-bound



Excel Spreadsheet of Some of the Data

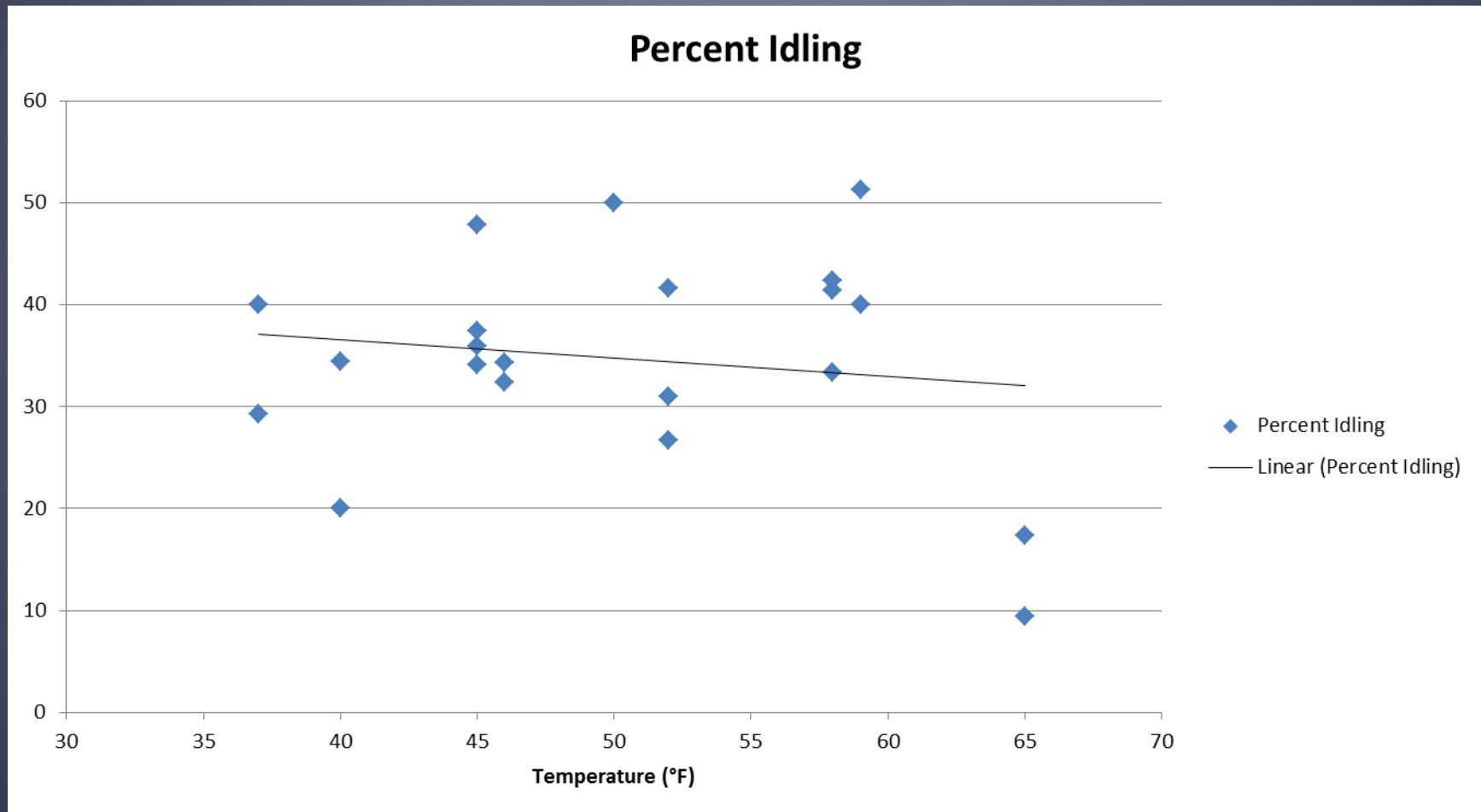
	A	B	C	D	E	F	G	H	I	J	K	L	M
1	52degrees - 10/3 I-81S 10:06 - 10:17				65degrees - 10/5 I-81N 11:01 - 11:07					65degrees - 10/5 I-81S 10:45 - 10:58			
2	Idling	License Plate	Identification		Idling	License Plate	Identification			Idling	License Pl	Identification	
3	0	IL	American Transport		0	NC	East West Inc			0	IN	GST	
4	0	IN	Celadon		0	PA	Utility			0	NJ	ORAZK	
5	0	ME	Great Wide		0	GA	Brown			0	MN	Cattle Ranch	
6	0	TX	Helwig		0	IL	Utility			0	NC	40 Cents	
7	0	NC	LISK		0	GA	Unmarked			0	TN	NPS Trucking	
8	0	IL	Metropolitan Trucking		0	IL	USA			0	OK	Millis Trucking	
9	0	TX	RV		0	TN	Unmarked			0	ME	PAM	
10	0	OH	Sauder		0	IN	Swift Transportation			0	TN	titan	
11	0	IN	Schneider		0	WI	Millis Transfer Inc			0	IN	Knight	
12	0	NY	Superior Tank		0	MO	PimeInc.com			0	PA	Unmarked	
13	0	Alberta	TransX		0	IN	Swift Transportation			0	ME	EPES Evergreen	
14	0	Quebec	TYT		0	PA	Utility			0	ME	Evergreen	
15	0	Unknown	Unmarked		0	PA	Heppard Enterprises Inc.			0	TN	Smith Trasport	
16	0	ME	Unmarked		0	TN	harris			0	OK	JB Hunt	
17	0	FL	Unmarked		0	NJ	Bronze Express			0	ME	EPES Evergreen	
18	0	NC	Unmarked		0	VA	Fleet			0	MO	PrimeInc.com	
19	0	ME	Unmarked		0	TN	Hampton Trucking			0	ME	Larry Wagner	
20	0	GA	Unmarked		0	TN	Logistics			0	NY	Utility	
21	0	TN	Unmarked		1	TN	McElroy			0	GA	RWH	
22	1	VA	BIR		1	ME	Utility			0	IN	Snider Native	
23	1	Unknown	Cargo Transportation		1	ME	Airride Equipment			0	AL	Utility	
24	1	TN	Inter Express		1	FL	MDA			0	NE	Unmarked	
25	1	TN	LTI							0	GA	Carne	

Date Dependent Idling



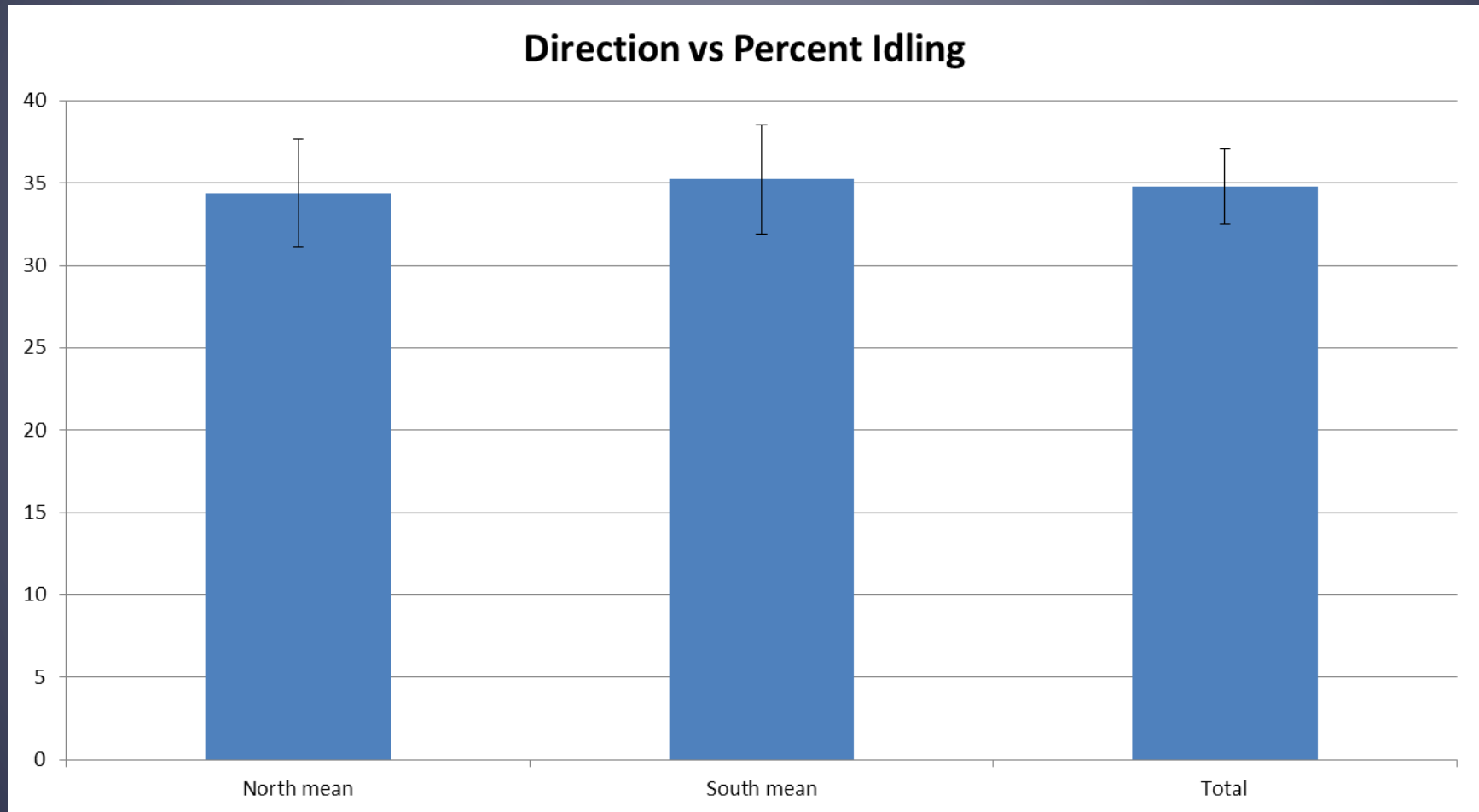
Temperature Dependent Idling

A trend towards more idling at lower temperatures



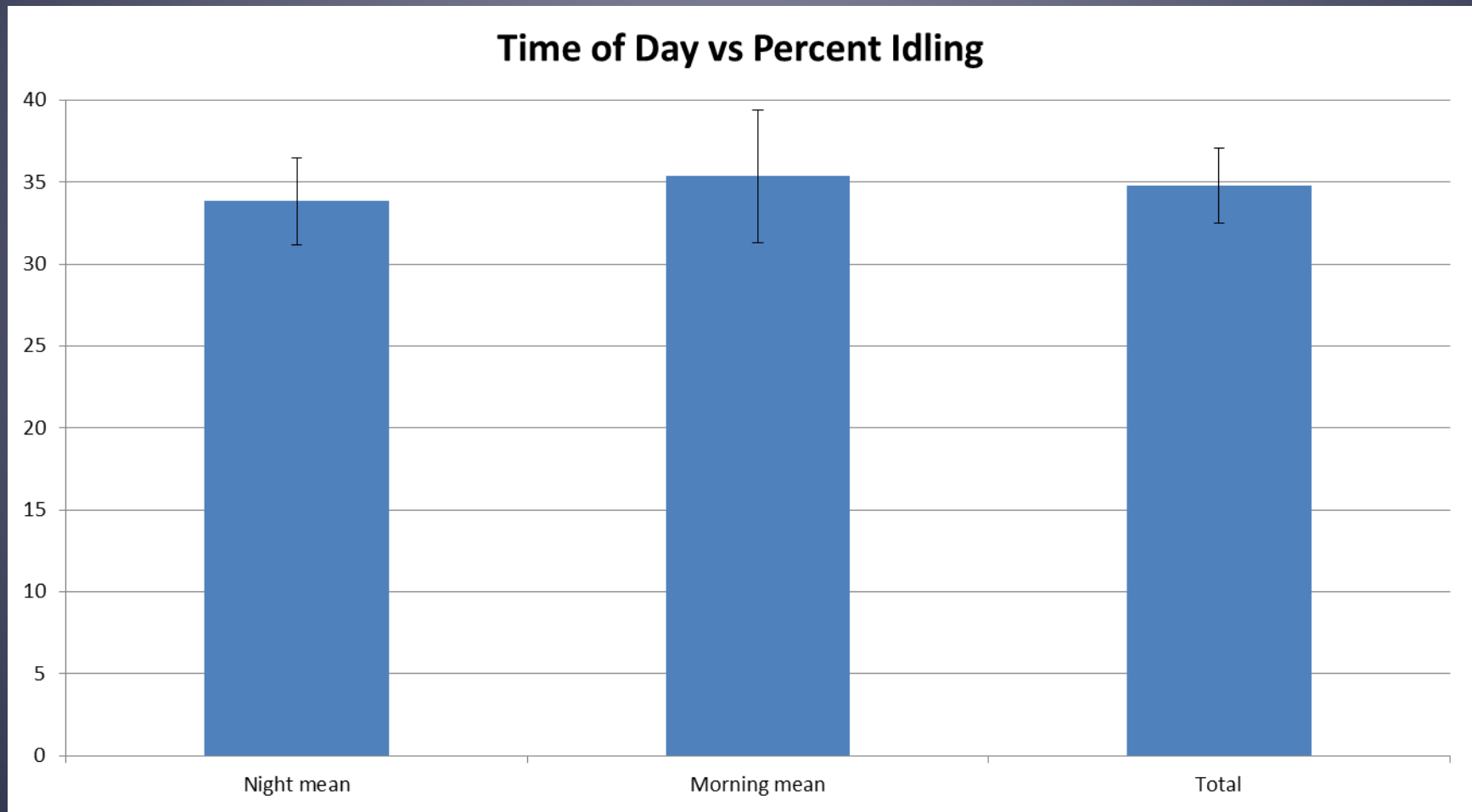
Travel Direction Dependent Idling

No difference



Time Dependent Idling

No Difference



Summary of Results

- Rest stops were observed twenty-one times (8 during the night, 13 during the morning).
- 666 trucks were observed
- 238 trucks were observed idling
- Average percent idling was 35.6%
- Idling percentages ranged from 9.4% to 51.3%
- Temperatures during observations ranged from 37°F to 65°F with an average of 50°F

Truck Idling Study: Conclusion

- Limited data did not allow this study to establish a correlation between the recorded environmental variables and truck idling
- Study suggested that there is a significant level of non-compliance of long haul trucks with the Pennsylvania Diesel-Powered Motor Vehicle Idling Act

Recommendations

- Pilot study provides framework for a more in-depth examination of potential non-compliance with Pennsylvania Diesel-Powered Motor Vehicle Idling Act
- Future research should expand the scope of the study to multiple locations over a longer period of time and attempt to determine links between environmental factors and idling rates
- Results of the current study should be made available to a local media outlet (The Sentinel, The Patriot News) for publication as well as enforcement agencies (PA State Police and PA Department of Environmental Protection)

School Buses

- PM emissions from diesel engines has potential negative health effects on all individuals
 - Particular risk for the elderly and children
- Particles contained in diesel exhaust from school buses increase people's exposure to harmful components



Bus Idling

- Bus idling has a direct effect on PM concentrations inside the bus
 - First hand exposure to passengers on the bus (children)
- Idling practices
 - Buses wait in line to pick up, drop off, and transfer students
 - The more buses present at any one stop, the greater the PM emission and consequentially, the more detrimental the health effects
- Idling drastically and rapidly increases PM levels up to 15 times more than already present PM levels in surrounding areas

Diesel Exhaust and PM Effects on Children

- Diesel has carcinogenic properties
 - 6th most potent carcinogenic compound
- Children are considered to be a high risk group in terms of sensitivity to PM emission
- Children breathe nearly 50% more air than is inhaled by adults
- PM exacerbates symptoms in children with asthma
 - *CDC estimates that 4.5 million U.S. children have asthma*
- In Connecticut alone, PM levels measured on buses are often 5-10 times greater than those measured at monitoring stations

Students on School Buses

Student Rides on School Buses in the US

Rides per Day 52 million

Rides per School Year 8.5 billion

Rides During Summer 1 billion

Total Rides per Year 10.5 billion

Carlisle Area School District

60 vehicles

22 Full size buses

26 Mini-buses

8 Passenger vans

4 Wheel chair mini-bus

2700 miles per day

11.4 square miles

99,400 gallons of fuel per year

Carlisle Regional High School

- 40 buses
- Buses are diesel-operated
 - Ultralow sulfur diesel and 89 Octane regular
- Since the Anti-Idling Law, 10 out of the 40 buses have been replaced/updated
 - Replaced by new buses with PM traps
 - New buses filtered with UREA system

South Middleton School District

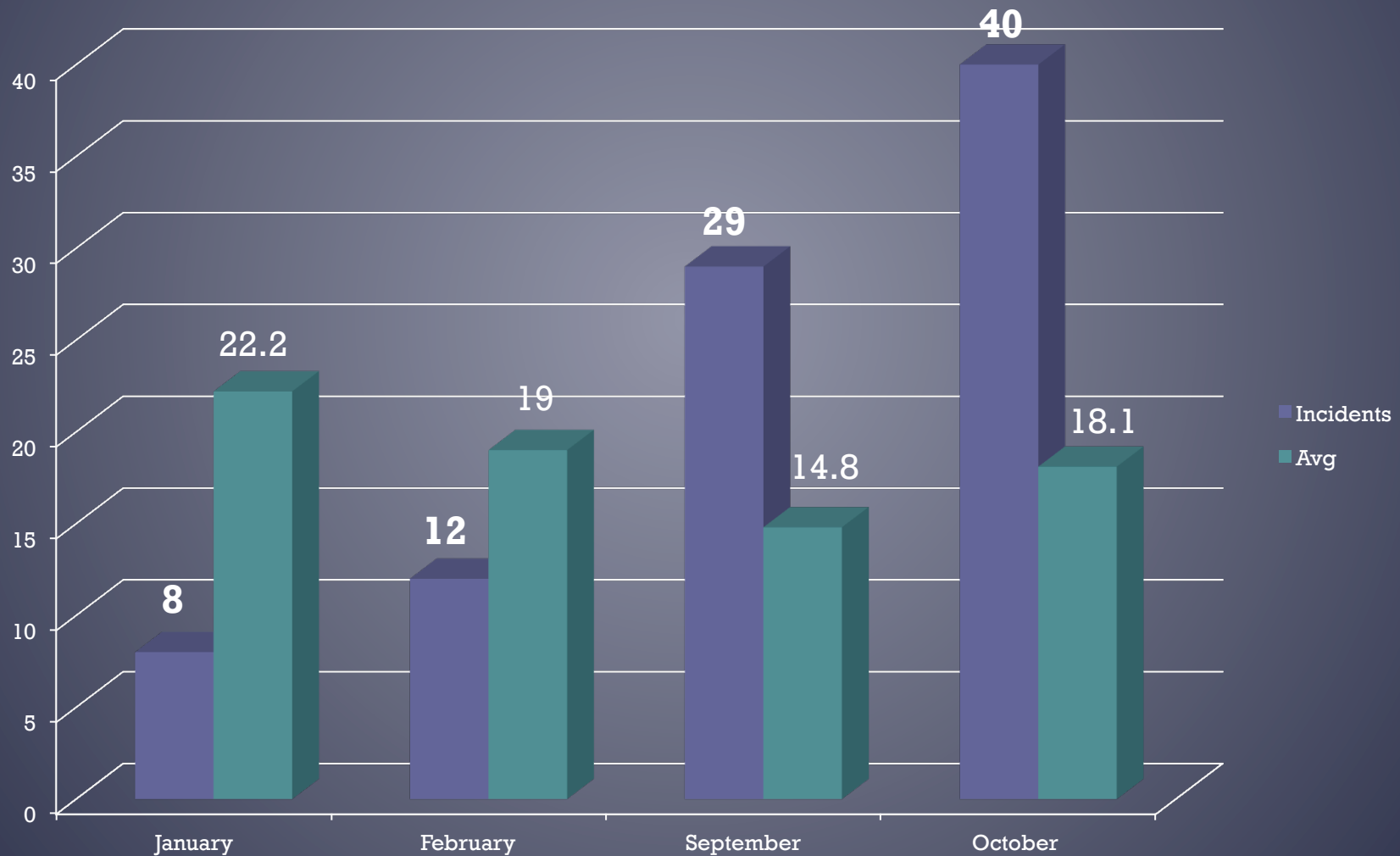
- 22 school buses
 - all gasoline
- Drivers are required to comply with the PA state laws on bus idling
- Contract their transportation through a third party vendor

Final Study: Correlation of Asthma Incidents and PM 2.5 Levels

- PM2.5 levels were collected from the PA DEP website
- Asthma incidents were collected from Sadler Health Center
- A four month period was analyzed
- No real correlation was found due to insignificant data over time

Average PM 2.5 Levels vs. Asthma Incidents at Sadler Health Center

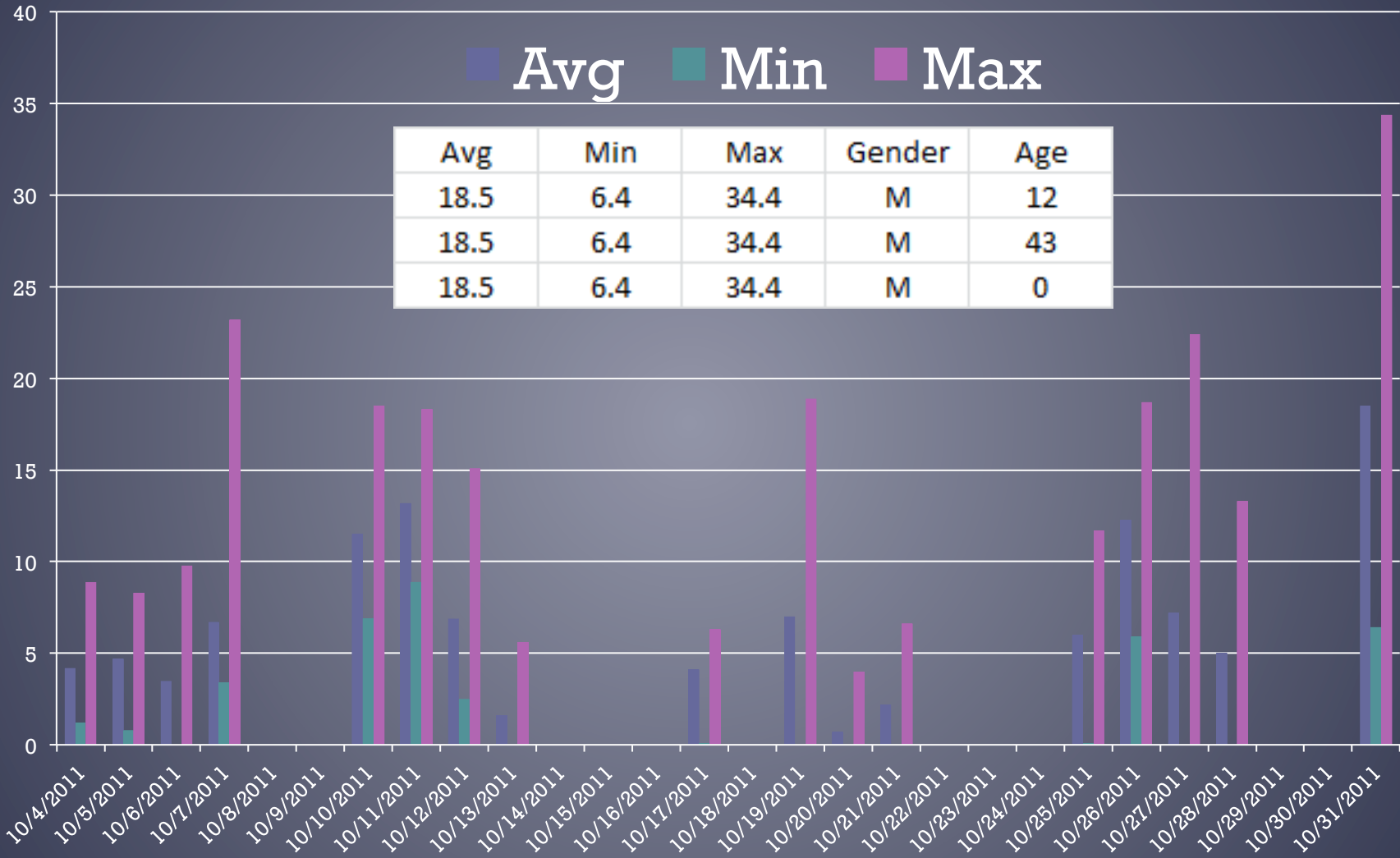
January—October 2011



Reported Asthma Cases and Avg, Min, & Max Levels of PM 2.5

Date of Service	Avg	Min	Max	Gender	Age
1/7/2011	22	8.6	35.6	F	39
1/10/2011	11.7	6.7	20	F	14
1/12/2011	21.2	3.5	51.5	F	38
1/18/2011	24.4	15.6	39.9	M	26
1/28/2011	33.9	16.6	46.4	F	5
1/31/2011	16.8	9.5	31.8	F	21
1/31/2011	16.8	9.5	31.8	F	67
1/31/2011	16.8	9.5	31.8	F	19

PM 2.5 Levels Over Time in October



Findings

- Difficult to deduce a correlation due to the number of variables
 - Avg, Min, Max of PM 2.5 levels for each month
 - Date of reported asthma incident
 - Age and sex of asthma patient
- Cold weather in January and February may contribute to people's reluctance to visit the doctor
- Allergy and hay fever season in September and October may contribute to increased incidents of asthma

Conclusions of PM2.5 and Asthma Study

- Although studies have shown that diesel emissions are detrimental to health, both short- and long-term, the studies that we have conducted are too cursory to draw any such conclusion.
- We recommend that more extensive research be conducted on diesel emissions and health effects in the Carlisle area.

Acknowledgements

- Clean Air Board of Central Pennsylvania
 - Tom Au, President and Justina Wasicek
- Prof. Gregory Howard, Dickinson College
- Carlisle Area Health and Wellness Foundation
 - Rebecca Raley, Executive Director
- Sadler Health Center
 - Mary Arthur, CRNP, QA Coordinator