



Update

Comparing Air Quality and Health Benefits: Two Case Studies

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- These studies are an update of work presented last year in Lexington, Kentucky.
- The health data previously presented was in error.



- The two studies focus on Marion County (Indianapolis), a county with a population just under 1,000,000.

Asthma Study

- This study looks at the number of people hospitalized per day with asthma, treated as an outpatient for asthma, and the total of both from 2012-2017 in Marion County.
- These values are compared to values for that day, the day before, and two days before for:
 - Ozone Level
 - Temperature
 - Relative Humidity
 - PM2.5 Levels



Asthma Cases by Year

Year	(ppb) Ozone	Hospital Admin.	Outpatient	Total
2012	51	1594	2890	4484
2013	44	1332	2942	4274
2014	45	1456	2674	4130
2015	43	1035	2850	3885
2016	43	771	3401	4172
2017	44	758	3220	3978



Speciated PM2.5 Data

Includes:

Maximum/Average	Elemental	Carbon
Maximum/Average	Nitrates	
Maximum/Average	Sulfates	
Maximum/Average	Organic	Carbon
Maximum/Average	Ammonium	
Maximum/Average	Sulfur	
Maximum/Average	Soil	



Speciated Metals

Antimony	Magnesium
Arsenic	Manganese
Aluminum	Nickel
Barium	Phosphorus
Bromine	Potassium
Cadmium	Rubidium
Calcium	Selenium
Cerium	Silicon
Cesium	Silver
Chlorine	Sodium
Chromium	Strontium
Cobalt	Tin
Copper	Titanium
Indium	Vanadium
Iron	Zinc
Lead	Zirconium



Results of Regression Analysis

Total Asthma Cases

Parameter	Time Basis	R-value
Hours of Temperature >75°F	Day Before	0.1086
Hours of Relative Humidity > 90%	2 Days Before	0.1157
Average Organic Carbon	Day of	0.0995
Average Antimony	Day of	0.1086
Average Arsenic	Day of	0.1260
Average Barium	Day of	0.1018
Average Bromine	Day of	0.1083
Average Cadmium	Day of	0.1086
Maximum Copper	Day of	0.0982
Maximum Magnesium	Day of	0.1128
Average Phosphorus	Day of	0.1337
Average Strontium	Day of	0.1216
Maximum Potassium	Day of	0.0923
Average Zirconium	Day of	0.1070

- No statistically significant relationship between ozone and asthma cases.



Average Asthma Cases By Month

Month	Total Cases	Average PM25
January	1855	11.2
February	1677	12.4
March	2048	10.7
April	2031	9.0
May	2228	10.3
June	1627	10.9
July	1595	12.2
August	2630	11.5
September	2462	11.0
October	2492	8.9
November	2260	11.9
December	2018	11.8

PM2.5 Analysis versus Chronic Lower Respiratory Disease Deaths

- Study looks at number of deaths per day for Marion County from 2000-2017 for deaths from chronic lower respiratory disease.
- This is compared to values for that day, the day before, and two days before for:
 - PM2.5 Levels
 - Temperature
 - Relative Humidity



Results of Linear Regression

	R-Value
Average Nitrate (Day of)	0.1123
Minimum Temperature (2 Days Before)	0.1096
Maximum Copper (Day of)	0.0980

- No statistically significant relationship between PM_{2.5} and chronic lower respiratory disease deaths.



Chronic Lower Respiratory Disease Death by Year

Year	Deaths	Average PM2.5
2000	466	16.8
2001	482	17.1
2002	457	16.6
2003	492	15.7
2004	477	14.7
2005	507	17.1
2006	497	14.4
2007	426	15.5
2008	552	13.3
2009	533	13.1
2010	524	14.4
2011	560	13.7
2012	533	12.0
2013	532	12.2
2014	533	12.1
2015	578	10.6
2016	555	9.6
2017	546	9.4



Chronic Lower Respiratory Disease Death by Month

Month	Deaths	Average PM2.5
January	892	14.0
February	867	15.0
March	897	13.1
April	789	11.6
May	763	12.5
June	722	14.1
July	694	16.4
August	675	15.8
September	657	13.9
October	699	11.4
November	755	13.5
December	840	14.0



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