

PM 2.5 Concentrations & Asthma Incidence in New York City (2008 - 2010)



(2008 - 2010)



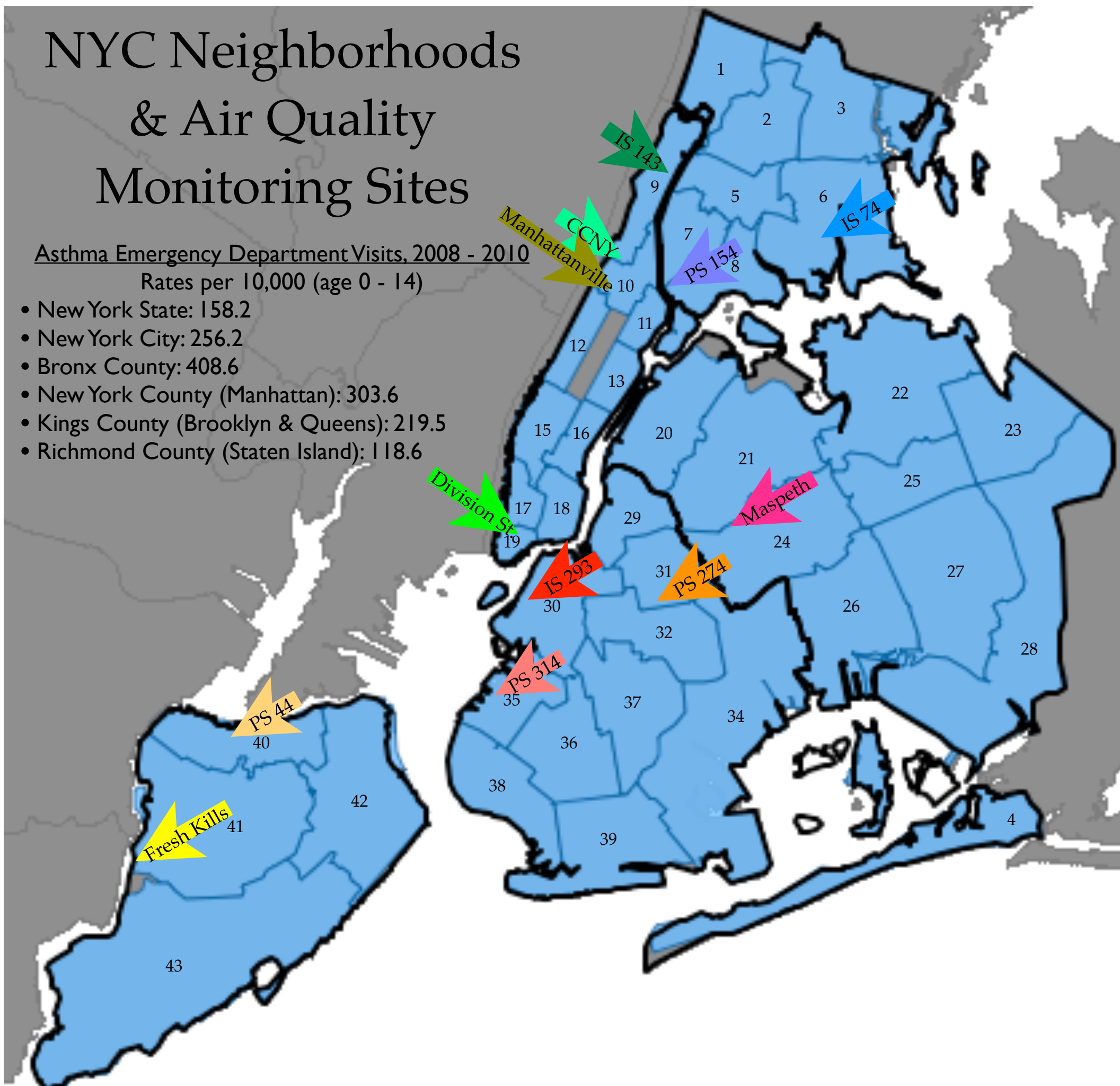
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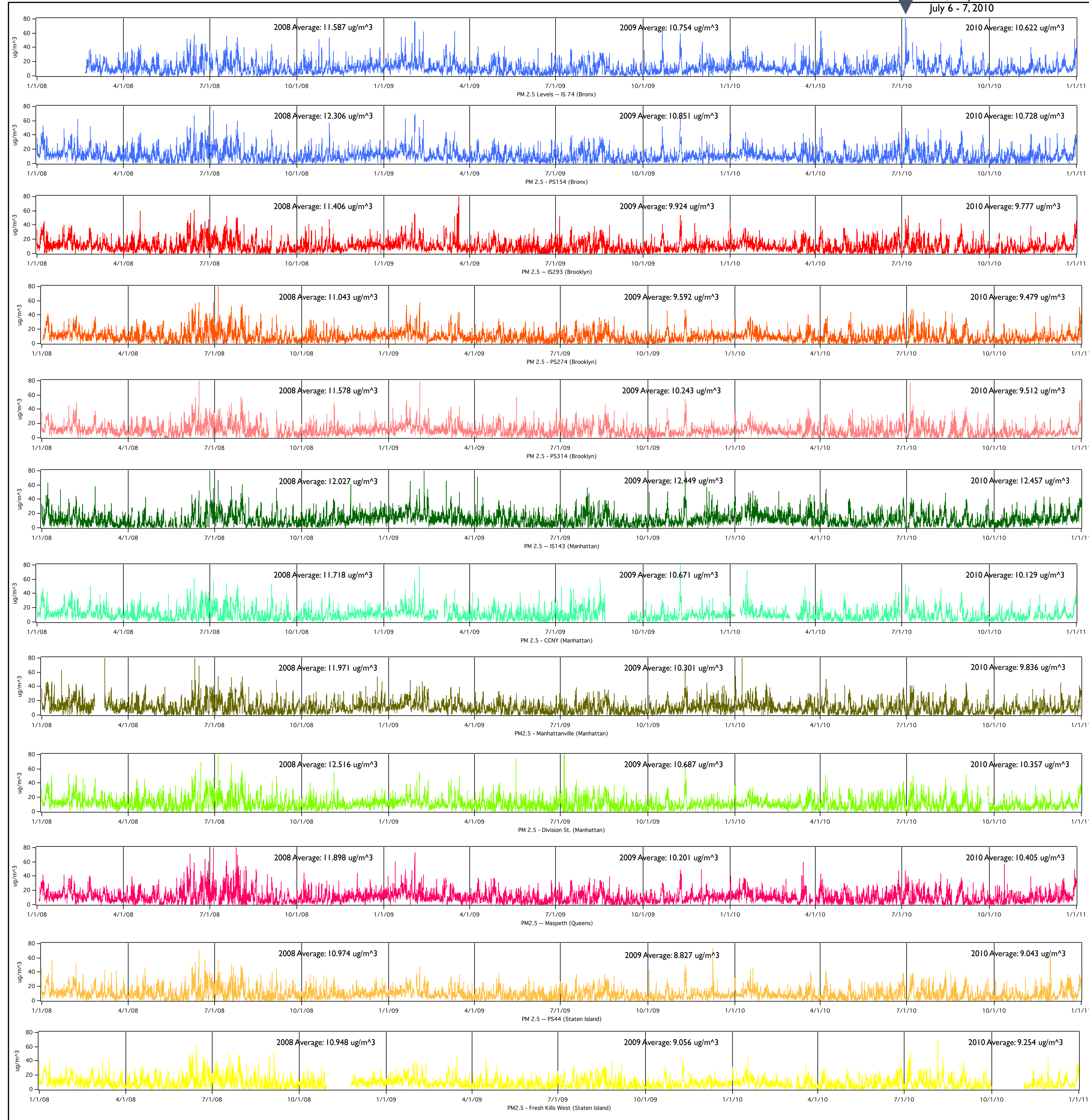
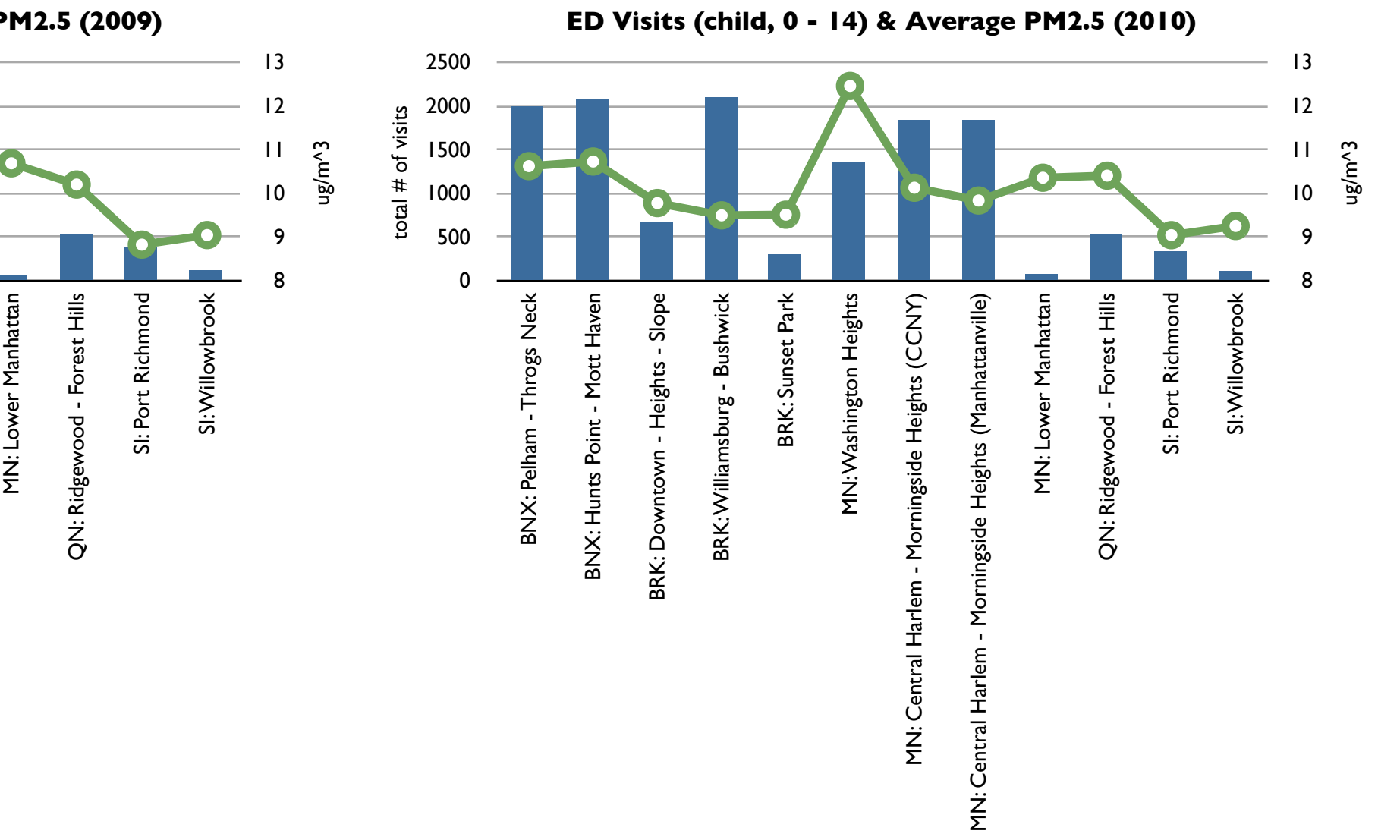
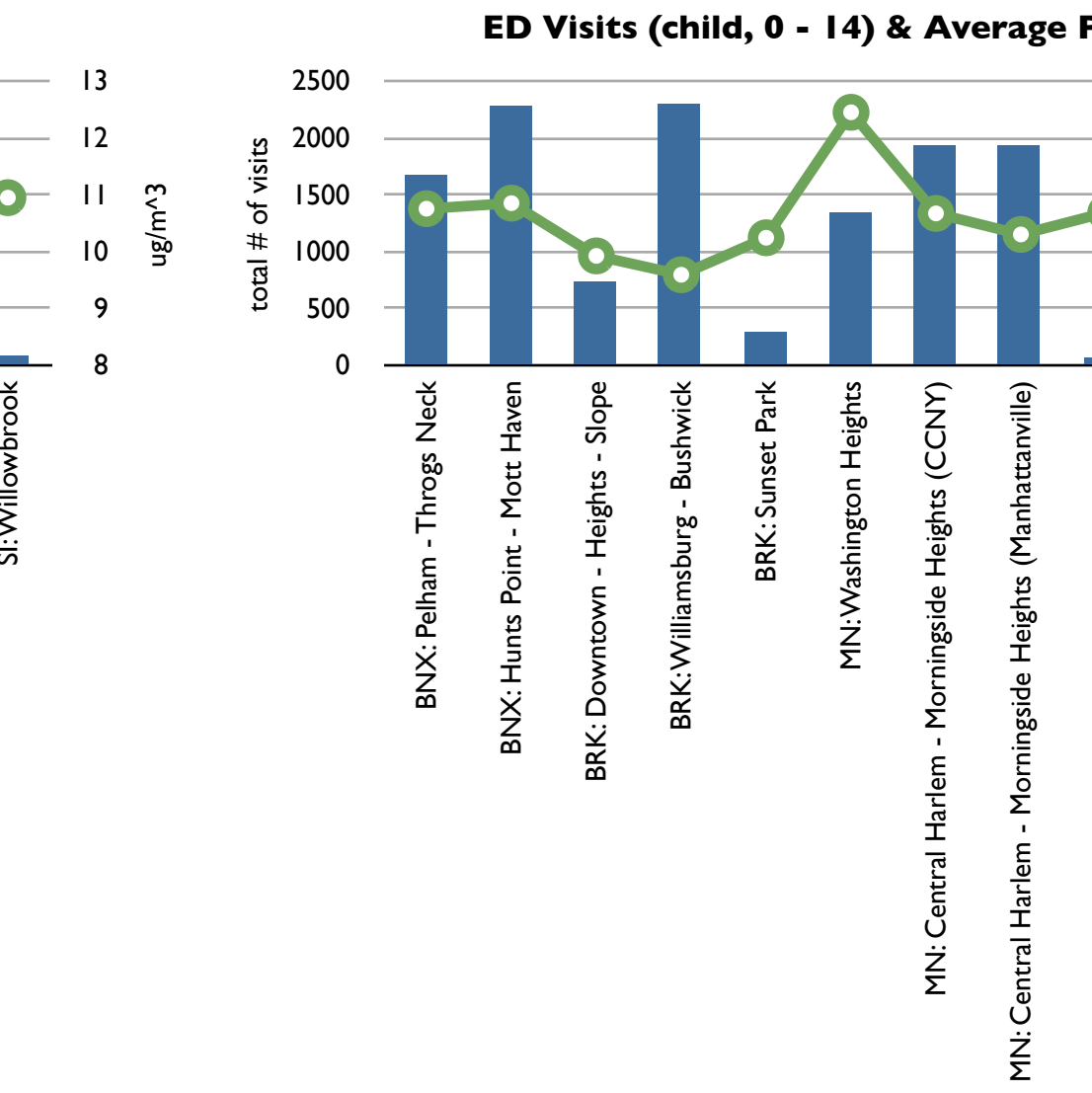
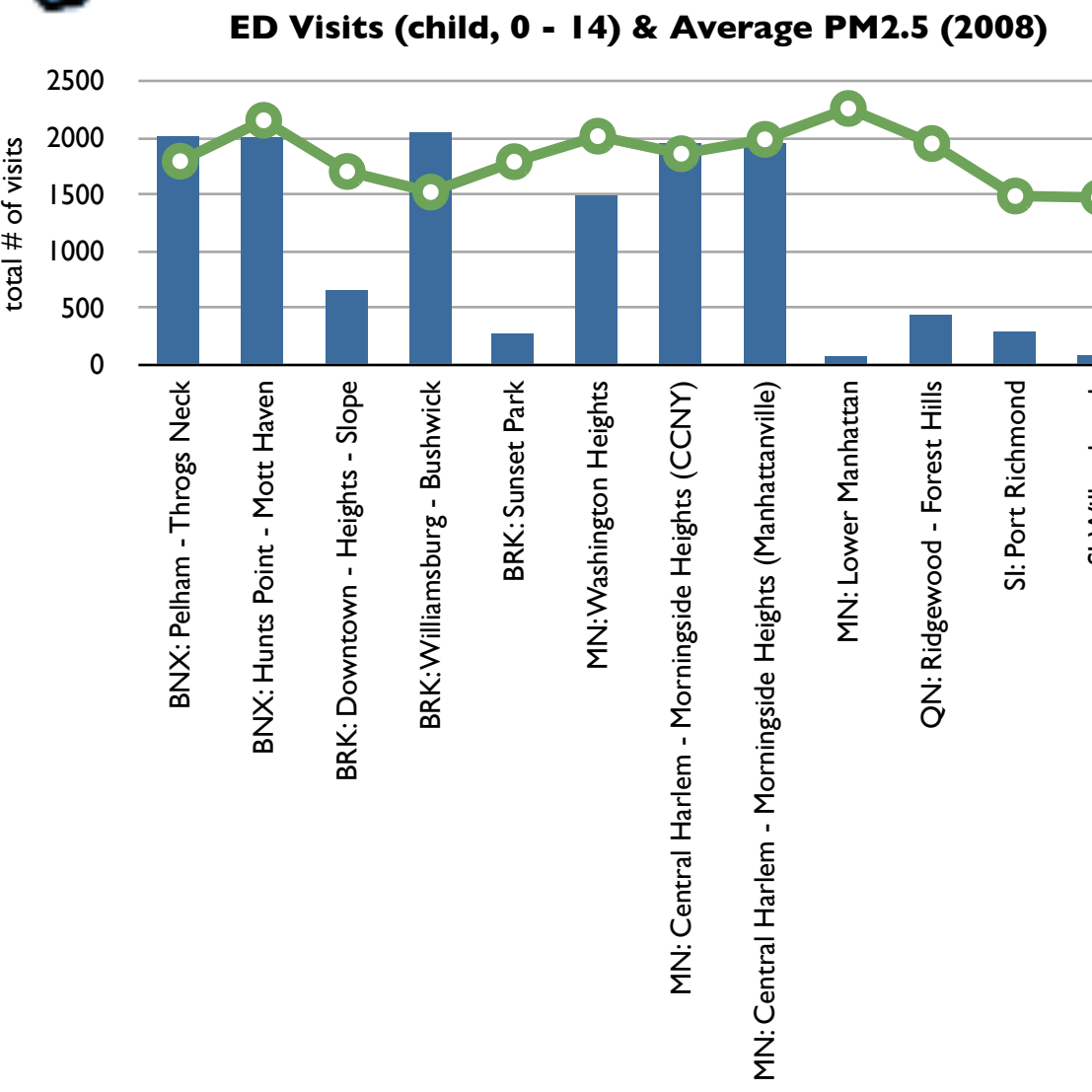
NYC Neighborhoods & Air Quality Monitoring Sites

Asthma Emergency Department Visits, 2008 - 2010
Rates per 10,000 (age 0 - 14)

- New York State: 158.2
- New York City: 256.2
- Bronx County: 408.6
- New York County (Manhattan): 303.6
- Kings County (Brooklyn & Queens): 219.5
- Richmond County (Staten Island): 118.6



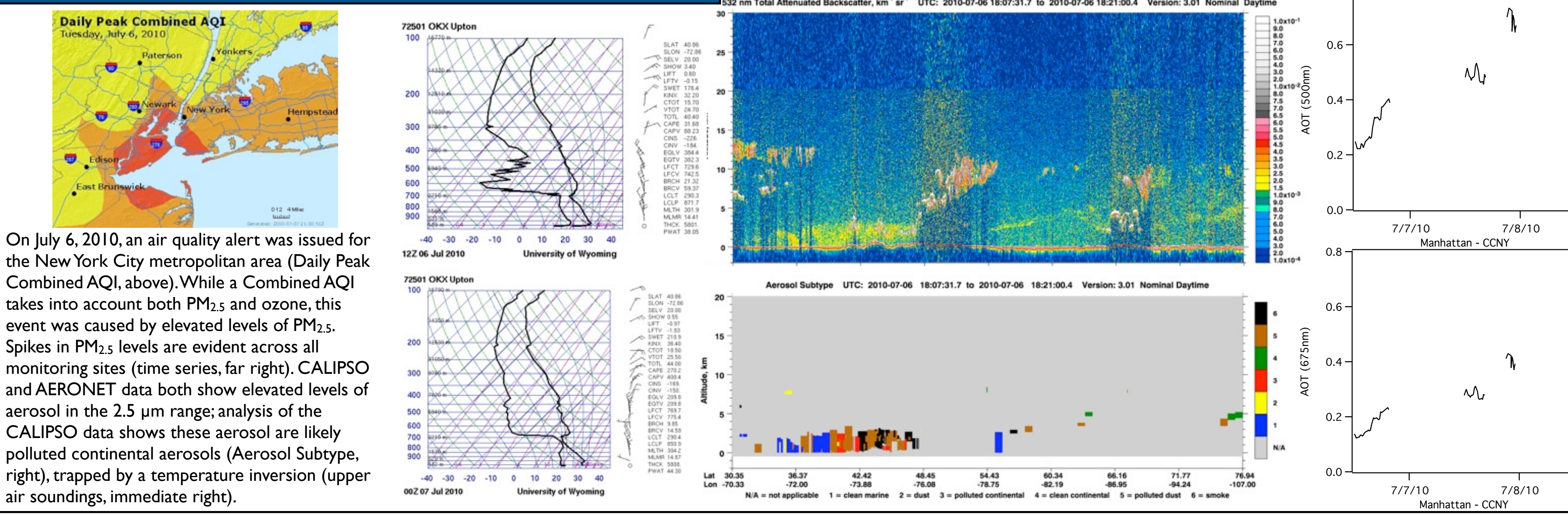
Map Number	Borough	Neighborhood Name	Air Quality Monitoring Site	Total ED Visits (2008)	Average PM2.5 (2008)	Total ED Visits (2009)	Average PM2.5 (2009)	Total ED Visits (2010)	Average PM2.5 (2010)
1	Bronx	Kingsbridge - Riverdale		244		201		219	
2	Bronx	Fordham - Bronx Pk.		2037		2000		1843	
3	Bronx	Northeast Bronx		1269		772		698	
4	Bronx	Crotona - Tremont		2915		2566		2690	
5	Bronx	Palham - Throg Neck	PS 74	2016	11.987	1675	10.754	1905	10.622
6	Bronx	High Bridge - Morrisania		3195		3095		3133	
7	Bronx	Hunter Point - Mott Haven	PS 154	2405	12.306	2280	10.851	2076	10.728
8	Brooklyn	Greenpoint		310		393		339	
9	Brooklyn	Downtown - Heights - Slope	PS 293	660	11.406	735	9.924	669	9.778
10	Brooklyn	Williamsburg - Bushwick	PS 274	2045	11.043	2298	9.592	2098	9.497
11	Brooklyn	Bedford Stuyvesant - Crown Heights		2735		2869		2884	
12	Brooklyn	Canarsie - Flatlands		773		826		803	
13	Brooklyn	Sunset Park	PS 314	279	11.578	298	10.243	302	9.512
14	Brooklyn	Borough Park		266		354		376	
15	Brooklyn	East Flatbush - Flatbush		1390		1654		1661	
16	Brooklyn	East New York		1745		1847		1751	
17	Brooklyn	Bensonhurst - Bay Ridge		125		145		189	
18	Brooklyn	Coney Island - Sheepshead Bay		447		479		451	
19	Manhattan	Lower Manhattan - Division St.		76,142	14.491	78,027	12.449	80,868	13.479
20	Manhattan	Central Harlem - Morningside Heights	CCNY	1956	11.715	1950	10.671	1941	10.129
21	Manhattan	Central Harlem - Morningside Heights	Manhattanville	1956	11.971	1930	10.301	1841	9.836
22	Manhattan	East Harlem		1745		1592		1440	
23	Manhattan	Upper West Side		533		480		469	
24	Manhattan	Upper East Side		202		206		213	
25	Manhattan	Chelsea - Clinton		193		205		171	
26	Manhattan	Gramercy Park - Murray Hill		130		151		151	
27	Manhattan	Greenwich Village - SoHo		45		34		46	
28	Manhattan	Union Square - Lower East Side		591		635		586	
29	Manhattan	Lower Manhattan - Division St.		76,142	12.515	78,027	10.667	80,868	10.397
30	Queens	Rockaways		771		867		722	
31	Queens	Long Island City - Astoria		596		537		537	
32	Queens	West Queens		1676		1836		1578	
33	Queens	Flushing - Clearview		378		428		349	
34	Queens	Bayside - Little Neck		104		98		76	
35	Queens	Ridgewood - Forest Hills	Maegeth	441	11.896	549	10.201	625	10.405
36	Queens	Fresh Meadows		193		223		204	
37	Queens	Southwest Queens		969		1167		1089	
38	Queens	Jamaica		1434		1900		1800	
39	Queens	Southeast Queens		592		715		671	
40	Staten Island	Port Richmond	PS 44	296	10.974	386	8.827	336	9.044
41	Staten Island	Willowbrook	Fresh Kills West	84	10.948	116	9.046	112	9.254
42	Staten Island	Stapleton - St. George		388		453		459	
43	Staten Island	South Beach - Tottenville		180		170		184	



Background & Analysis

This research project was initially inspired by my New York City public high school students, a disproportionate number of whom have asthma. Evidence -- both anecdotal and research-based -- indicates that, while New York City's asthma incidence rate is 60% higher than New York State, specific boroughs (and neighborhoods within those boroughs) are the drivers of this elevated rate. In New York State, information on asthma incidence is provided in two forms: data reported to the Statewide Planning and Research Cooperative System (SPARCS) by hospitals, and self-reported data. Analysis of the most recent SPARCS data on Emergency Department visits for asthma (2008 - 2010) reveal that the boroughs of the Bronx and Manhattan have much higher rates of asthma incidence (408.6 and 303.6 per 10,000, respectively) than Brooklyn, Queens (219.5 per 10,000) and Staten Island (118.6 per 10,000). However, delimiting the data by neighborhood reveals a clearer picture. For example, while the entire borough of Manhattan appears to have an elevated level of asthma incidence, only 3 neighborhoods -- Washington Heights, Central Harlem/Morningside Heights and East Harlem -- have elevated levels of asthma incidence; the remaining 7 neighborhoods have far fewer ED visits for asthma. Similar patterns appear in Brooklyn and Queens. During the same time period (2008 - 2010), the New York Department of Environmental Conservation maintained 12 air quality monitoring sites that, hourly, measured levels of 2.5µm Particulate Matter (PM_{2.5}). Time series plots of this hourly data (right) show clear episodes of elevated PM_{2.5} levels (one such air quality event is investigated below). However, when yearly averages are computed, differences between sites are shown to be relatively small. While there is some correlation between elevated average PM_{2.5} and elevated asthma incidence (above), there are also air quality monitoring sites in neighborhoods with low levels of asthma incidence (Division Street in Lower Manhattan, for example). The nature of the data available makes determining direct causation between elevated PM_{2.5} and elevated asthma incidence difficult. Air quality data obtained directly from the NYDEC has not been quality controlled, calling into question the accuracy of the calculated averages. Data reported to SPARCS is not date-specific; ED visits for asthma are reported for an entire year, making direct comparison between specific air quality events and ED visits for asthma difficult. Obtaining location- and date-specific data on ED visits for asthma directly from hospitals is a necessary next step in drawing accurate conclusions on the relationship between PM_{2.5} and asthma in New York City.

Anatomy of an Air Quality Event



Acknowledgements

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- Thanks to Daniel Andronico (Pan American International High School @ Monroe) for suggesting New York City's Environmental Public Health Tracking Portal as a source for asthma data.
- In memoriam Dorrell C. Clark.

Resources

- NASA LaRC CALIPSO LIDAR data & imagery (http://www-calipso.larc.nasa.gov/tools/data_avail/)
- NASA GSFC AERONET data & imagery (http://aeronet.gsfc.nasa.gov/new_web/data.html)
- University of Wyoming, Department of Atmospheric Science upper air data (<http://weather.uwyo.edu/upperair/sounding.html>)
- New York Department of Environmental Conservation air quality data (<http://www.dec.ny.gov/airmon/>)
- New York State Department of Health asthma prevalence data (http://www.health.ny.gov/statistics/ny_asthma/index.htm)
- New York City Environmental Public Health data on ER visits for asthma (<http://a816-dohbesp.nyc.gov/IndicatorPublic/>)