

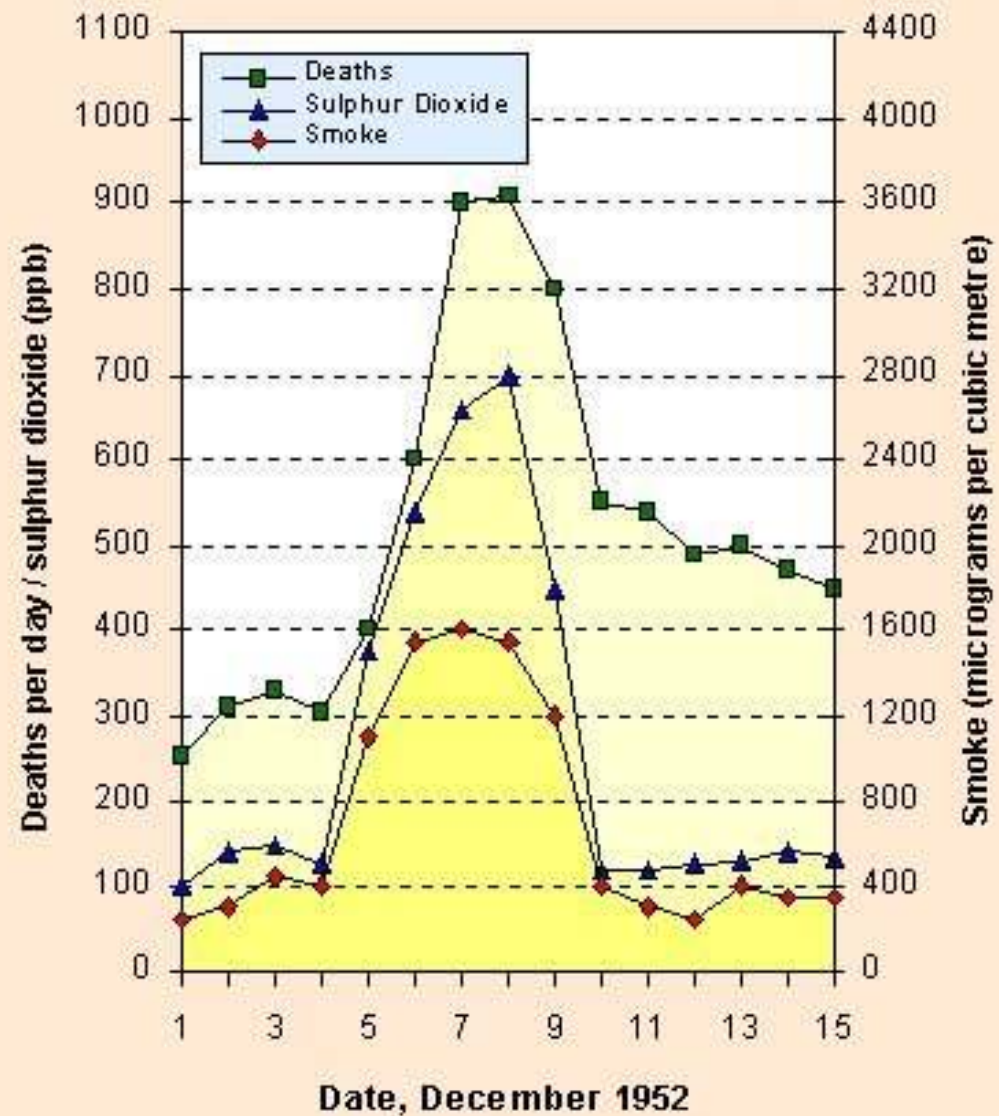


Impact of Air Quality on Health

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Over 4,000 deaths (cardiopulmonary) were attributable to the Great London Smog of December 1952



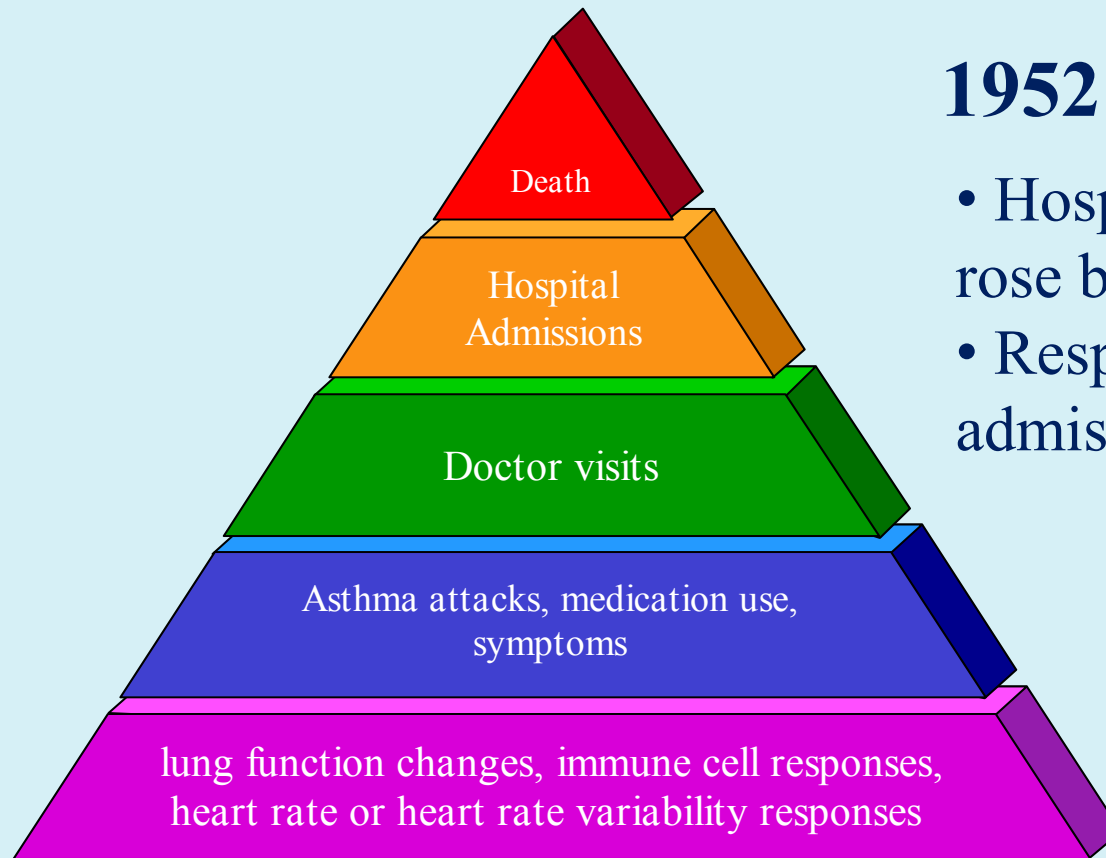
Deaths Registered in London Administrative County Classified by Age (Bates, 1995)							
	< 1 Month of Age	1-12 Mo. Old	1-14 Years of Age	15-44 Years of Age	45-64 Years of Age	65-74 Years of Age	75+ Years of Age
Week Before the Episode	16	12	10	61	237	254	335
Week After the Episode	28	26	13	99	652	717	949
Before/ After Episode Ratio	1.75	2.17	1.3	1.62	2.75	2.82	2.83

The greatest relative increase in mortality was from bronchitis, which rose nine-fold





Health Effects of Ambient Particulate Matter



1952 London Fog

- Hospital admissions rose by 50%
- Respiratory admissions by 160%





Health impact of fine particulate pollution

Steubenville

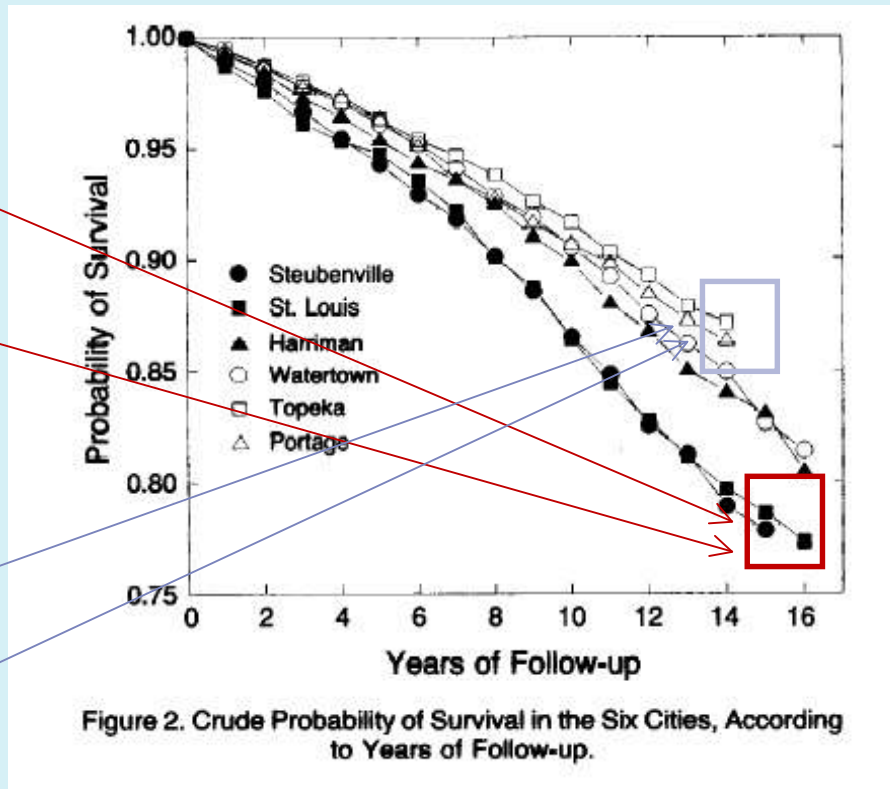
St. Louis

Harriman

Watertown

Topeka

Portage

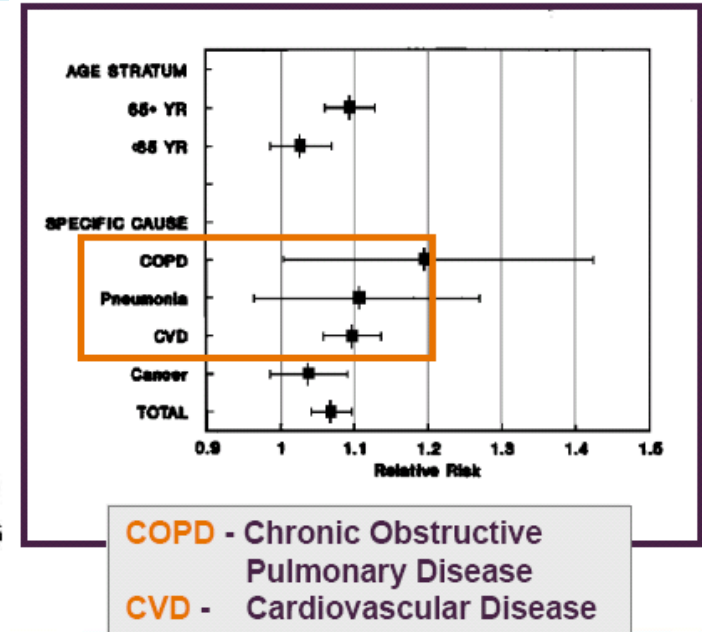
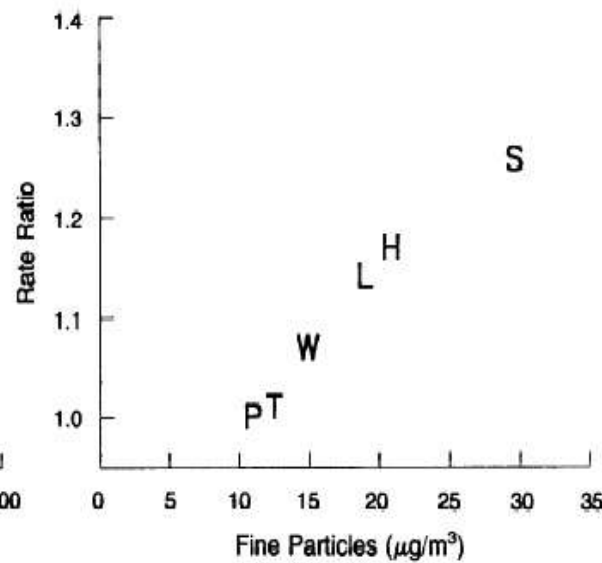
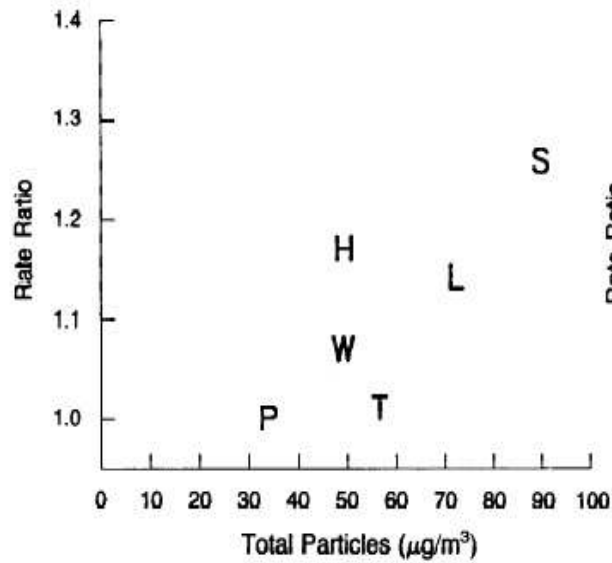


Dockery DW, et al. N Engl J Med 1993;329(24):1753-9





The Six Cities study

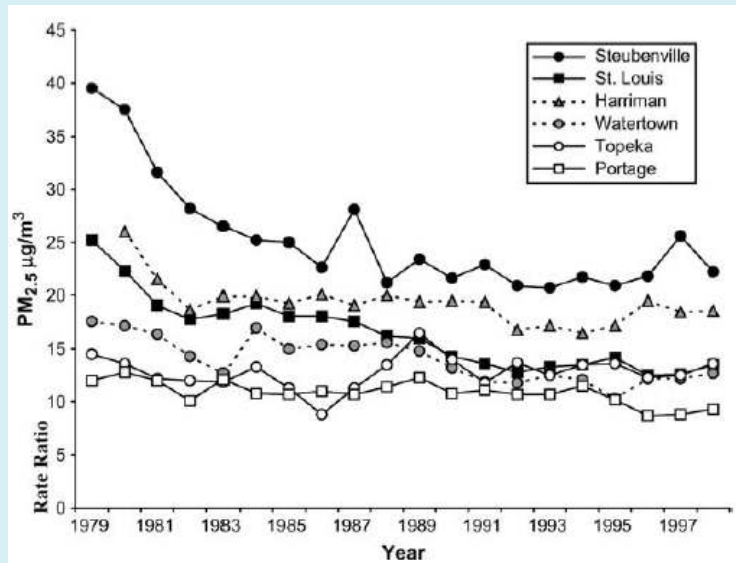


Dockery DW, et al. N Engl J Med 1993 Dec 9;329(24):1753-9



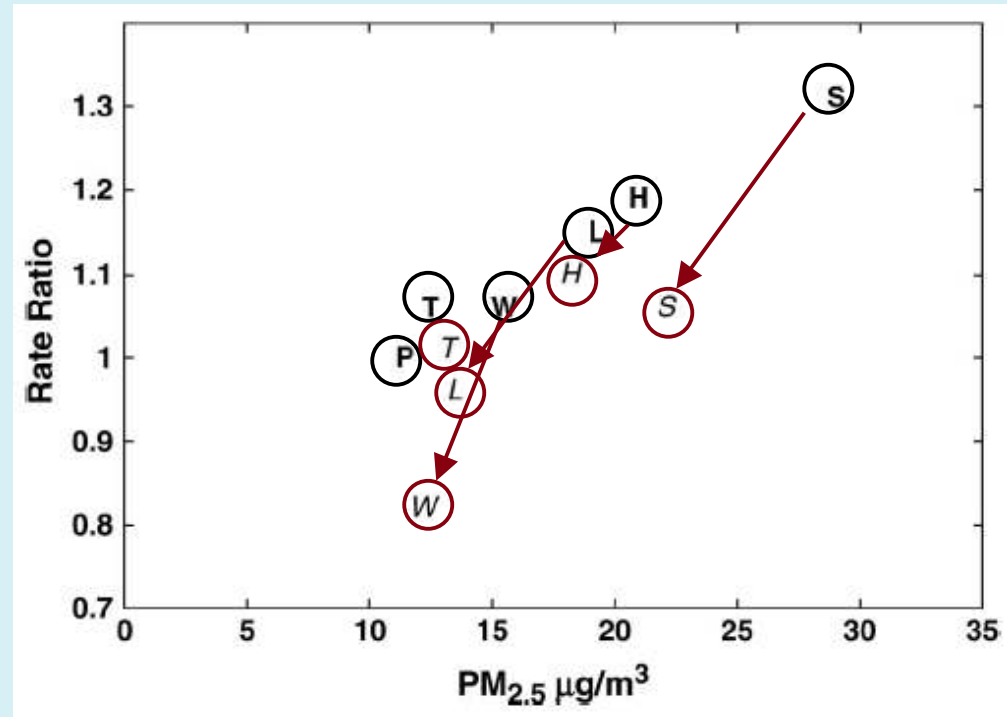


PM_{2.5} Reduction & Mortality: 6 Cities follow-up



Period 1: 1974-89

Period 2: 1990-98

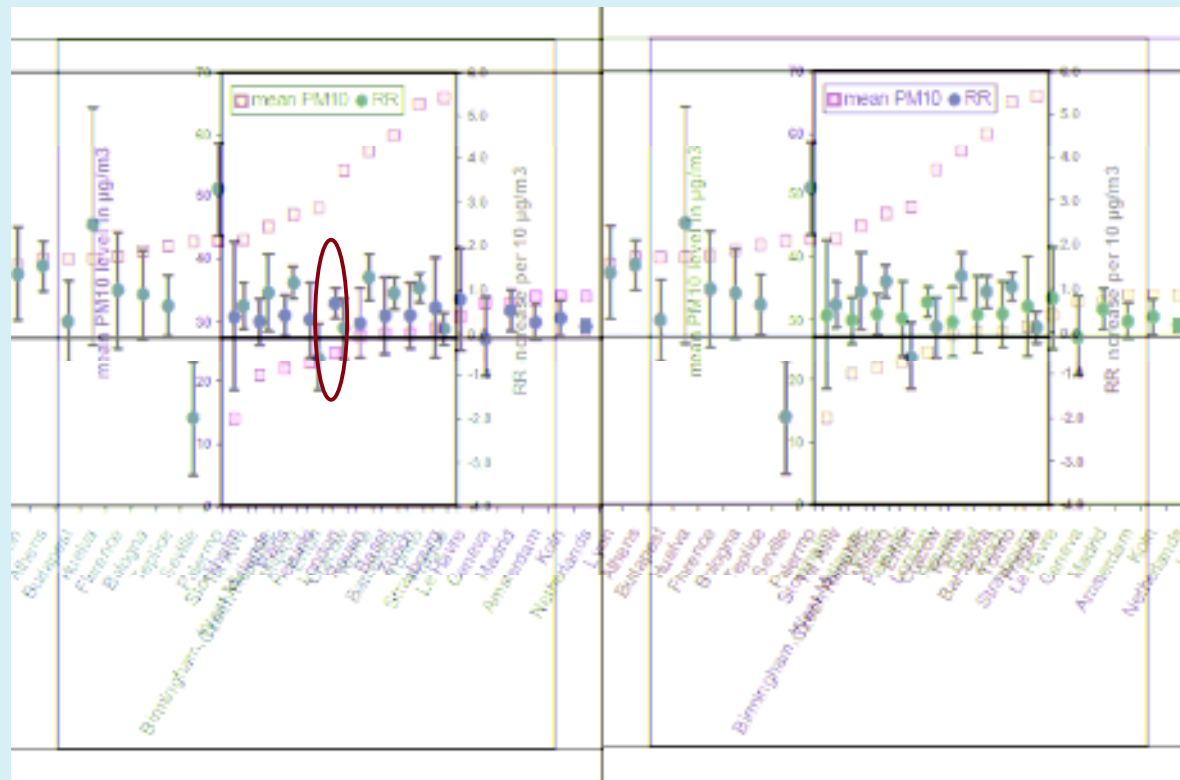


Laden F et al/ Am J Respir Crit Care Med. 2006 Mar 15;173(6):667-72.





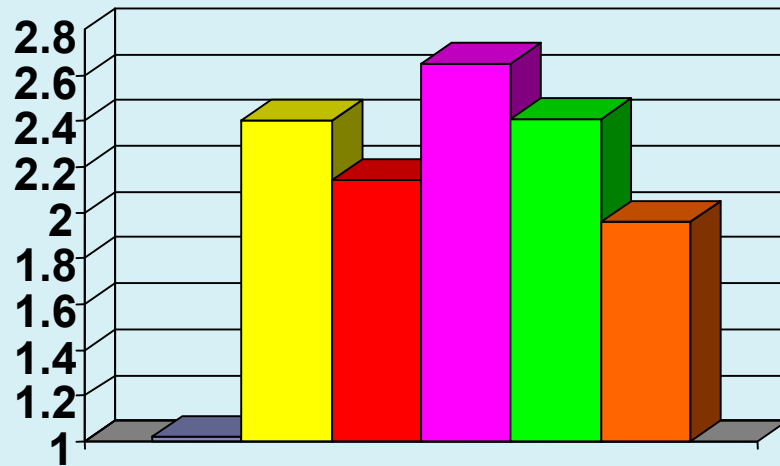
Ranking of PM_{10} estimates for all-cause mortality by annual average levels of PM_{10}





Truck traffic and symptoms

Janssen EHP 2003; 111: 1512



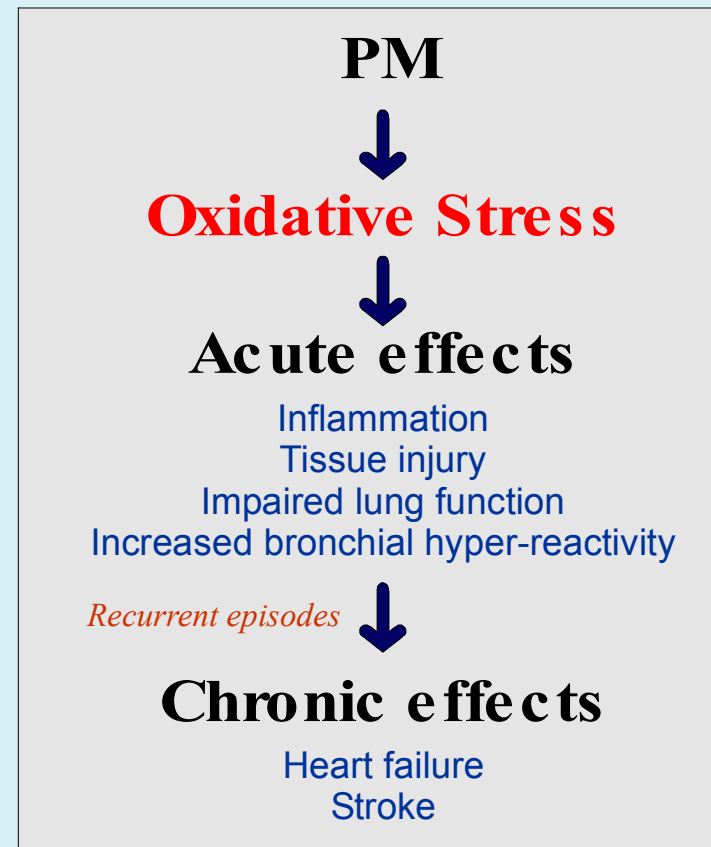
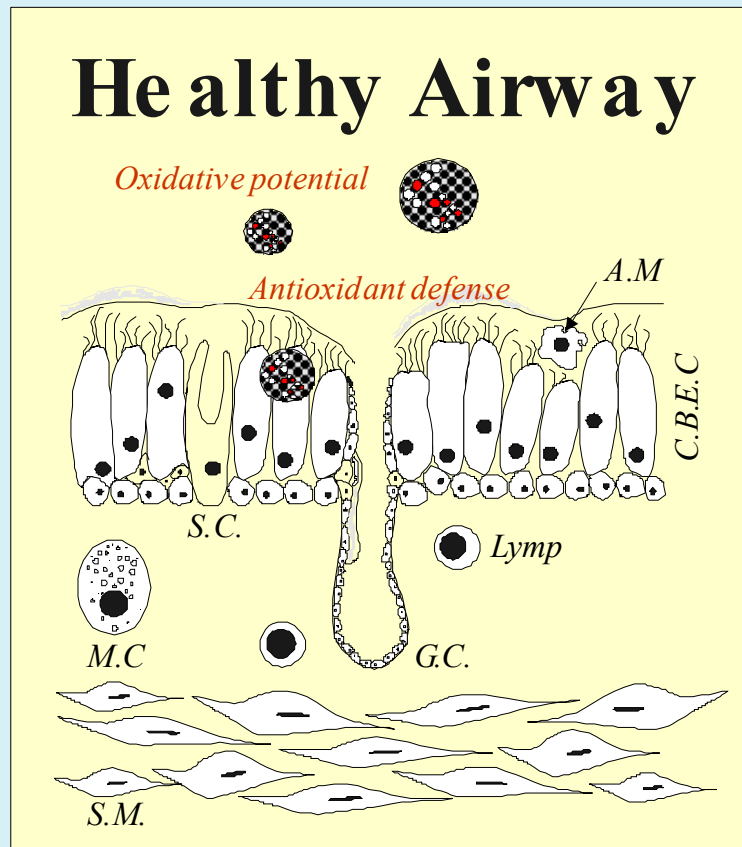
Odds ratio for 22,326 vs. 5,190 trucks/day

- asthma
- hayfever
- phlegm
- itchy rash
- bronchitis
- wheeze last year



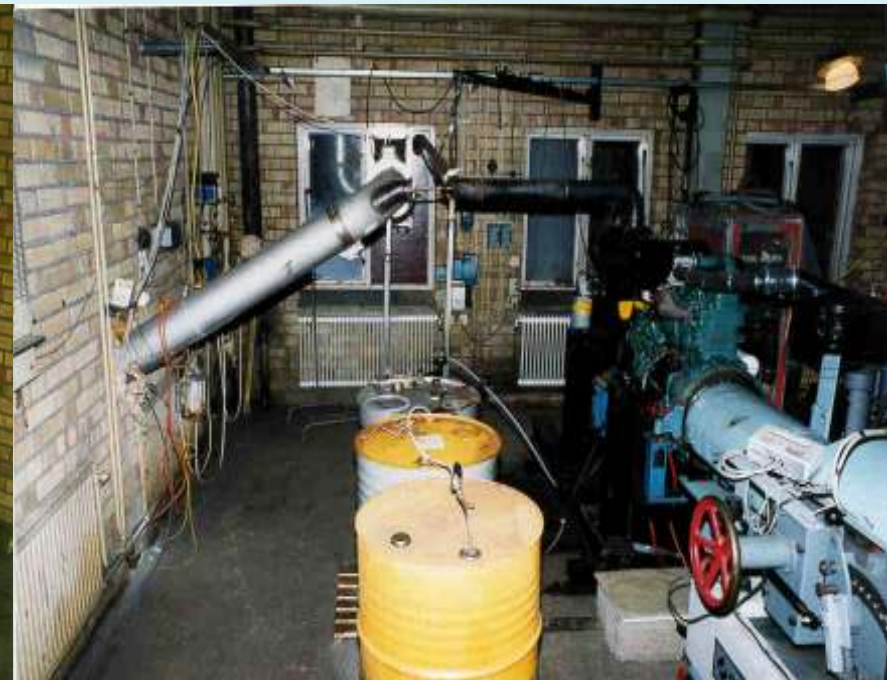


Understanding the mechanisms driving PM-induced health effects





Controlled Diesel Exposures

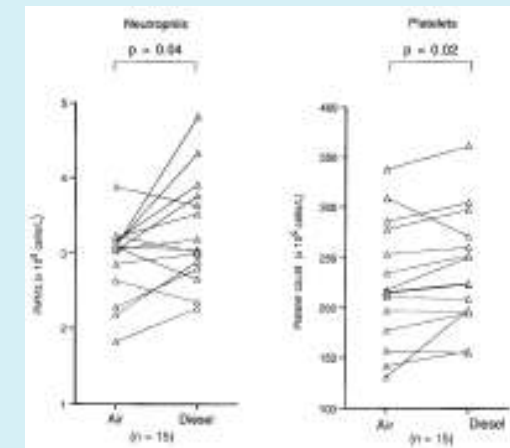
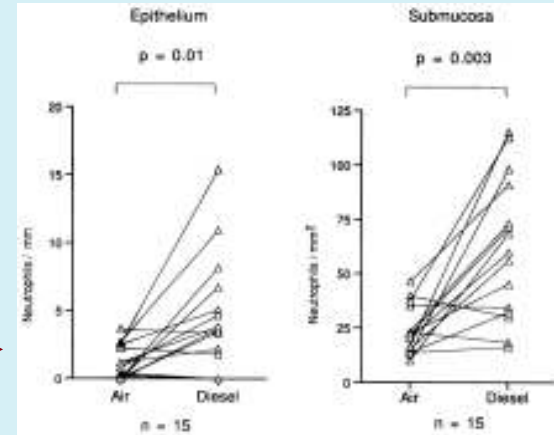
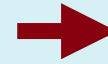
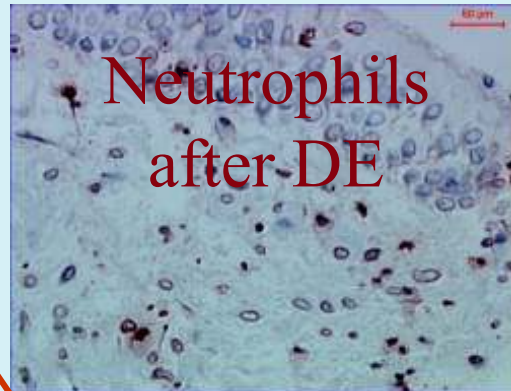
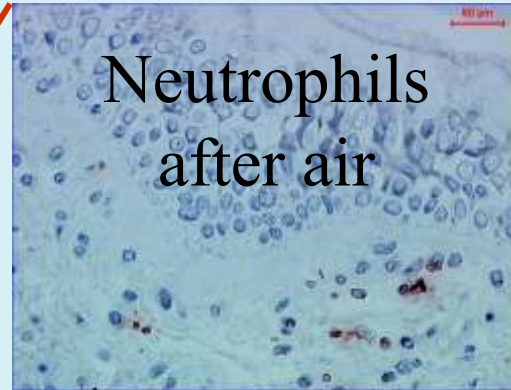
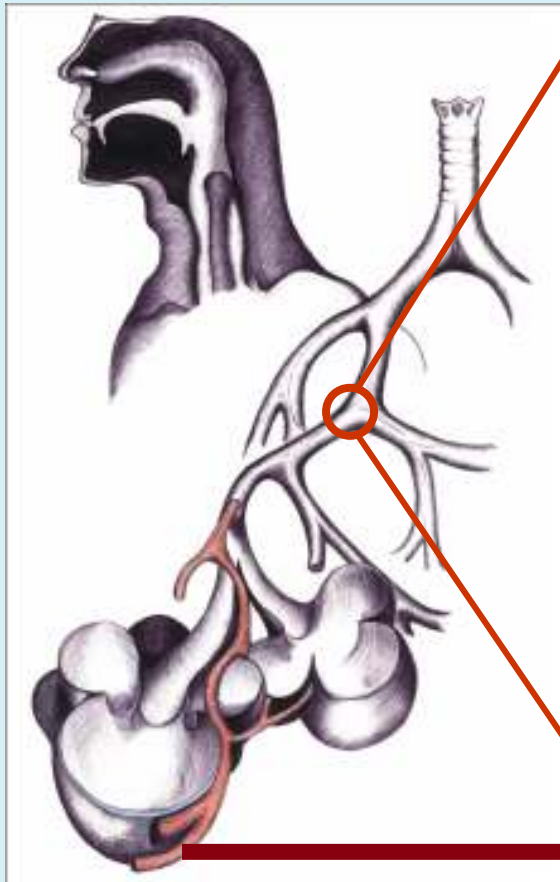


Exposure to DE: PM_{10} $300\mu g/m^3$ and filtered air for 1 hour & $100\mu g/m^3$ and filtered air for 2 hours





Diesel induced inflammation ($300\mu\text{g}/\text{m}^3$)

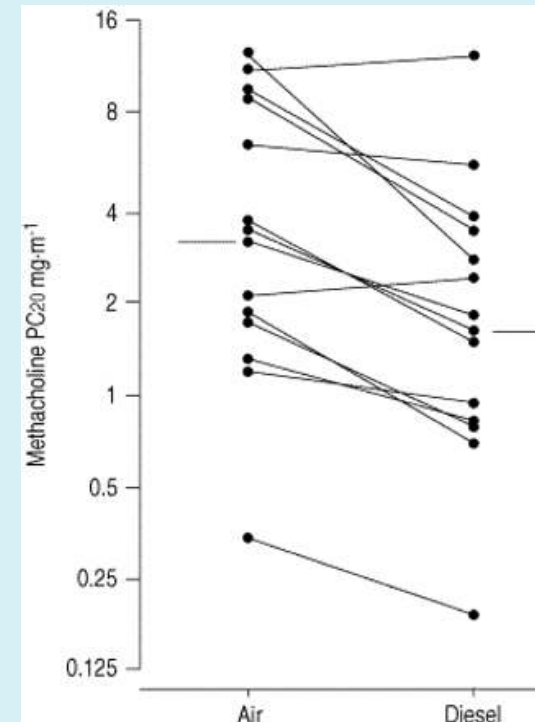
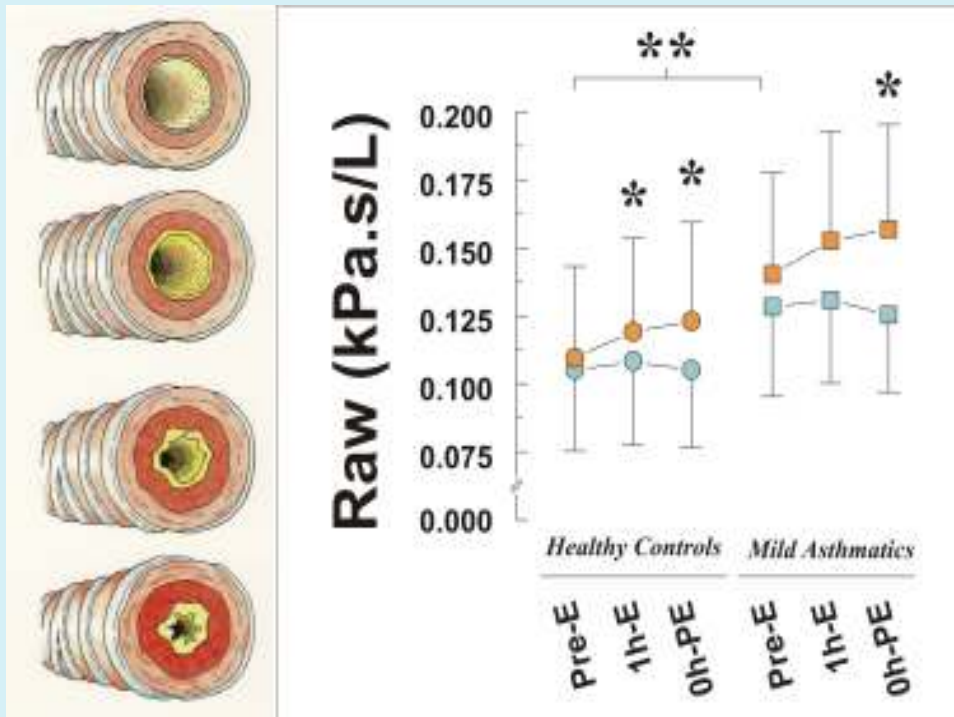




Pulmonary responses to DE

Impaired lung function
($100\mu\text{g}/\text{m}^3$)

Increase airway hyper-reactivity ($300\mu\text{g}/\text{m}^3$)



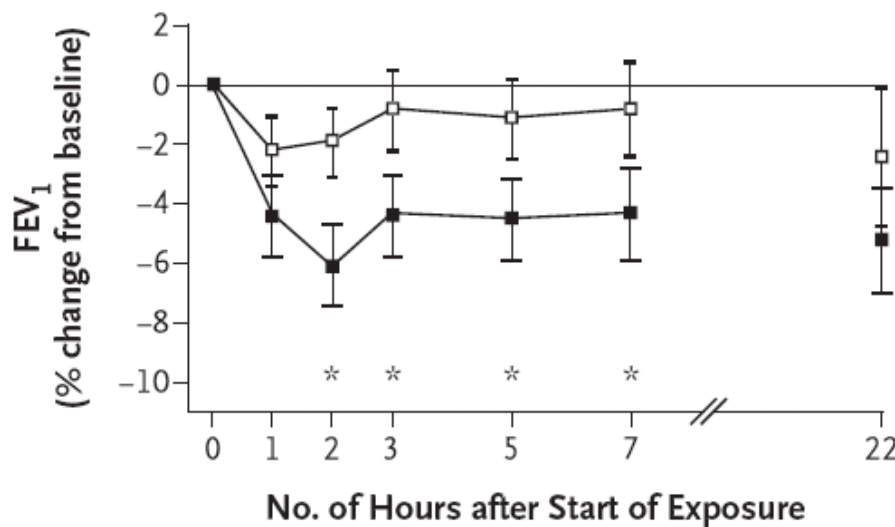


Responses to PM in the Real World

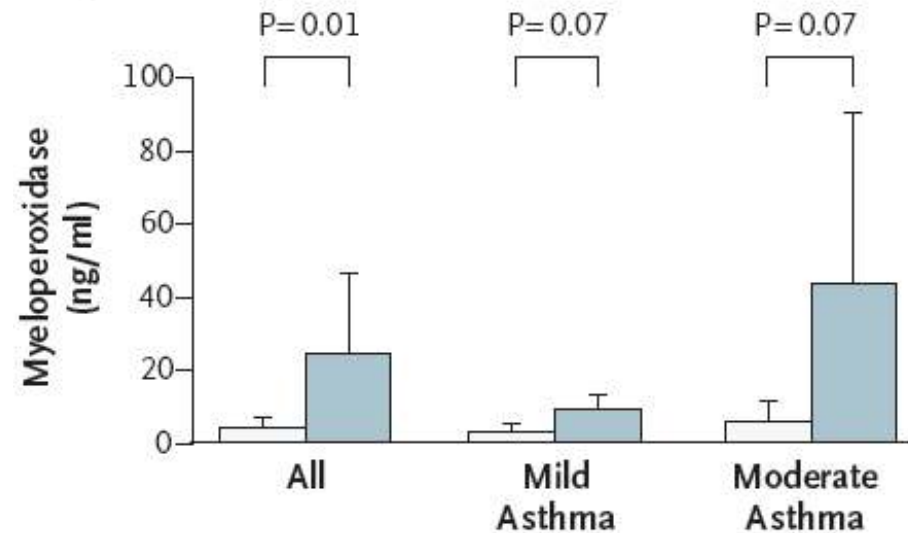
Impaired lung function

Inflammation

A All Participants



Supernatant Myeloperoxidase



—□— Hyde Park exposure

—■— Oxford Street exposure

McCreanor J et al. N Engl J Med. 2007 Dec 6;357(23):2348-58





Summary

- Prolonged exposure to elevated PM is associated with significant life-shortening and poor respiratory health
- The strength of the health impacts varies between locations for reasons that are not fully understood
- Subjects with pre-existing cardiopulmonary conditions are particularly sensitive
- Reductions in ambient PM provide measurable health benefits
- Human chamber and field exposures have provided mechanistic evidence to underpin the validity of the epidemiological observations





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