

Air Quality and Health

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1 vision **9** priorities **95** improvement programmes **400** lives saved

Overview

- Air Quality
- Health Effects of Air Pollution
 - Short-term
 - Long-term
- Health Costs of Air Pollution
- Air Quality and Inequality

Air Quality

- Air pollution is an unseen killer
- Wide variety of pollutants in our air
- No safe levels, but evidence based Air Quality standards set based on known effects on health and the environment

Air Quality Standards

Pollutant	UK Objective	WHO Guideline
PM _{2.5}	25 $\mu\text{g}/\text{m}^3$ annual mean	10 $\mu\text{g}/\text{m}^3$ annual mean 25 $\mu\text{g}/\text{m}^3$ 24 hour mean
PM ₁₀	40 $\mu\text{g}/\text{m}^3$ annual mean 50 $\mu\text{g}/\text{m}^3$ not to be exceeded more than 35 times per year	20 $\mu\text{g}/\text{m}^3$ annual mean 50 $\mu\text{g}/\text{m}^3$ 24 hour mean
Ozone	120 $\mu\text{g}/\text{m}^3$ not to be exceeded more than 25 times per year (3 yr ave.)	100 $\mu\text{g}/\text{m}^3$ 8 hour mean
NO ₂	40 $\mu\text{g}/\text{m}^3$ annual mean 200 $\mu\text{g}/\text{m}^3$ 1 hour mean (not to be exceeded more than 18 times per year)	40 $\mu\text{g}/\text{m}^3$ annual mean 200 $\mu\text{g}/\text{m}^3$ 1 hour mean
SO ₂	125 $\mu\text{g}/\text{m}^3$ 24 hour mean (not to be exceeded >3 times a year) 350 $\mu\text{g}/\text{m}^3$ 1 hour mean (not to be exceeded >24 times a year)	20 $\mu\text{g}/\text{m}^3$ 24 hour mean 500 $\mu\text{g}/\text{m}^3$ 10 minute mean

Air Quality Standards

Further standards exist for: -

- Benzene
- Carbon Monoxide
- Lead
- Nitrogen Oxide (NB, NO forms NO₂)
- Polycyclic aromatic hydrocarbons (PAHs)
- 1,3, Butadiene

Environmental tobacco smoke

- No standards, but legislation re smoking in public places

Health Effects of Air Pollution

- Effects vary with individuals sensitivity, with vulnerable groups including:-
 - Young children
 - Older people
 - Those with airway diseases (COPD, Asthma etc)
 - Those with cardiovascular disease
- However no-one is immune to the effects of air pollution
 - Halving life-long exposure to fine particles offers a potential 1-11 months increase in life expectancy

Short Term Health Effects

- Day to day changes in air pollution can significantly affect those with asthma and COPD
- Mortality and hospital admissions are associated with high air pollution levels
 - CVD patients
 - Lung disease patients
 - The elderly
- 2003 August Heatwave (2 weeks)
 - Estimated 225 – 593 excess deaths due to increased Ozone and 207 attributed to increased particulate matter
 - 21-38% of excess deaths from the heatwave attributed to air pollution

Long Term Health Effects

- Dependant on exposures: -
 - Type
 - Time
 - Levels
- Carcinogens – mainly low levels across UK, higher within workplaces and industrial environments. Tobacco smoke
- Particulates, NO_x, SO₂ irritate the lungs and can have a long term effect on lung capacity
- Air pollutants also enter the blood stream, irritating the lining of blood vessels and contributing to heart and circulatory disease

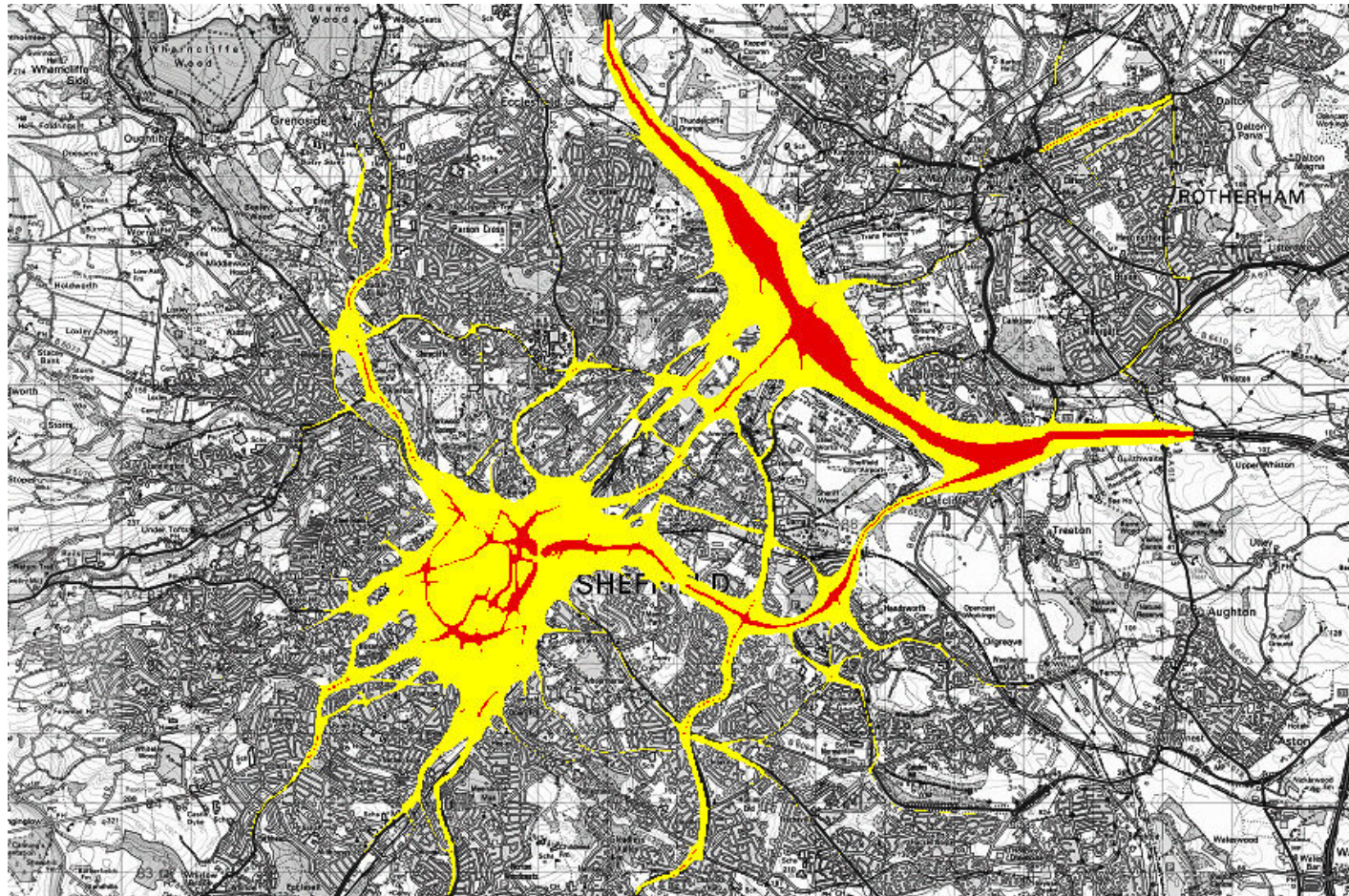
Health Costs of Air Pollution

- UK estimates indicate between 35000 and 50000 premature deaths per year (Sheffield c.1%)
- 2007 Air Quality Strategy – cross govt analysis gave costs of £8.5bn - £20.2bn relating to man-made particulate pollution (mortality alone)

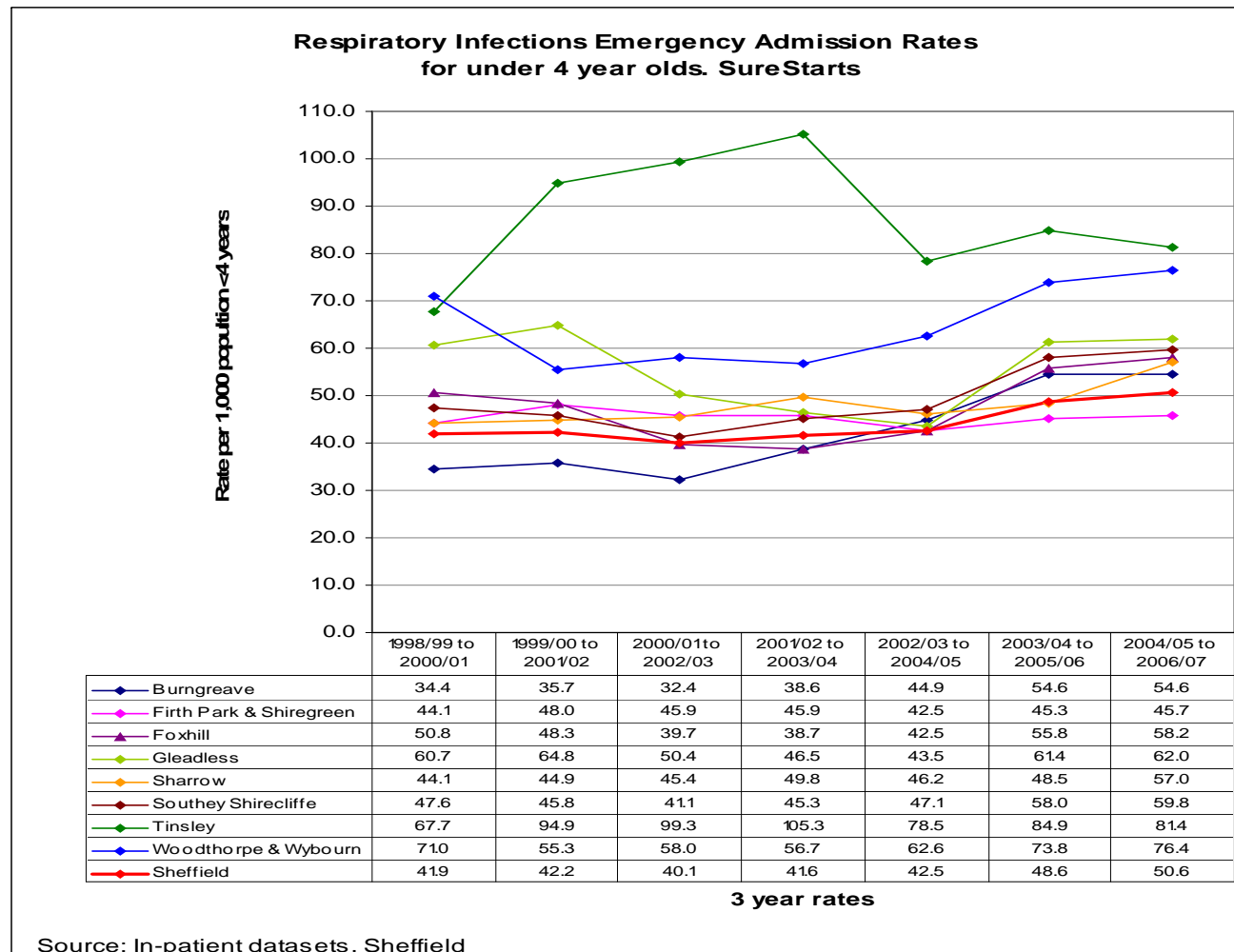
Air Quality and Inequality

- Air quality variations reflect variation in deprivation
- Sheffield developed to have its affluent areas up wind of its industry
- Transport infrastructure developed to supply industry

NO_x Map for Sheffield



Emergency Respiratory Admissions in Under 4s



UK Inequalities in Exposure to High Pollution Levels

Decile	NO₂	PM₁₀	O₃	SO₂
1	18.8	20.3	0.8	13.2
2	21.3	22.7	2.0	12.6
3	16.7	17.2	4.2	12.2
4	11.8	11.4	9.1	10.8
5	9.6	9.0	14.0	10.3
6	6.0	6.3	16.3	10.5
7	6.0	4.7	16.6	9.4
8	3.9	3.5	16.0	9.3
9	3.4	3.4	14.2	7.4
10	2.8	2.0	9.5	4.2
CI value	0.353	0.389	-0.243	0.136
Average µg/m³*	40.6/40.9	27.4/27.8	70.9	207/190

* Average values for high concentration areas for decile 10 / decile 1

Triple Jeopardy

1. Deprivation
2. Poor air quality
3. Higher susceptibility