

Health Effects of Poor Air Quality

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URBAN CHANGE

Kent and Medway Air Quality Partnership, 14th October 2010



AN ASSOCIATION BETWEEN AIR POLLUTION AND MORTALITY IN SIX U.S. CITIES

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Abstract *Background.* Recent studies have reported associations between particulate air pollution and daily mortality rates. Population-based, cross-sectional studies of metropolitan areas in the United States have also found associations between particulate air pollution and annual mortality rates, but these studies have been criticized, in part because they did not directly control for cigarette smoking and other health risks.

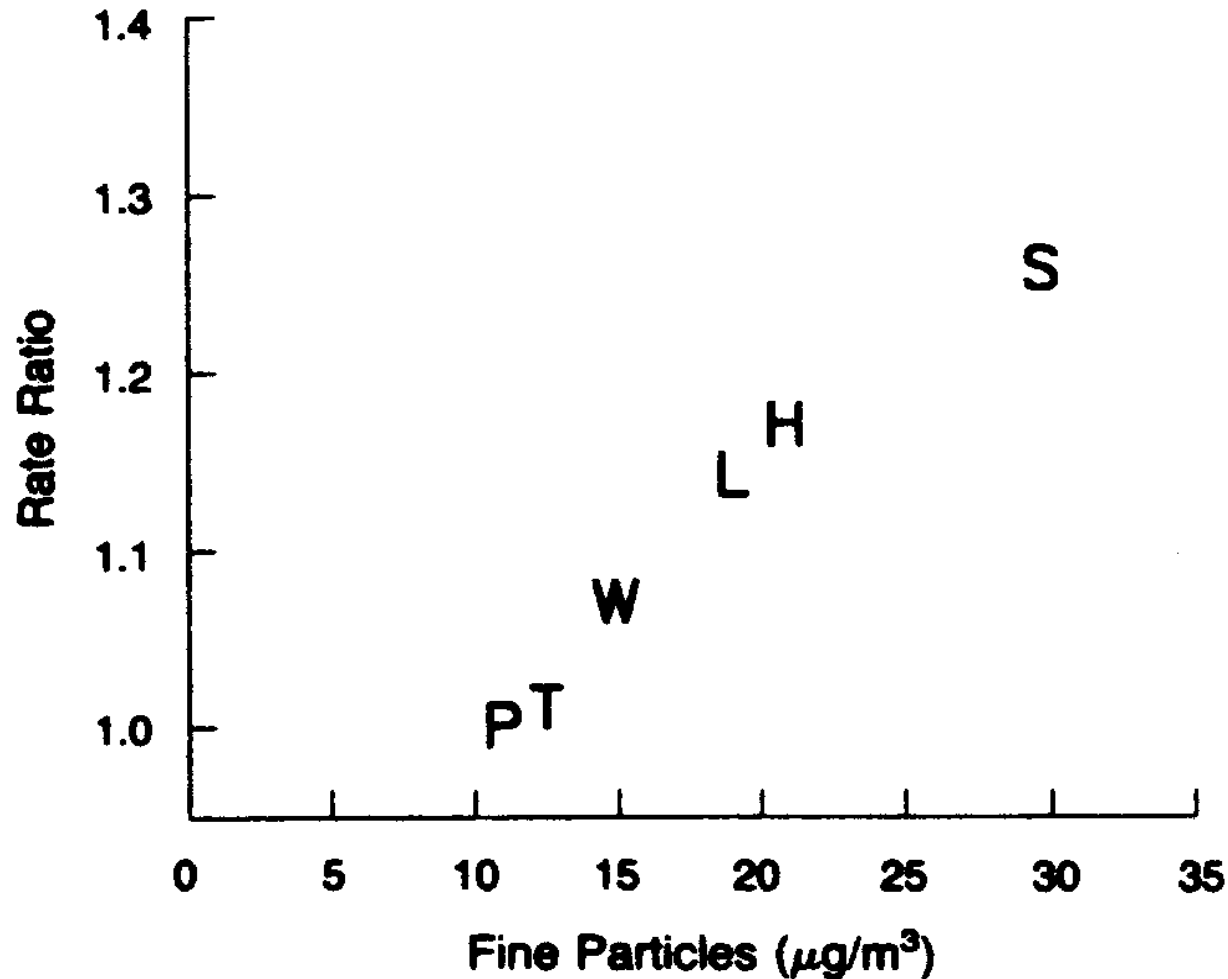
Methods. In this prospective cohort study, we estimated the effects of air pollution on mortality, while controlling for individual risk factors. Survival analysis, including Cox proportional-hazards regression modeling, was conducted with data from a 14-to-16-year mortality follow-up of 8111 adults in six U.S. cities.

Results. Mortality rates were most strongly associated with cigarette smoking. After adjusting for smoking and

other risk factors, we observed statistically significant and robust associations between air pollution and mortality. The adjusted mortality-rate ratio for the most polluted of the cities as compared with the least polluted was 1.26 (95 percent confidence interval, 1.08 to 1.47). Air pollution was positively associated with death from lung cancer and cardiopulmonary disease but not with death from other causes considered together. Mortality was most strongly associated with air pollution with fine particulates, including sulfates.

Conclusions. Although the effects of other, unmeasured risk factors cannot be excluded with certainty, these results suggest that fine-particulate air pollution, or a more complex pollution mixture associated with fine particulate matter, contributes to excess mortality in certain U.S. cities. (N Engl J Med 1993;329:1753-9.)

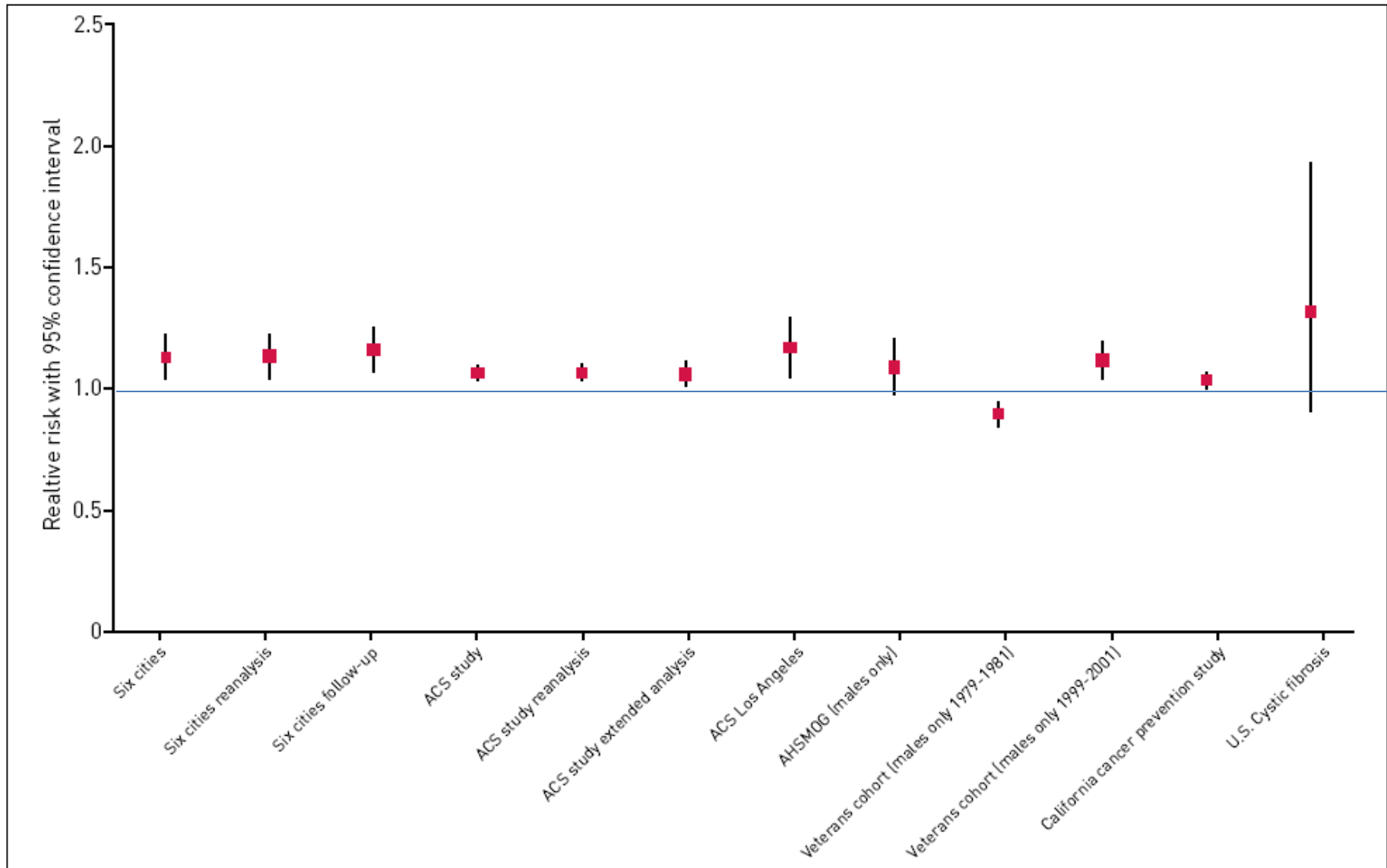
Association between air pollution and mortality



What we have learnt: 1993-2010

1. The epidemiologically observed association between premature death and long term residence in areas with high PM concentrations is robust.
2. The deaths are largely due to cardio-pulmonary causes.
3. Similar associations have been observed with asthma exacerbations and aggravation of other respiratory disease, and in many locations the prevalence of asthma and allergy.
4. Proximity to busy roads, with a high density of diesel vehicles increases the risk of negative health effects

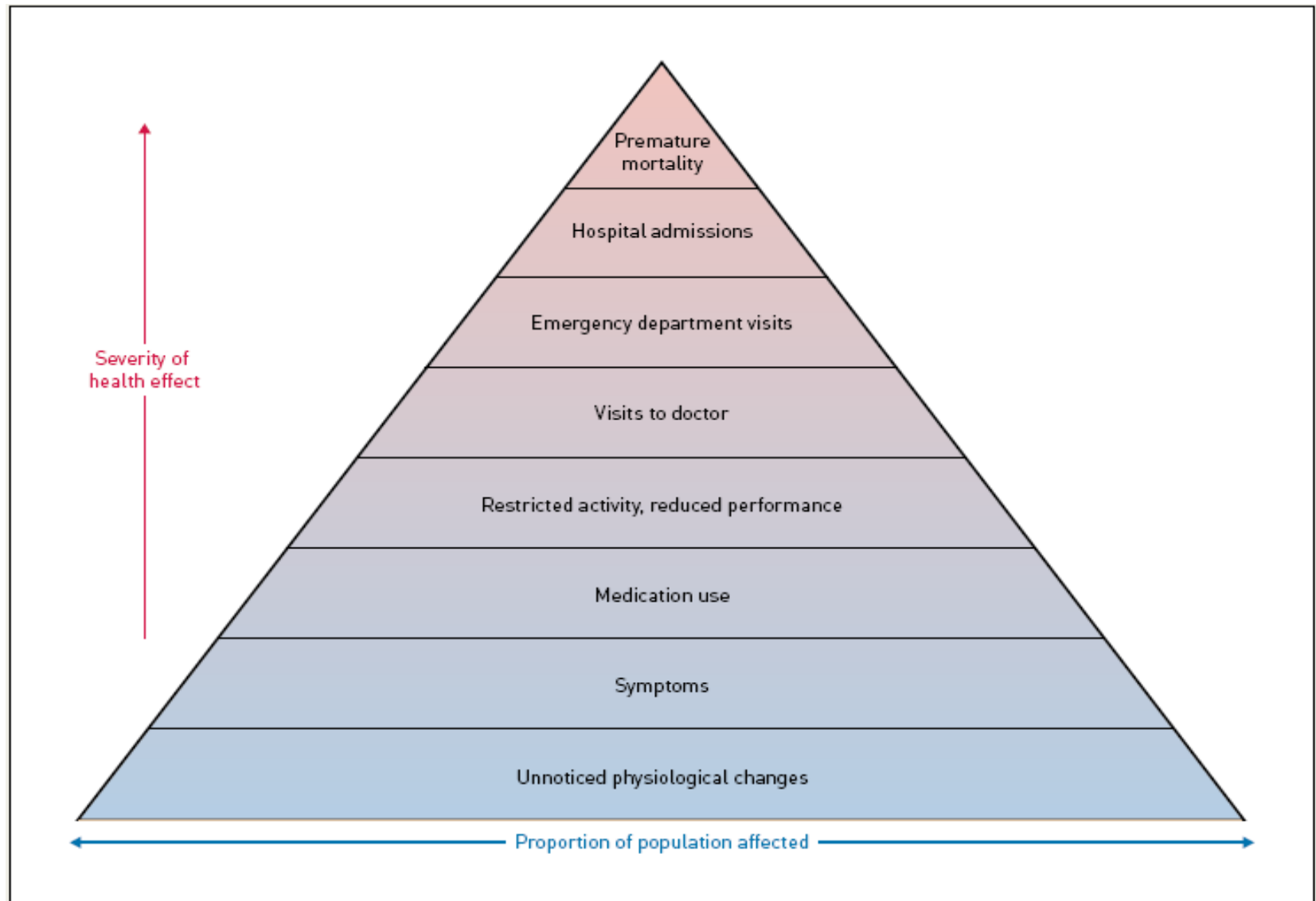
Associations between long term exposure to PM2.5 and mortality



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Impact of air pollution on health



Recent and predominant directions for PM (and ozone) research

- Reproductive outcomes
- Neurological outcomes
- Vitamin Deficiency



**<25nmol
(deficiency)**

**<75nmol
(insufficiency)**

Hyponnen UK 2007

White 45 yr olds

15%

87%

Hull Tower Hamlets 2007

White

24%

80%

Asian

49%

98%

Somali / African

59%

100%

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SPECIAL REPORT 17

HEALTH
EFFECTS
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January 2010

PRESS
VERSION
January 12, 2010

Traffic-Related Air Pollution: A Critical Review of the Literature on Emissions, Exposure, and Health Effects

HEI Panel on the Health Effects
of Traffic-Related Air Pollution

Summary of Air Pollution Related Health Effects- Toxicology and Epidemiology Evidence Synthesis

Health Outcome	Association with Air Pollution Exposure
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Mortality and Morbidity

All-cause and Cardiovascular mortality
Cardiovascular morbidity

Suggestive but not sufficient
Suggestive but not sufficient

Asthma and Respiratory - Children

Asthma onset and prevalence
Exacerbation of asthma symptoms

Sufficient
Sufficient

Asthma and Respiratory - Adults

Adult-onset of asthma
Respiratory symptoms

Inadequate
Suggestive but not sufficient

Respiratory Symptoms

Pulmonary function

Suggestive but not sufficient

Other Health Outcomes

Birth Outcomes
Cancer

Suggestive but not sufficient
Inadequate



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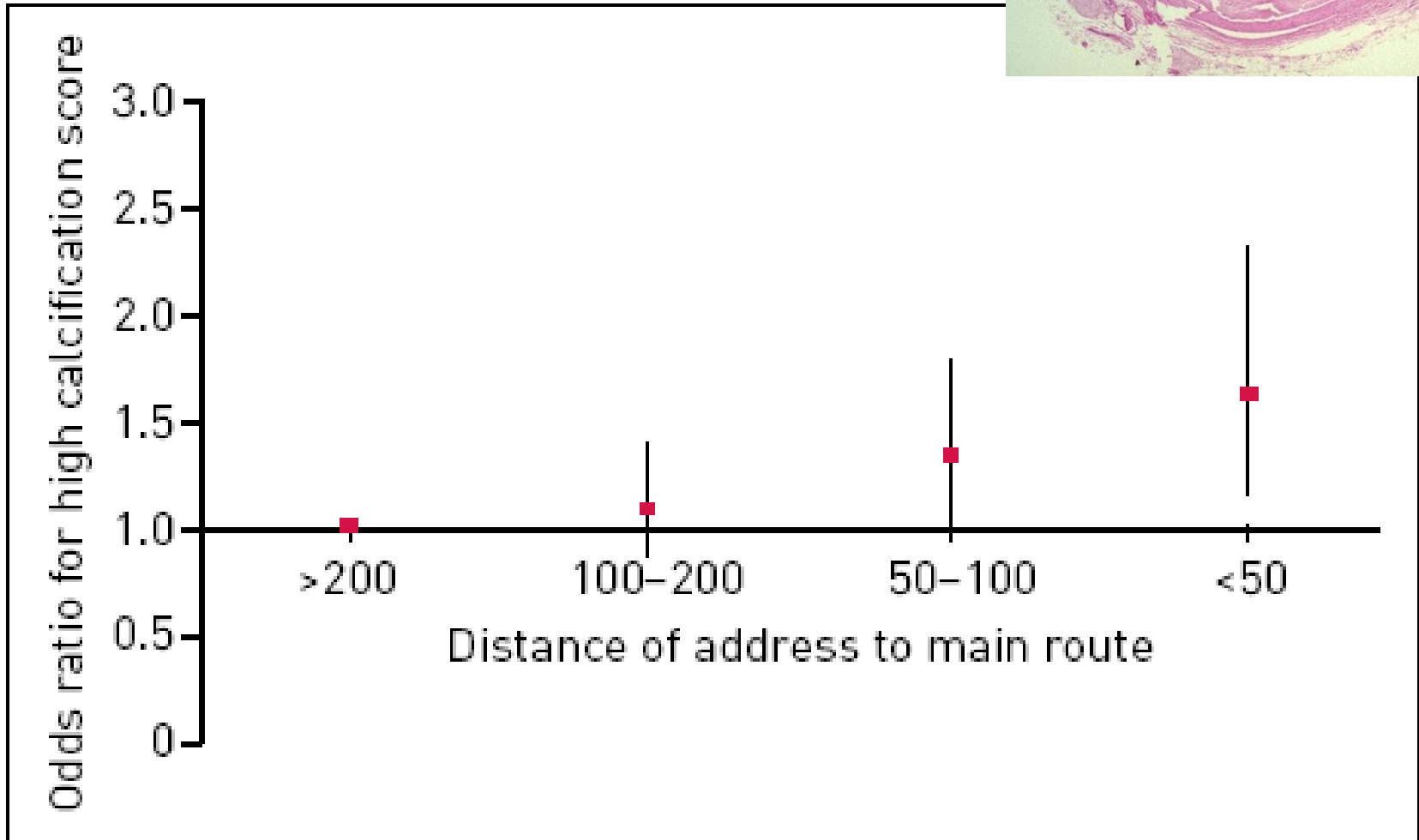
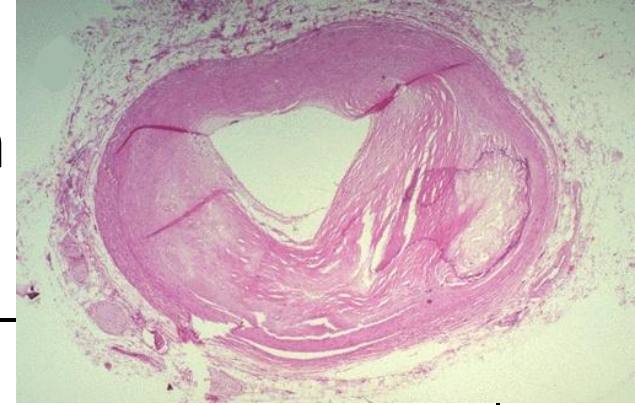
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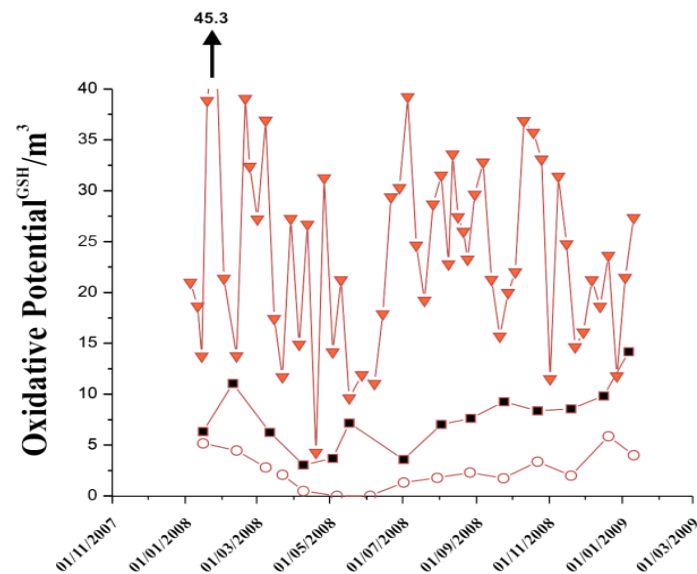
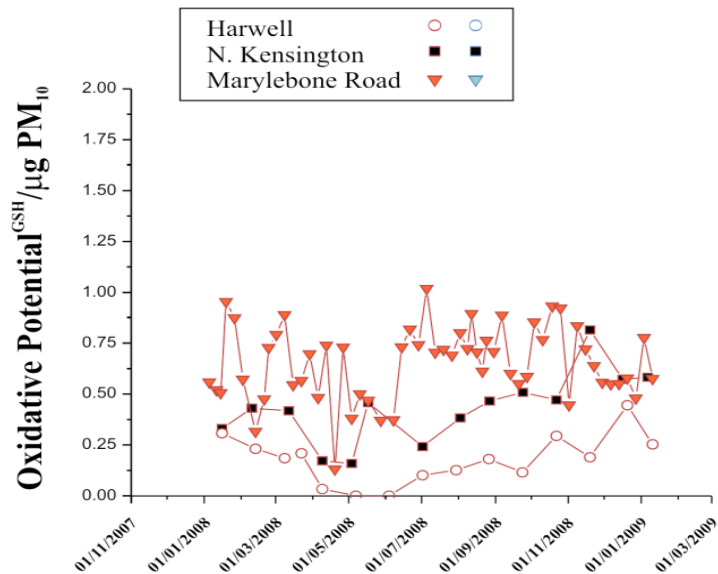
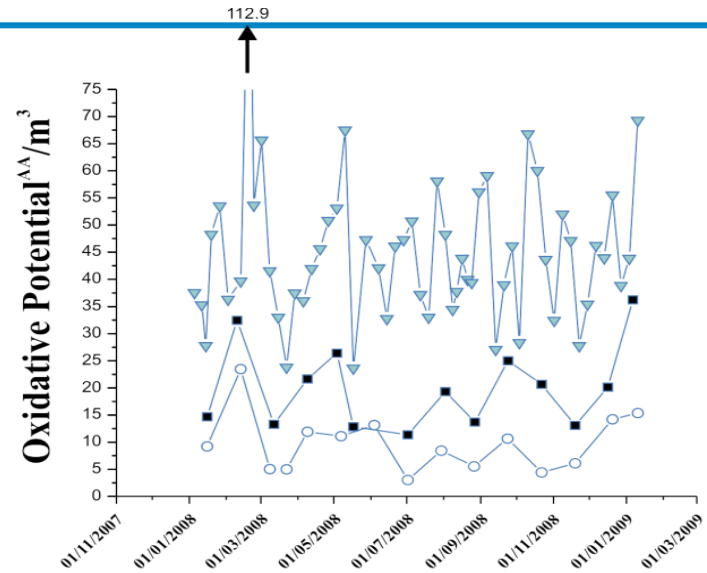
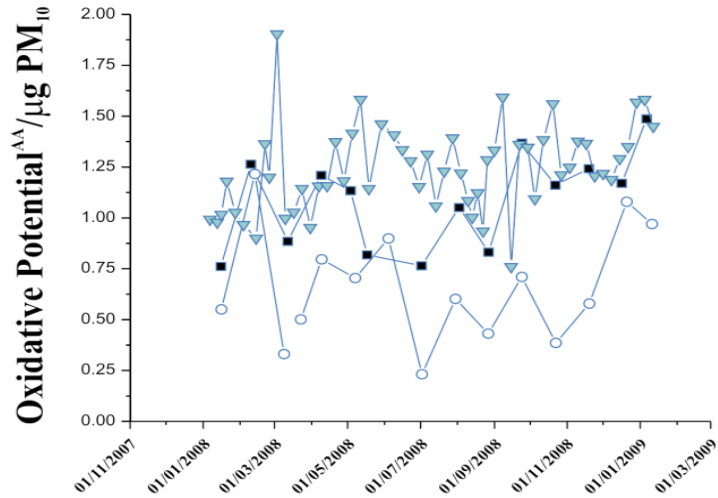
HEI Panel on the Health Effects
of Traffic-Related Air Pollution

.. there is a lack of mechanistic evidence with which to interpret epidemiological evidence....

Risk of coronary artery calcification and distance to heavy traffic



PM oxidative activity is location sensitive





EFFECTS OF AIR POLLUTION ON CHILDREN'S HEALTH AND DEVELOPMENT

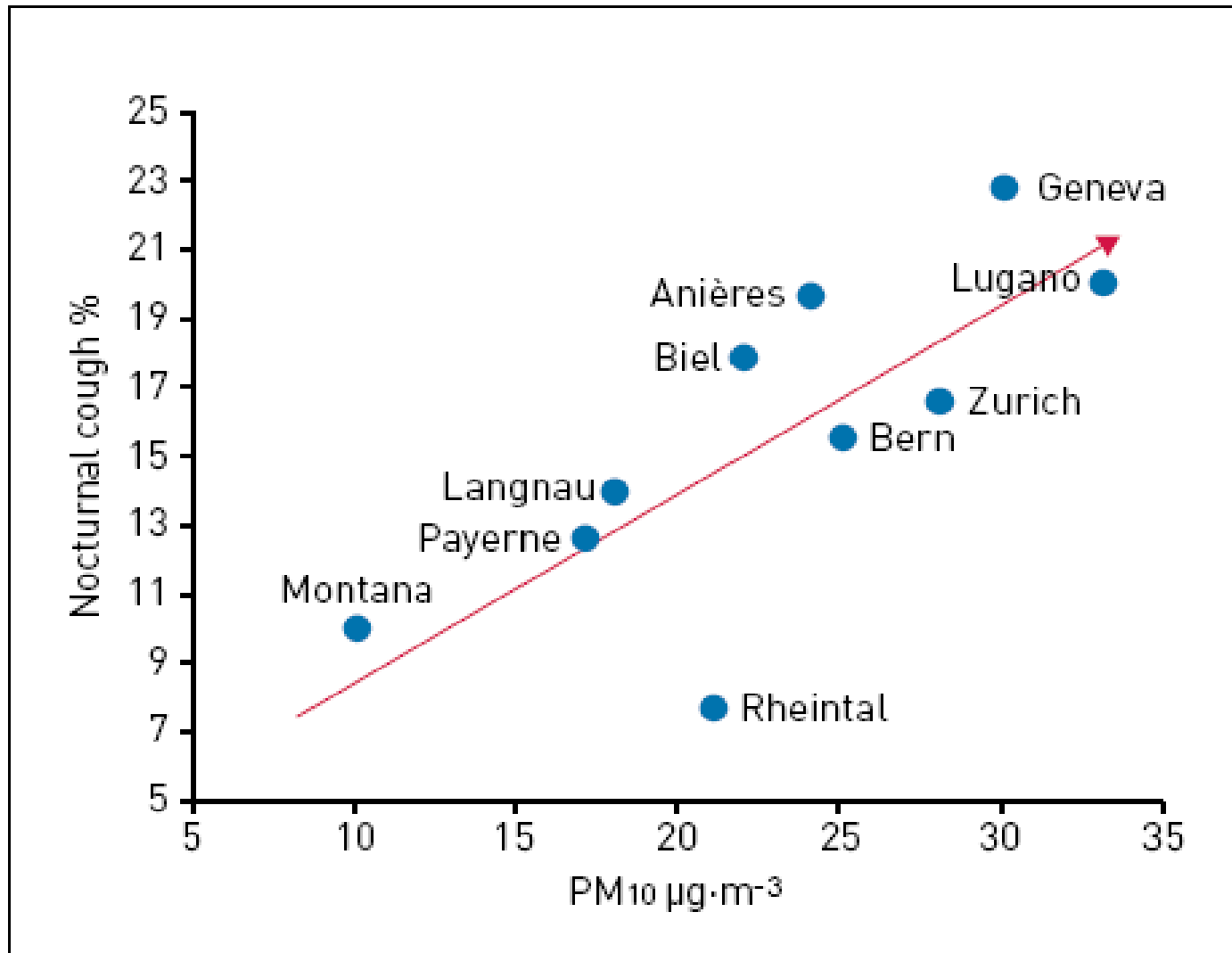


EUROPE



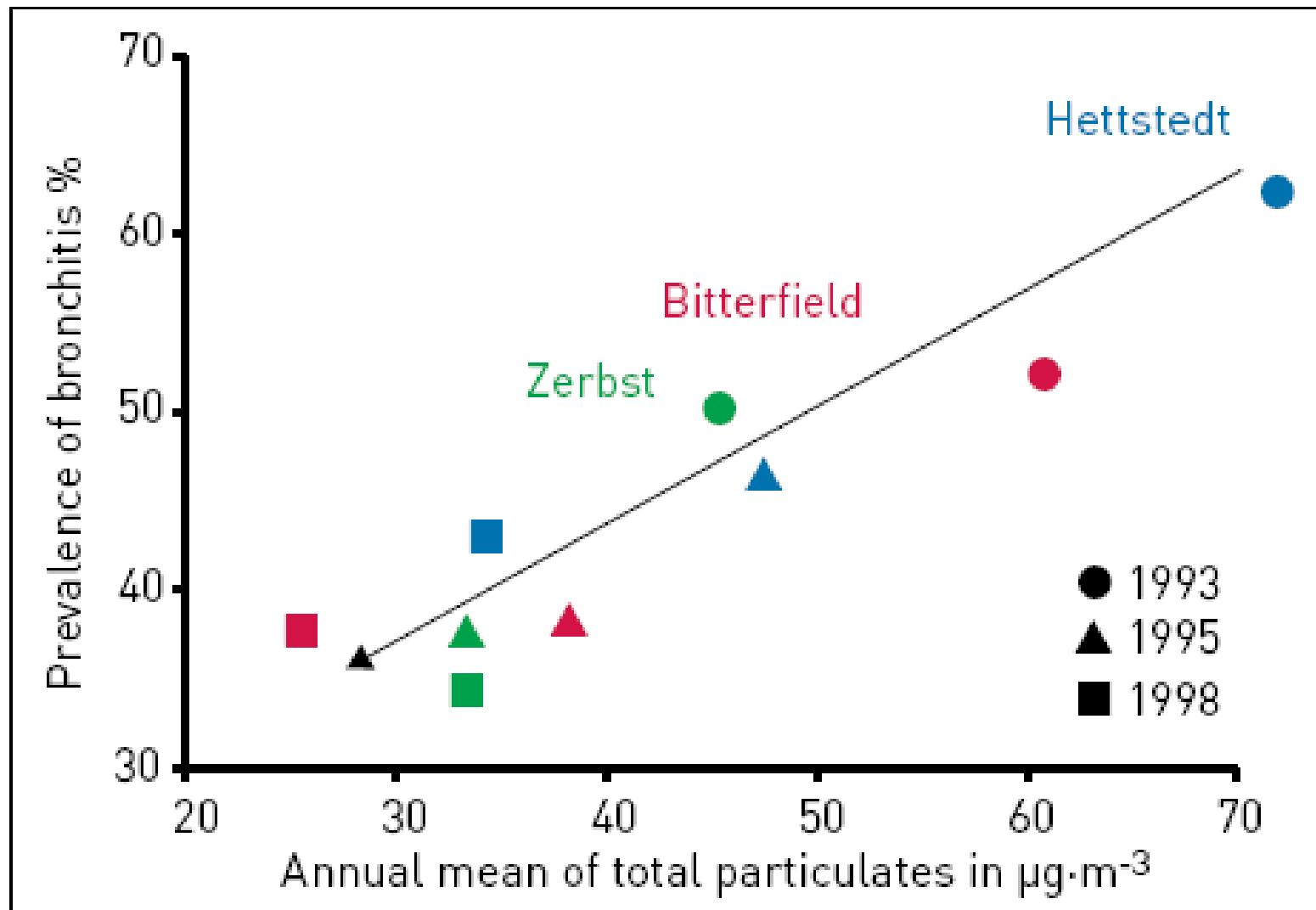
A REVIEW OF THE EVIDENCE

Prevalence of nocturnal cough and annual PM10 concentration



SCARLOL study of Swiss school children

PM exposure and bronchitis in German school children



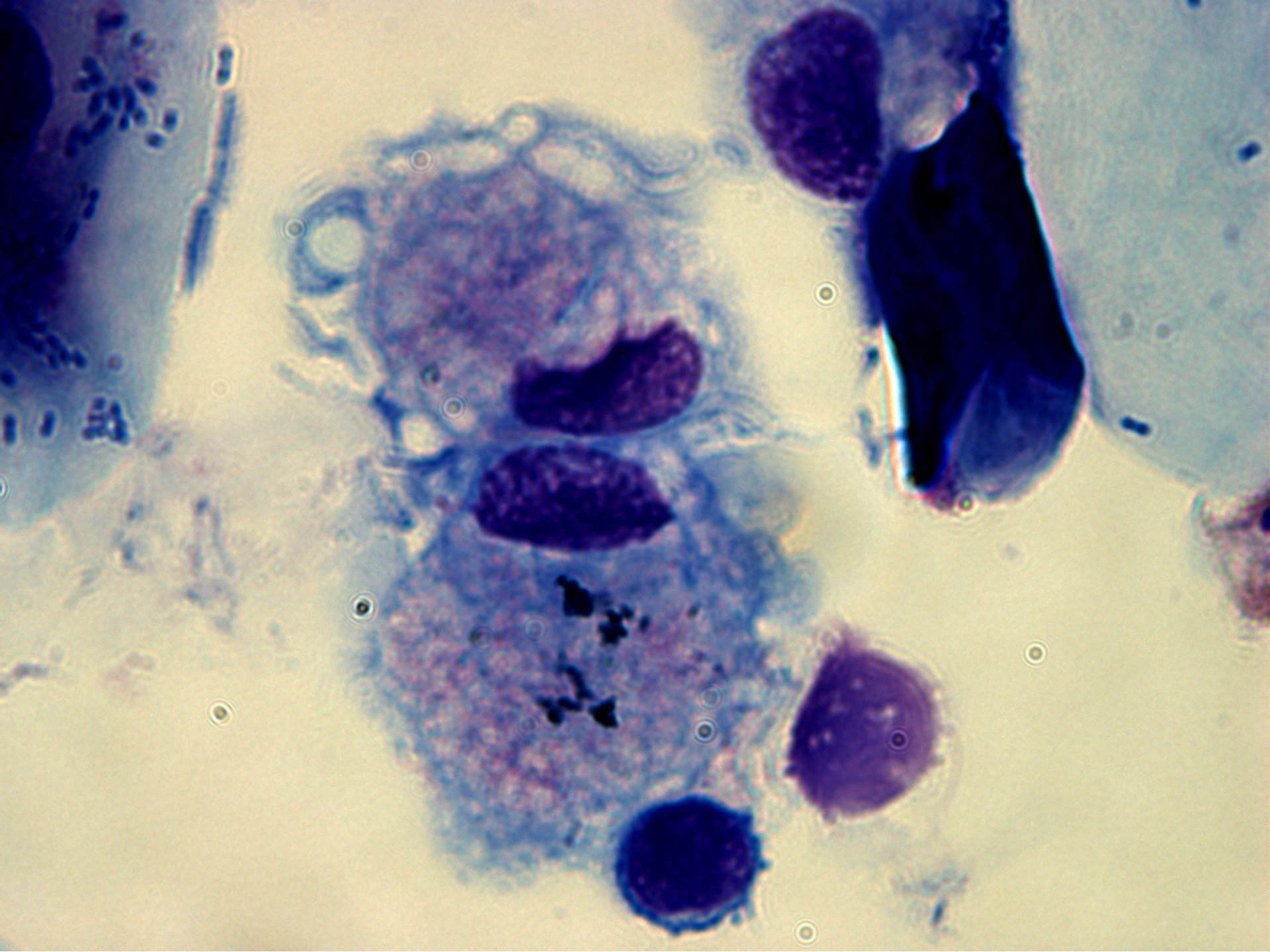
Chronic effects of air pollution: lung development

Gaudermann et al, Lancet 2007;

- 3677 children followed from aged 10 to aged 18
- Living <500m vs >1500m from main road associated with deficits in lung development
- 3% reduction in lung growth in those living close to busy highways







AQ and health: 4 reasons not to be complacent

1. Current PM2.5 concentrations are estimated to reduce life expectancy of everyone in the UK by an average of 6 months
2. Current AQ limit values (which we are struggling to meet) are NOT strict enough – the health evidence suggests they should be lower
3. On going research is both strengthening the association between AQ and health as well as revealing new health end points
4. Is restricted lung growth of children living in urban areas the next ‘big issue’ for us to deal with ???

THANK YOU!

