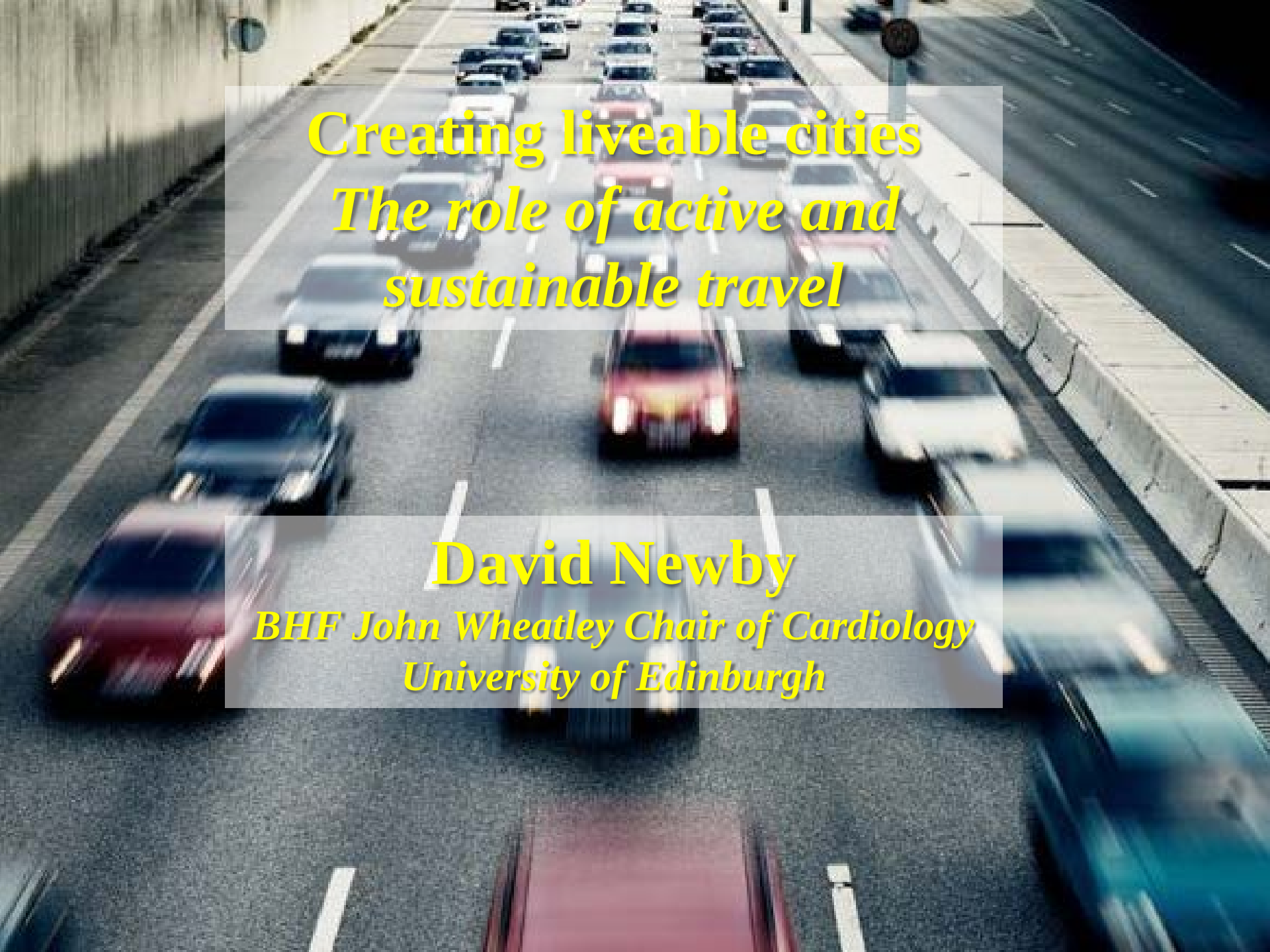


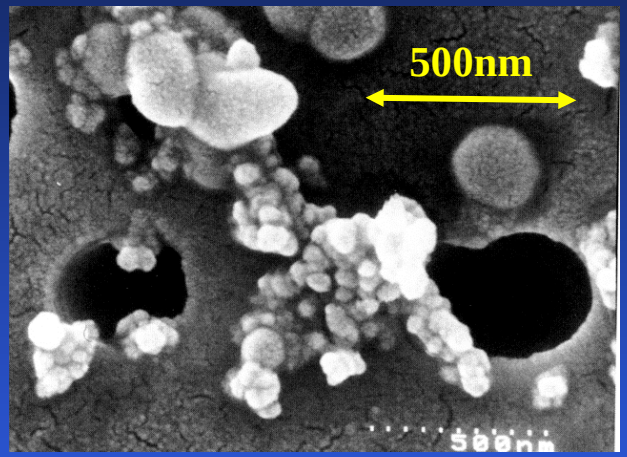
Creating liveable cities
The role of active and sustainable travel

David Newby

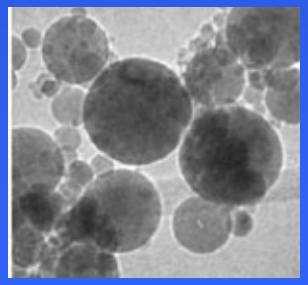
BHF John Wheatley Chair of Cardiology

University of Edinburgh

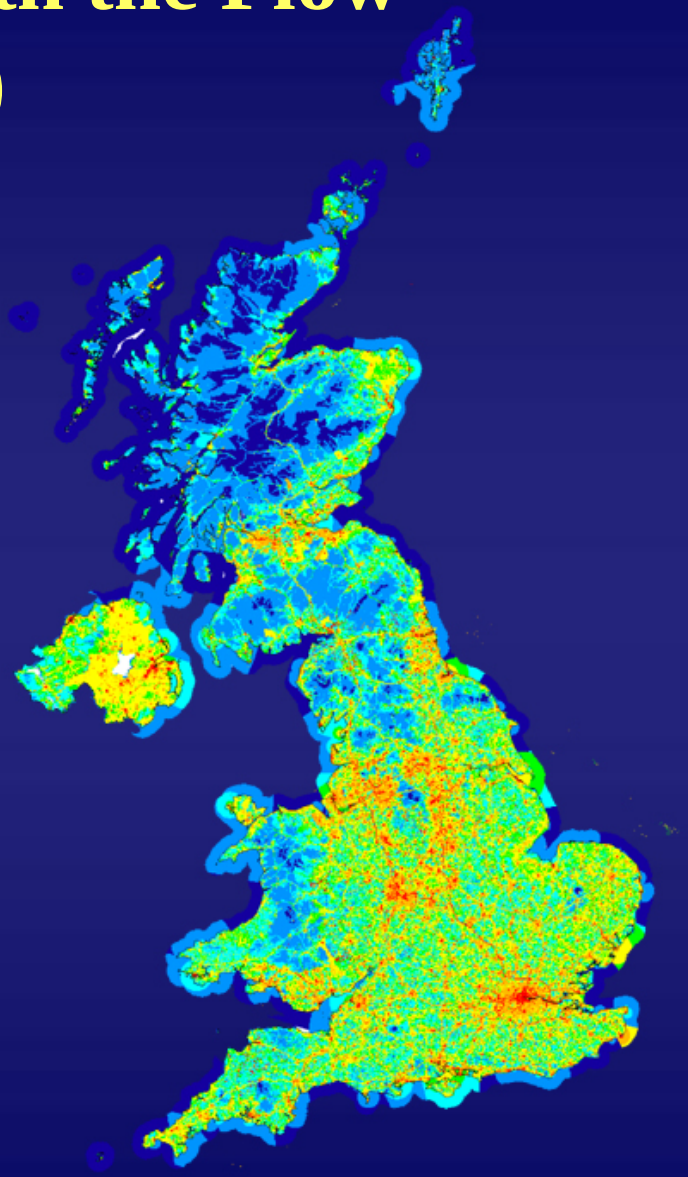
Air Pollution Particles



Coarse	2.5 - 10.0 µm
Fine	0.1 - 2.5 µm
Ultrafine (nanoparticles)	< 0.1 µm

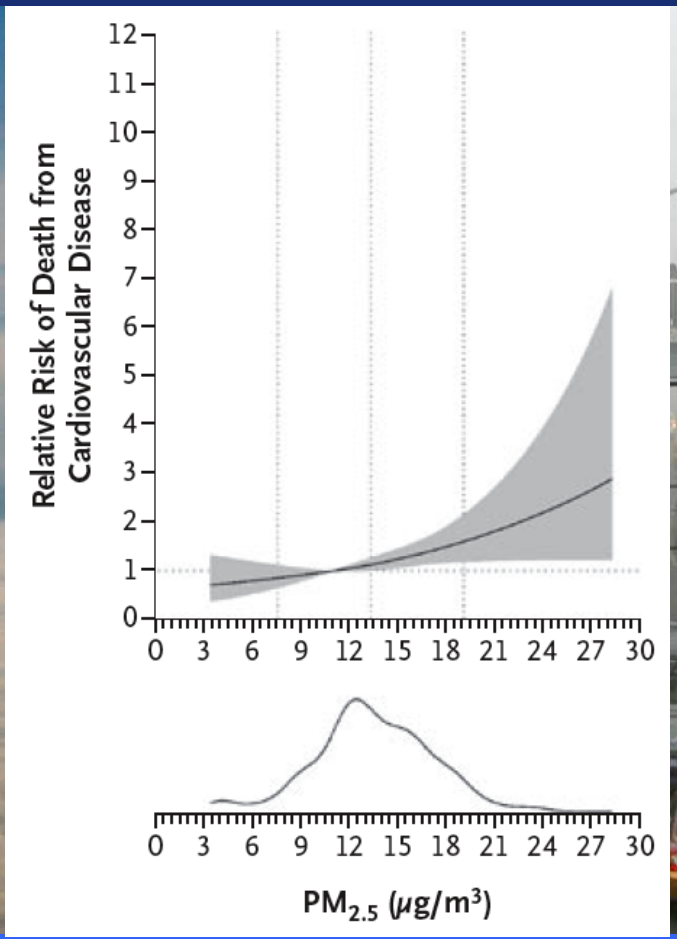


Air Pollution Goes With the Flow (of Traffic!)



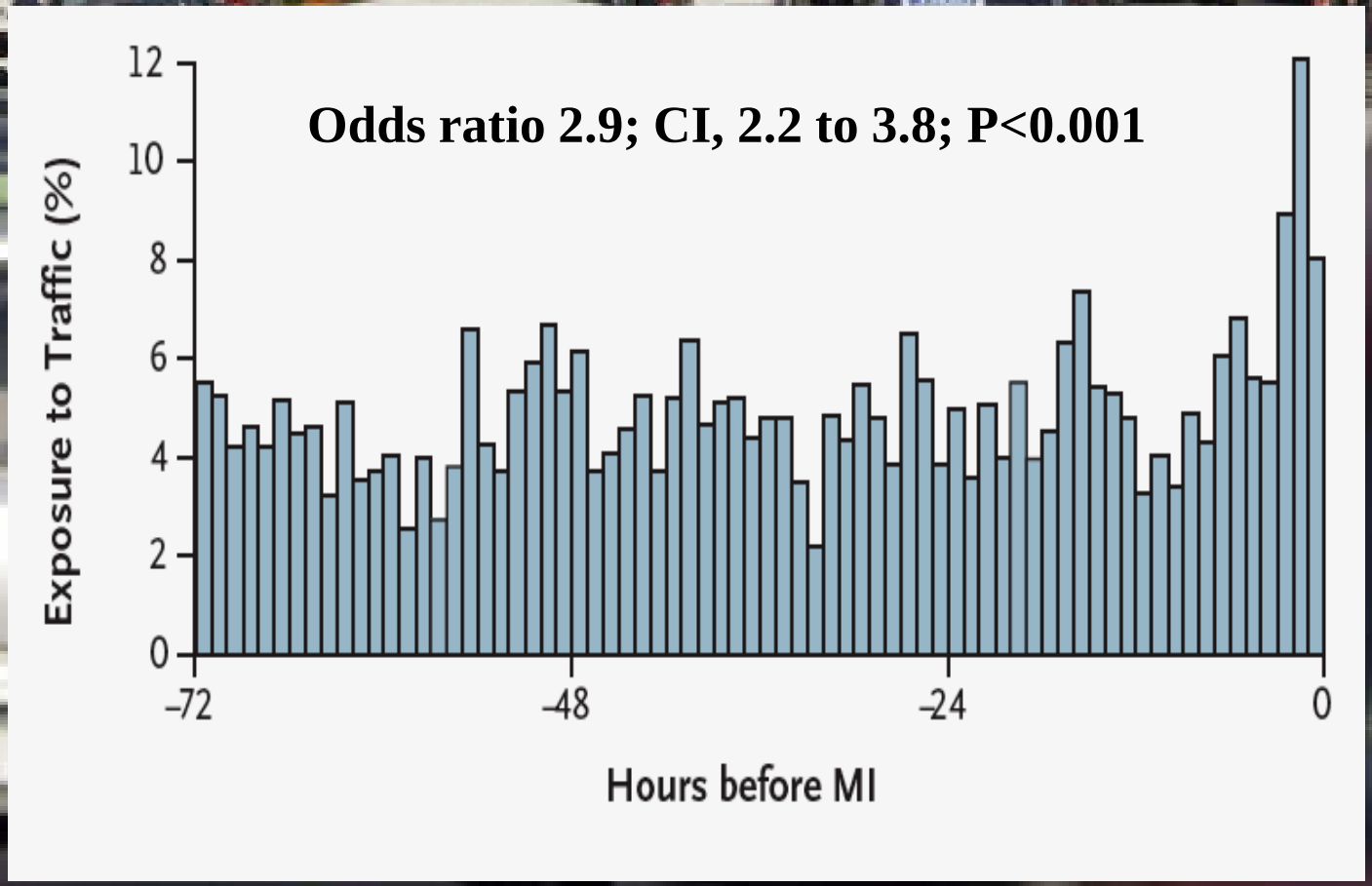
National Atmospheric Emissions Inventory (NAEI), 2005

Air Pollution and Heart Disease



Miller *et al. N Engl J Med* 2007;356:447-458

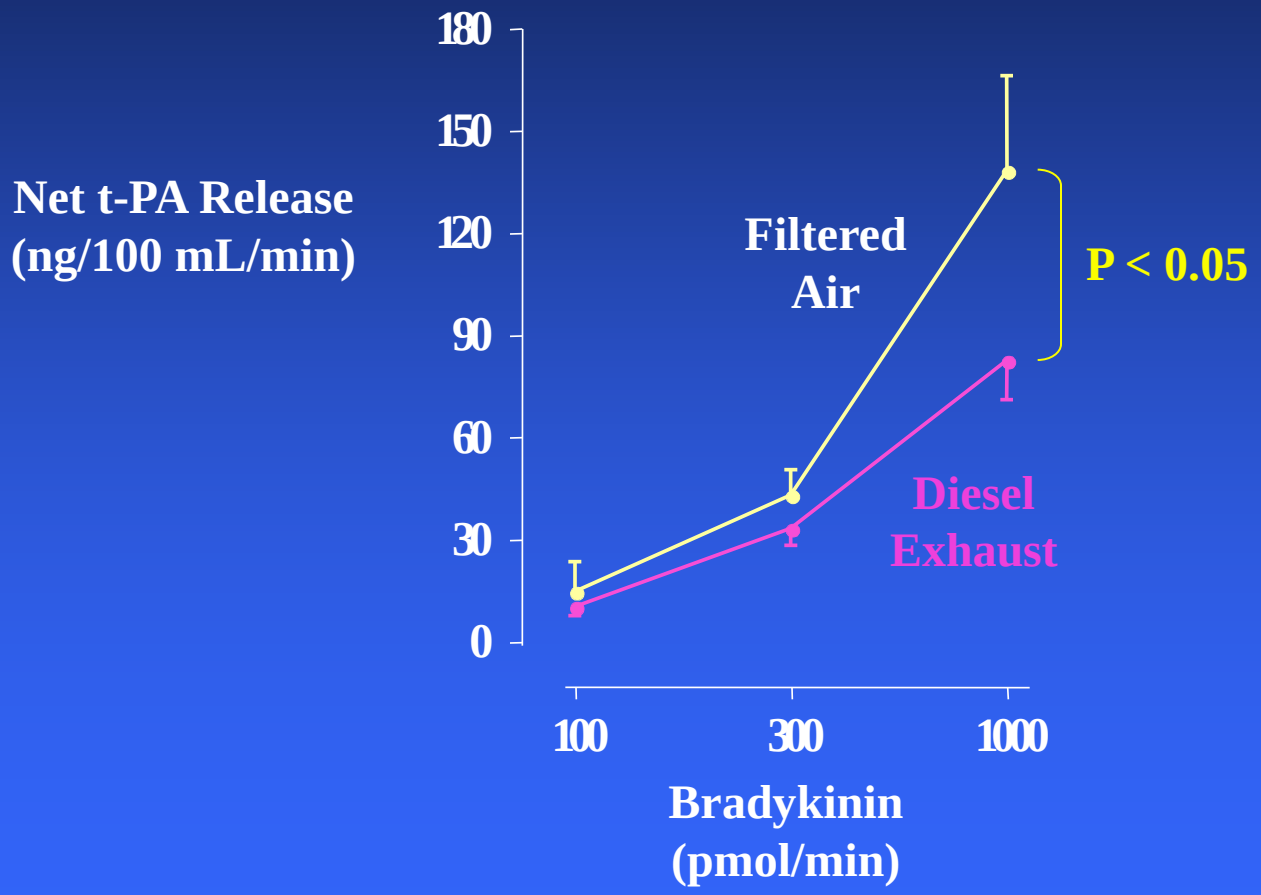
HEART ATTACK VICTIMS AND TRAFFIC



Peters *et al. N Engl J Med* 2004;351:1721-1730

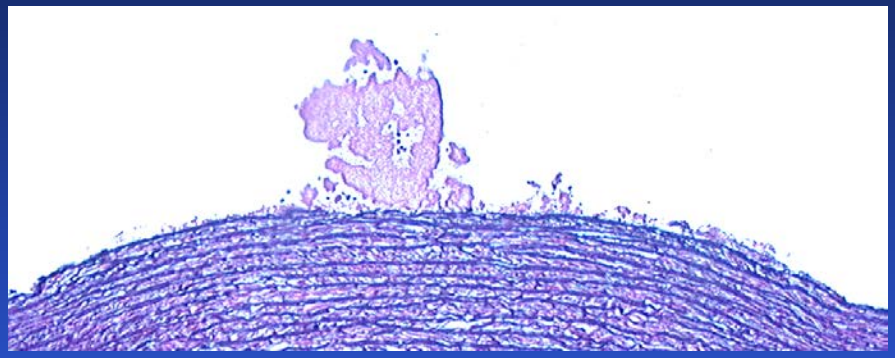
Diesel Exposure Chamber
Umeå, Sweden

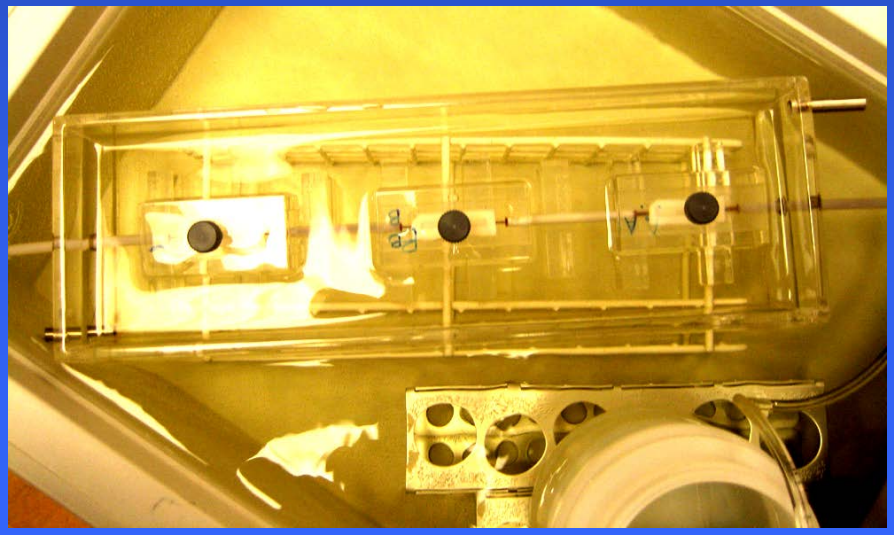
Air Pollution Reduces Release of Clot Dissolving Protein

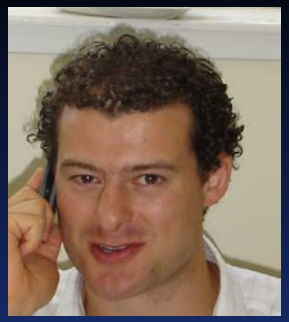


Mills *et al*. *Circulation* 2005;**112**:3930-3936

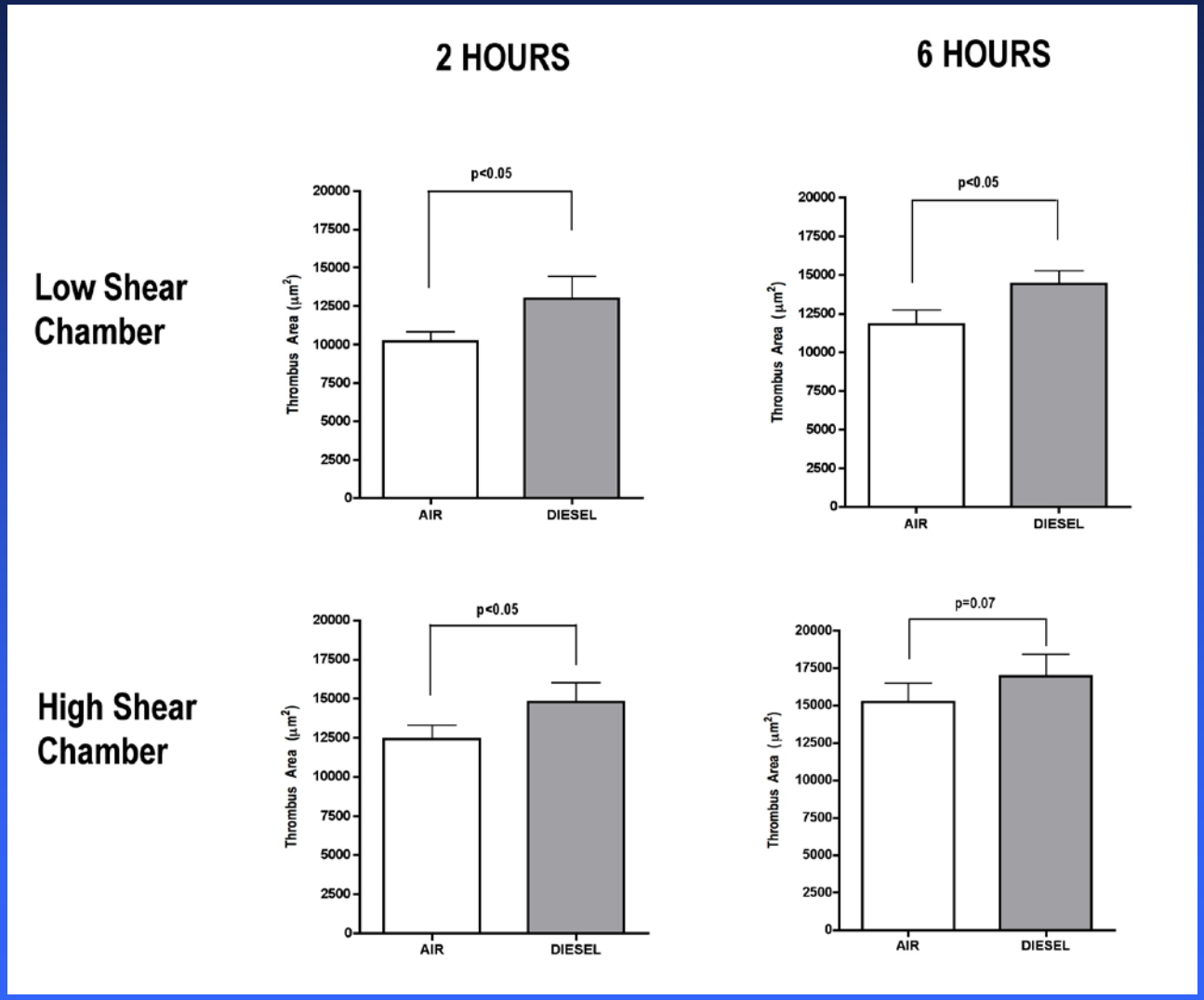
Blood Clot Formation





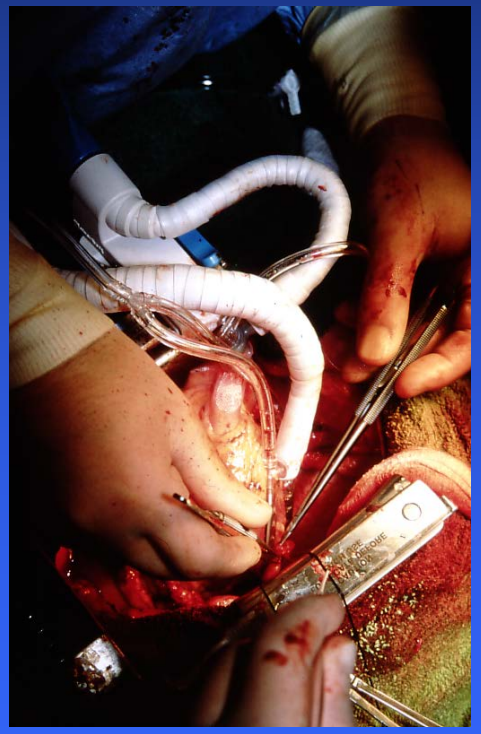


Blood Clots Form More Easily

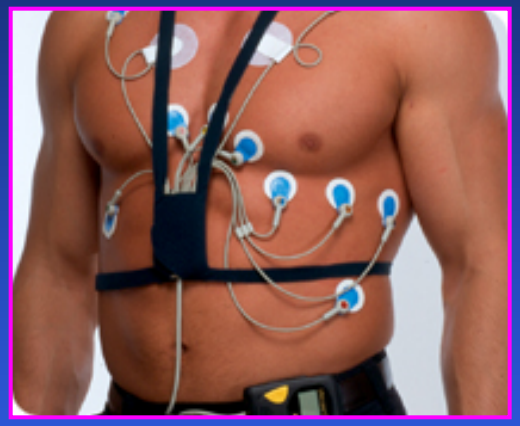


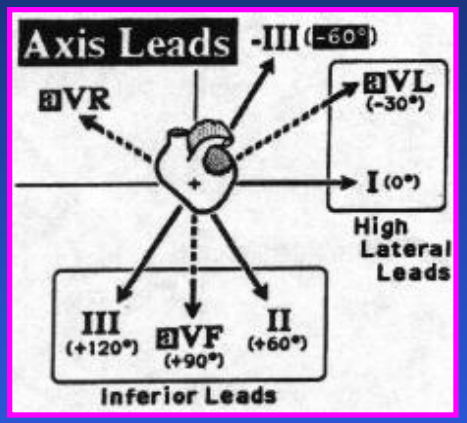
Lucking *et al. Eur Heart J.* 2008;**29**:2043-3051.

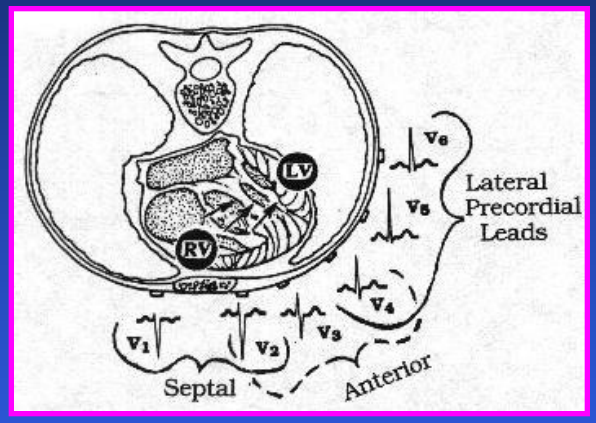
What About Patients with Heart Disease?



Measuring Heart Stress

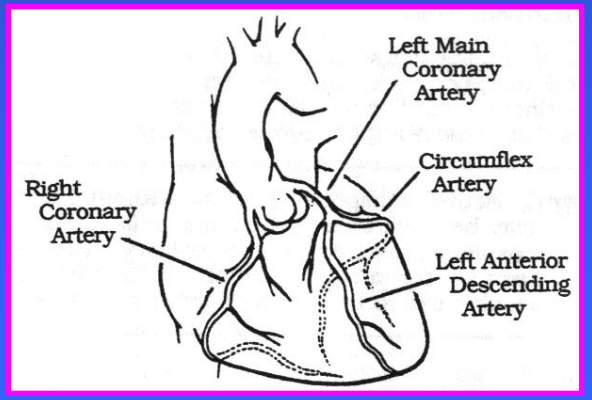




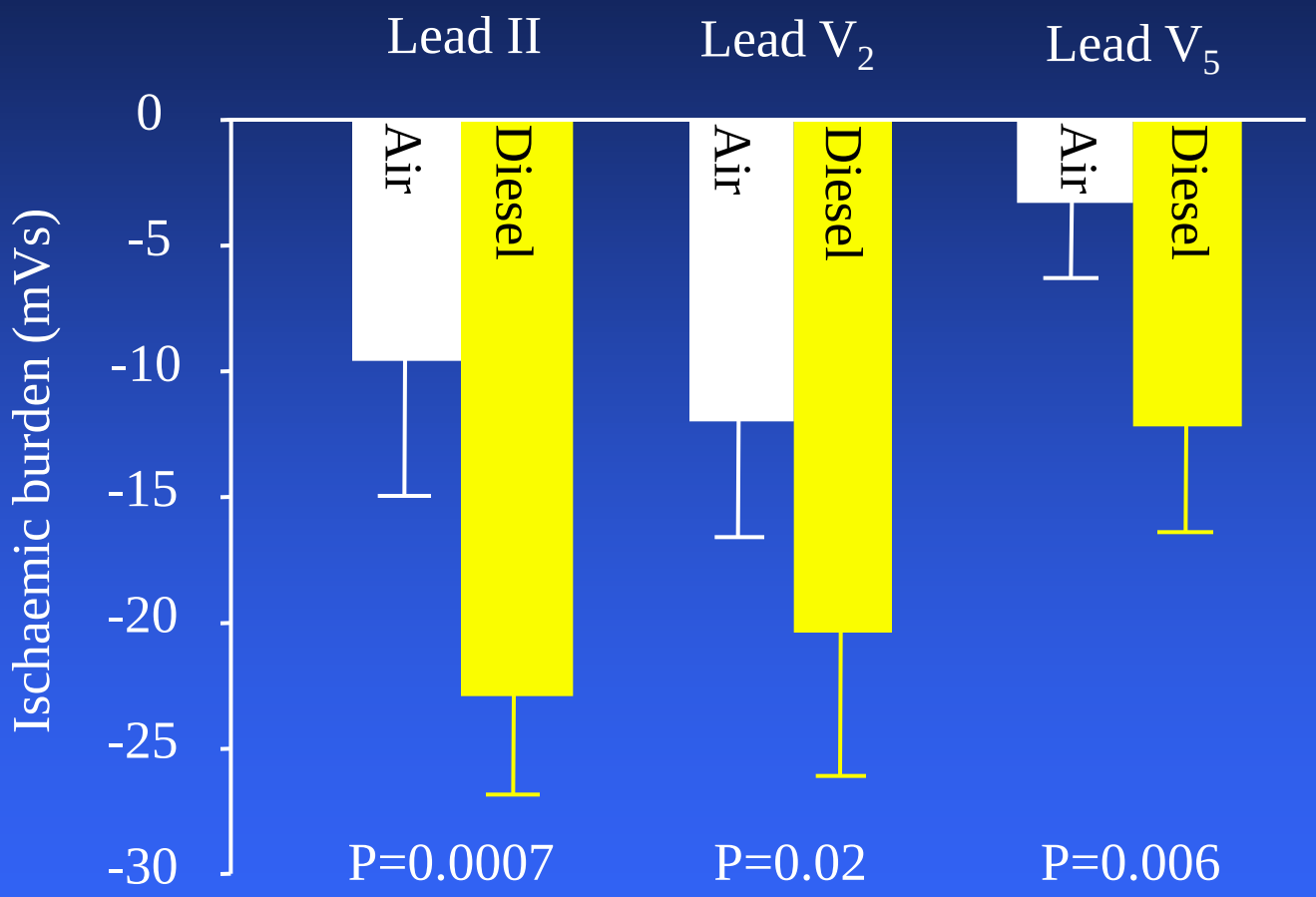


Lead II, V_2 and V_5

Regions correspond to distribution of three main coronary arteries and reflect global ischaemia

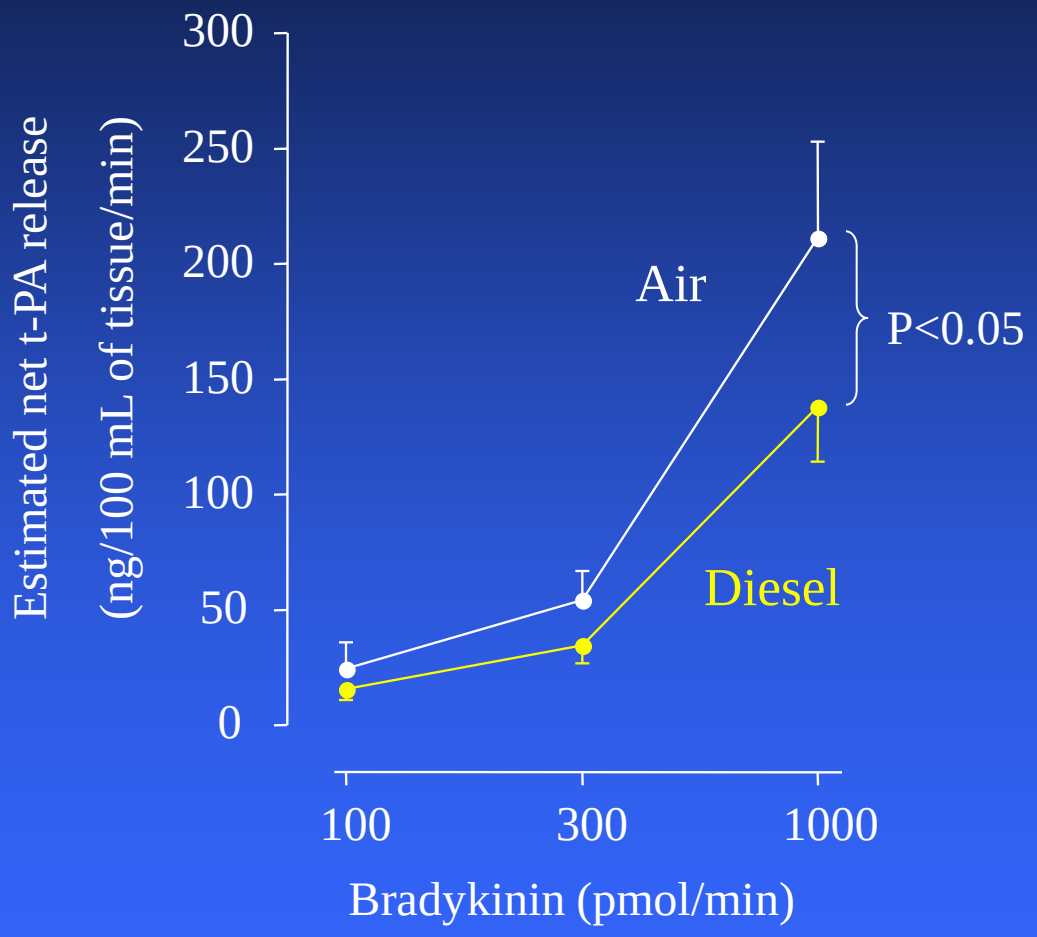


Heart Stress



Mills *et al. N Engl J Med* 2007;357:1075-1082

Less Clot Dissolving Protein



Mills *et al. N Engl J Med* 2007;357:1075-1082

Atmospheric Air Pollution or Diesel Exhaust?

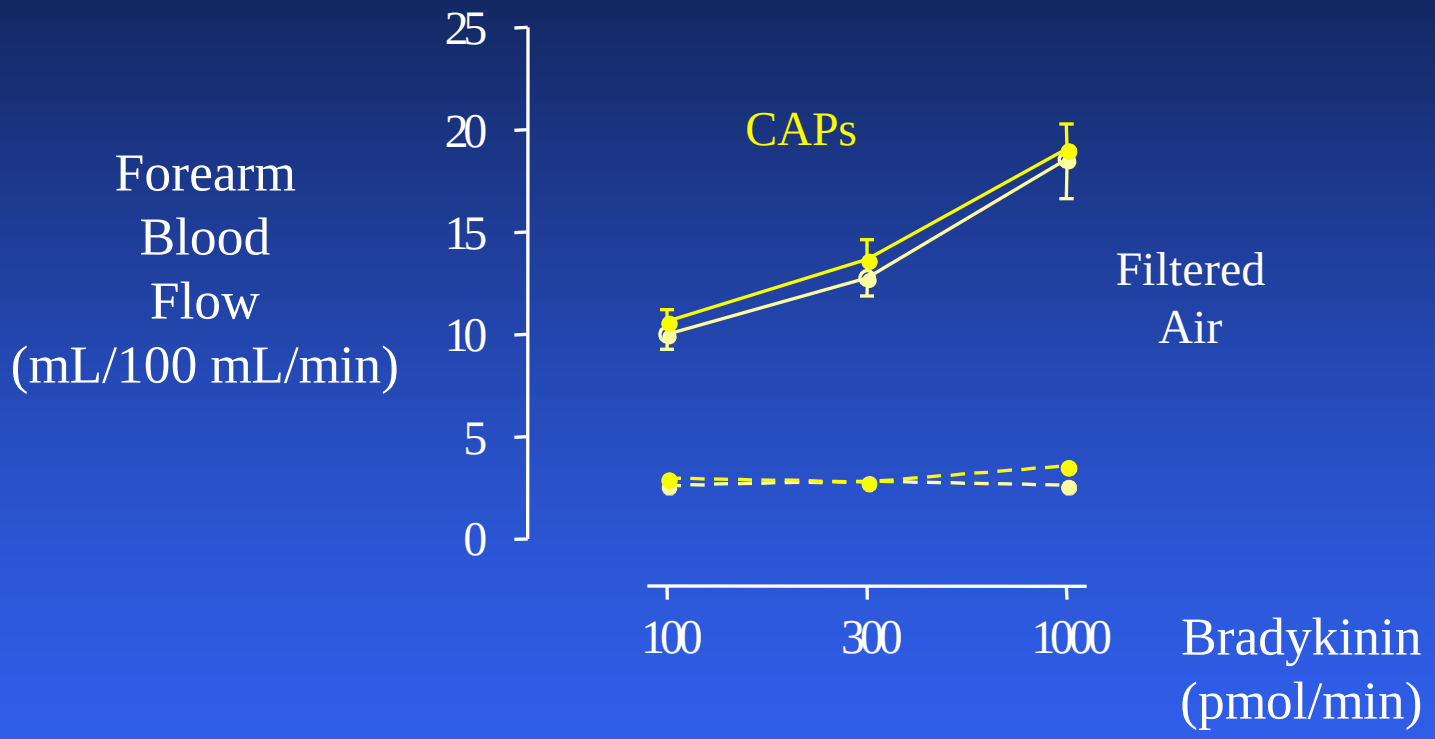
rivm
Rijksinstituut
voor Volksgezondheid
en Milieu

MAPCEL

Mobile Ambient Particle Concentrator Exposure Laboratory

THE UNIVERSITY OF EDINBURGH

NO EFFECT!!

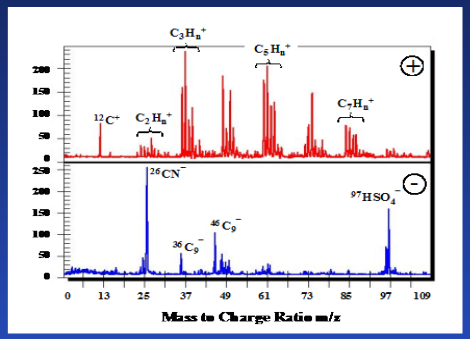


No difference between ambient particle and air exposures in :

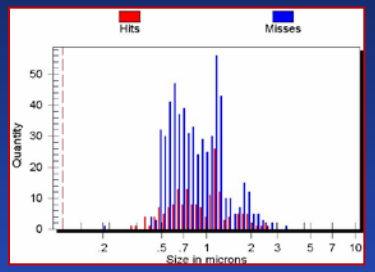
- Endothelium-dependent or -independent vasodilatation
- Endogenous fibrinolysis

Mills *et al*. *Environ Health Perspect* 2008;116:709-715

The ATOFMS
(Aerosol Time-of-Flight Mass Spectrometer)

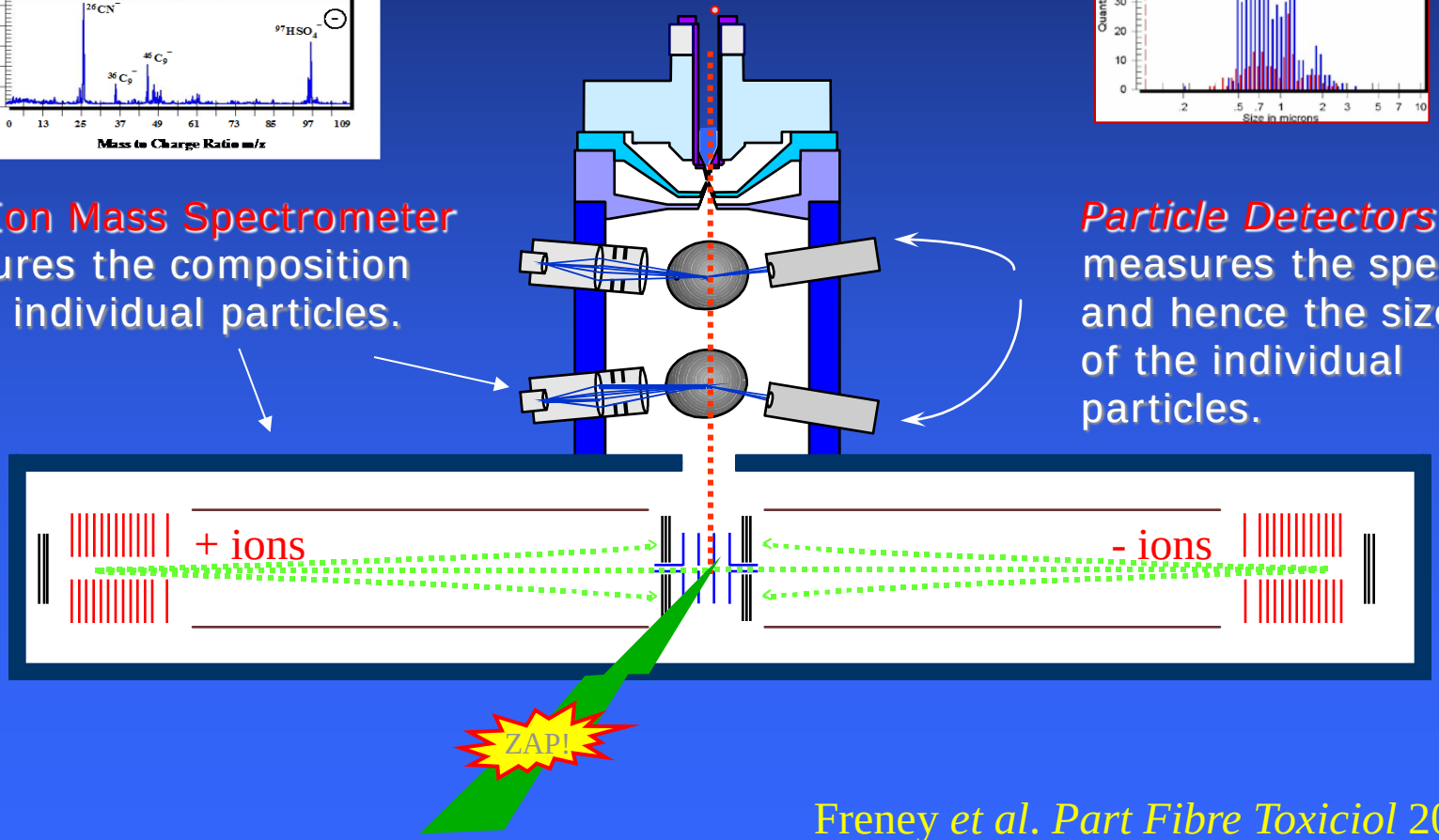


Atmospheric Particles



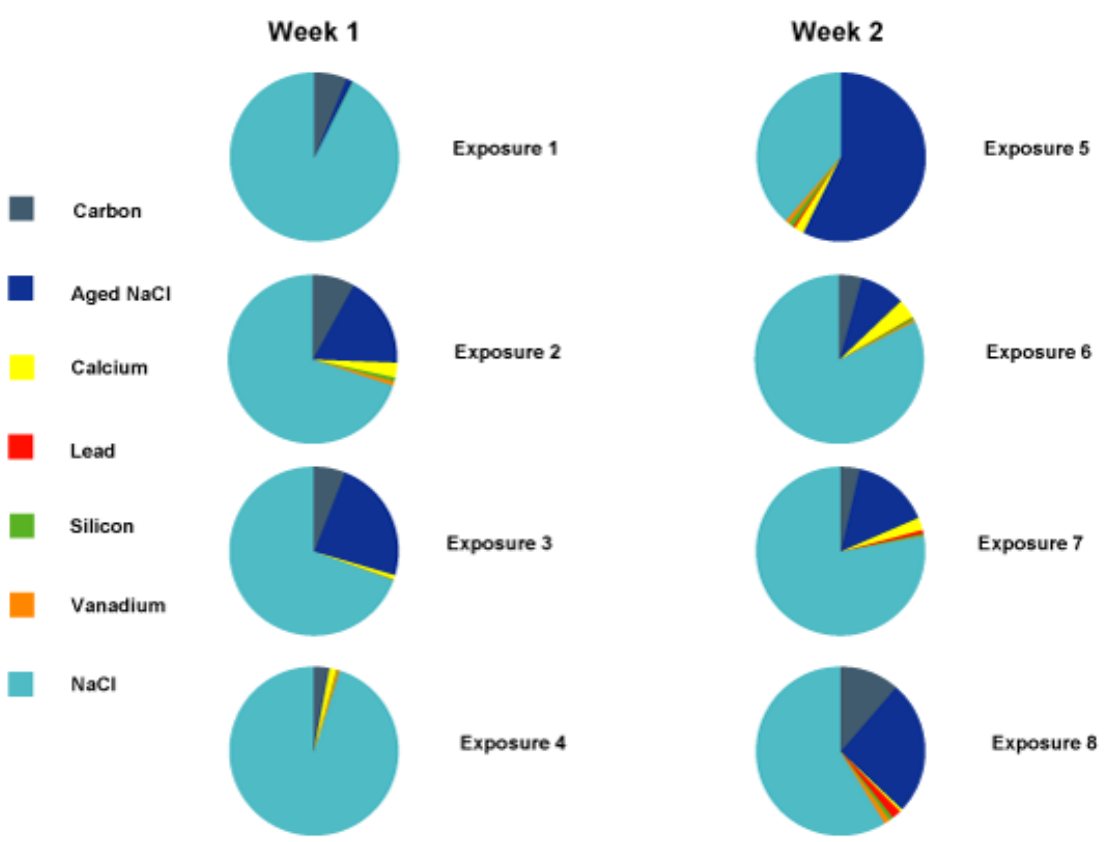
Dual Ion Mass Spectrometer measures the composition of the individual particles.

Particle Detectors measures the speed and hence the size of the individual particles.



Freney *et al. Part Fibre Toxiciol* 2006;3:8

Edinburgh Air!



Primary Constituent was Sodium Chloride

Mills *et al*. *Environ Health Perspect* 2008;116:709-715

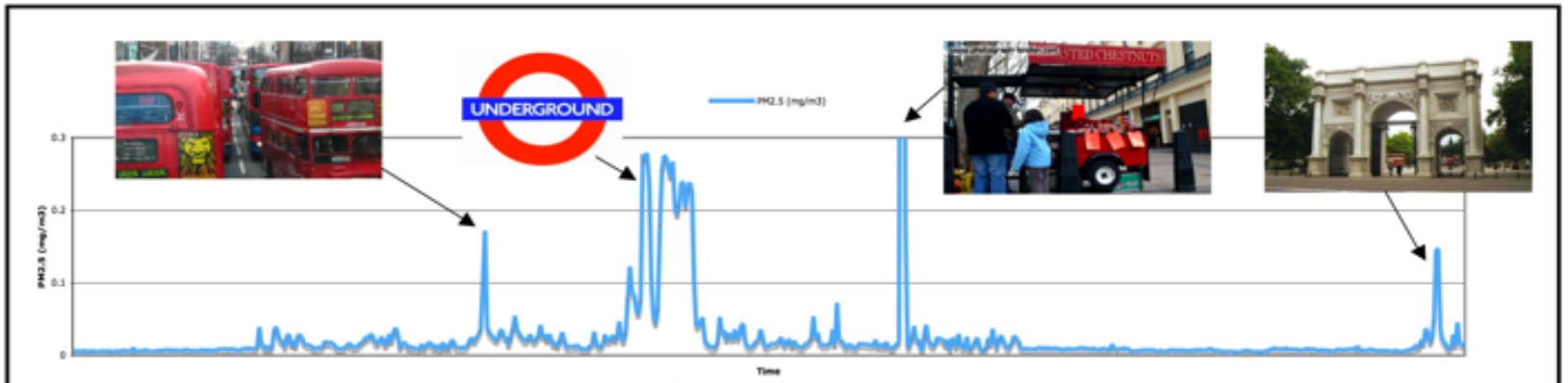
Edinburgh is a Costal City

Air Pollution Goes With the Flow (of Traffic!)

Model of local nitrogen oxide levels in central London

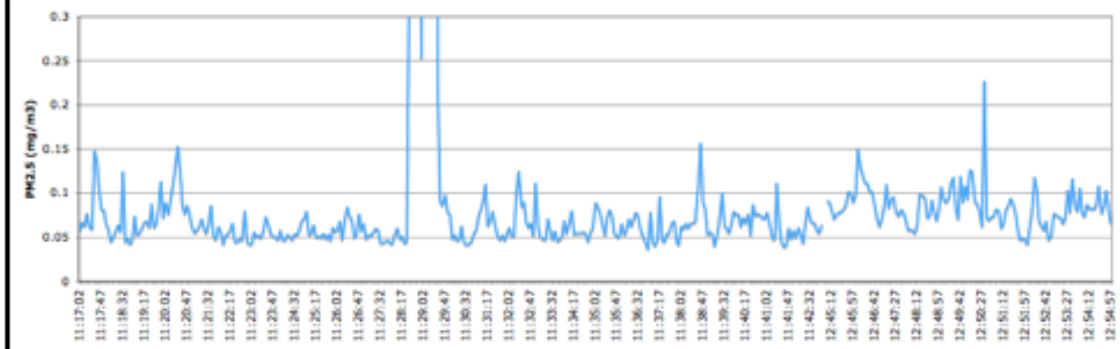
Image courtesy of the London Air Quality Network

My Trip to BHF in London



London, 30/11/07

	Max	Min	Mean
PM2.5 (µg/m^3)	1334	4	30

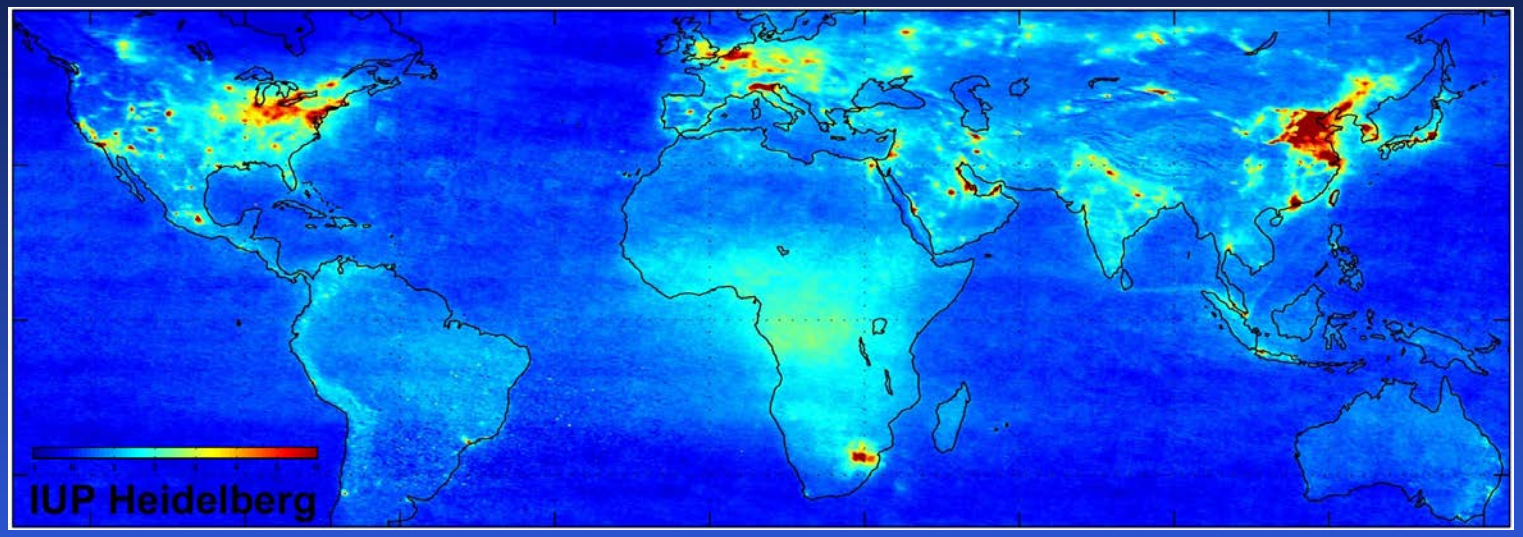


	Max	Min	Mean
PM2.5 (µg/m^3)	340	36	72

Oxford Street, 13/12/07

Why Beijing?

Global Air Pollution Emissions

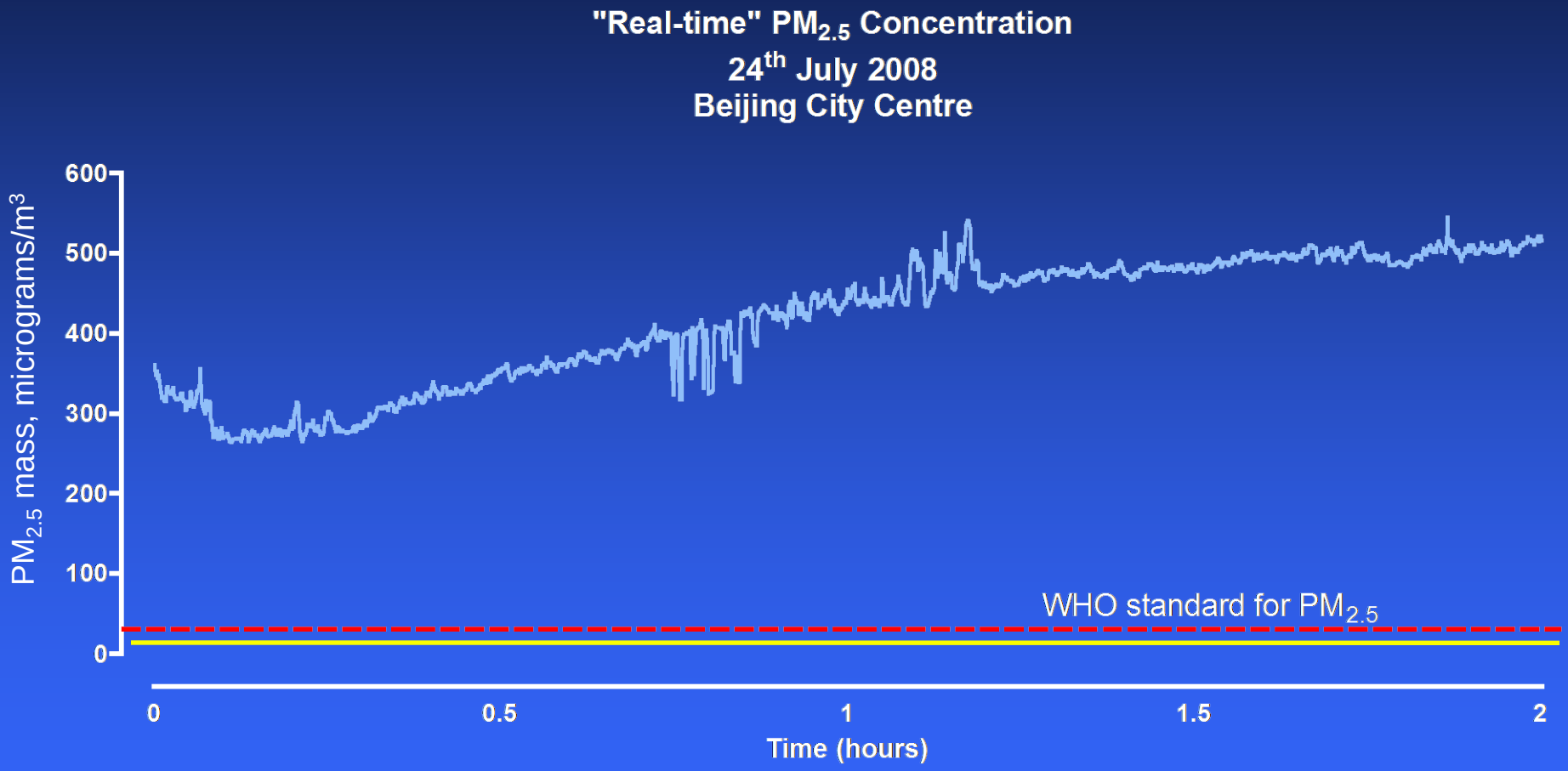


Annual mean PM_{10} in residential areas ($\mu g/m^3$)

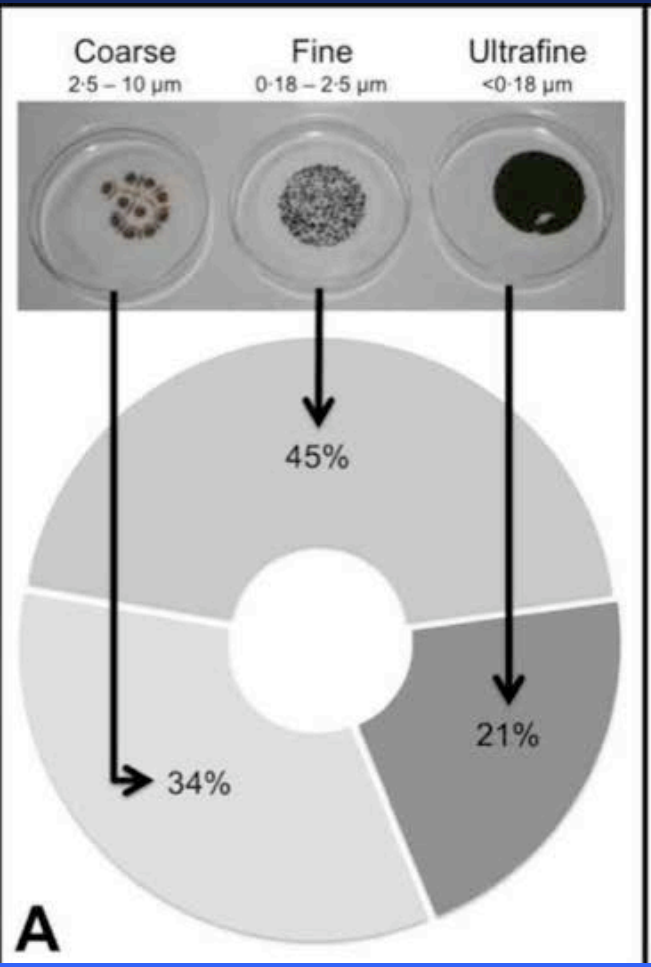
Beijing	**106**	**Edinburgh**	**18**
Buenos Aries	**107**	**London**	**40**
Calcutta	**153**	**Los Angeles**	**38**
Delhi	**187**	**Mexico City**	**69**
Karachi	**220**	**Tokyo**	**43**

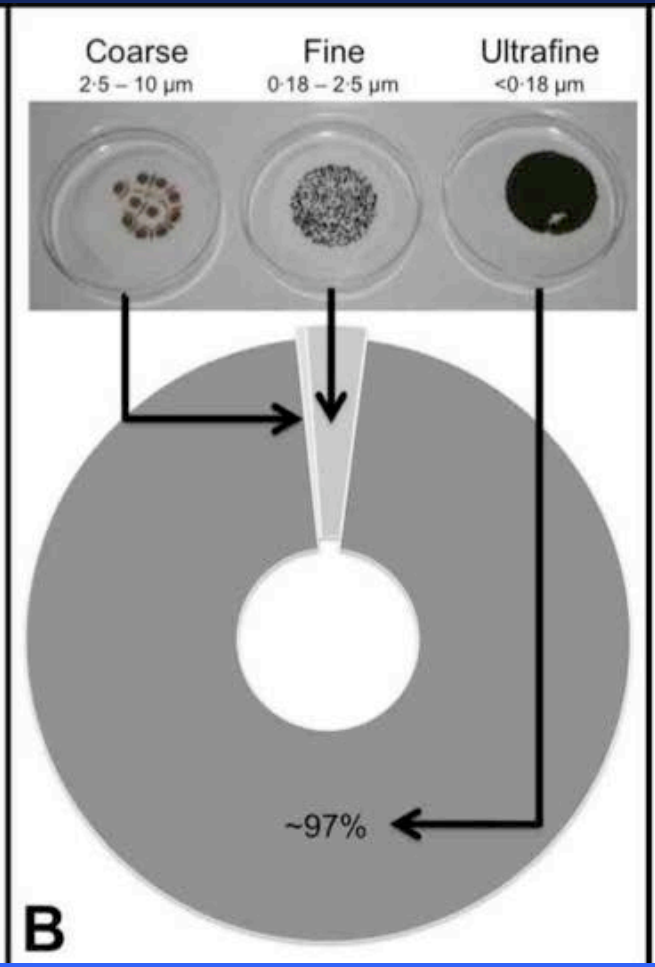
Source: The World Bank, Development Economics Research Group Estimates 2006

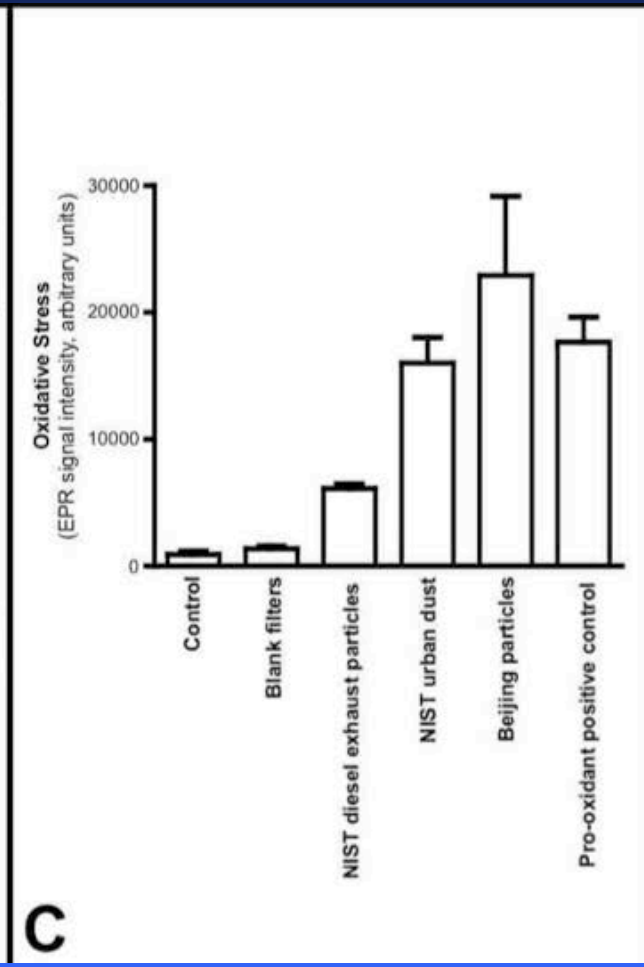
Air Quality in Beijing



Air Quality in Beijing







Langrish *et al. Environ Health Perspect* 2012;120:367-372

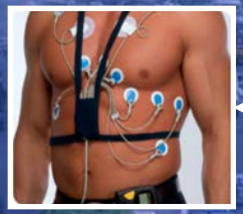
阜外心血管病医院

空气污染研究数据采集过程说明
Air Pollution Study

爱丁堡大学

病人在八点到达阜外医院
08:00 - Attend the Fuwai Hospital

安上心率血压测试仪器
Heart rate and blood pressure monitors applied



开启空气污染监测仪
Air pollution monitors applied and switched on

在研究人员的陪同下在市区内步行两小时
Walk for 2 hours in the city with researcher

病人可以自由活动
Free to do own activities

十八点返回医院
18:00 - Reattend the Fuwai Hospital

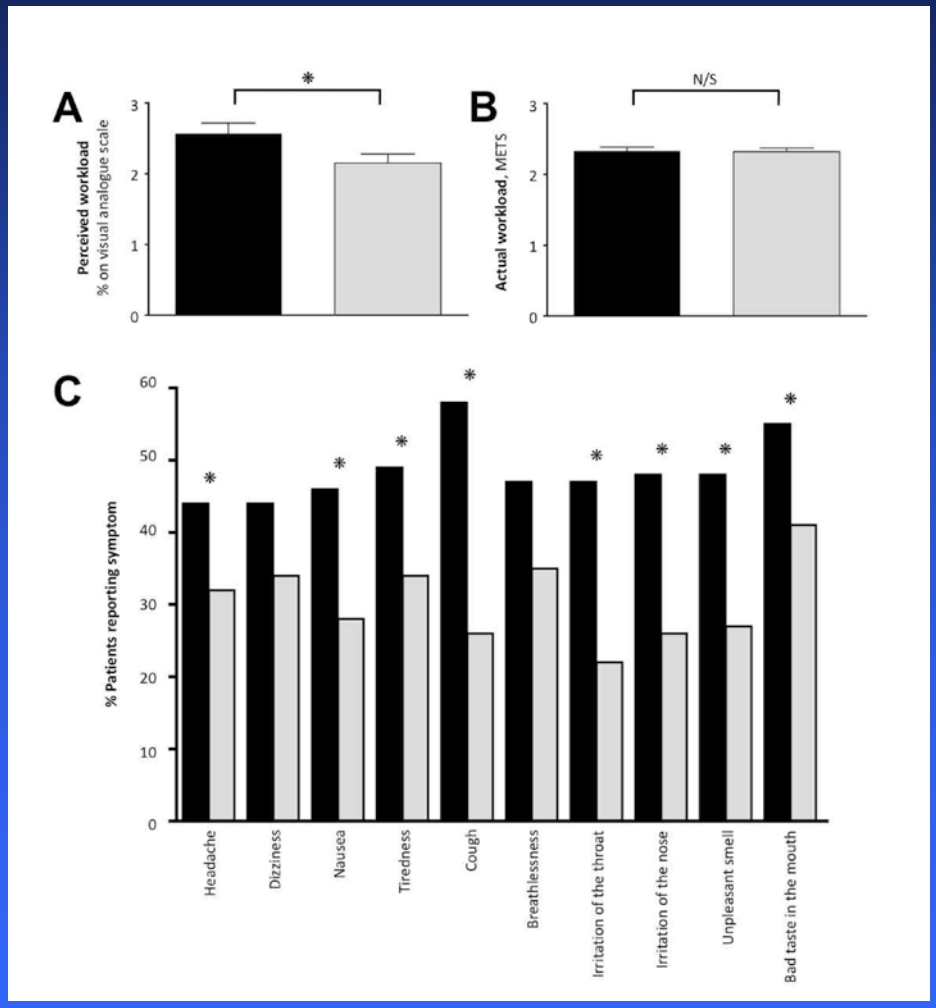
扯掉监控装置
Monitors removed

此次数据采集过程结束
Study complete

下一次数据采集过程将在奥林匹克运动会之后进行
One more visit to complete after Olympic games

Alternative interventions to reduce exposure: face masks

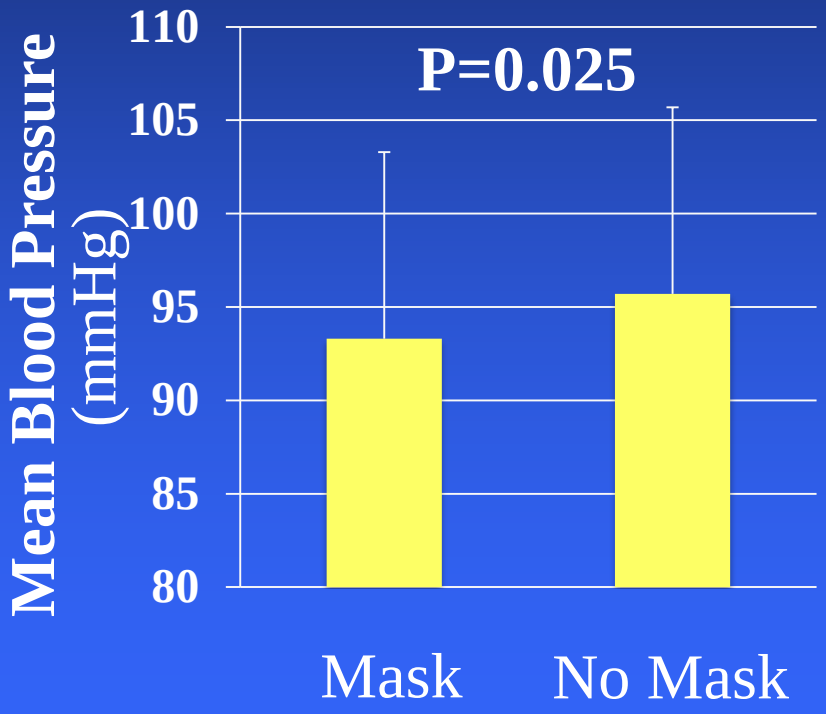
Face Masks
Less Symptoms & Perceived Effort

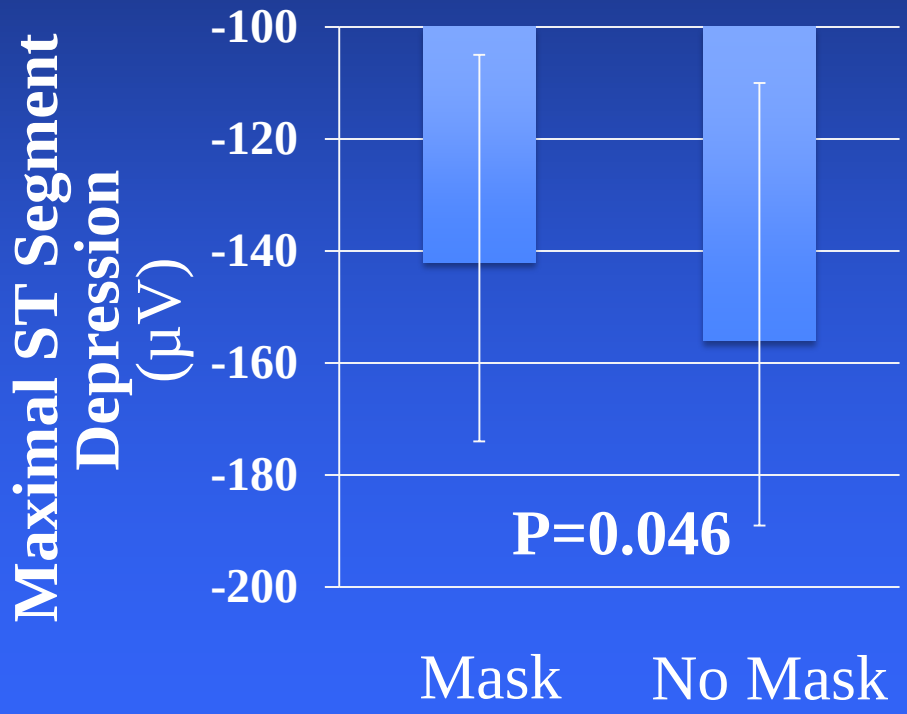


Langrish *et al. Environ Health Perspect* 2012;120:367-372

Face Masks

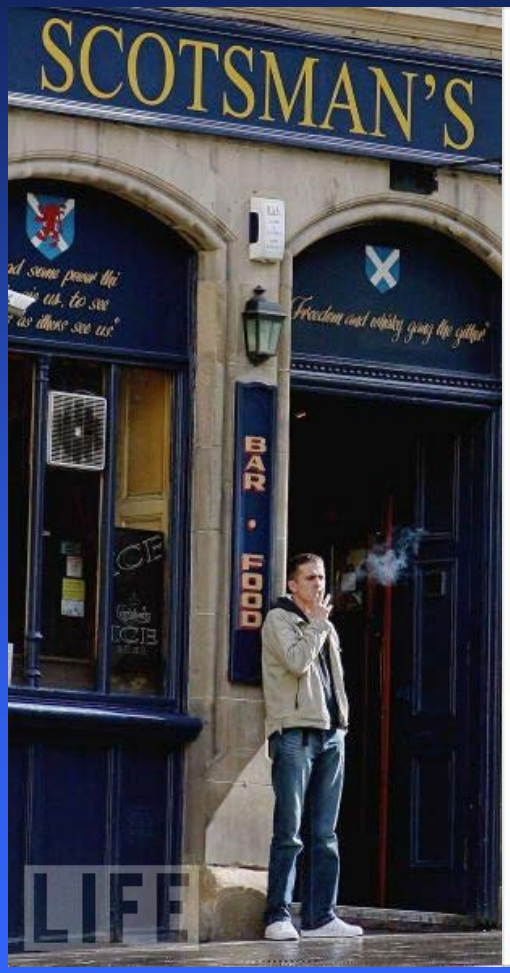
Reduces Blood Pressure & Silent Ischaemia





Langrish *et al. Environ Health Perspect* 2012;120:367-372


March
26th
2006


SCOTSMAN'S
BAR
FOOD
LIFE


No smoking
It is against the law
to smoke in these
premises

The STOPIT Study

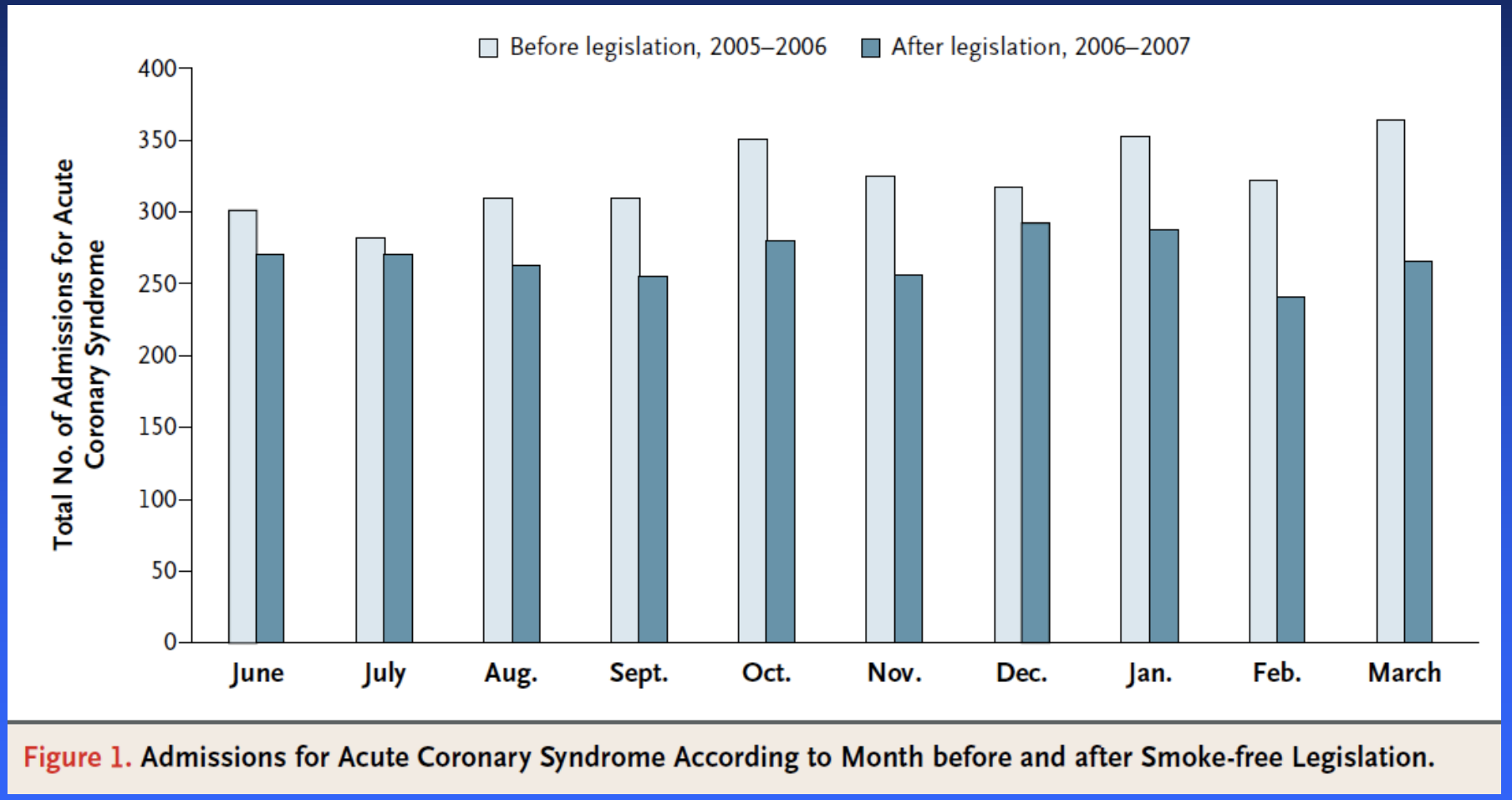


Figure 1. Admissions for Acute Coronary Syndrome According to Month before and after Smoke-free Legislation.

Pell *et al. N Engl J Med* 2008;**359**:482-491

Conclusions

- Environmental air pollution is associated with causing and precipitating heart attacks and strokes
- Air pollution causes adverse effects on how the circulation works and functions
- Combustion-derived nanoparticulate appears to be the primary mediator of these adverse effects
- Strategies to eliminate or reduce particle exposure appear to reduce the harmful effects of air pollution

Acknowledgments

British Heart Foundation Project Grant: The effects of air pollution on vascular vasomotor and fibrinolytic function in patients with ischaemic heart disease

British Heart Foundation Programme Grant: Atherothrombotic effects or air pollution

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Paddy Hadoke

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Daan Leseman

ELEGI
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William MacNee
Rodger Duffin
Simon Brown

University of Glasgow
Jill Pell
Stuart Cobbe

University of Umeå, Sweden
Thomas Sandström
Anders Blomberg
Håkan Törnqvist
Manuel Gonzalez
Stefan Soderberg

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