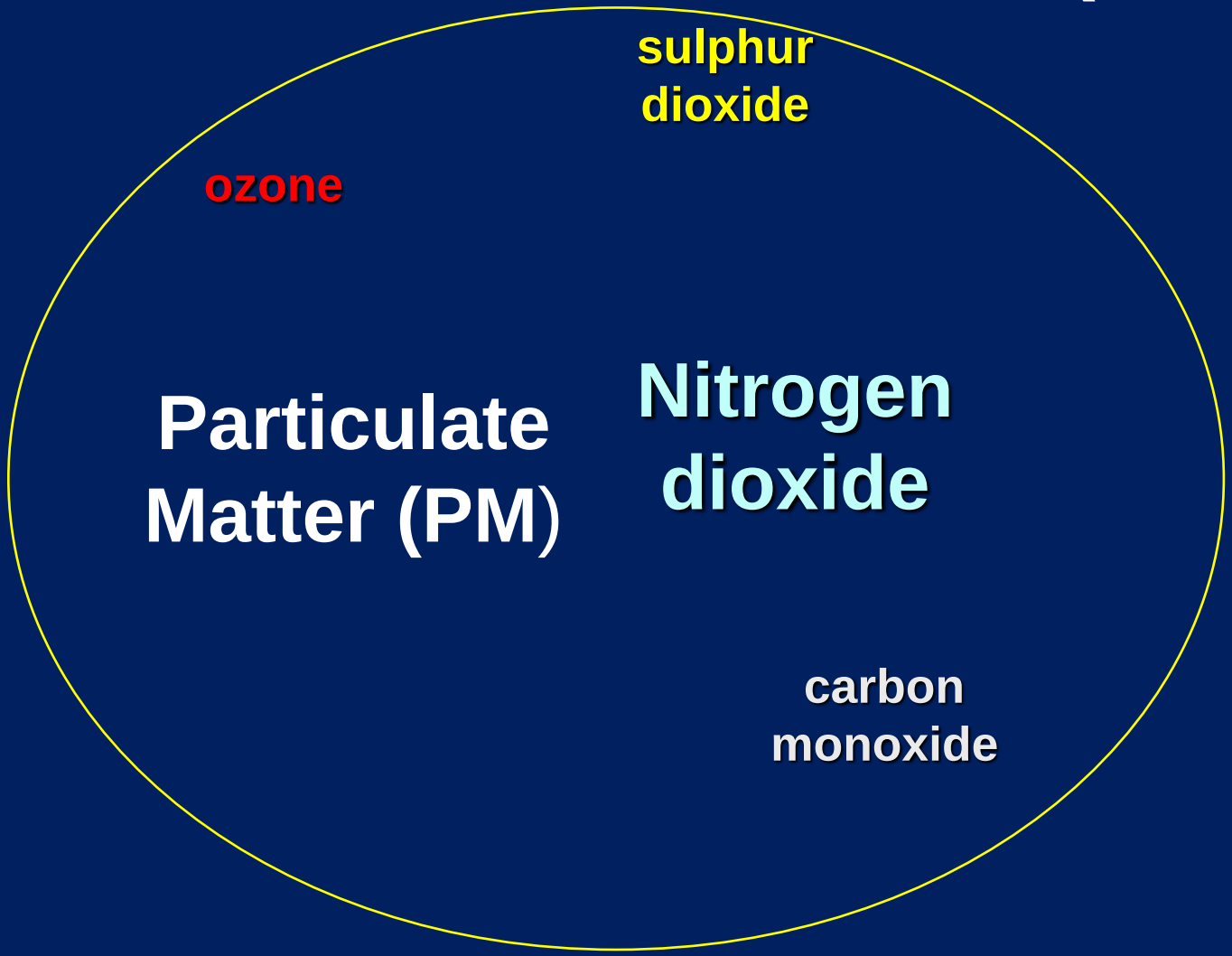
Air pollution and children's respiratory health

Jonathan Grigg

Queen Mary University of London

- the air pollution mix
- biomarker of exposure
- pollution/infection models
- epidemiological studies
- policy and advocacy

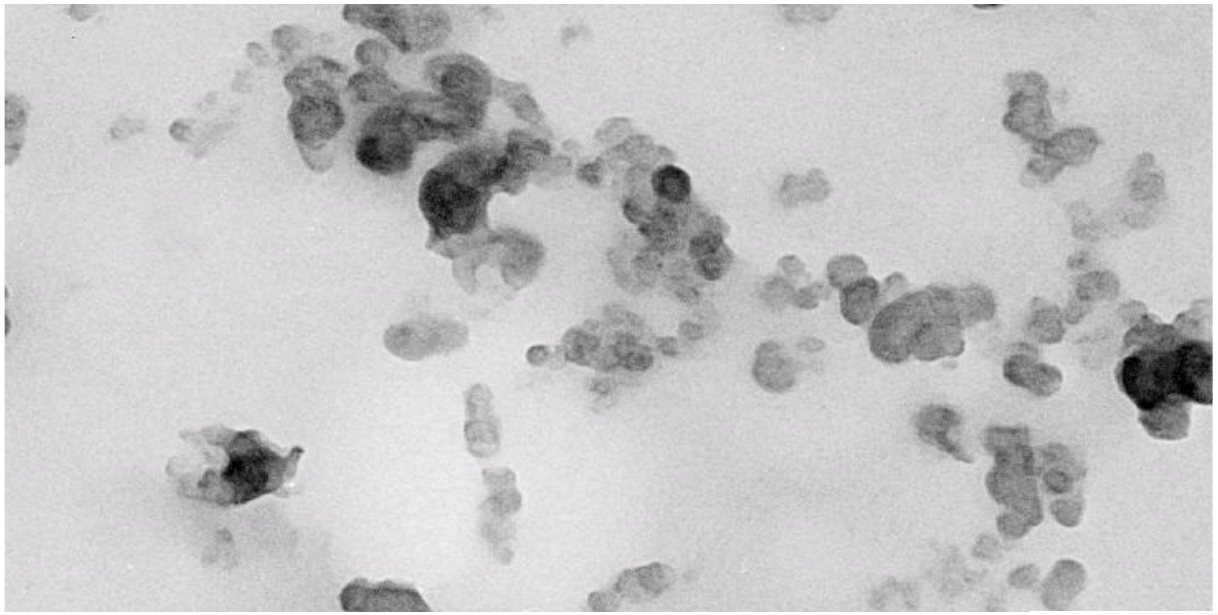
Air pollution mix
Traffic-Related Air Pollution (TRAP)

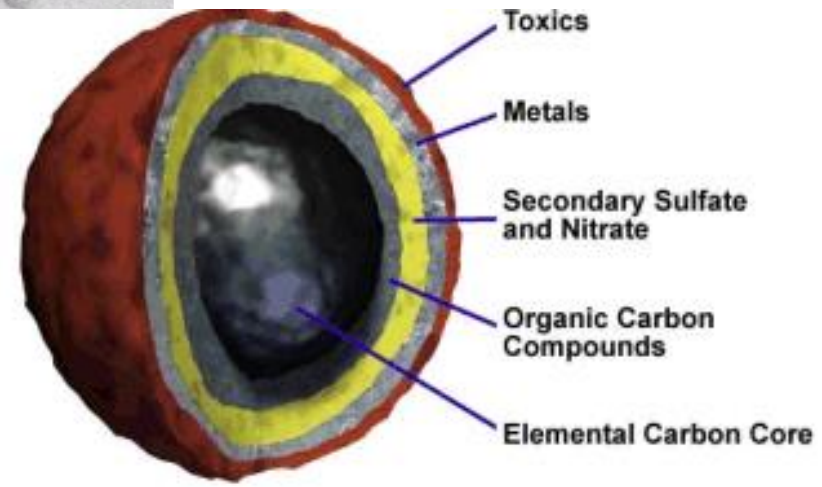



P
IVECO
VD03 UVT

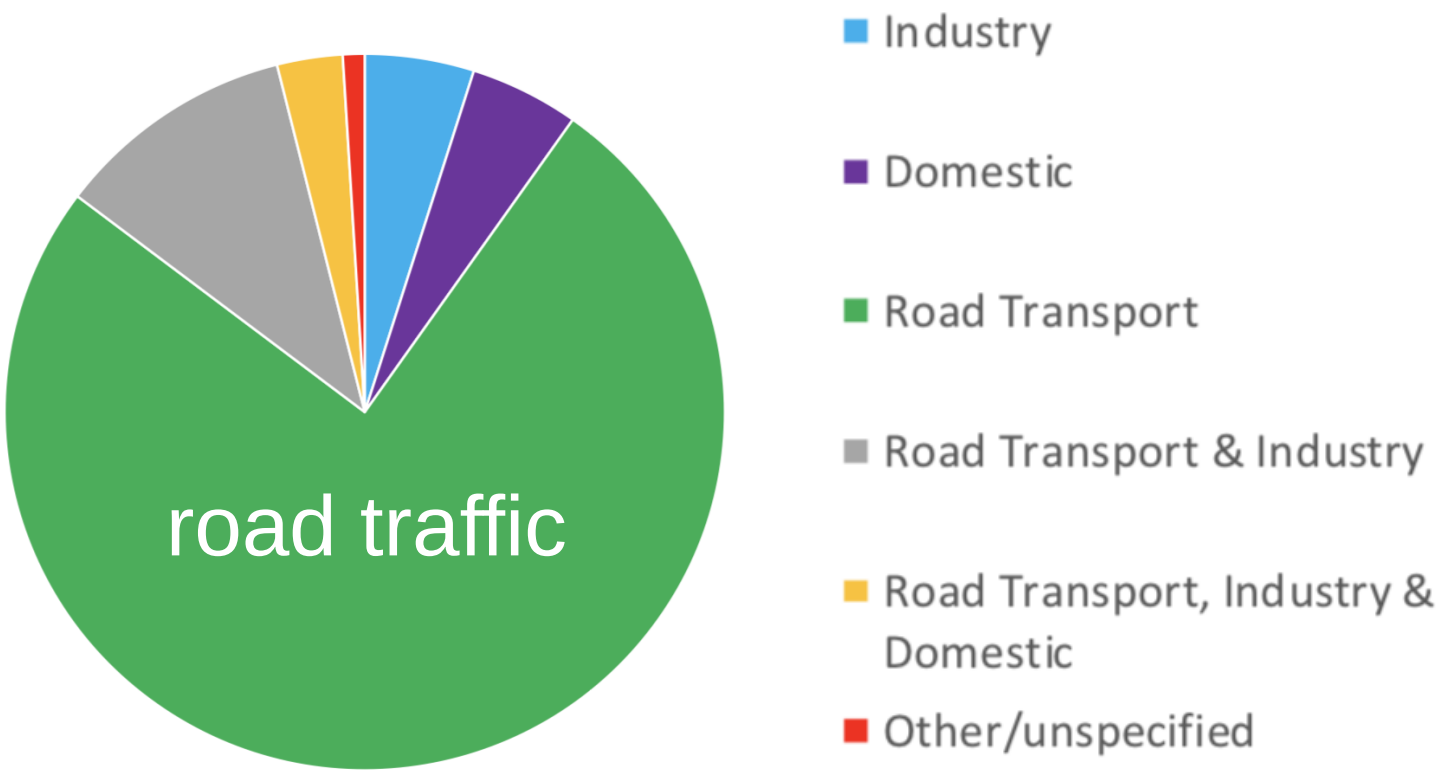

TRAFALGAR STUDIOS

PM_{10} = less than 10μm



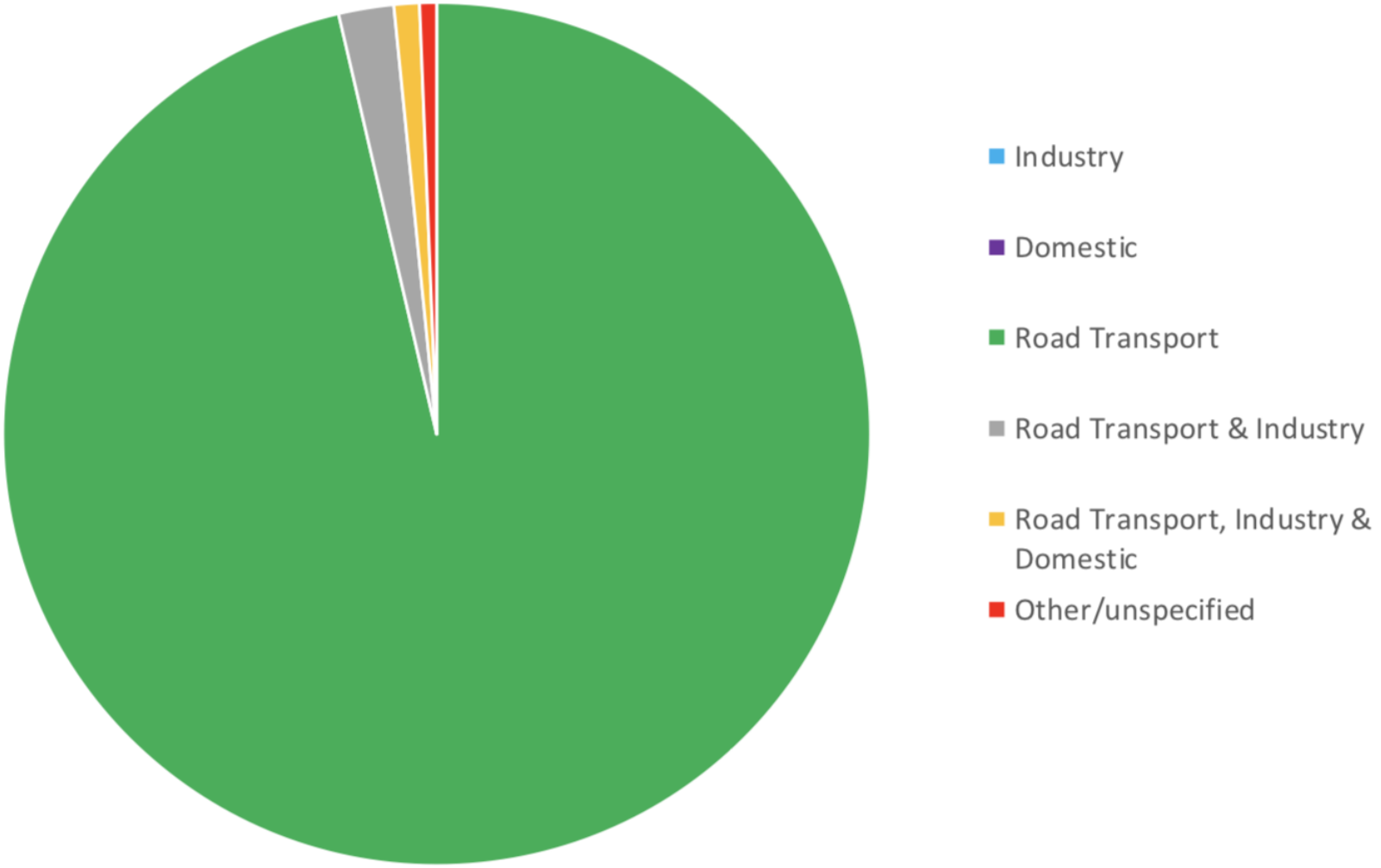


PM sources; UK urban

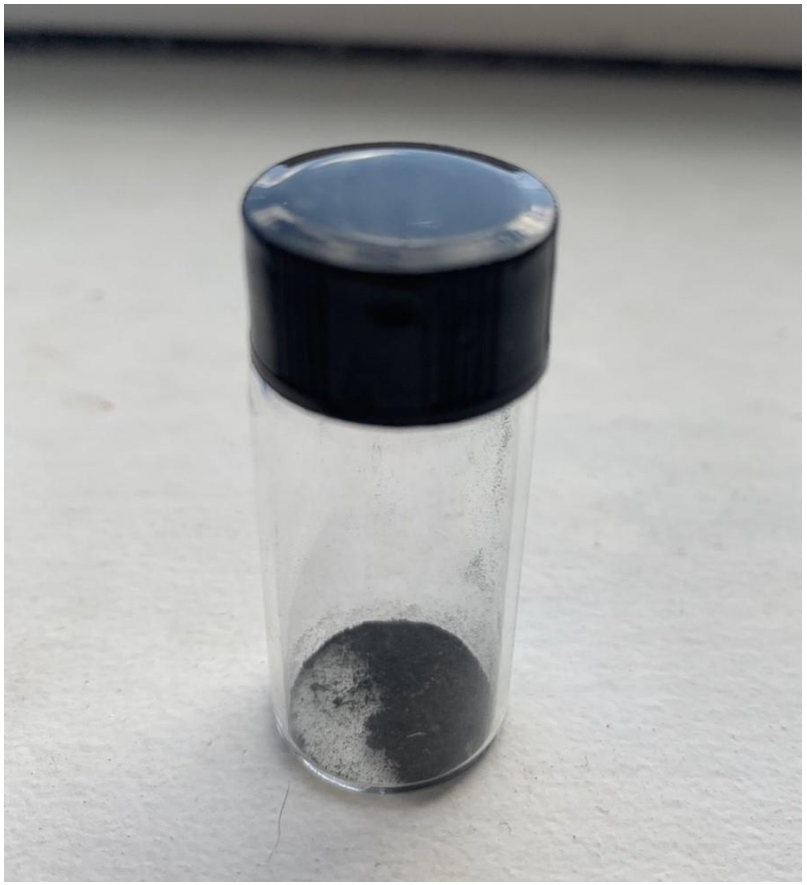


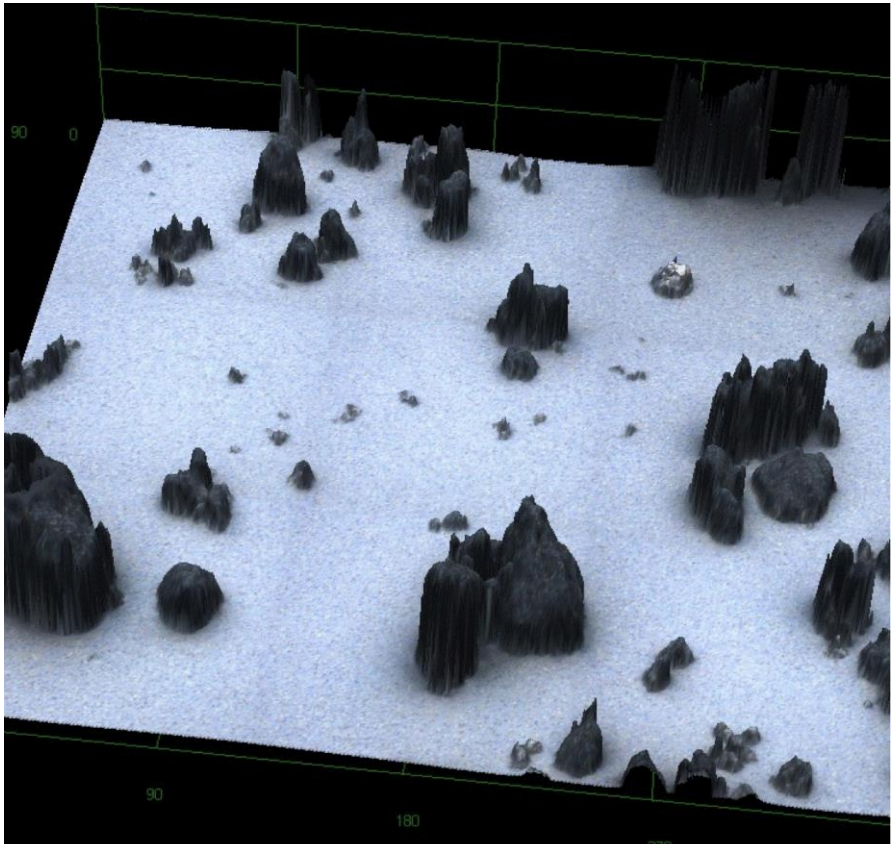
https://uk-air.defra.gov.uk/

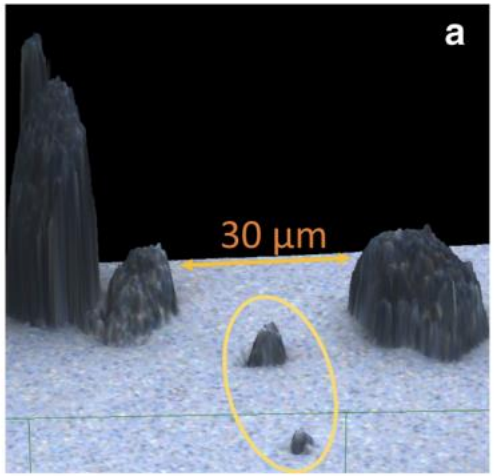
nitrogen dioxide

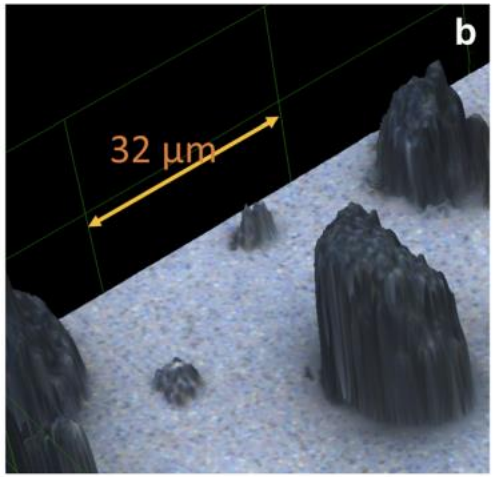


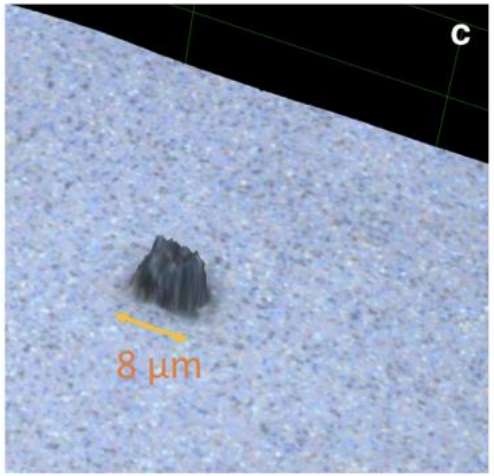
collecting kerbside-PM_{10}





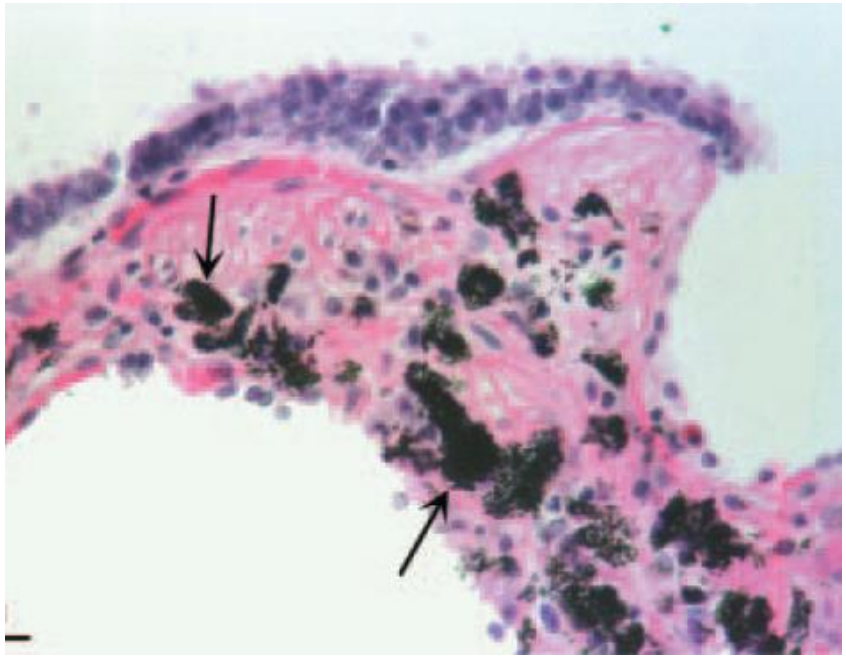






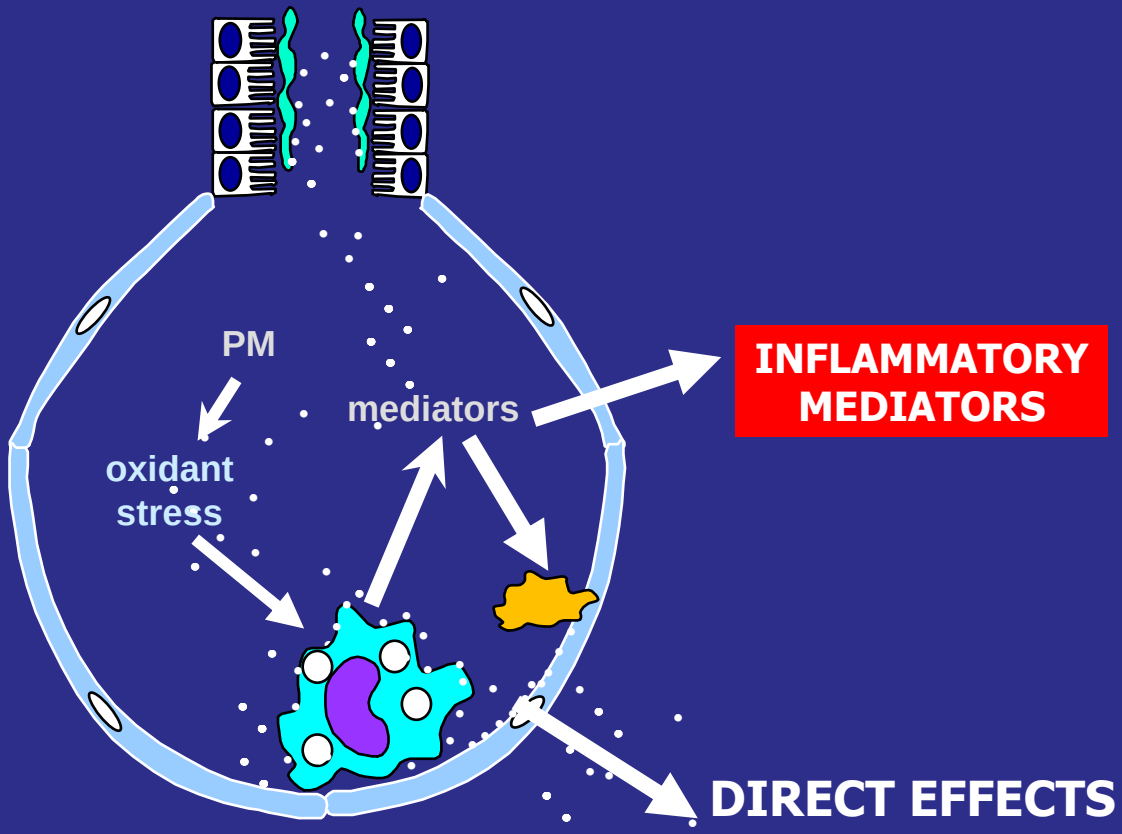
Environ Sci Pollut Res Int 2021

respiratory bronchiole

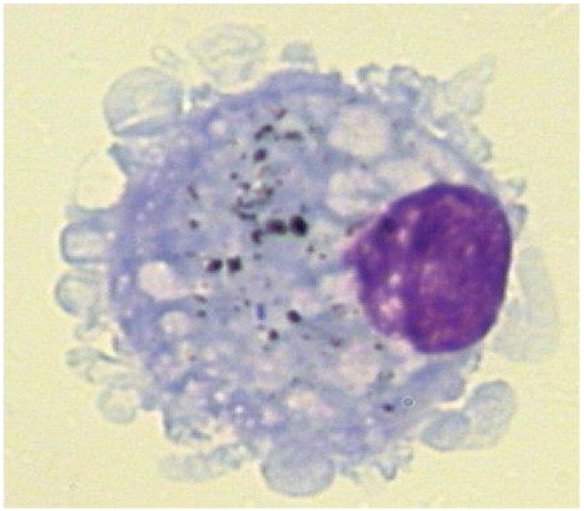


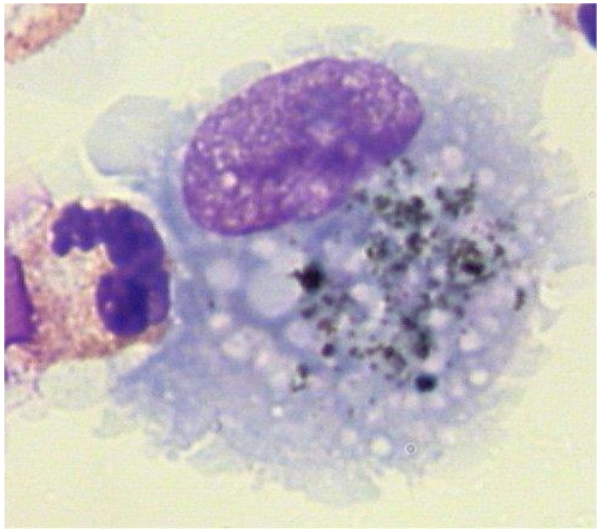
Pinkerton, *EHP* 2000

oxidative stress

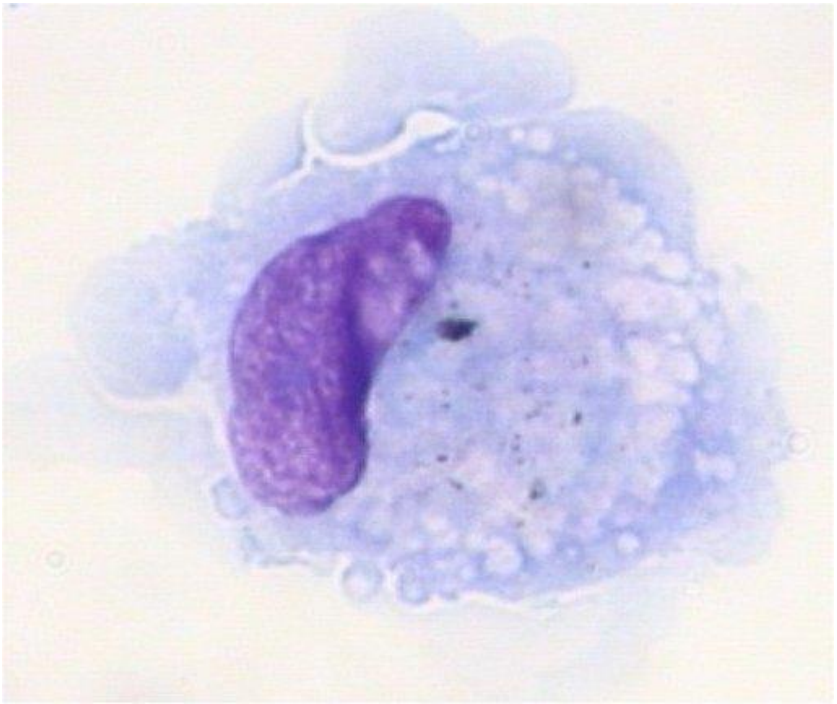


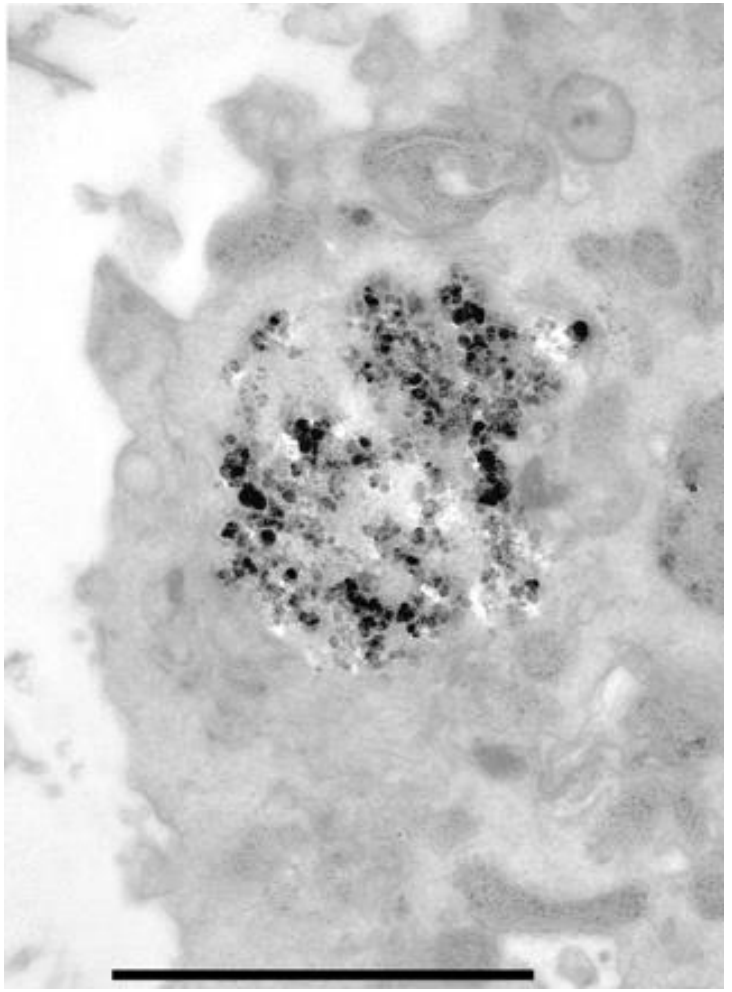
Laboratory studies





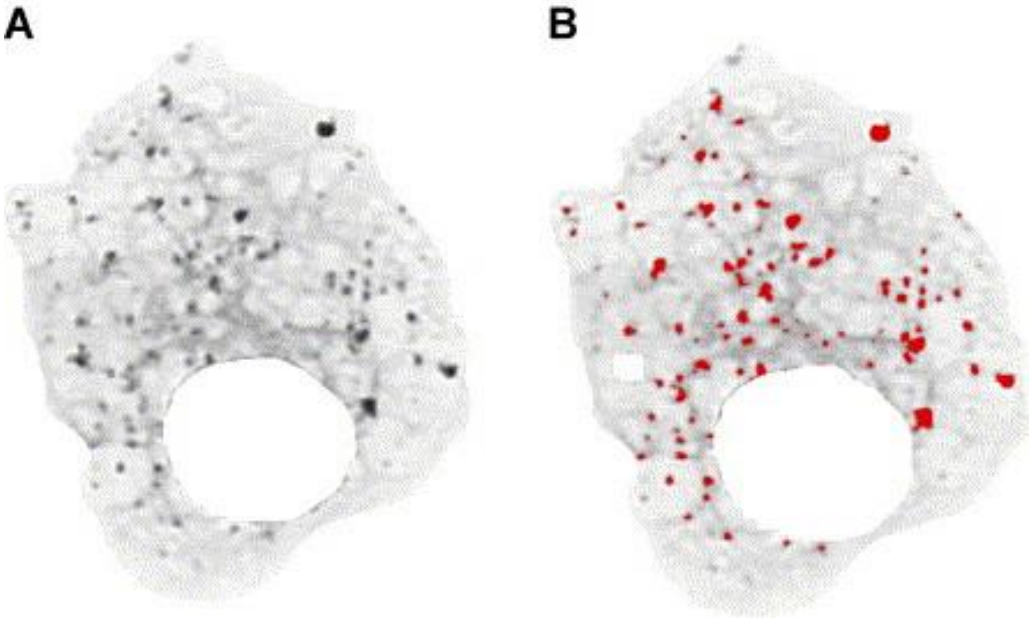
NEJM 2006 355:21-30

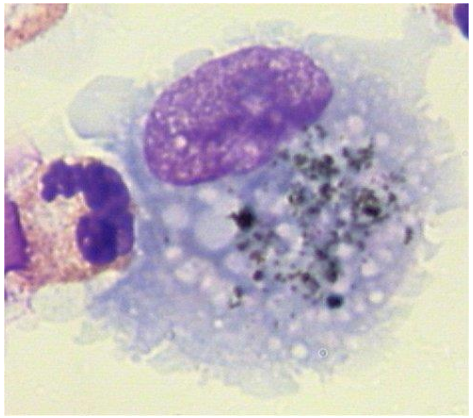


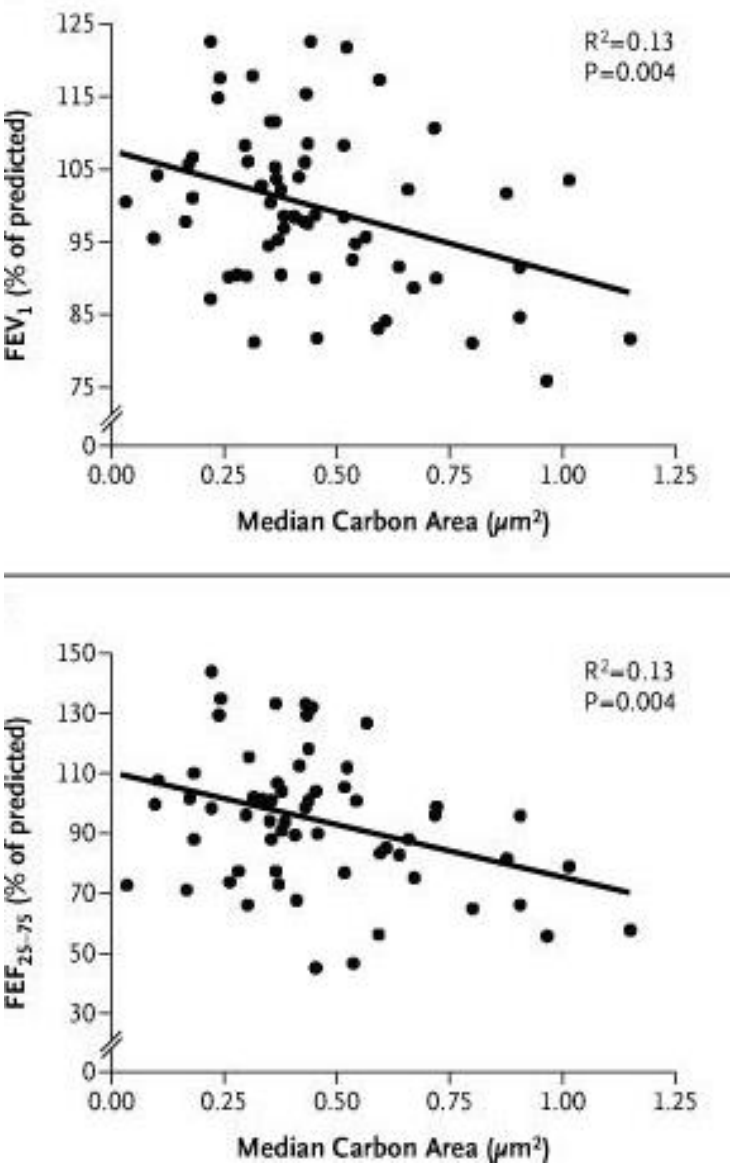


Thorax 2001

black carbon area

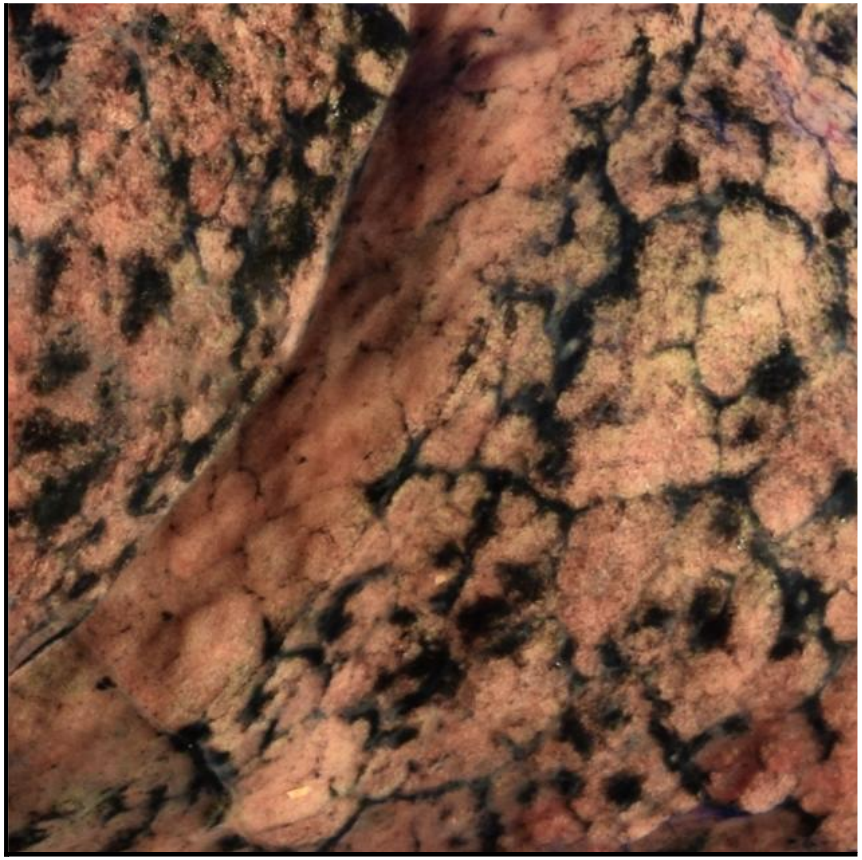




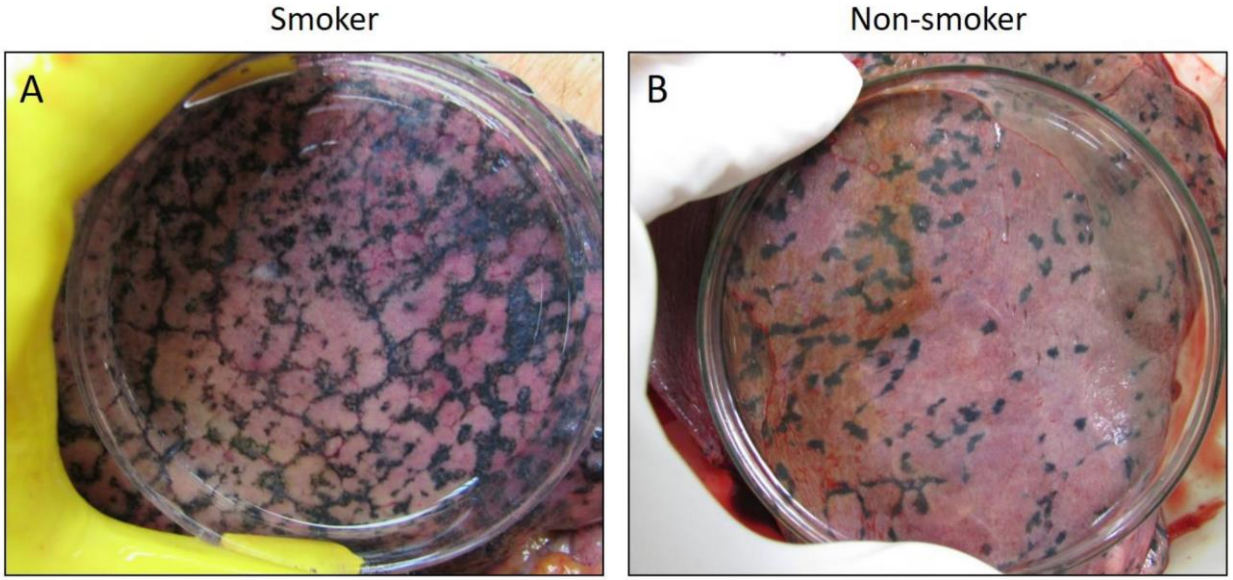

125
115
105
95
85
75
0
FEV1 (% of predicted)
R2=0.13
P=0.004
0.00
0.25
0.50
0.75
1.00
1.25
Median Carbon Area (μm2)
150
130
110
90
70
50
30
0
FEF25–75 (% of predicted)
R2=0.13
P=0.004
0.00
0.25
0.50
0.75
1.00
1.25
Median Carbon Area (μm2)

NEJM 2006

nonsmoker Sao Paulo



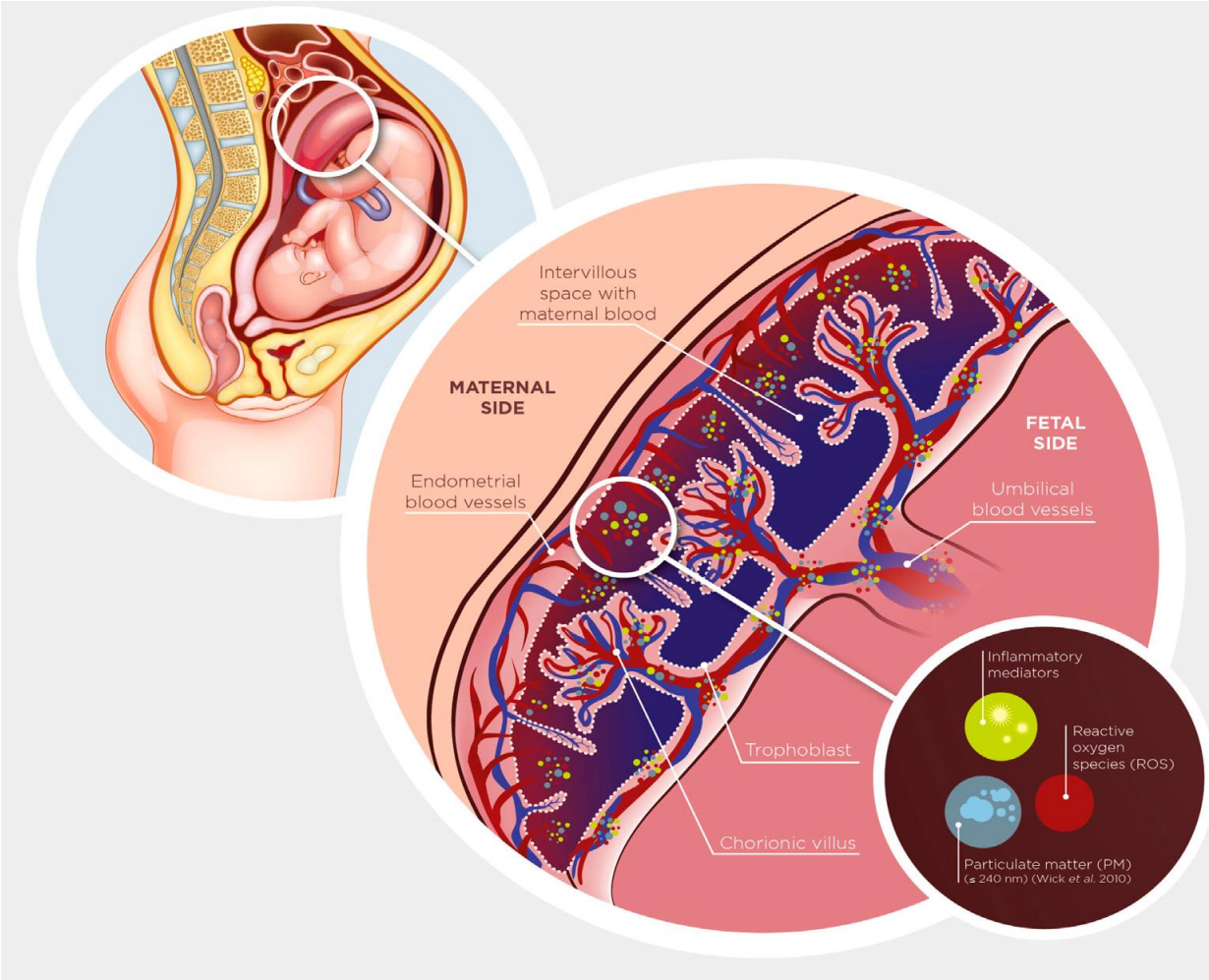
PLOS one 2018



- one hour in daily commuting in Sao Paulo during whole of active life is carbon PM equivalent to smoking 5 cigarettes per day

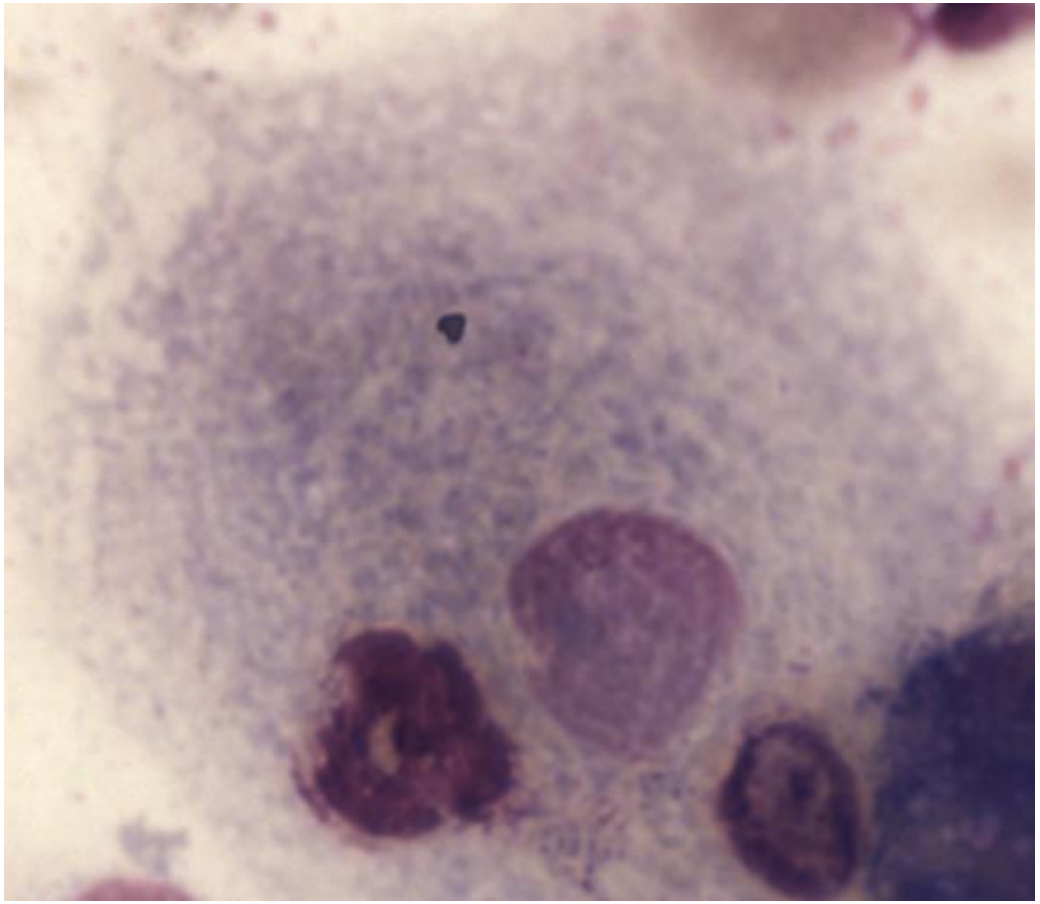
Cremasco *Environmental Res* 2019

PM at other sites



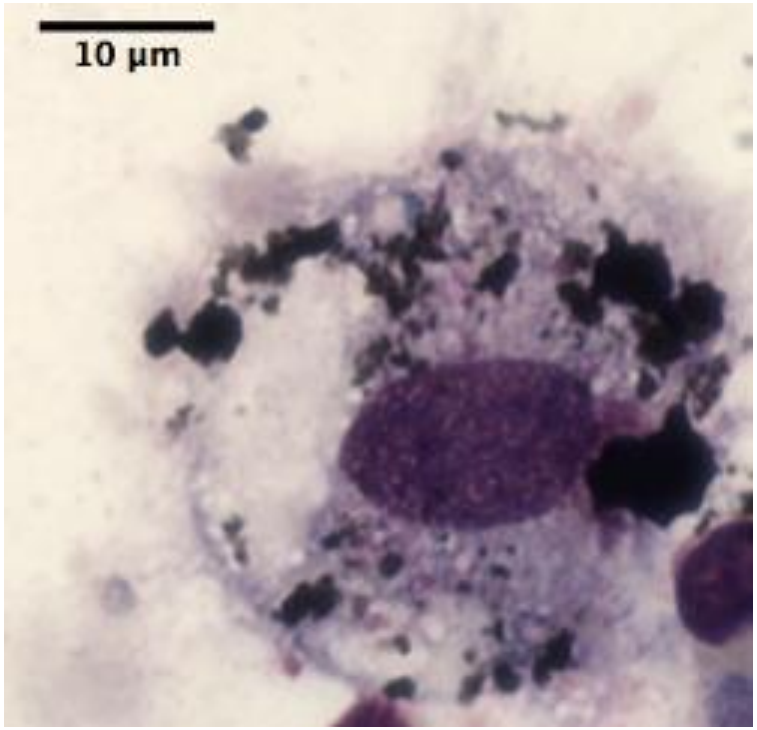
Leen *Environmental Research* 2018

placental phagocytic cells



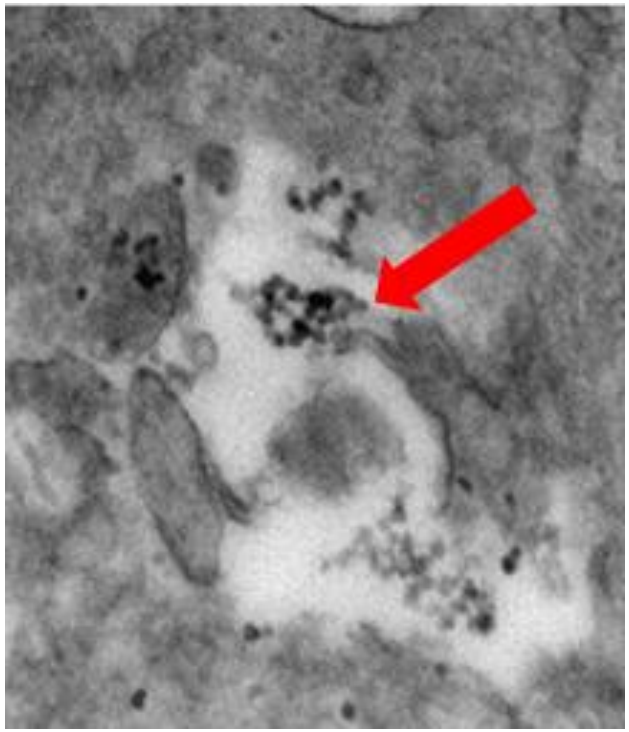
Sci Total Environ 2020

placental Macs + PM *in vitro*

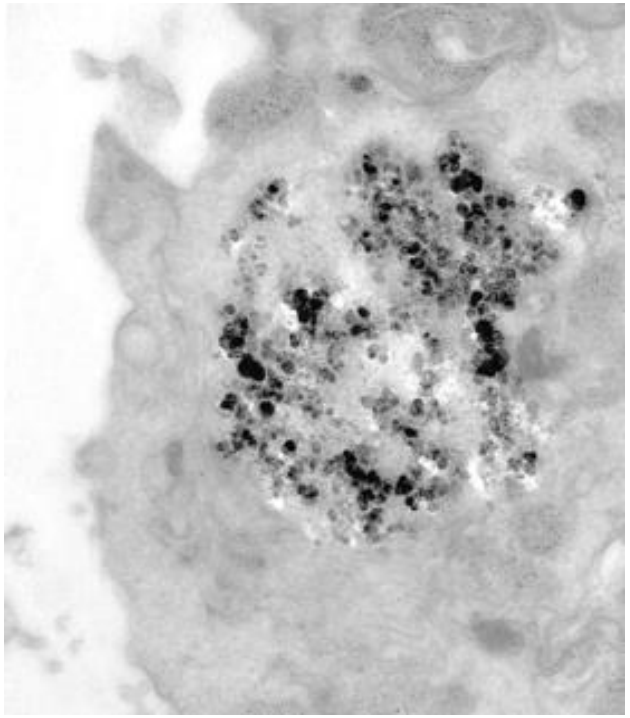


Sci Total Environ 2020

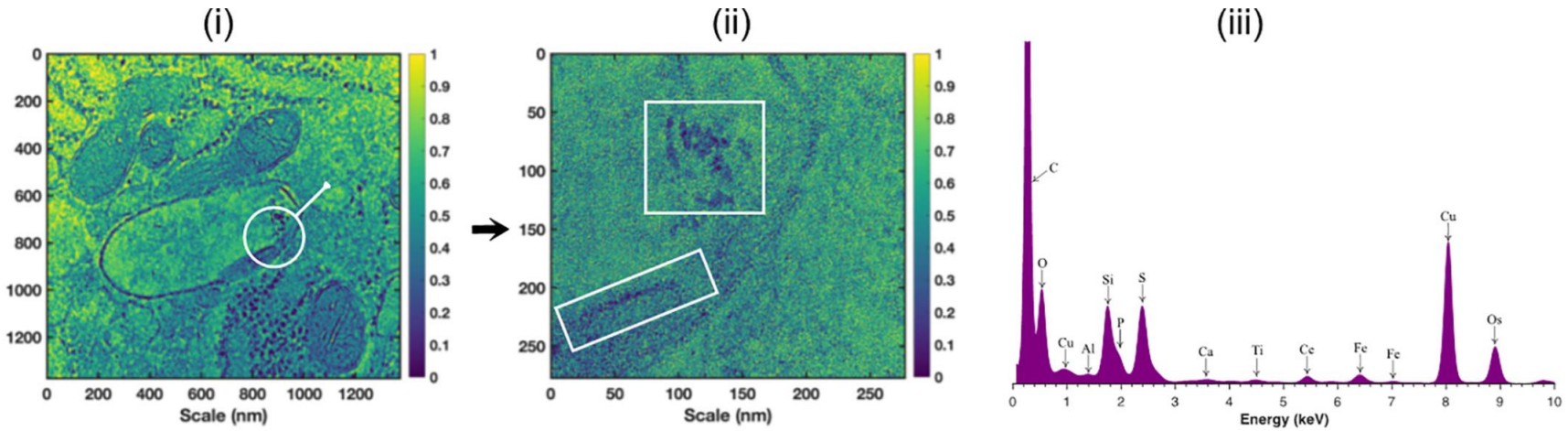
placenta



airway

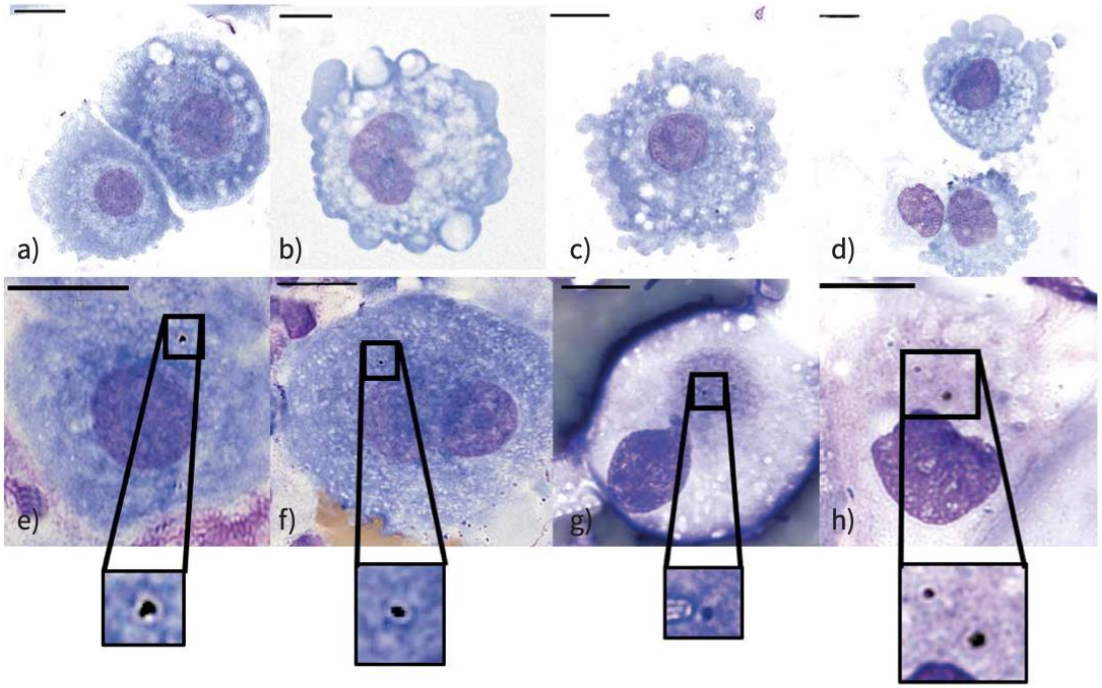


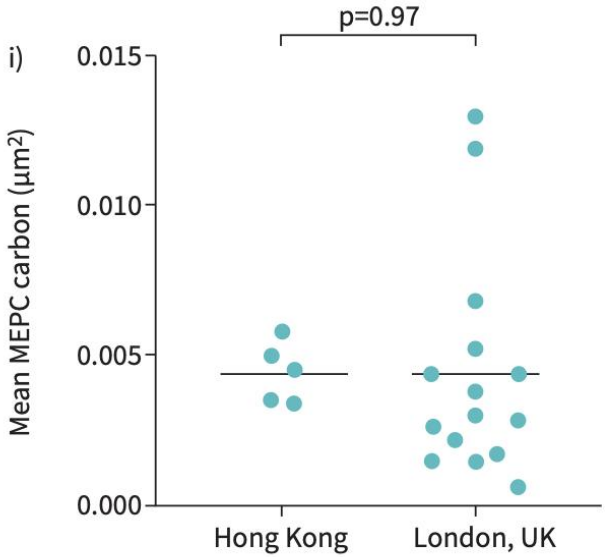
Placental macrophages



Sci Total Environ 2020

PM in stored placentas

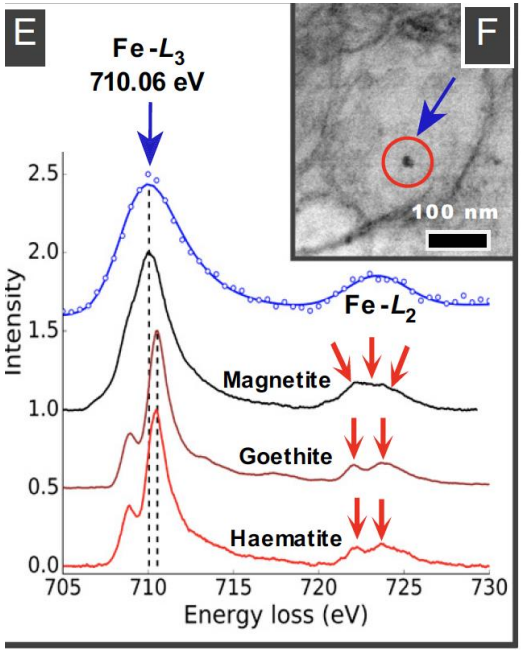




ERJ open 2021

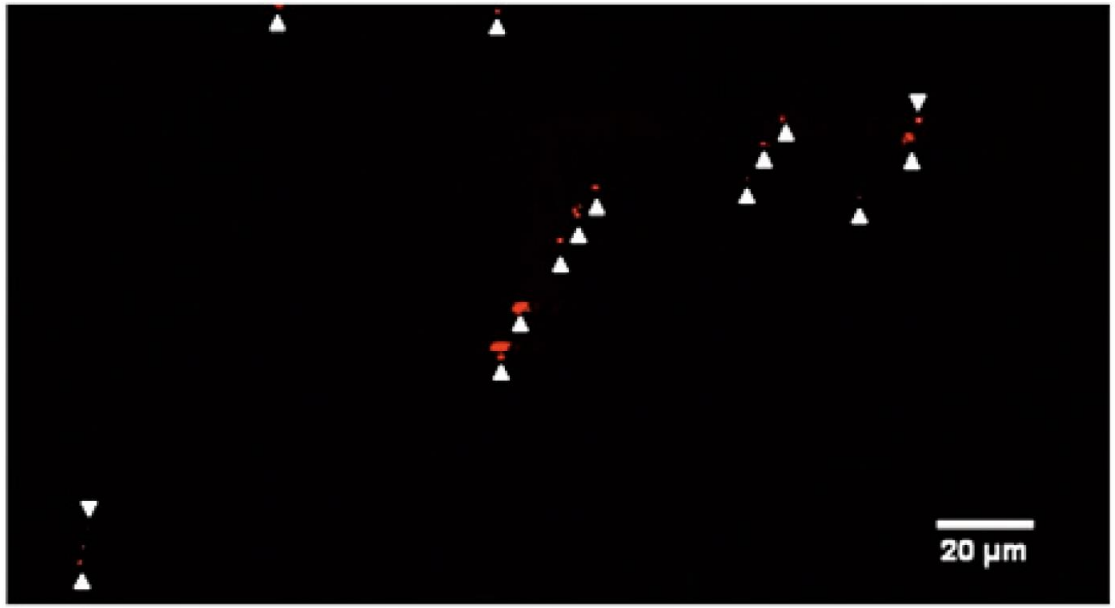
Magnetite pollution nanoparticles in the human brain

Barbara A. Maher[a,1], Imad A. M. Ahmed[b], Vassil Karloukovski[a], Donald A. MacLaren[c], Penelope G. Foulds[d], David Allsop[d], David M. A. Mann[e], Ricardo Torres-Jardón[f], and Lilian Calderon-Garciduenas[g,h]



PNAS 2016

particles in urine



femtosecond pulsed laser excitation at 810 nm
observation at 400-410 nm

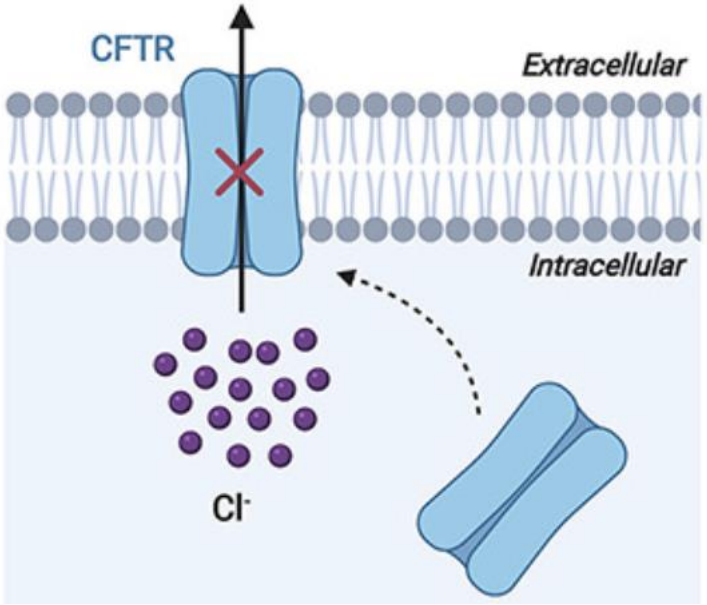
Saenen *Am J Resp Crit Care Med* 2017

Cystic fibrosis and $PM_{2.5}$ – time to acquisition

	Nearest monitor
	HR (95% CI)
MRSA	*1.48 (1.14, 1.93)*
S. maltophilia	*1.34 (1.07, 1.68)*

Psoter *BMC Pul Med* 2017

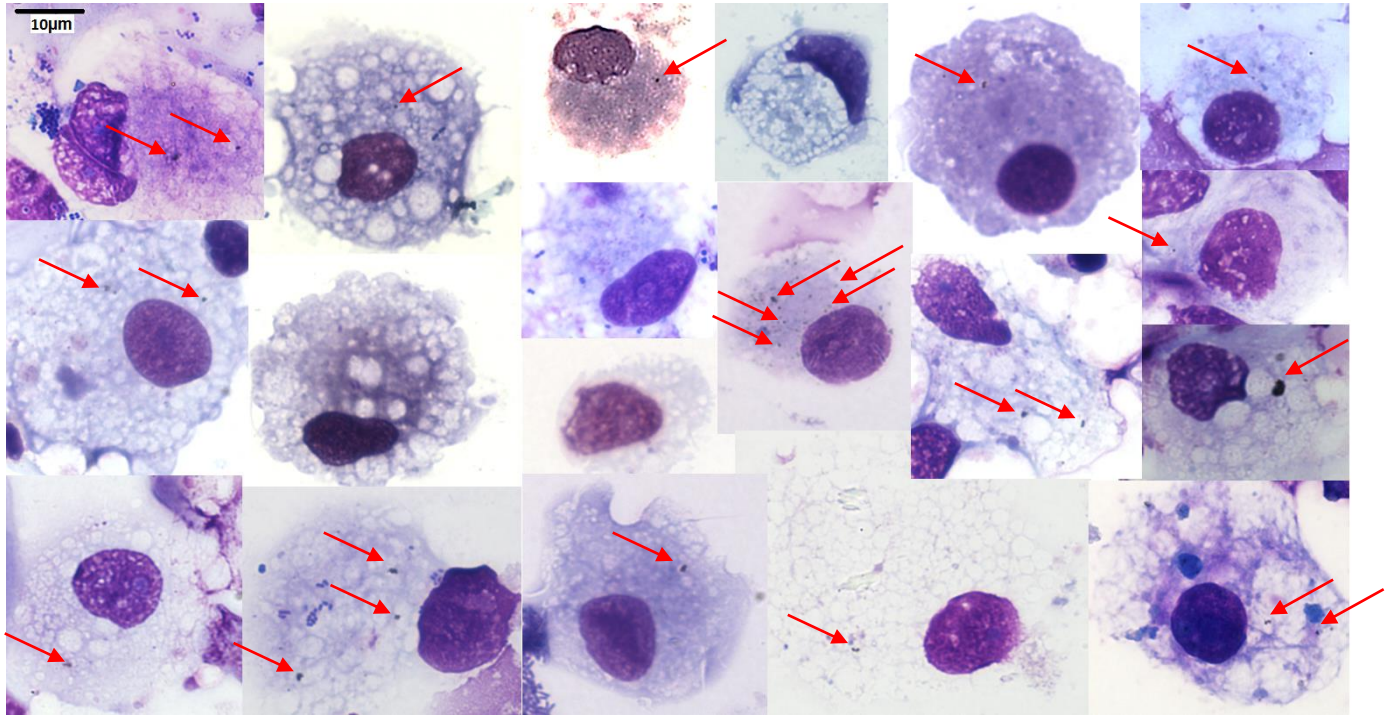
Diesel Exhaust Particles



No effect on cell viability
No effect on CFTR expression
↓ CFTR function
↑ Oxidative stress

Nguyen *Toxicol In Vitro*. 2021

AM in CF

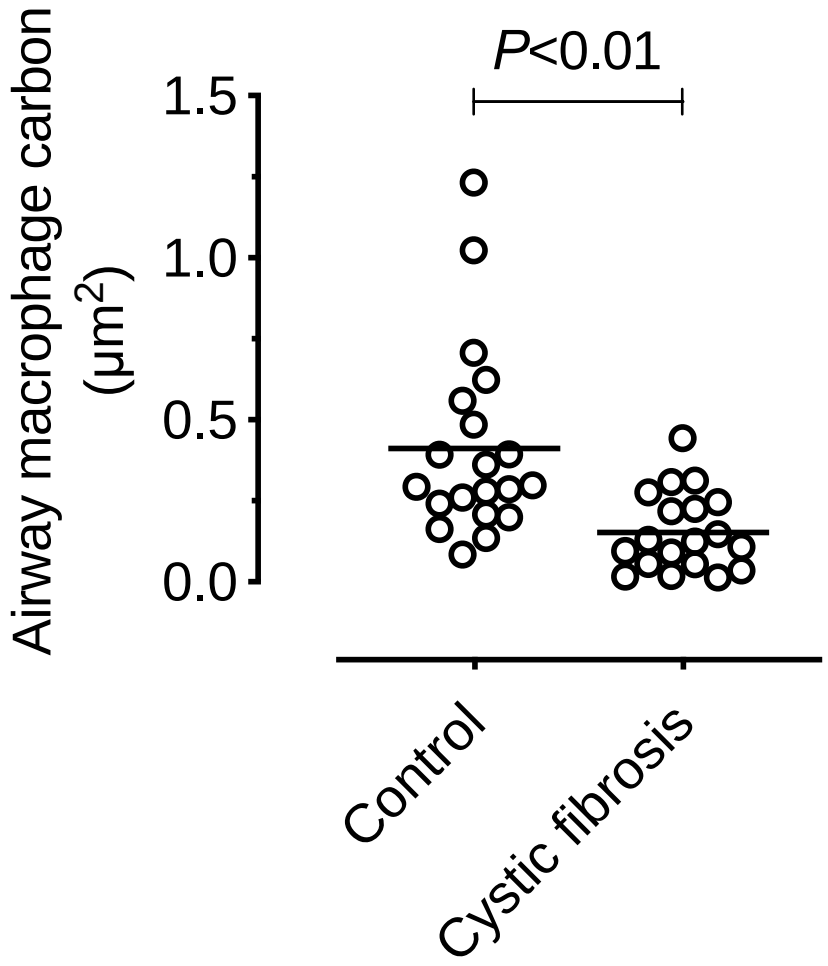


J Cyst Fibros 2021

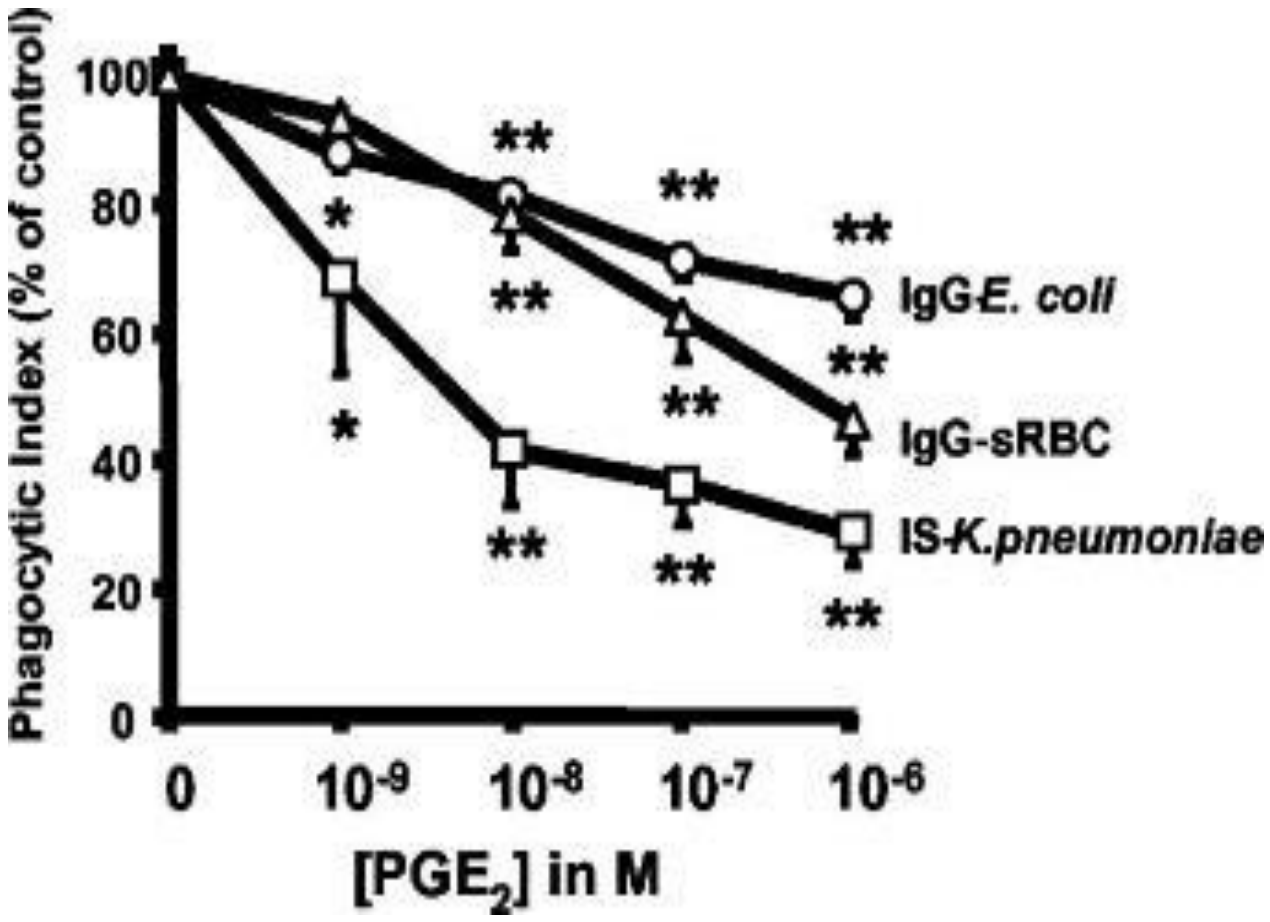
personal exposure controls vs CF

	Controls (n=20)	Cystic Fibrosis (n=19)	P value
Predicted FEV_1 (%)	99.3 ± 1.22	84.8 ± 3.73	0.0006
Modelled annual exposure at home address			
1. PM_{10} ($\mu g/m^3$)	25.51 ± 0.47	25.94 ± 0.45	0.52
2. $PM_{2.5}$ ($\mu g/m^3$)	15.81 ± 0.40	16.30 ± 0.35	0.36
3. NO_2 ($\mu g/m^3$)	37.26 ± 1.29	35.06 ± 1.27	0.24

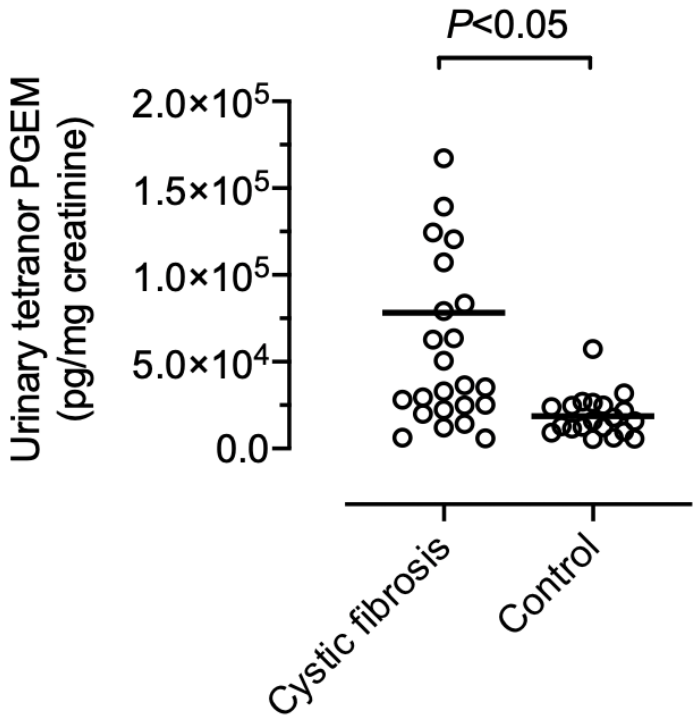
J Cyst Fibros 2021

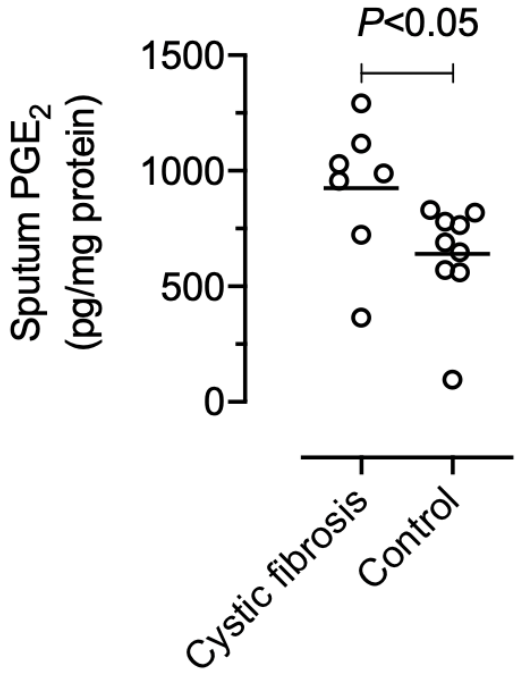


J Cyst Fibros 2021



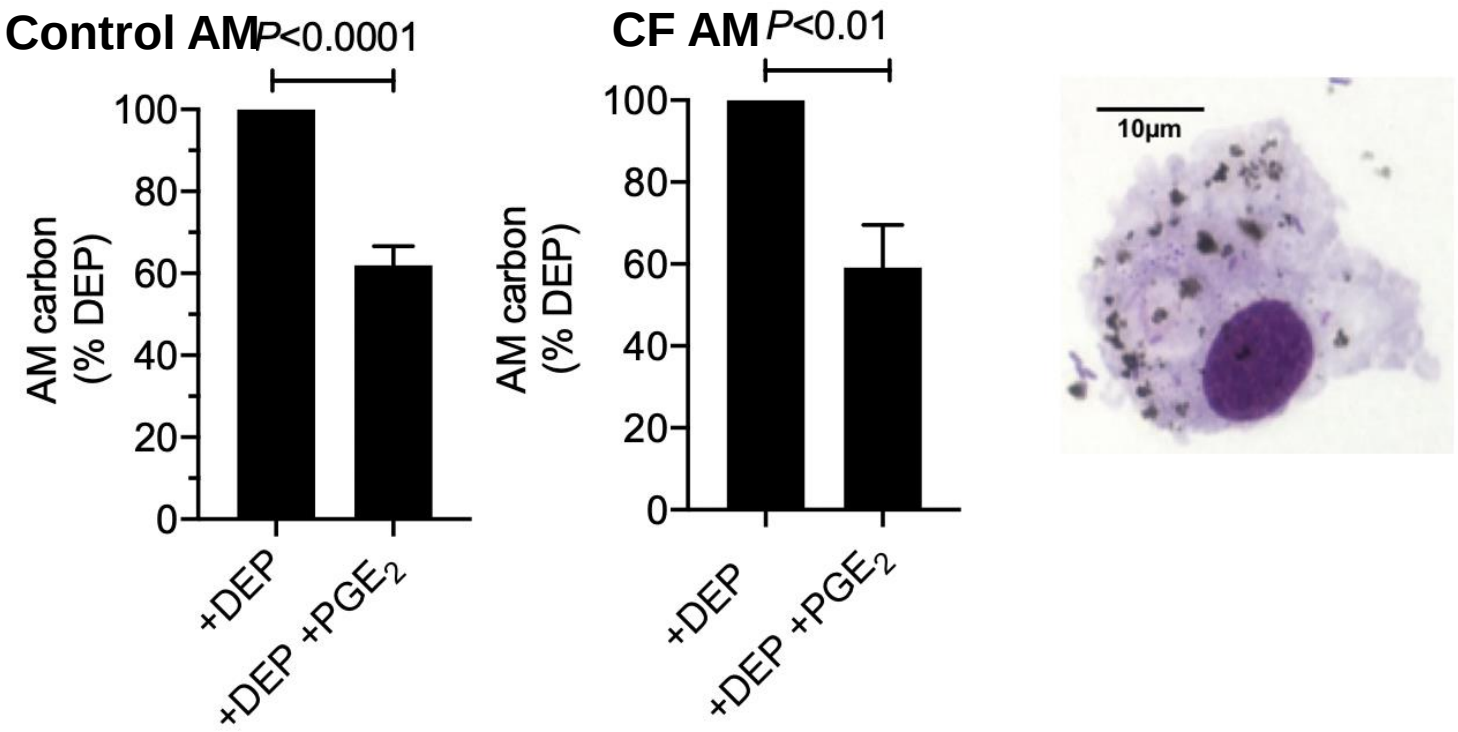
Aronoff *J Immunol 2004*





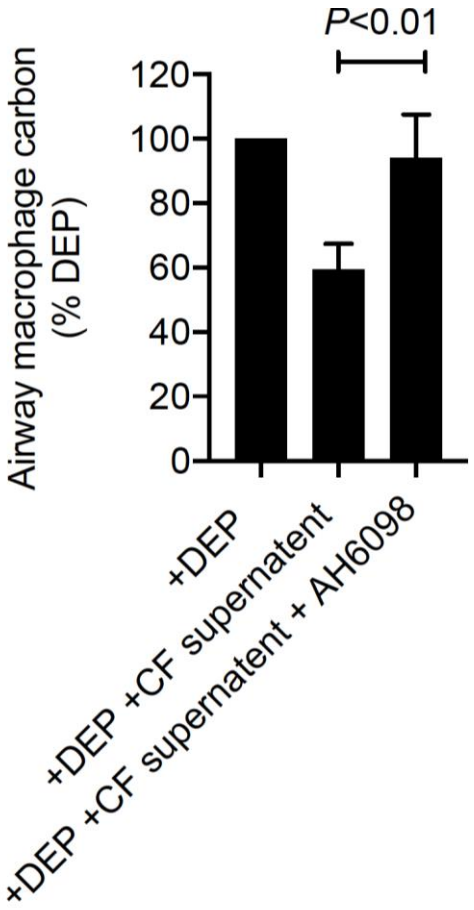
J Cyst Fibros 2021

phagocytosis



J Cyst Fibros 2021

CF sputum



J Cyst Fibros 2021

Cochrane Library

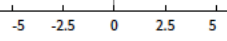
Cochrane Database of Systematic Reviews

Oral non-steroidal anti-inflammatory drug therapy for lung disease in cystic fibrosis (Review)

Lands LC, Stanojevic S

Analysis 1.1. Comparison 1 Oral nonsteroidal anti-inflammatory drug versus placebo, Outcome 1 Annual rate of change in % predicted FEV_1.

Study or subgroup	NSAID N	NSAID Mean(SD)	Placebo N	Placebo Mean(SD)	Mean Difference Fixed, 95% CI	Weight	Mean Difference Fixed, 95% CI
Konstan 1995	41	-2.2 (3.7)	43	-3.6 (3.6)		50.88%	1.43[-0.12,2.98]
Lands 2007	70	-1.5 (4.8)	72	-2.7 (4.8)		49.12%	1.2[-0.38,2.78]
Total ***	**111**		**115**			**100%**	**1.32[0.21,2.42]**
Heterogeneity: Tau^2=0; Chi^2=0.04, df=1(P=0.84); I^2=0%							
Test for overall effect: Z=2.33(P=0.02)							



Favours Placebo

Favours NSAIDs

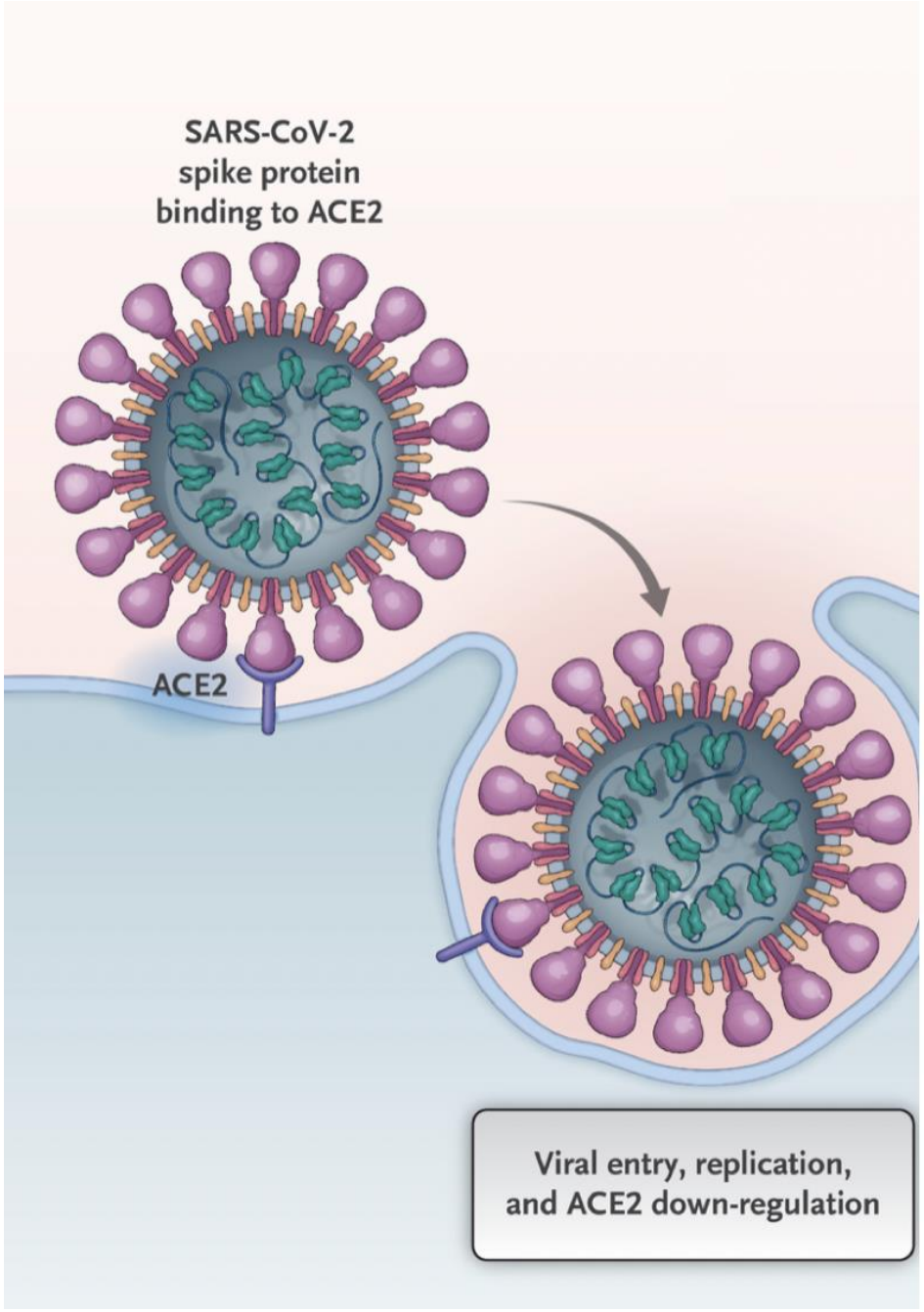

10 µm

New Research Links Air Pollution to Higher Coronavirus Death Rates

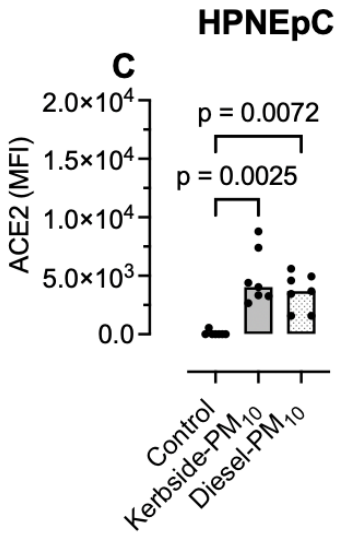
Atlanta on Saturday evening. The area is likely to suffer more deaths than the adjacent Douglas County, Ga. Kevin C. Cox/Getty Images

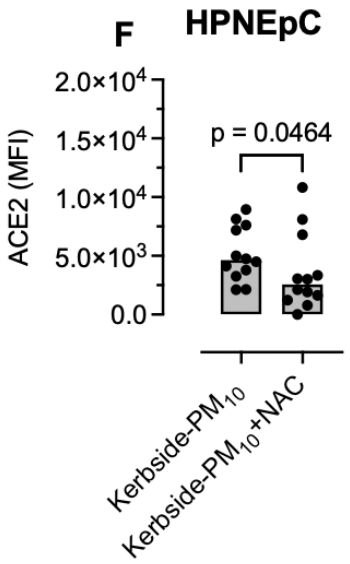
By Lisa Friedman

Published April 7, 2020 Updated April 17, 2020

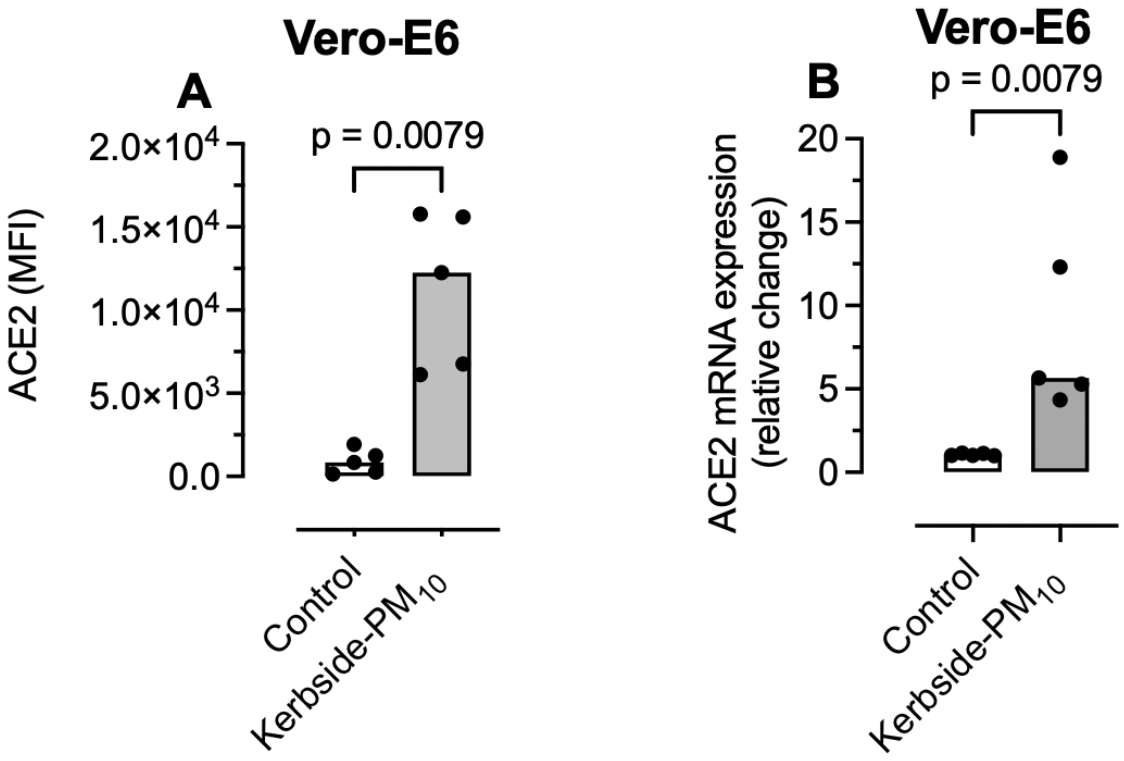

SARS-CoV-2
spike protein
binding to ACE2
ACE2
Viral entry, replication,
and ACE2 down-regulation

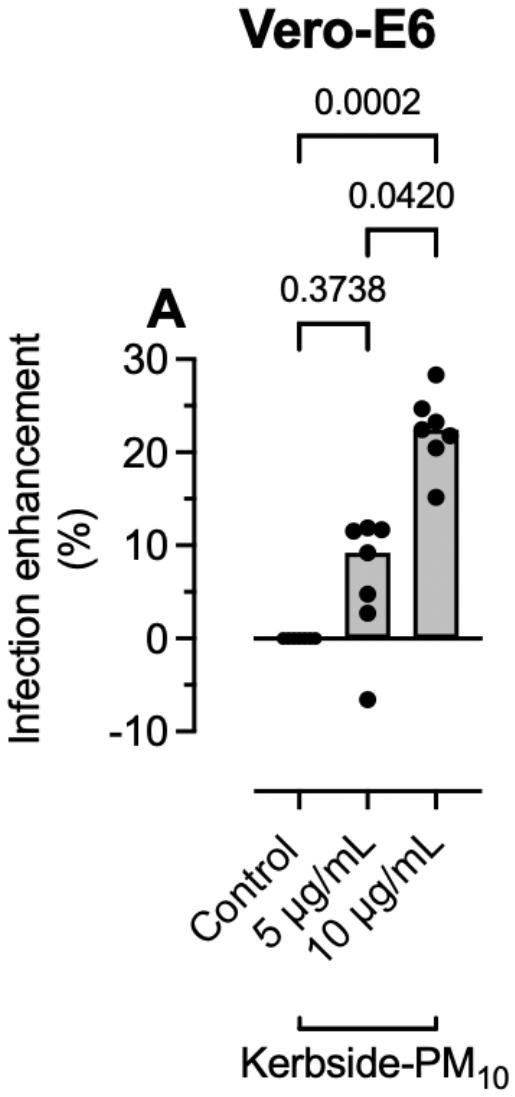
NEJM 2020


HPNEpC
C
2.0×10^4
1.5×10^4
1.0×10^4
5.0×10^3
0.0
ACE2 (MFI)
p = 0.0072
p = 0.0025
Control
Kerbside-PM10
Diesel-PM10

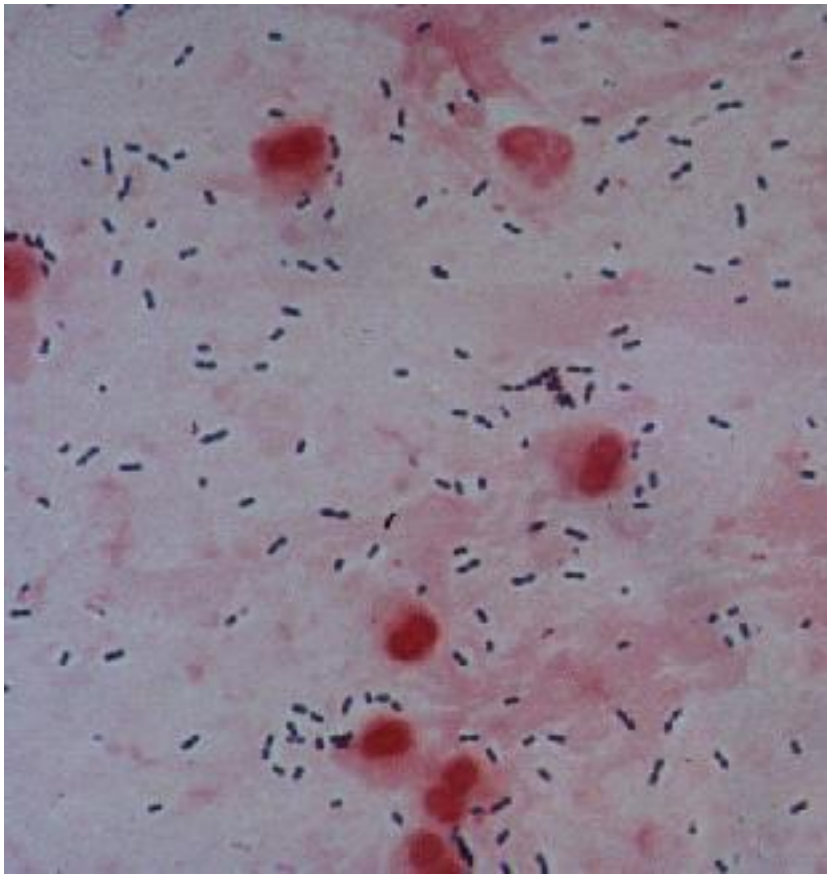

F
HPNEpC
2.0×10^4
1.5×10^4
1.0×10^4
5.0×10^3
0.0
ACE2 (MFI)
p = 0.0464
Kerbside-PM10
Kerbside-PM10+NAC

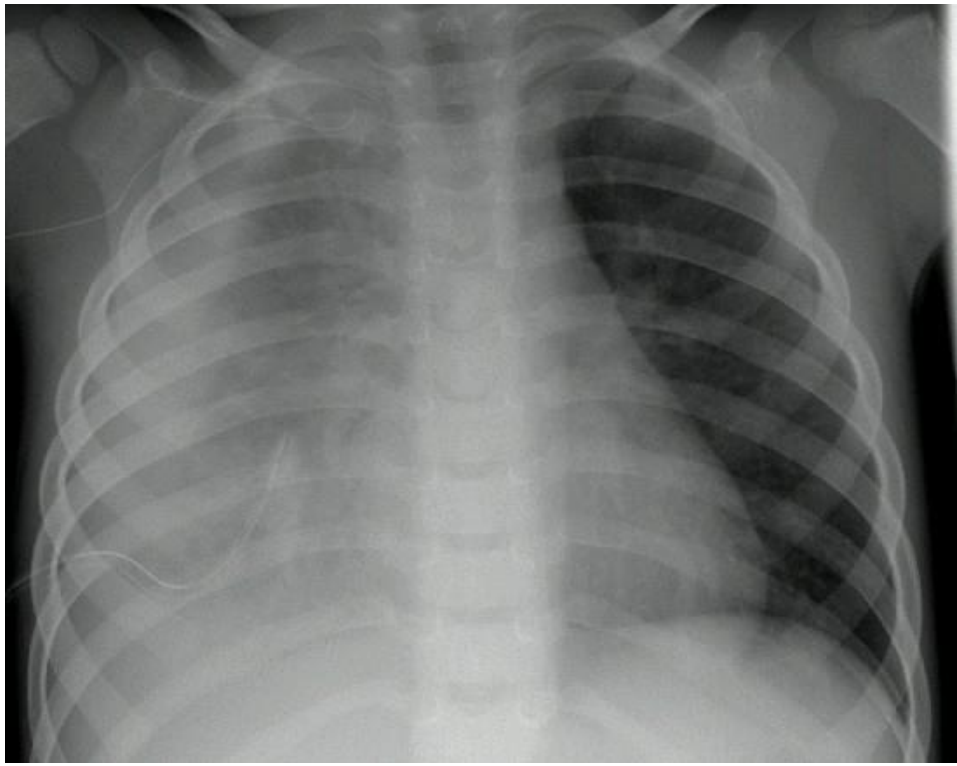
Vero-E6 cells



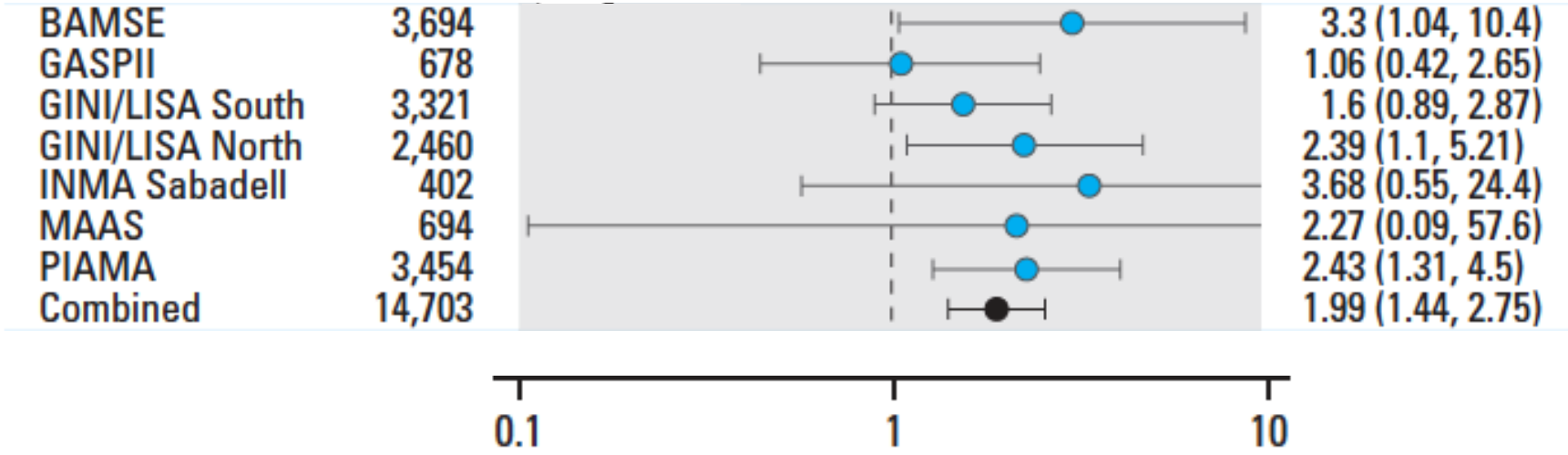

Vero-E6
0.0002
0.0420
0.3738
A
Infection enhancement (%)
30
20
10
0
-10
Control
5 µg/mL
10 µg/mL
Kerbside-PM10

S. pneumoniae

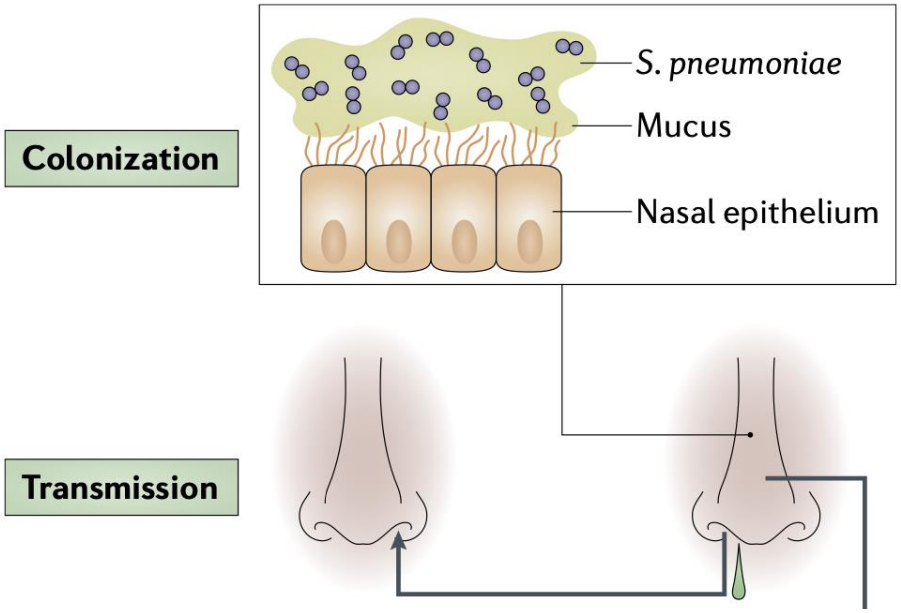




pneumonia in children and $PM_{2.5}$



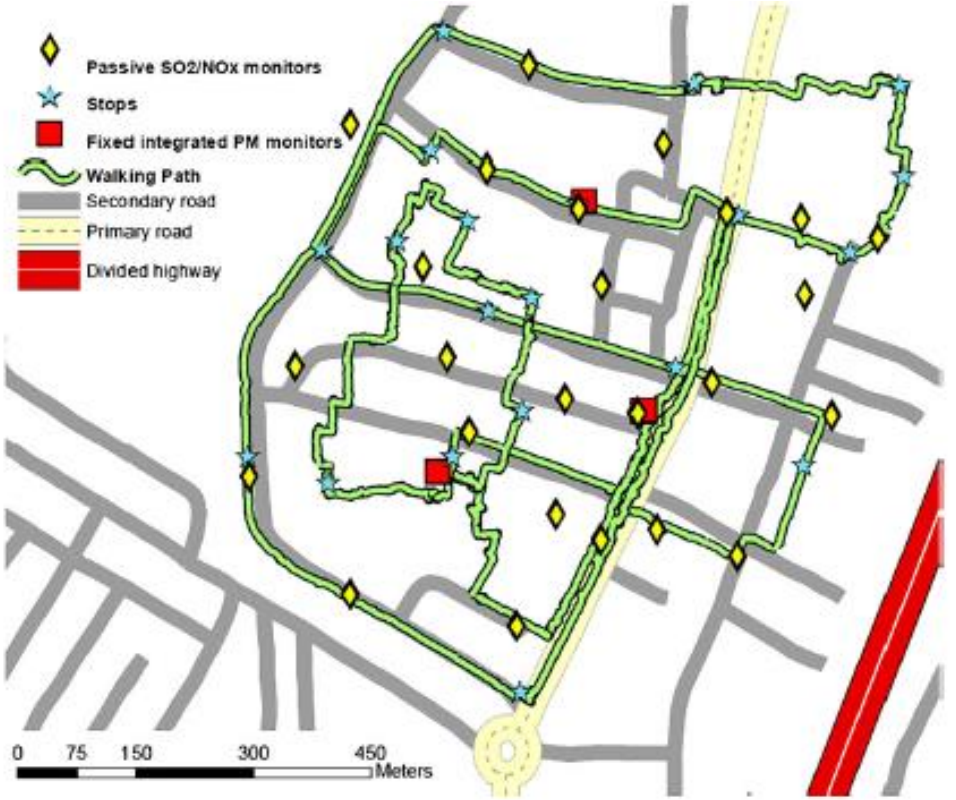
MacIntyre *EHP* 2014

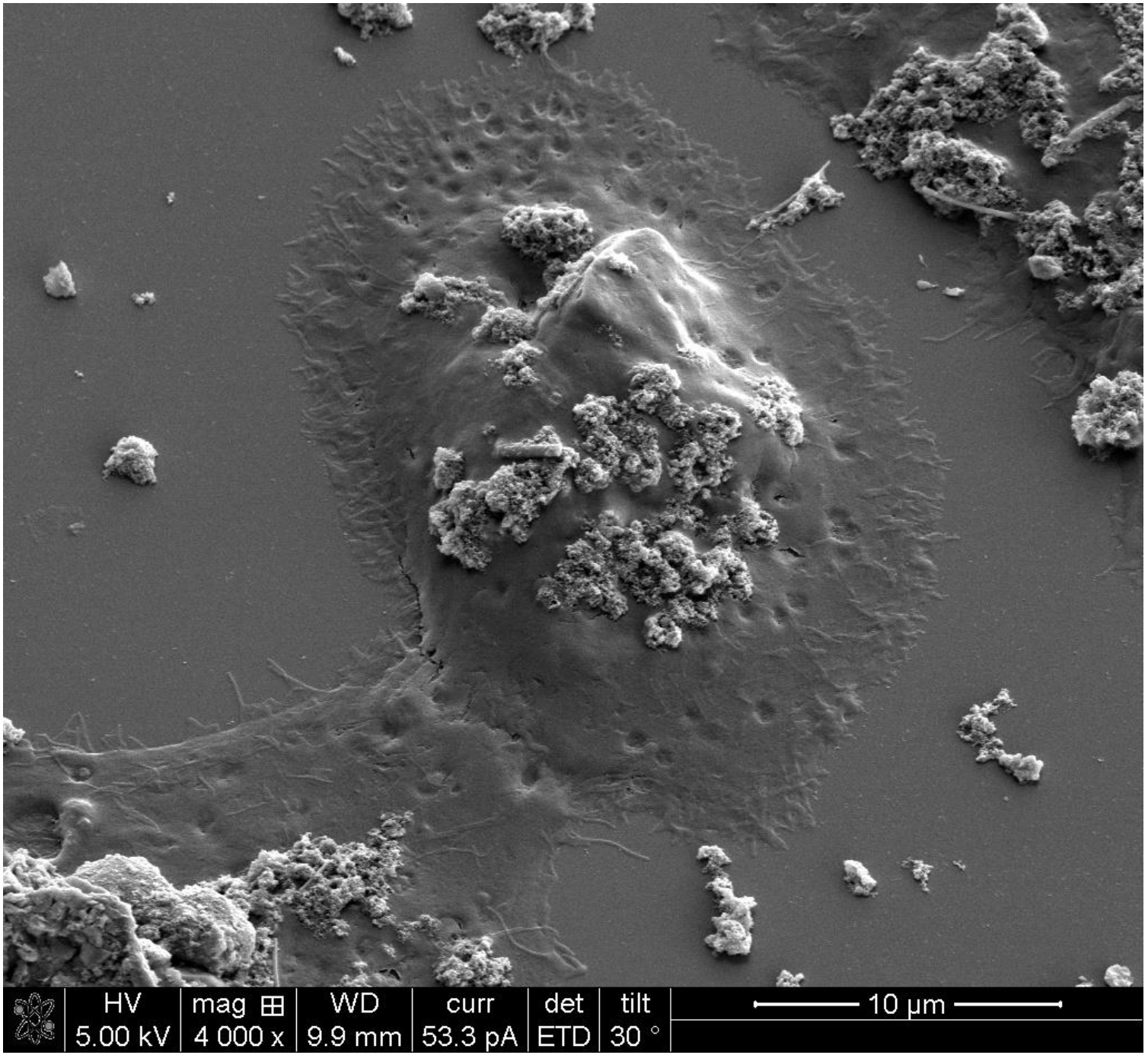


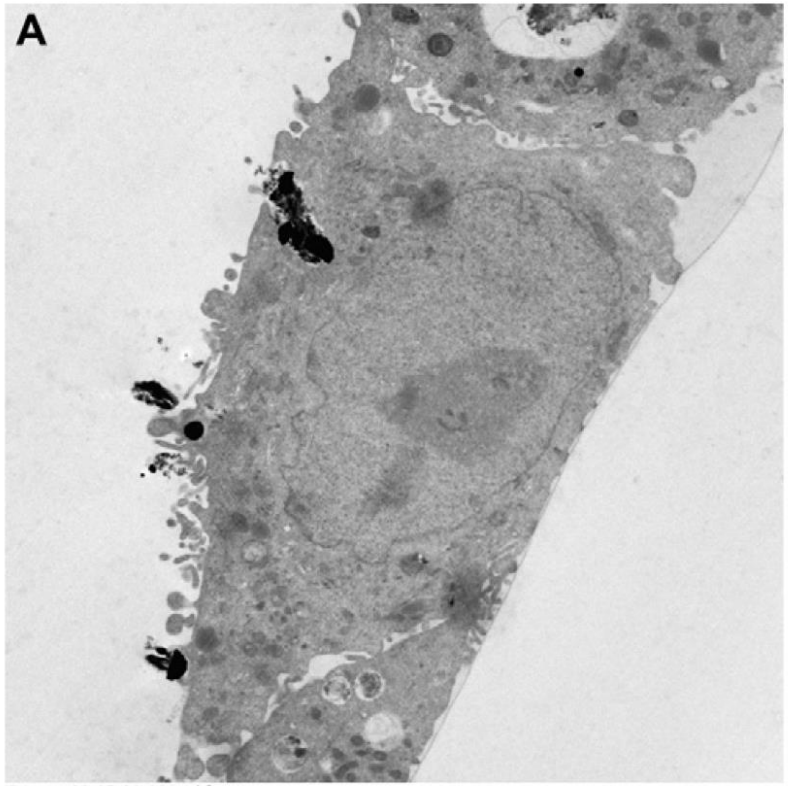
Weiser *Nature Rev. Micro.* 2018

pneumococcal adhesion

- UK
- Ghana

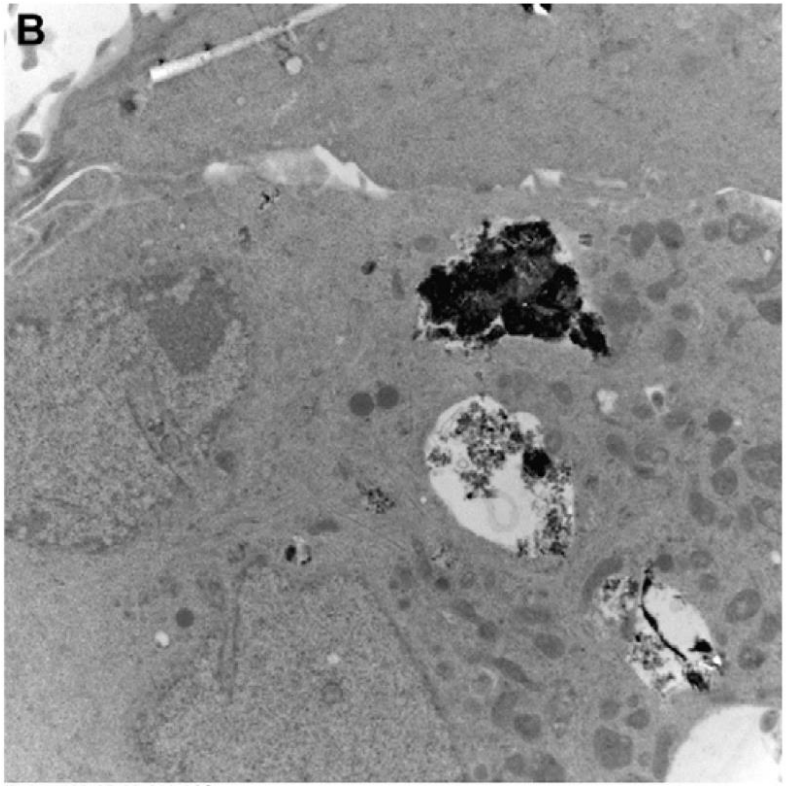



HV
5.00 kV
mag
4 000 x
WD
9.9 mm
curr
53.3 pA
det
ETD
tilt
30 °
10 µm



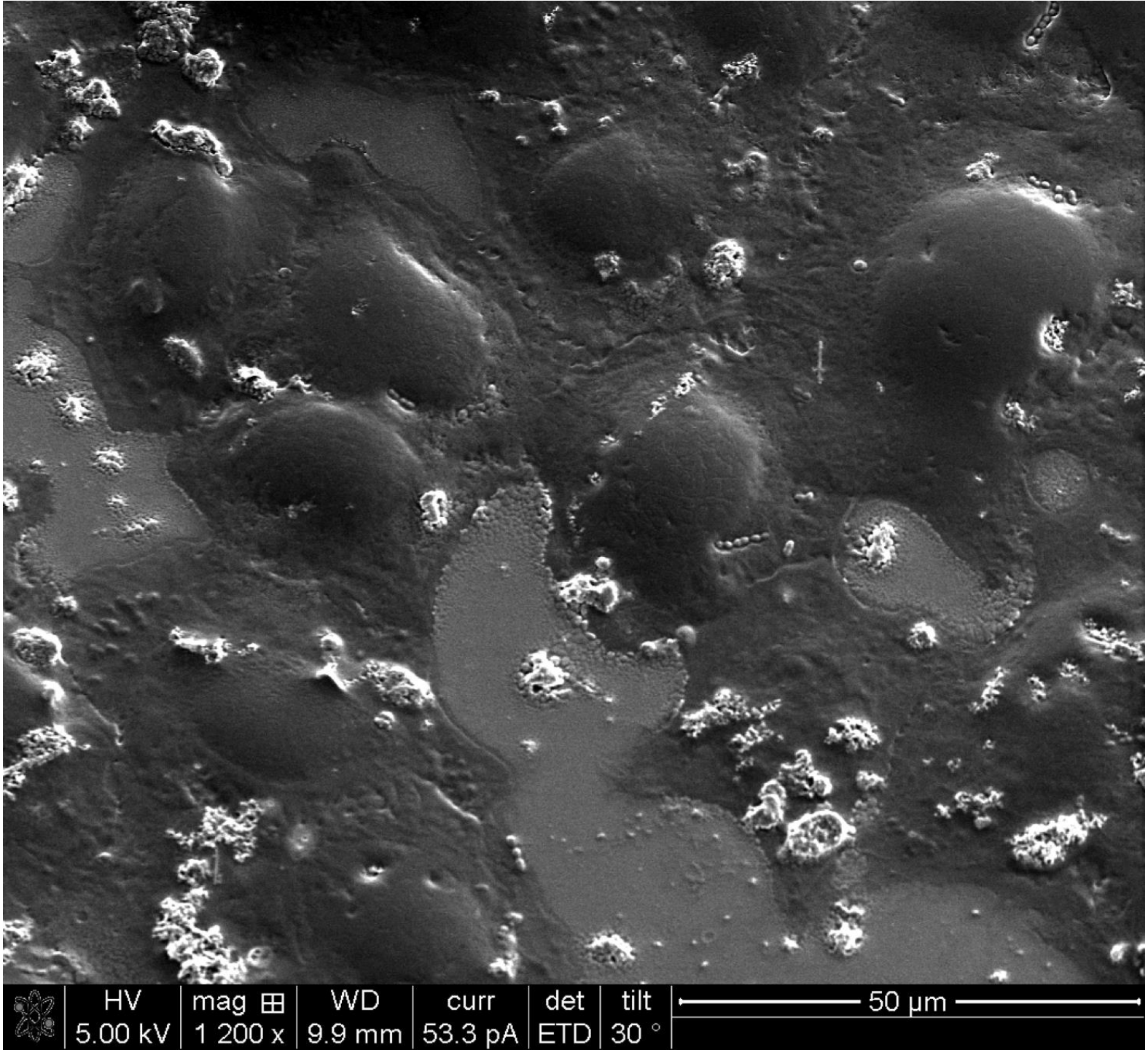
Naseem 20.07.09_001.tif
Print Mag: 7330x @ 150 mm
14:26 07/20/09
Microscopist: ML

2 microns
HV=75.0kV
Direct Mag: 7000x
CUI

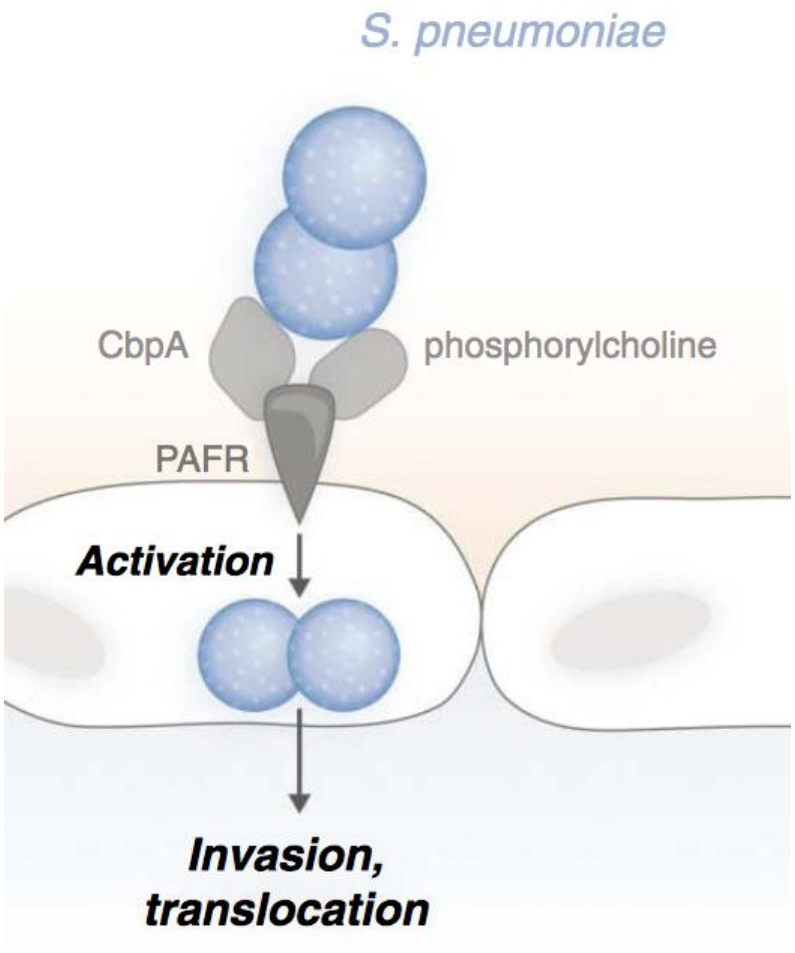


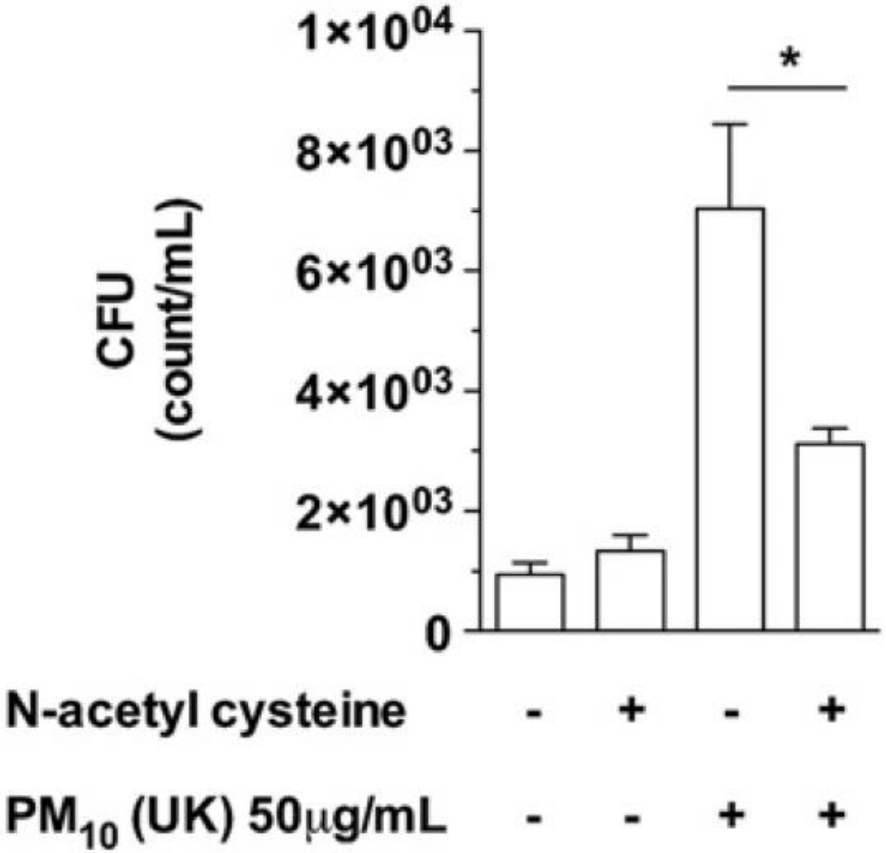
Naseem 20.07.09_010.tif
Print Mag: 10500x @ 150 mm
14:55 07/20/09
Microscopist: ML

2 microns
HV=75.0kV
Direct Mag: 10000x
CUI


HV
5.00 kV
mag
1 200 x
WD
9.9 mm
curr
53.3 pA
det
ETD
tilt
30 °
50 µm

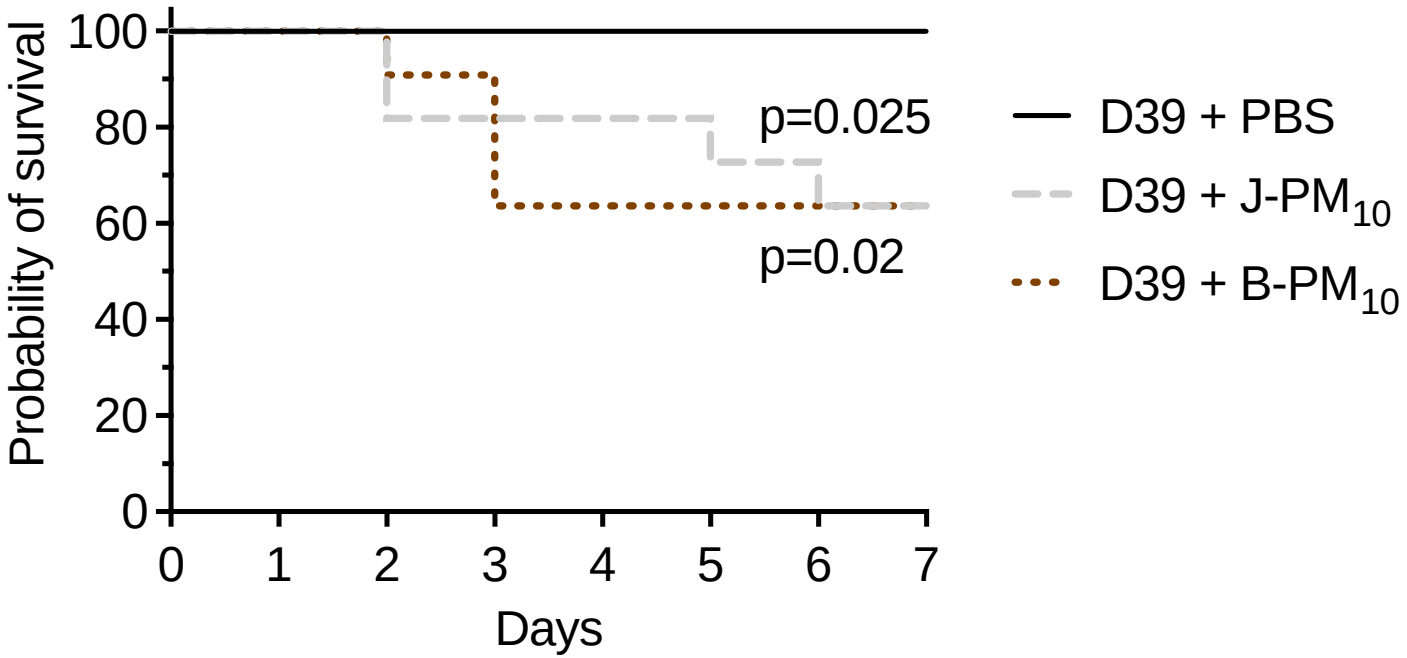
Adhesion mechanisms




1×10^04
8×10^03
6×10^03
4×10^03
2×10^03
0
CFU
(count/mL)
*
N-acetyl cysteine - + - +
PM10 (UK) 50μg/mL - - + +

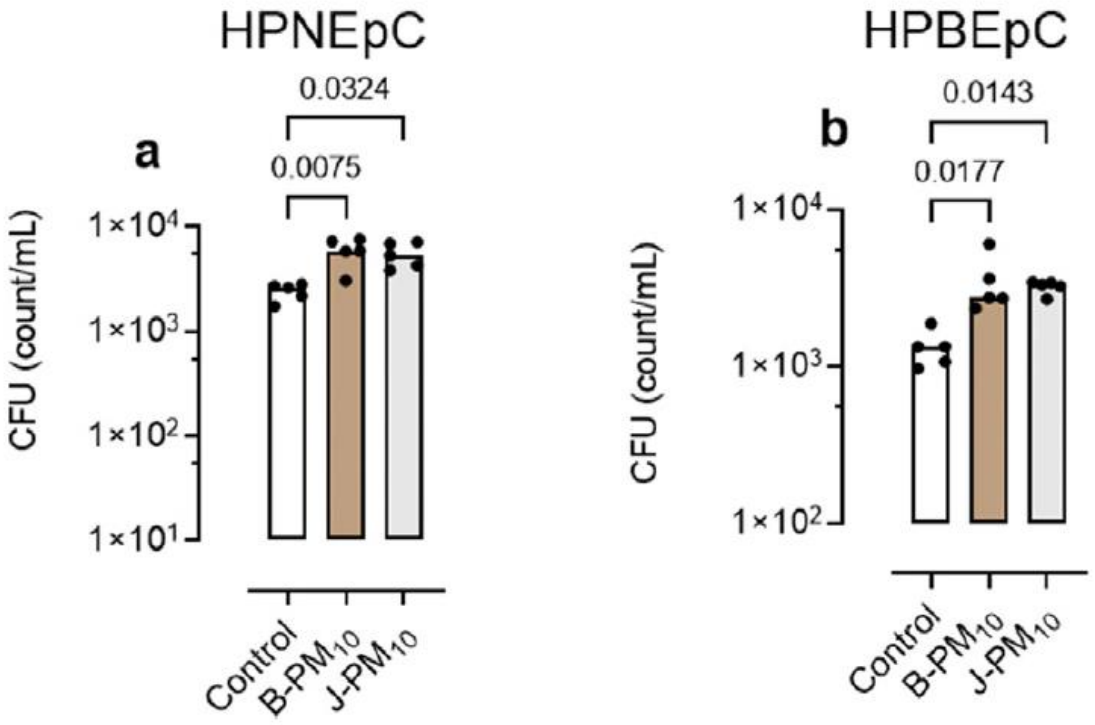
London Underground

pneumococcal infection mouse model



Ebiomed 2022

pneumococcal CFU and PAFR

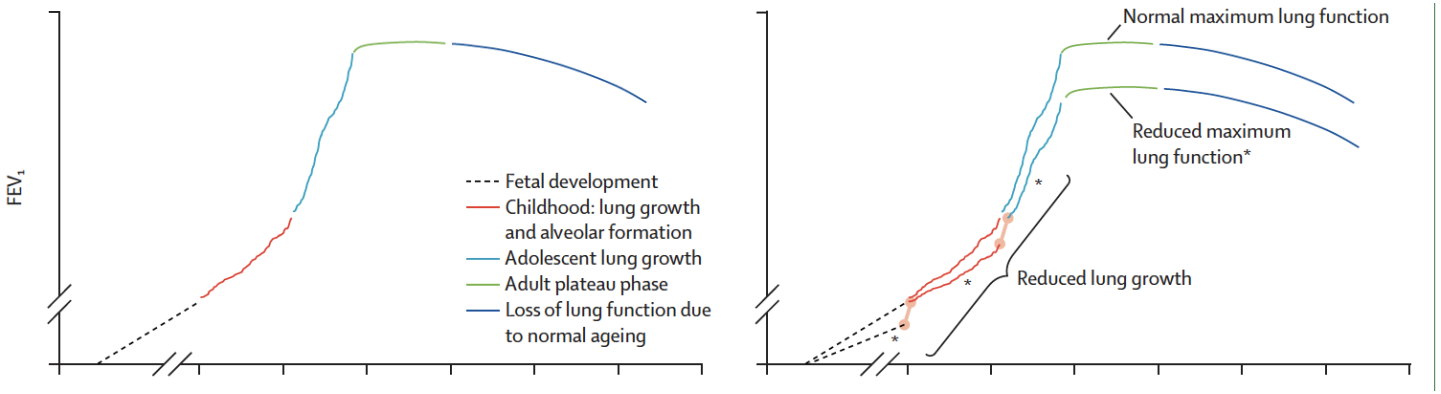


Ebiomed 2022

Epidemiological studies

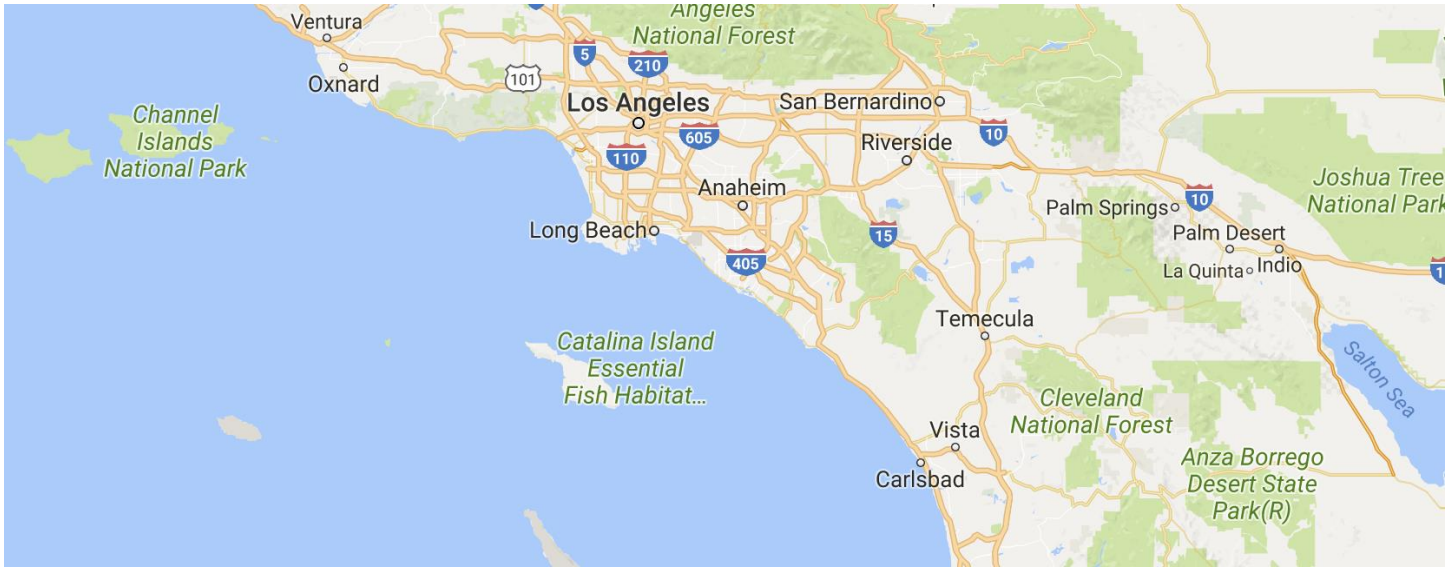
- lung function growth
- new-onset wheeze and asthma
- asthma exacerbations
- global south issues

reduced lung function – long term effects

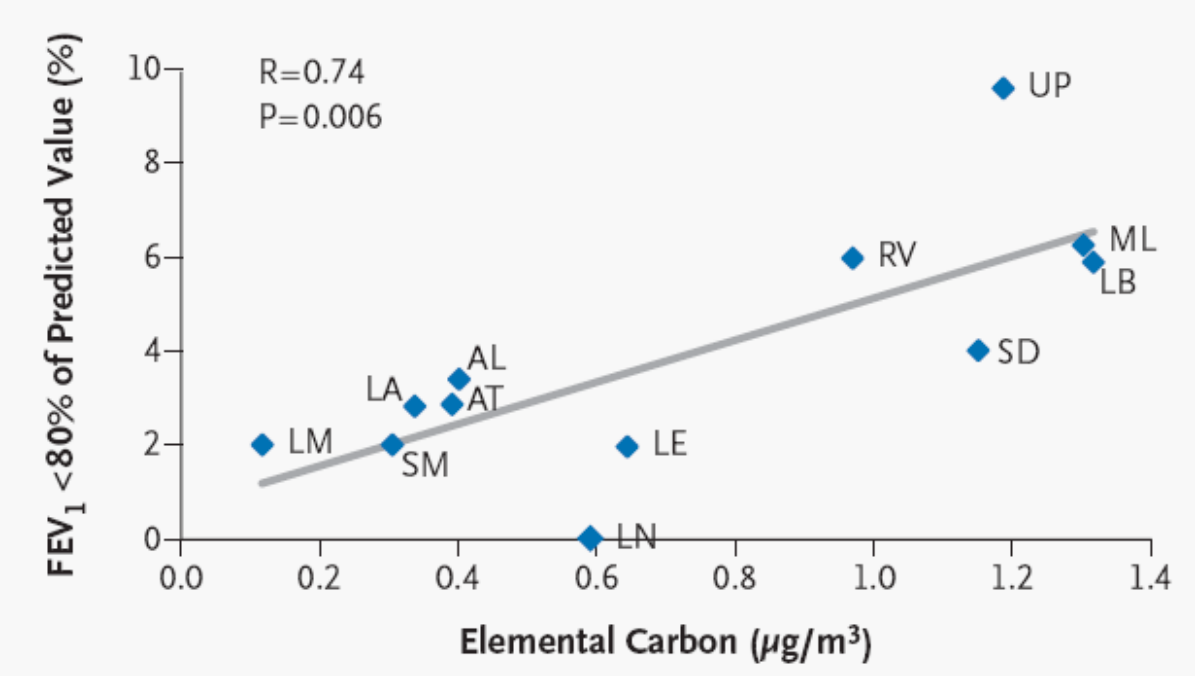


Rennard *Lancet* 2015

lung function growth

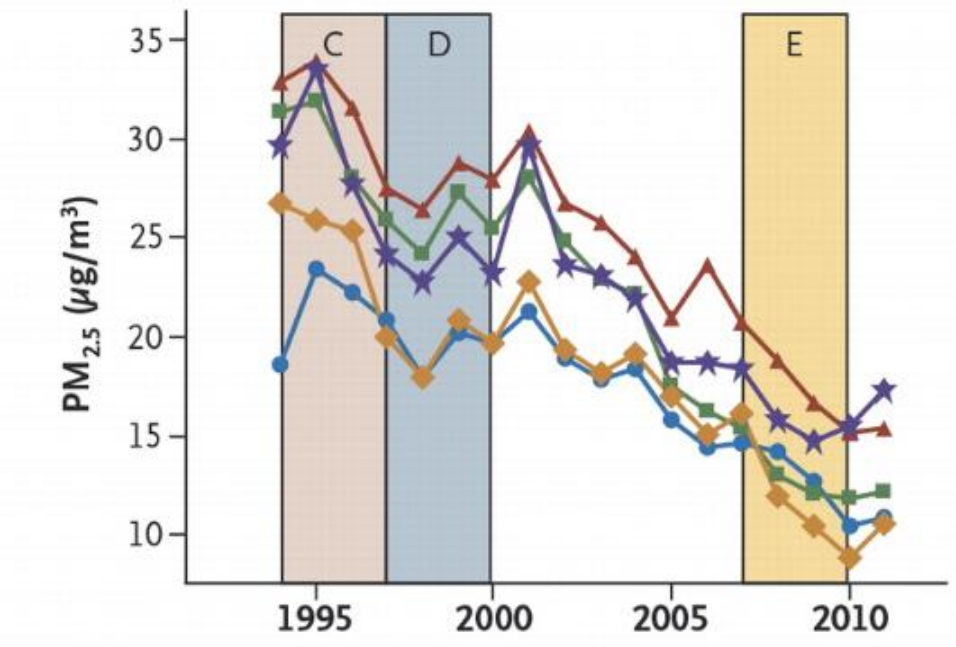


lung function growth



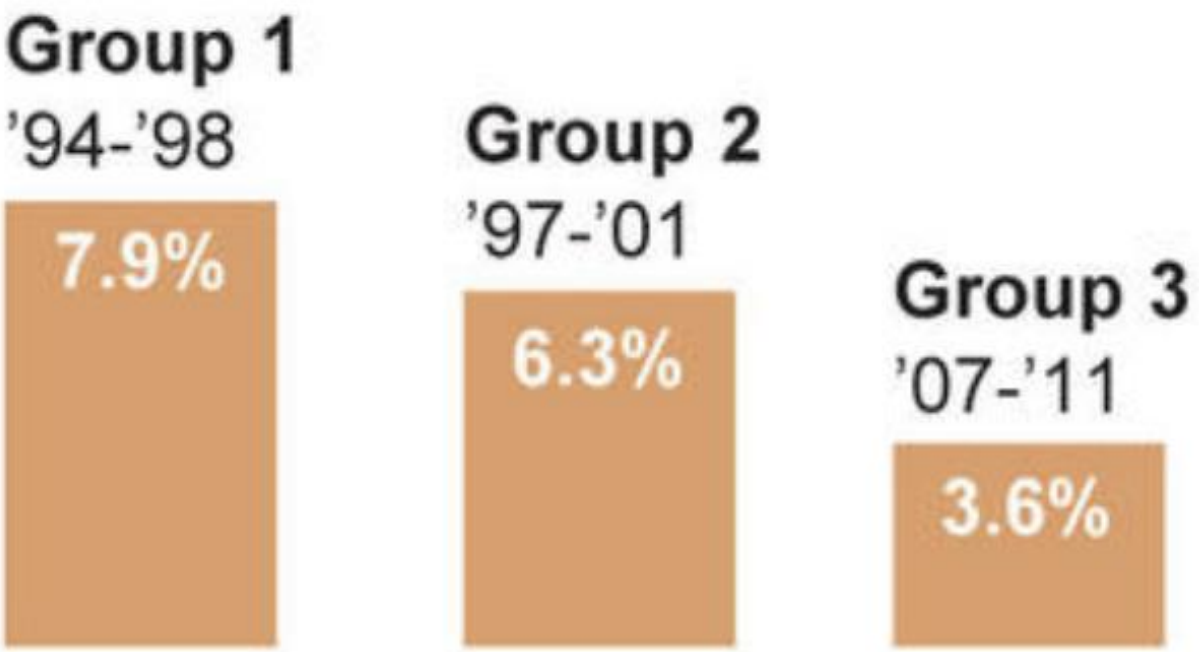
Gauderman, *NEJM* 2004

changes in PM in Southern California



Gauderman, *NEJM* 2015

…the percentage of children with abnormally low lung function dropped.



Gauderman, *NEJM* 2015

Effects of policy-driven hypothetical air pollutant interventions on childhood asthma incidence in southern California

Erika Garcia[a,1], Robert Urman[a], Kiros Berhane[a], Rob McConnell[a], and Frank Gilliland[a]

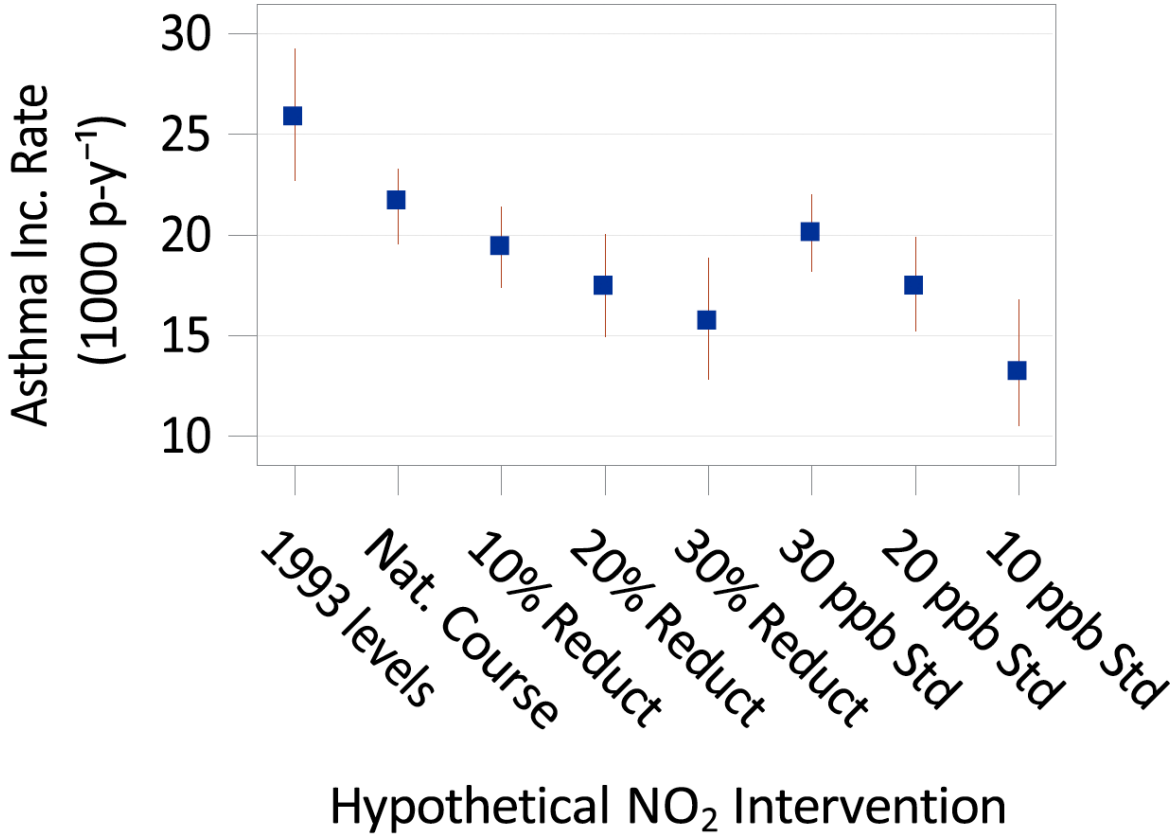
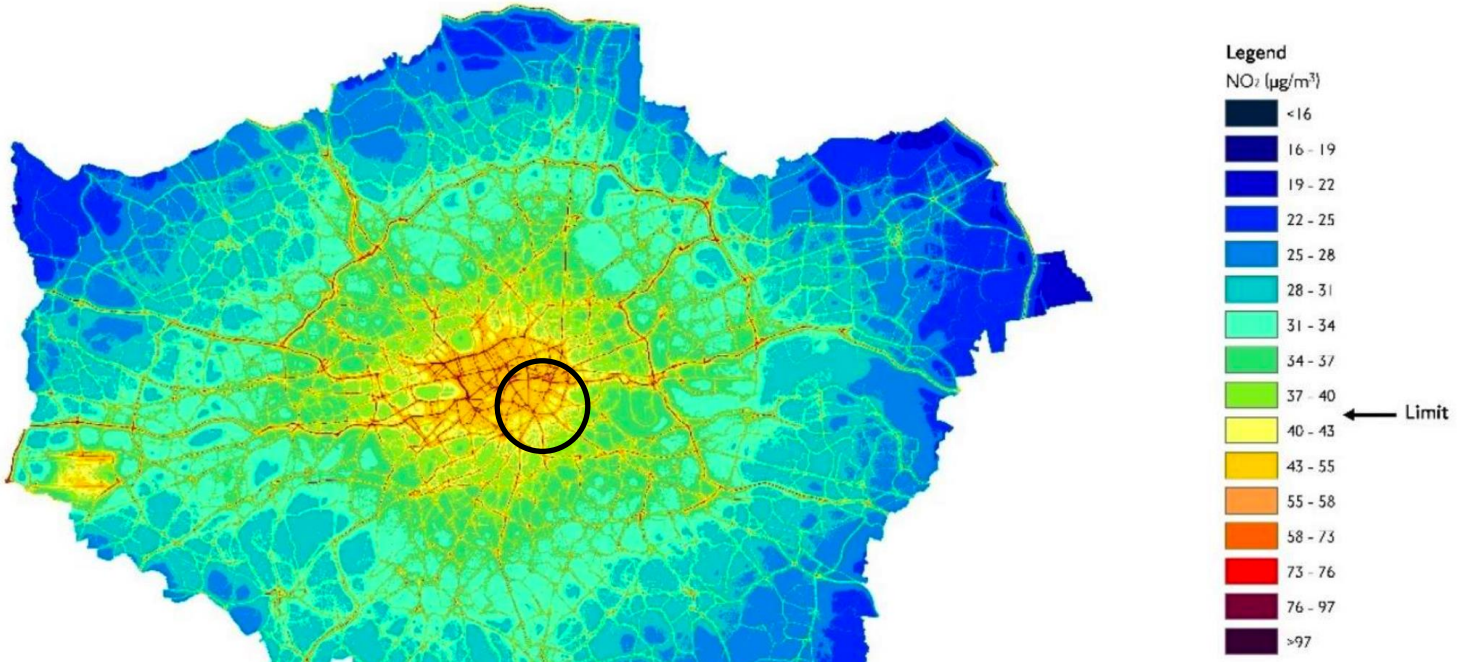
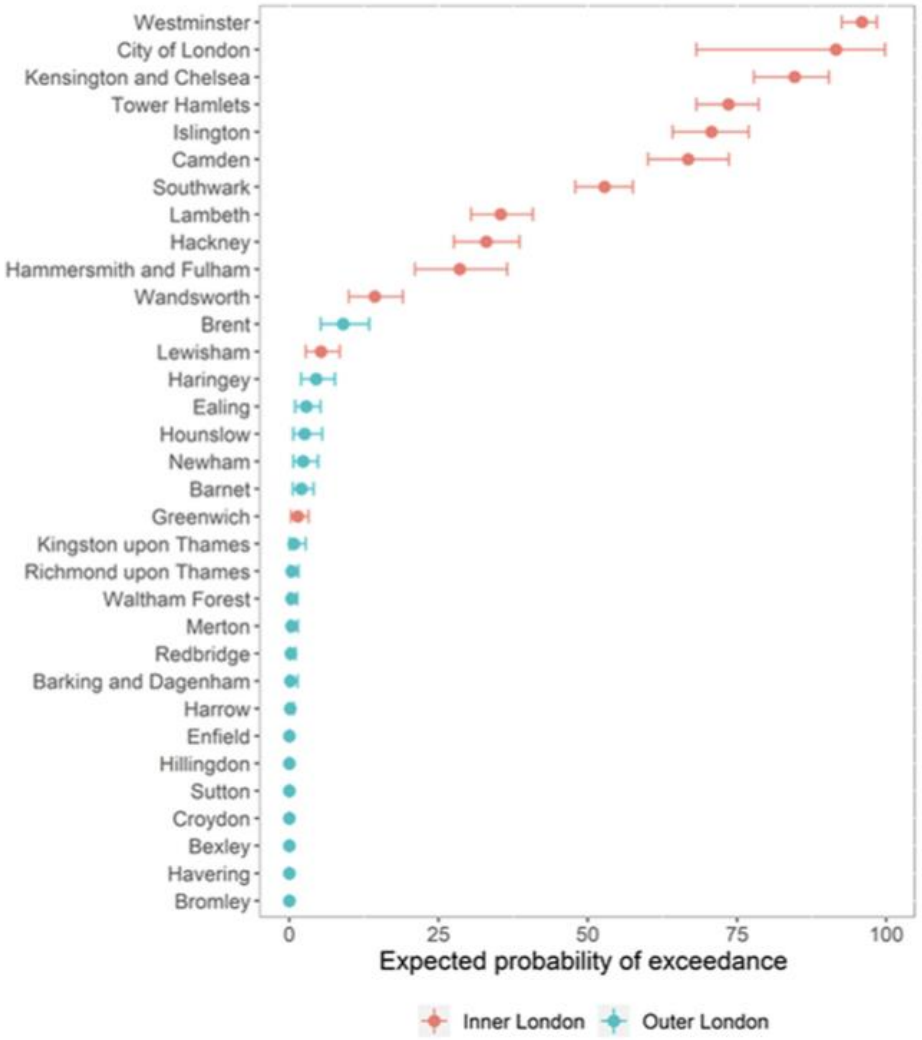


Figure 1 Annual mean NO_2 concentrations in 2013 in Greater London[3]



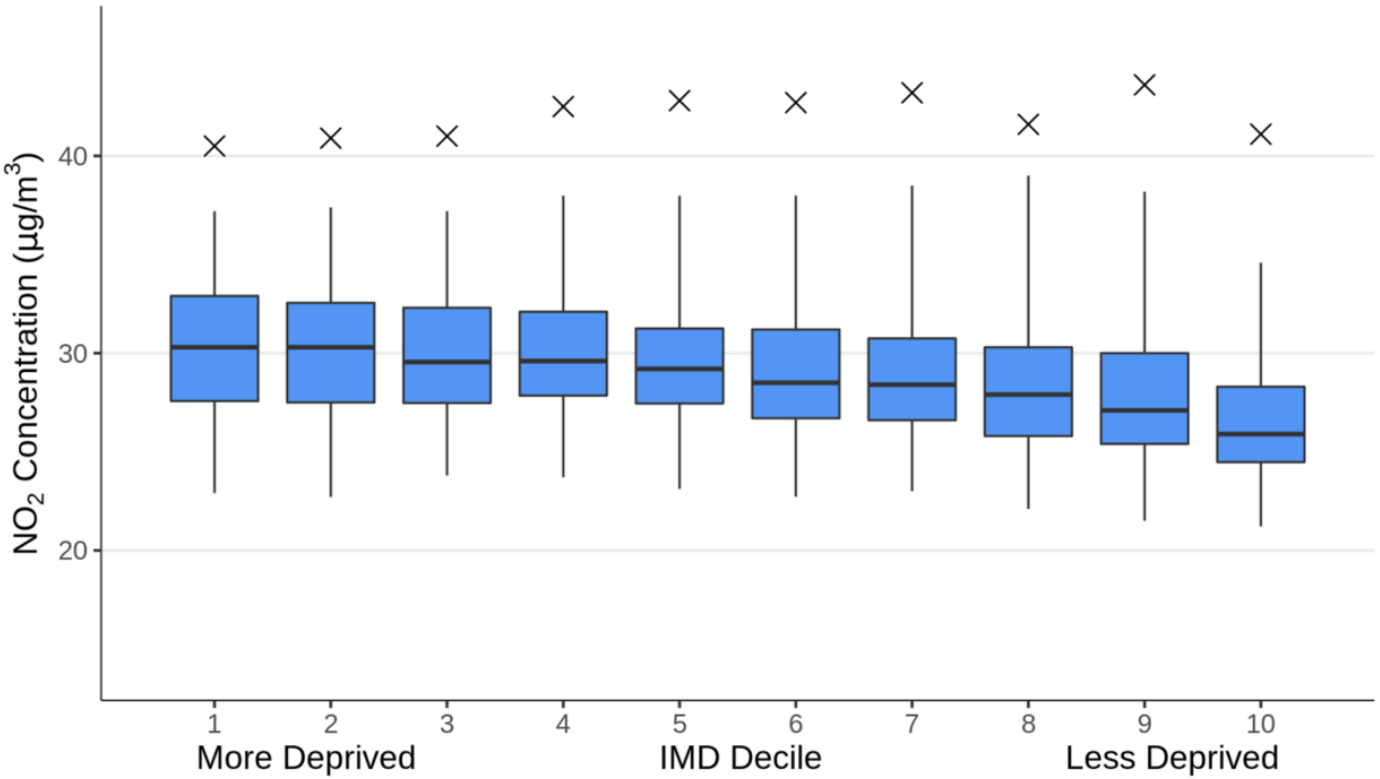
Lancet Public Health 2018

- mean probability of schools' non compliance to WHO 40 μg/m^3

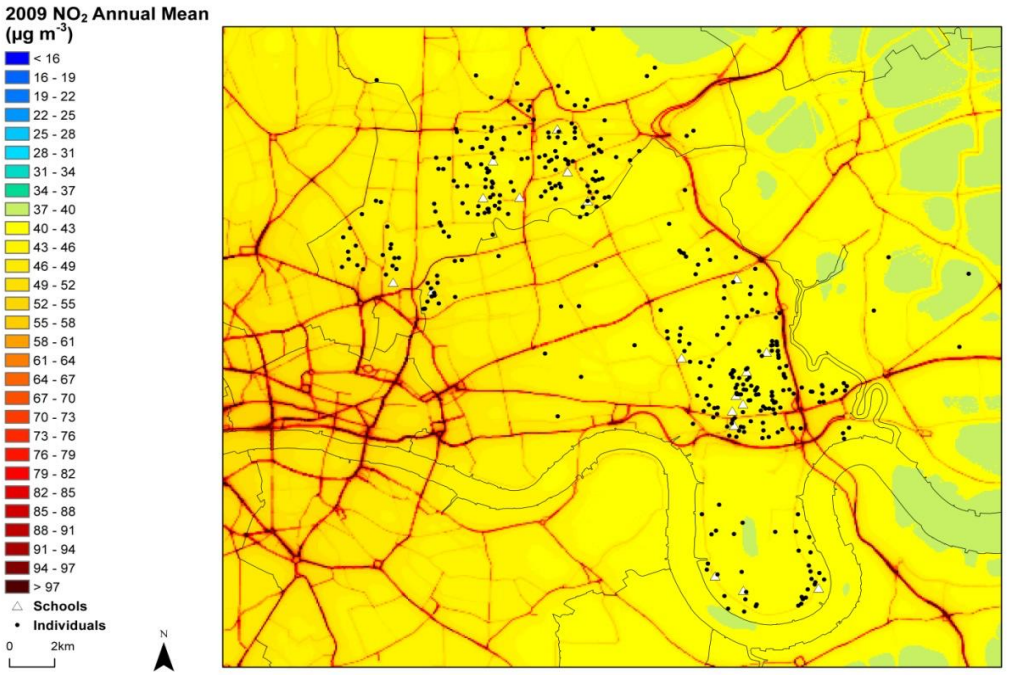


Shoari, *Sci Total Environ* 2022

inequalities (exposure)

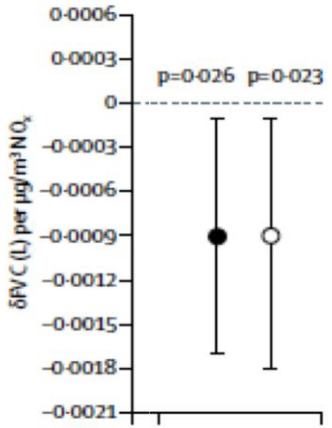


https://www.london.gov.uk/

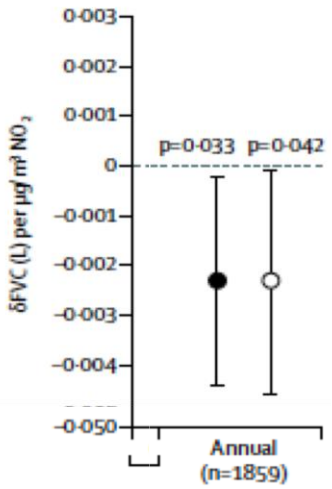


Lancet Public Health 2018

NOx



NO_2



- FVC loss
- 5% over 5 yr.

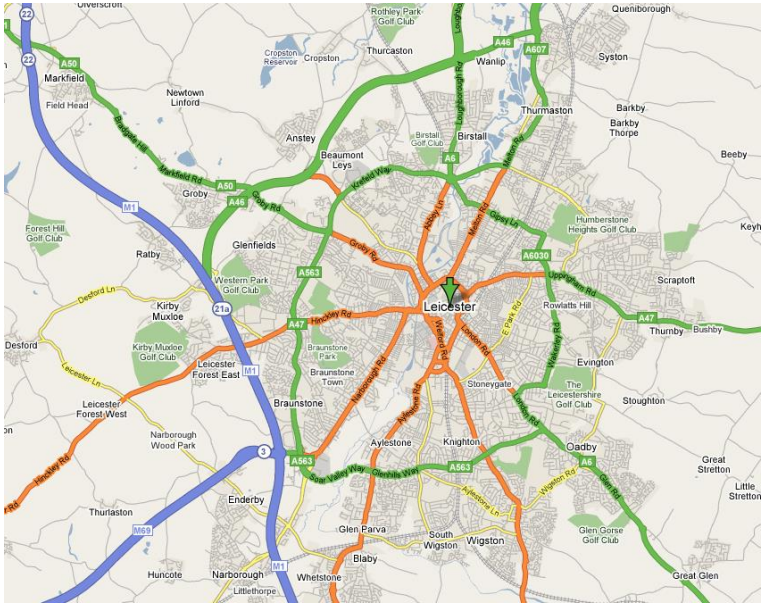
Lancet Public Health 2018

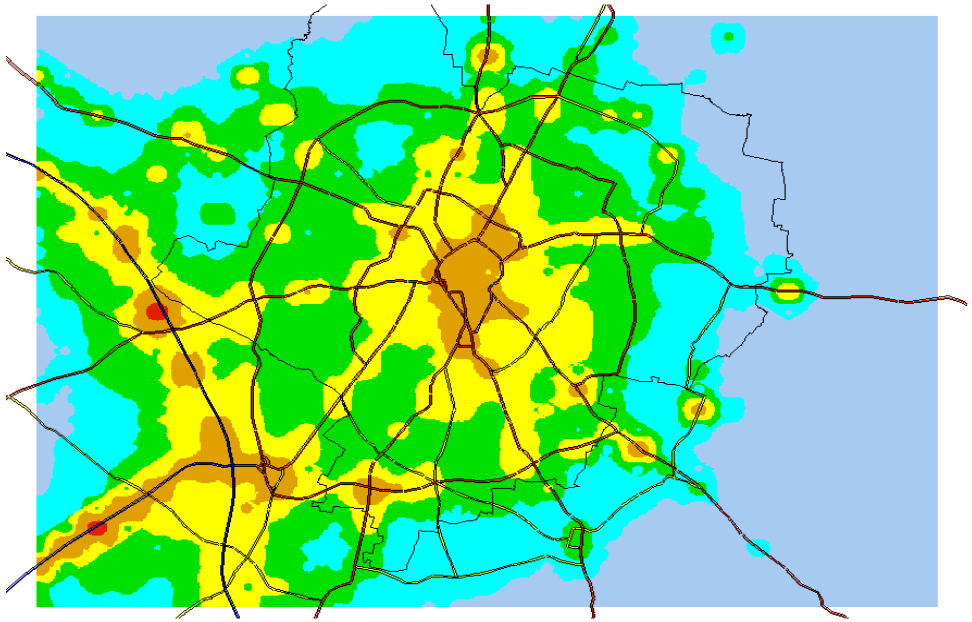
incident preschool wheeze

- 4,400 preschool children
- 1 to 5 yrs
- surveyed in 1998 and 2001

Thorax 2006

incident preschool wheeze





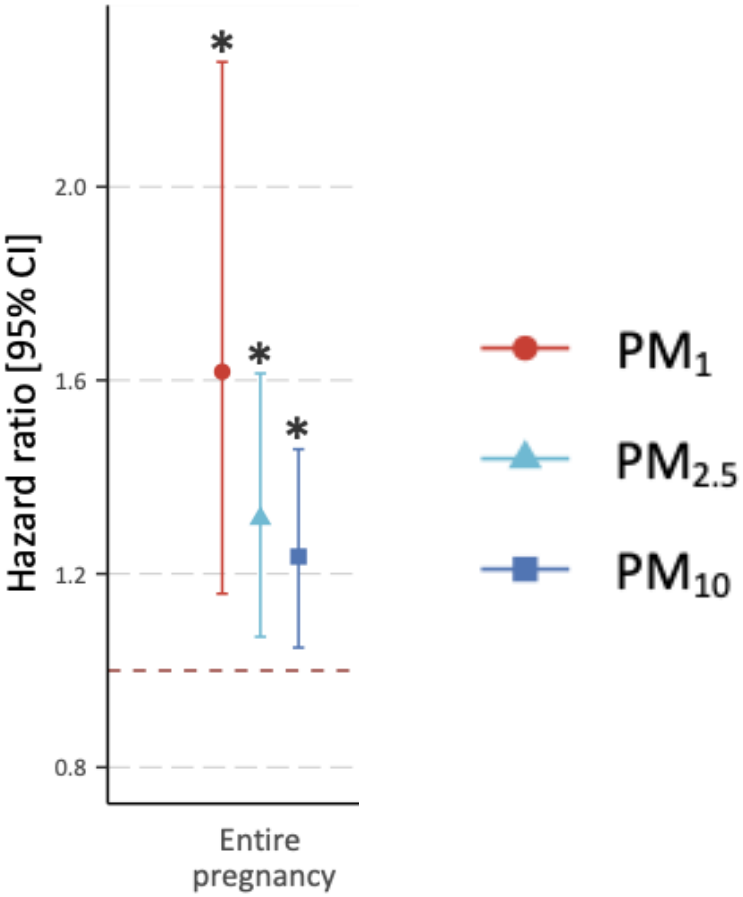
Thorax 2006

incident preschool wheeze

	Adjusted*		
	OR†	95% CI	n‡
Cough without a cold	1.62	1.31 to 2.00	1287
Night time cough	1.19	0.96 to 1.47	1191
Wheeze	1.42	1.02 to 1.97	1319

Thorax 2006

incident preschool wheeze



- 5788 children 3 to 5 yr.
- time-to-event
- preschool asthma

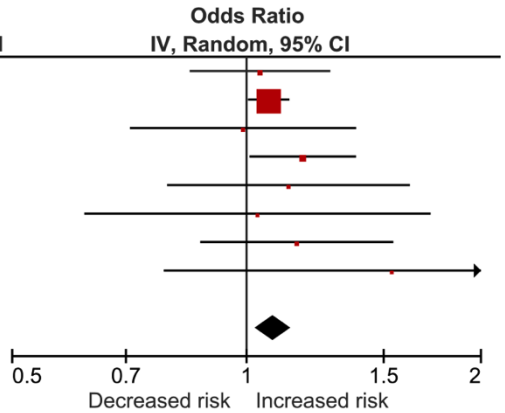
Zhang, *JACI* 2021

new-onset school-age asthma

Black carbon; 0.5 x 10^{-5} m^{-1}

Study or Subgroup	log[Odds Ratio]	SE	Weight	Odds Ratio IV, Random, 95% CI
Carlsten et al. 2010 - at 7 y.o.	0.0397	0.1061	6.3%	1.04 [0.85, 1.28]
Clark et al. 2010 LUR - at mean age of 4 y.o.	0.0655	0.0312	73.1%	1.07 [1.00, 1.14]
Gehring et al. 2015 b - BAMSE birth to 16 y.o.	-0.0105	0.1707	2.4%	0.99 [0.71, 1.38]
Gehring et al. 2015 b - PIAMA birth to 14 y.o.	0.1662	0.0804	11.0%	1.18 [1.01, 1.38]
Gehring et al. 2015b - GINI&LISA South birth to 15	0.124	0.1831	2.1%	1.13 [0.79, 1.62]
Gehring et al. 2105b - GINI&LISA North birth to 15	0.0322	0.2613	1.0%	1.03 [0.62, 1.72]
Krämer et al. 2009 - 4 to 6 y.o.	0.14842	0.14567461	3.4%	1.16 [0.87, 1.54]
Mölter et al. 2014 b - MAAS only birth to 8 y.o.	0.4293	0.344	0.6%	1.54 [0.78, 3.01]
Total (95% CI)			**100.0%**	**1.08 [1.03, 1.14]**

Heterogeneity: Tau² = 0.00; Chi² = 3.13, df = 7 (P = 0.87); I² = 0%
Test for overall effect: Z = 2.96 (P = 0.003)



Khreis *Environmental International* 2017

Incident asthma

- 4 million new asthma cases in children per year attributable to traffic-related pollution

Global, national, and urban burdens of paediatric asthma incidence attributable to ambient NO_2 pollution: estimates from global datasets

Pattanun Achakulwisut, Michael Brauer, Perry Hystad, Susan C Anenberg

Achakulwisut *Lancet Planet Health. 2019 Apr;3(4):e166-e178.*

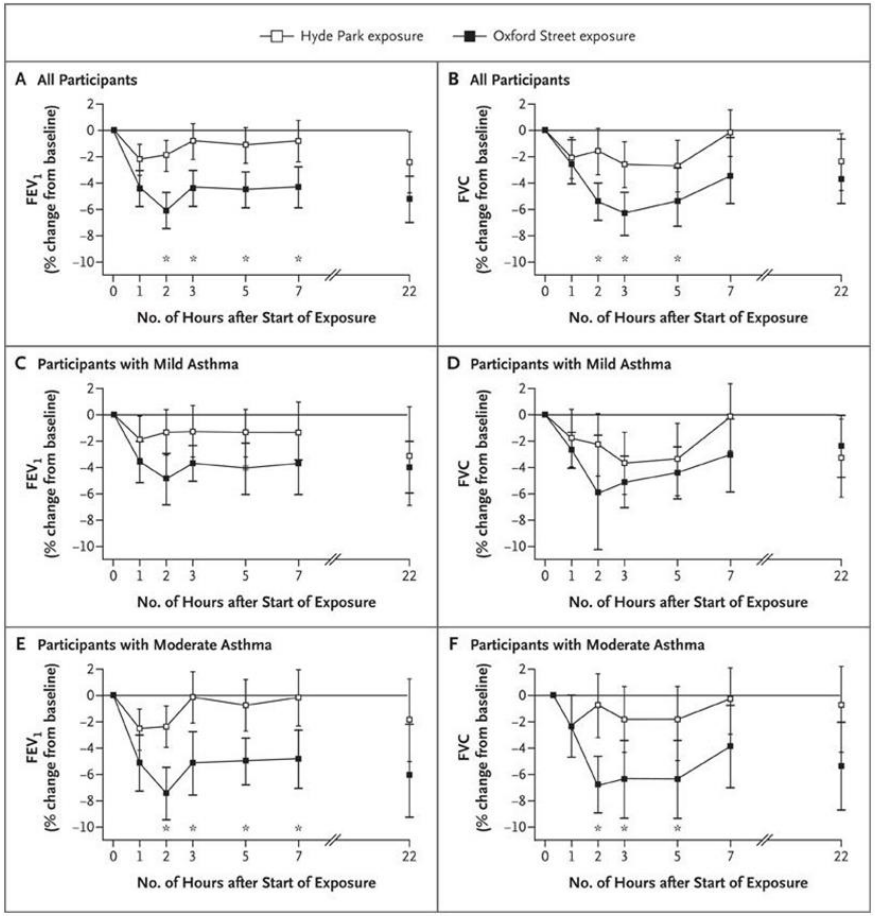
Short-term effects - asthma

Oxford Street (high pollution)

vs

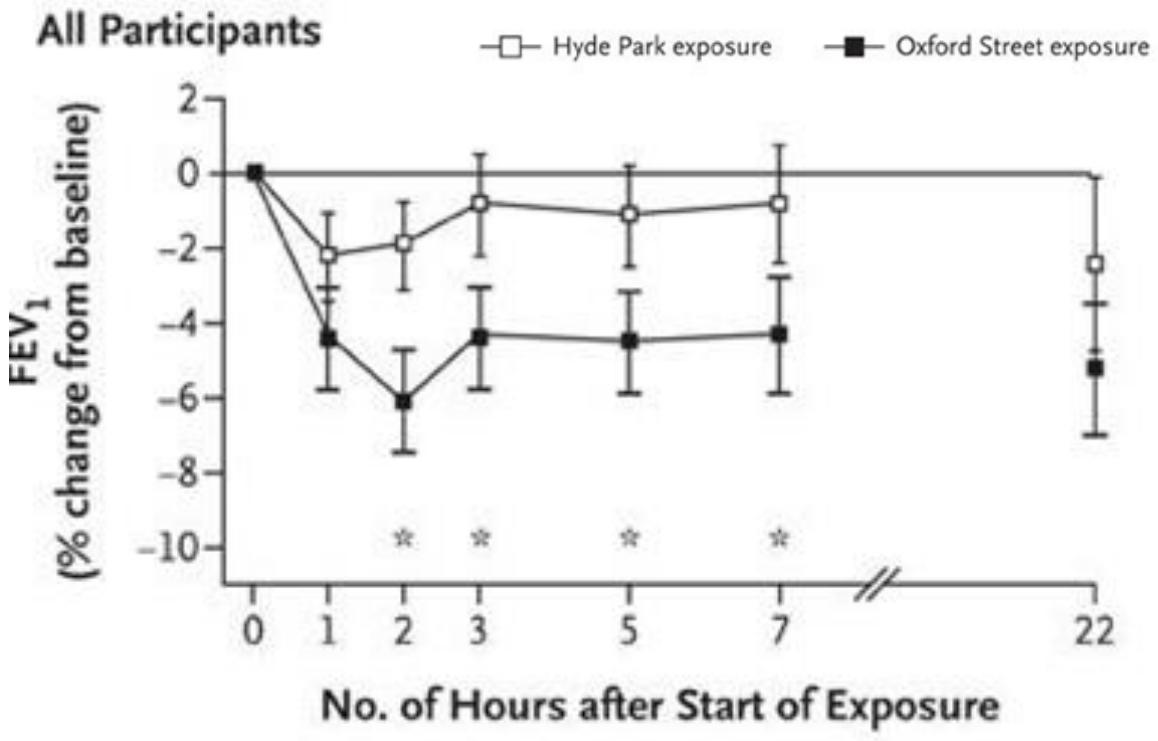
Hyde Park (low pollution)

Significant FEV_1 and FVC drop worst when on Oxford Street



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

exacerbations; asthma



McCreanor, *Lancet* 2007

Morbidity by cause and pollutant, in two pollutant models.[1]

Morbidity	RR (per 10 μg/m^3)	Lower 95% CI	Upper 95% CI
NO_2			
Asthma (adults)	1.169	1.075	1.271
Asthma (children)	1.182	1.094	1.276

Long term exposure to air pollution, mortality and morbidity in New Zealand: Cohort study

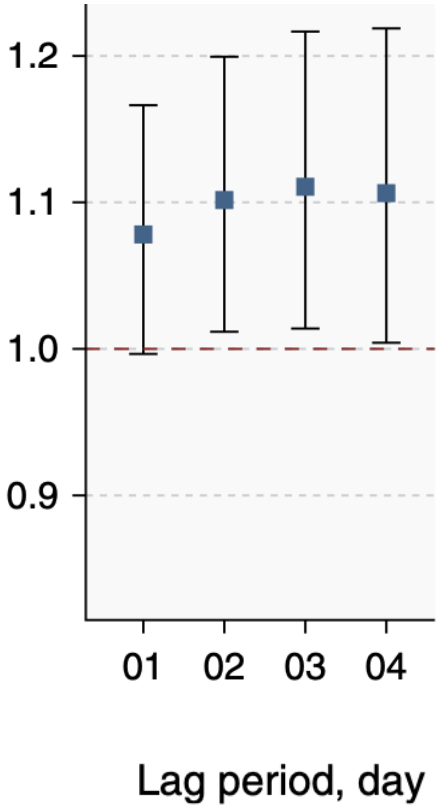
Simon Hales [a,*], June Atkinson [a], Jayne Metcalfe [b], Gerda Kuschel [b], Alistair Woodward [c]

[a] Department of Public Health, University of Otago, Wellington, New Zealand
[b] Emission Impossible Limited, Auckland, New Zealand
[c] School of Population Health, University of Auckland, Auckland, New Zealand

Sci Total Environ 2021

asthma deaths

OR per IQR increase NO_2



- 5.5-year period
- 7,358 asthma deaths
- Hubei residents

Liu, *AJRCCM* 2019

Evening Standard

First clinic to look at dirty air's impact on children to open in London

VIEW 1 COMMENTS

By Ross Lydal @RossLydall18 March 2022

Record of Inquest

Following an Inquest opened on the 17 December 2019, And an inquest hearing at Main on the 30 November 2020 heard before Philip Barlow in the coroner's area for London Inner South ,

The following is the record of the inquest (including the statutory determination and, where required, findings).

1. Name of Deceased (if known)

   Ella Roberta ADOO KISSI-DEBRAH

2. Medical cause of death

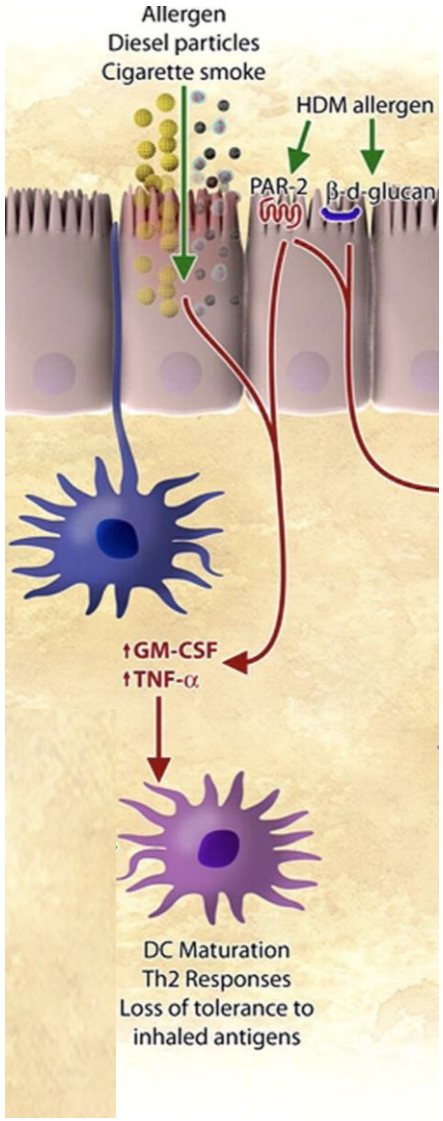
   1a Acute Respiratory Failure

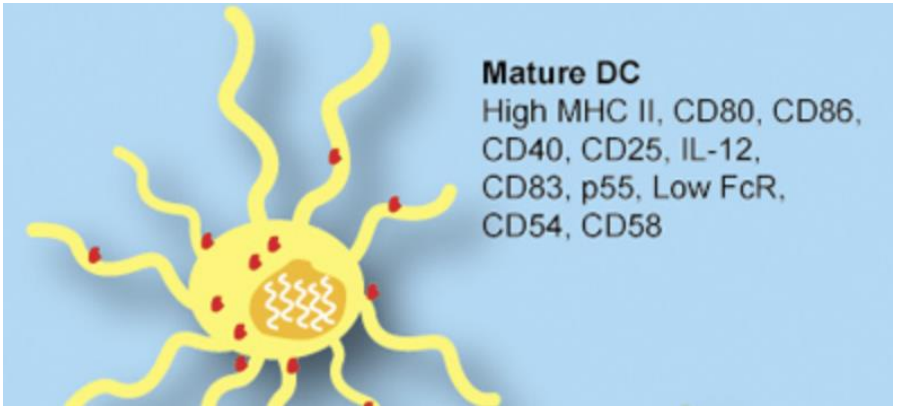
   1b Severe Asthma

   1c Air Pollution exposure

is air pollution exposure associated with changes in lung immune cells?

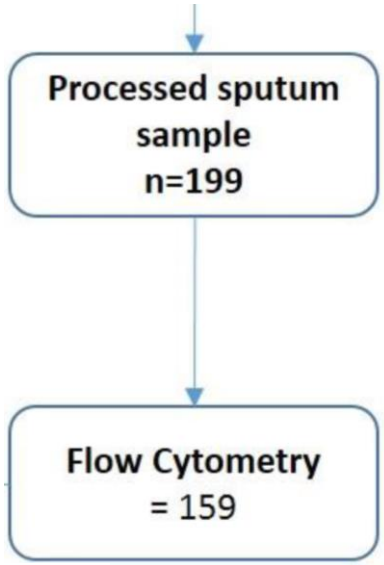
dendritic cells



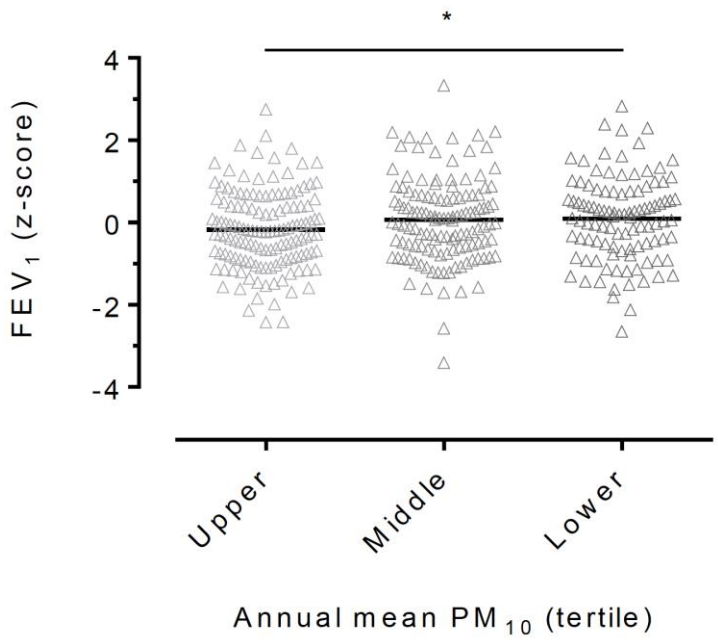


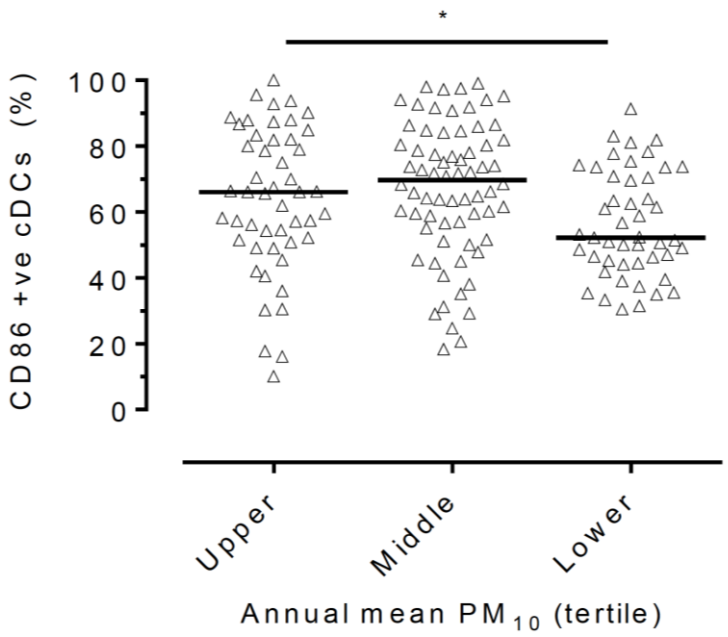
http://dendritic-cells-research.com

airway dendritic cell CD86



PLOS one


*
4
2
0
-2
-4
FEV1 (z-score)
Upper
Middle
Lower
Annual mean PM10 (tertile)

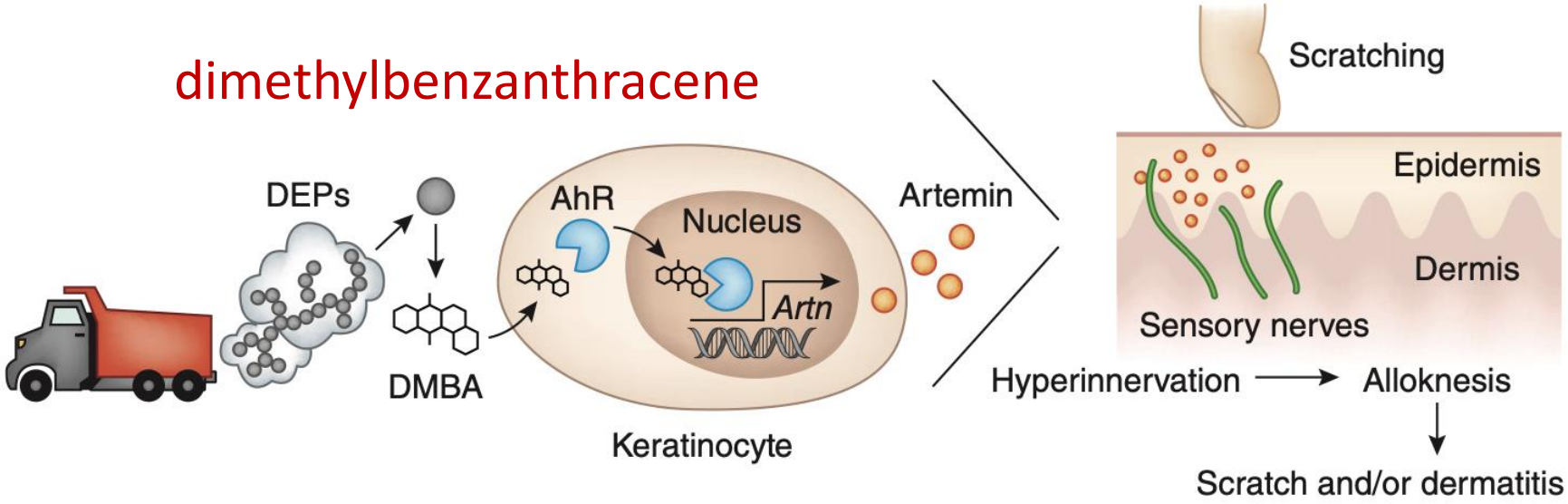

*
100
80
60
40
20
0
CD86 +ve cDCs (%)
Upper
Middle
Lower
Annual mean PM10 (tertile)

eczema

Air pollutant	HR (95% CI) Unadjusted	*P* value	HR (95% CI) Adjusted Model 1*	*P* value
Long-term average concentration				
$PM_{2.5}$‡	1.713 (1.693-1.734)	<.001	1.458 (1.431-1.486)	<.001

Park, *Am Acad Dermatol* 2021

dimethylbenzanthracene

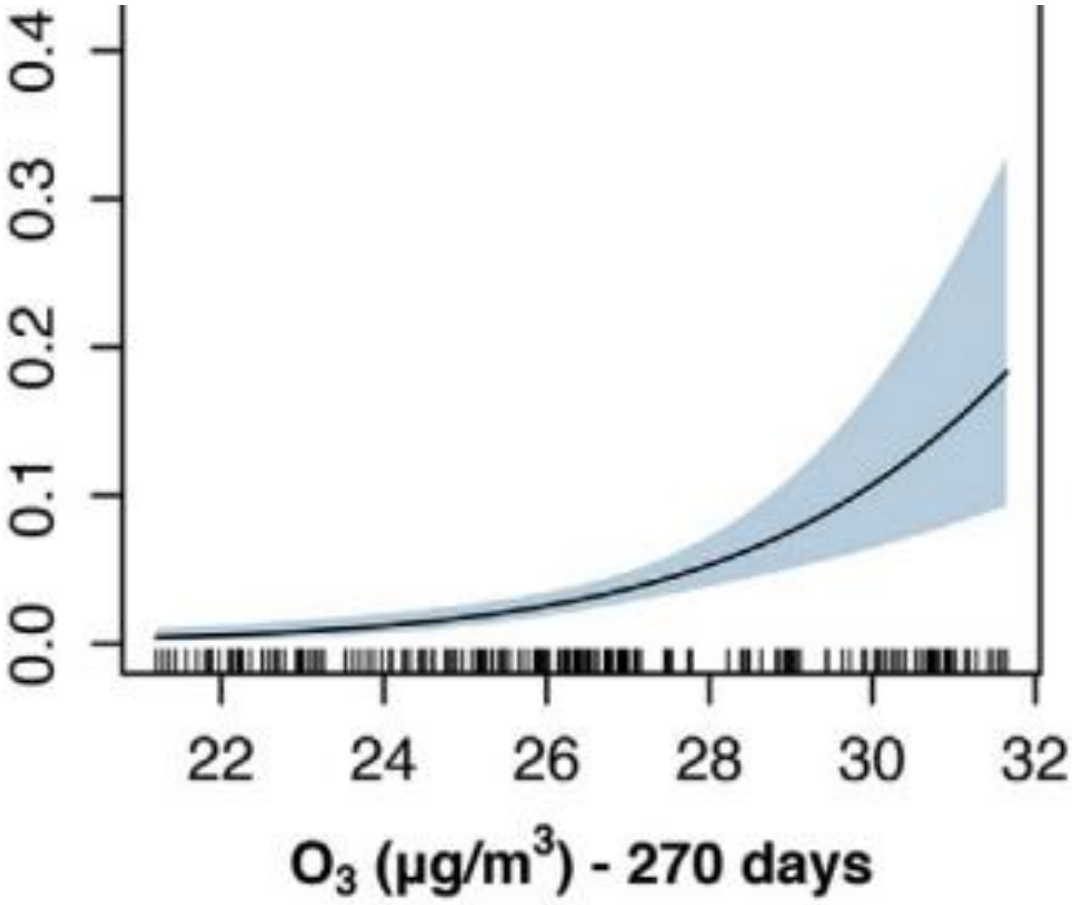


Kabashima, *Nature Immunol* 2019

- diagnosis of eczema
- in East London
- Bangladeshi ethnicity
- aged <31 yr
- Eczema Area and Severity Index

JID Innovations 2022

probability of EASI >10



JID Innovations 2022

Brain: *Stroke*, *Dementia*, *Parkinson's Disease*

Eye: *Conjunctivitis, Dry Eye Disease, Blepharitis, Cataracts*

Heart: *Ischemic Heart Disease*, *Hypertension*, *Congestive Heart Failure*, *Arrhythmias*

Lung: *Chronic Obstructive Pulmonary Disease Asthma*, *Lung Cancer*, *Chronic Laryngitis*, *Acute and Chronic Bronchitis*

Liver: *Hepatic Steatosis*, *Hepatocellular carcinoma*

Blood: *Leukemia*, *Intravascular Coagulation*, *Anemia*, *Sickle Cell Pain Crises*

Fat: *Metabolic Syndrome*, *Obesity*

Pancreas: *Type I and II Diabetes*

Gastrointestinal: *Gastric Cancer*, *Colorectal Cancer*, *Inflammatory Bowel Disease*, *Crohn's Disease*, *Appendicitis*

Urogenital: *Bladder Cancer*, *Kidney Cancer*, *Prostate Hyperplasia*

Joints: *Rheumatic Diseases*

Bone: *Osteoporosis*, *Fractures*

Nose: *Allergic Rhinitis*

Skin: *Atopic Skin Disease*, *Skin Aging*, *Urticaria*, *Dermographism*, *Seborrhea*, *Acne*

Schraufnagel *Chest* 2019

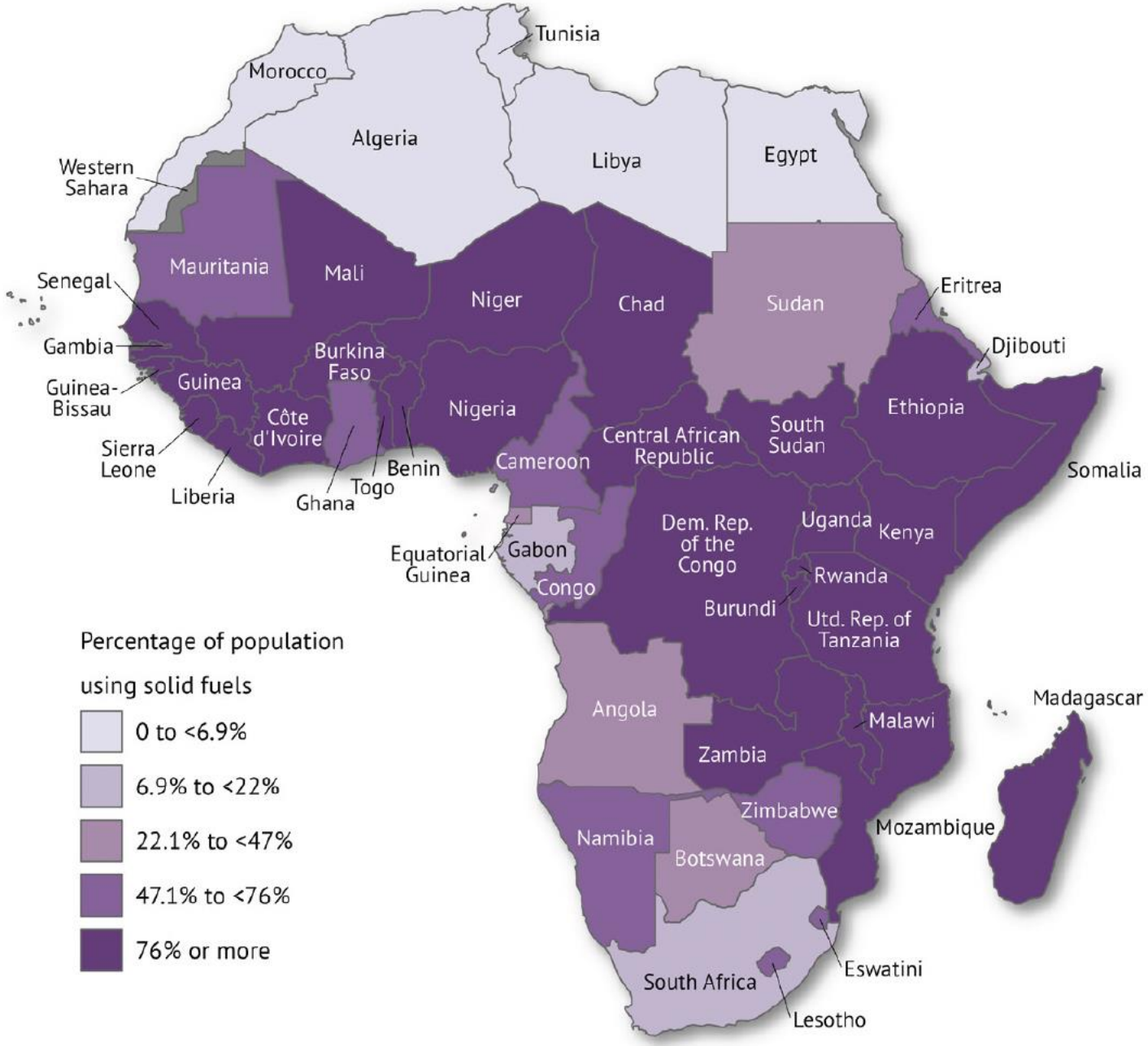
THE STATE OF AIR QUALITY AND HEALTH IMPACTS IN AFRICA

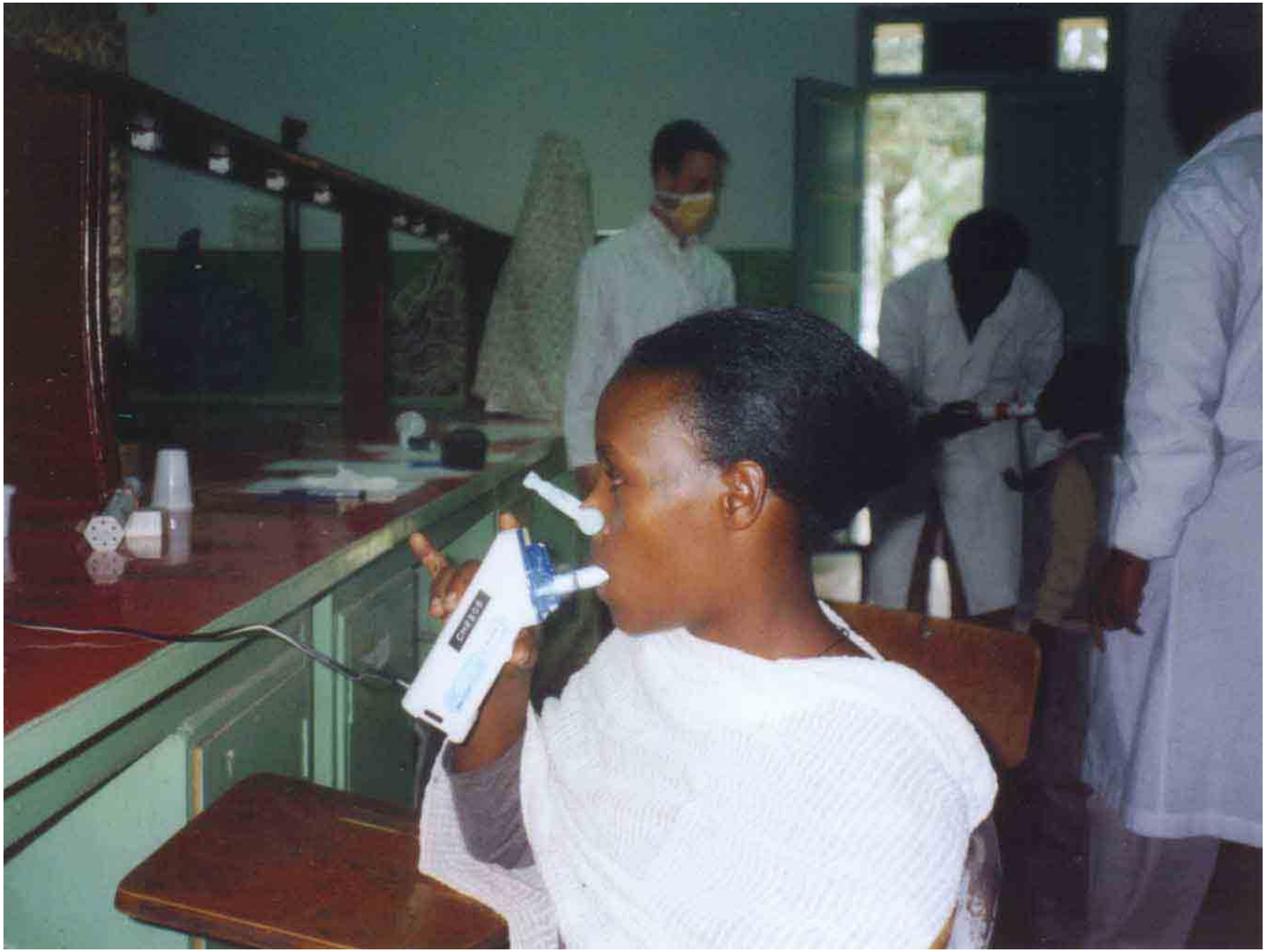
A REPORT FROM THE STATE OF GLOBAL AIR INITIATIVE

2022

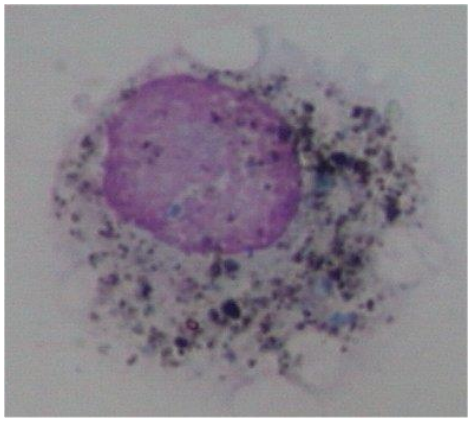
The State of Global Air is a collaboration between the Health Effects Institute and the Institute for Health Metrics and Evaluation's Global Burden of Disease project.

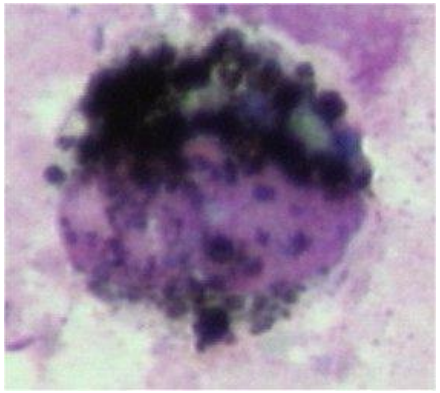
Citation: Health Effects Institute. 2022. The State of Air Quality and Health Impacts in Africa. A Report from the State of Global Air Initiative. Boston, MA:Health Effects Institute.

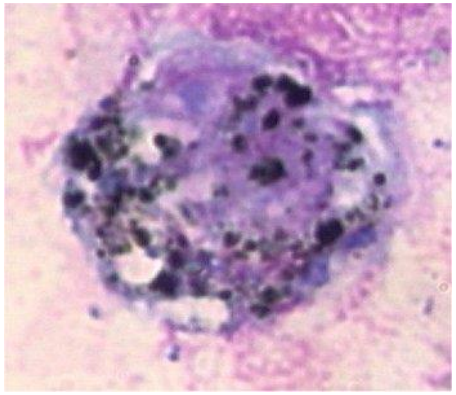

Tunisia
Morocco
Algeria
Libya
Egypt
Western Sahara
Mauritania
Mali
Niger
Chad
Sudan
Eritrea
Djibouti
Senegal
Gambia
Guinea-Bissau
Guinea
Burkina Faso
Nigeria
Ethiopia
Somalia
Côte d'Ivoire
Sierra Leone
Liberia
Ghana
Togo
Benin
Cameroon
Central African Republic
South Sudan
Equatorial Guinea
Gabon
Congo
Dem. Rep. of the Congo
Uganda
Kenya
Rwanda
Burundi
Utd. Rep. of Tanzania
Angola
Malawi
Zambia
Madagascar
Zimbabwe
Namibia
Botswana
Mozambique
South Africa
Eswatini
Lesotho
Percentage of population using solid fuels
0 to <6.9%
6.9% to <22%
22.1% to <47%
47.1% to <76%
76% or more



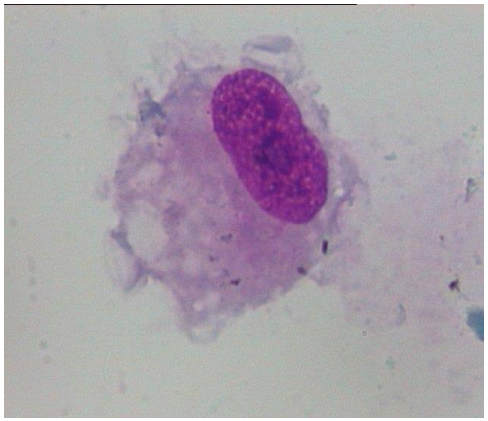
Gondar

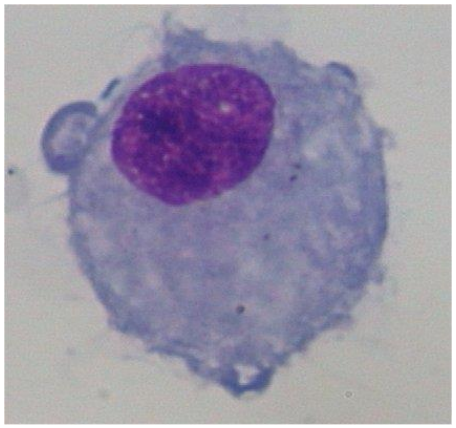


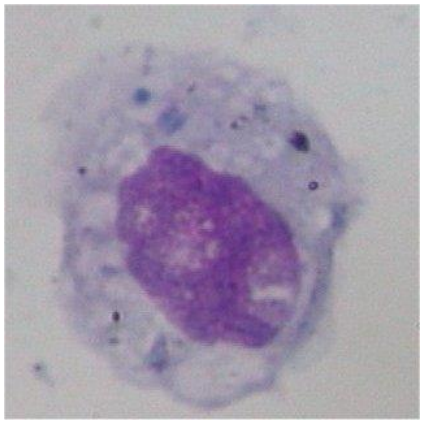


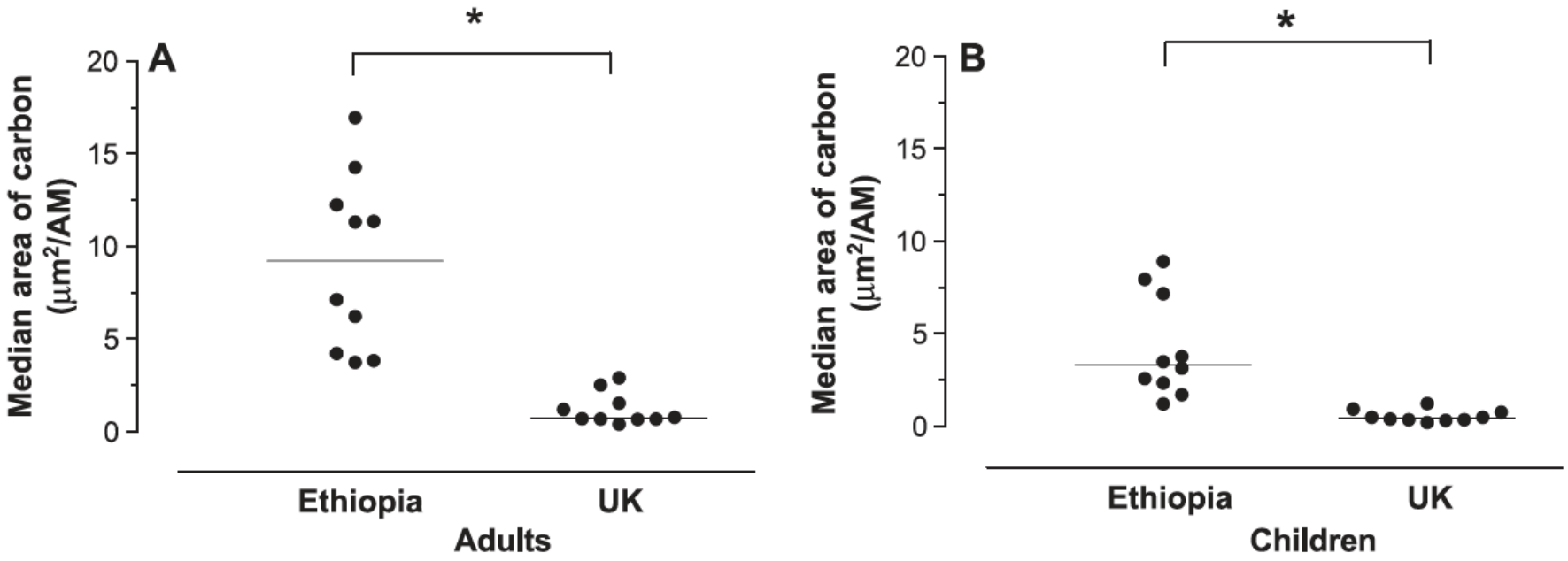


UK

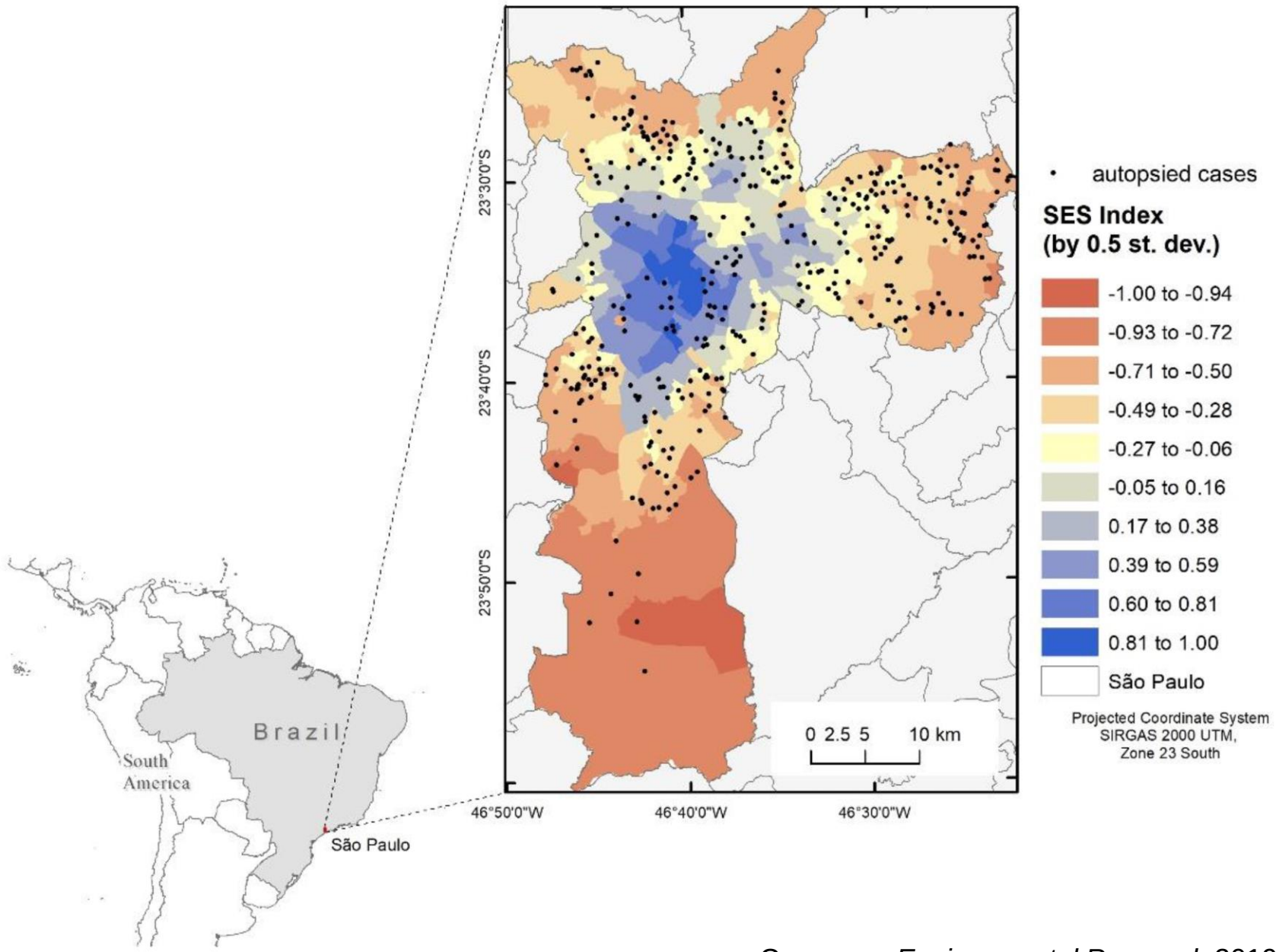








Sci Total Environ. 2005

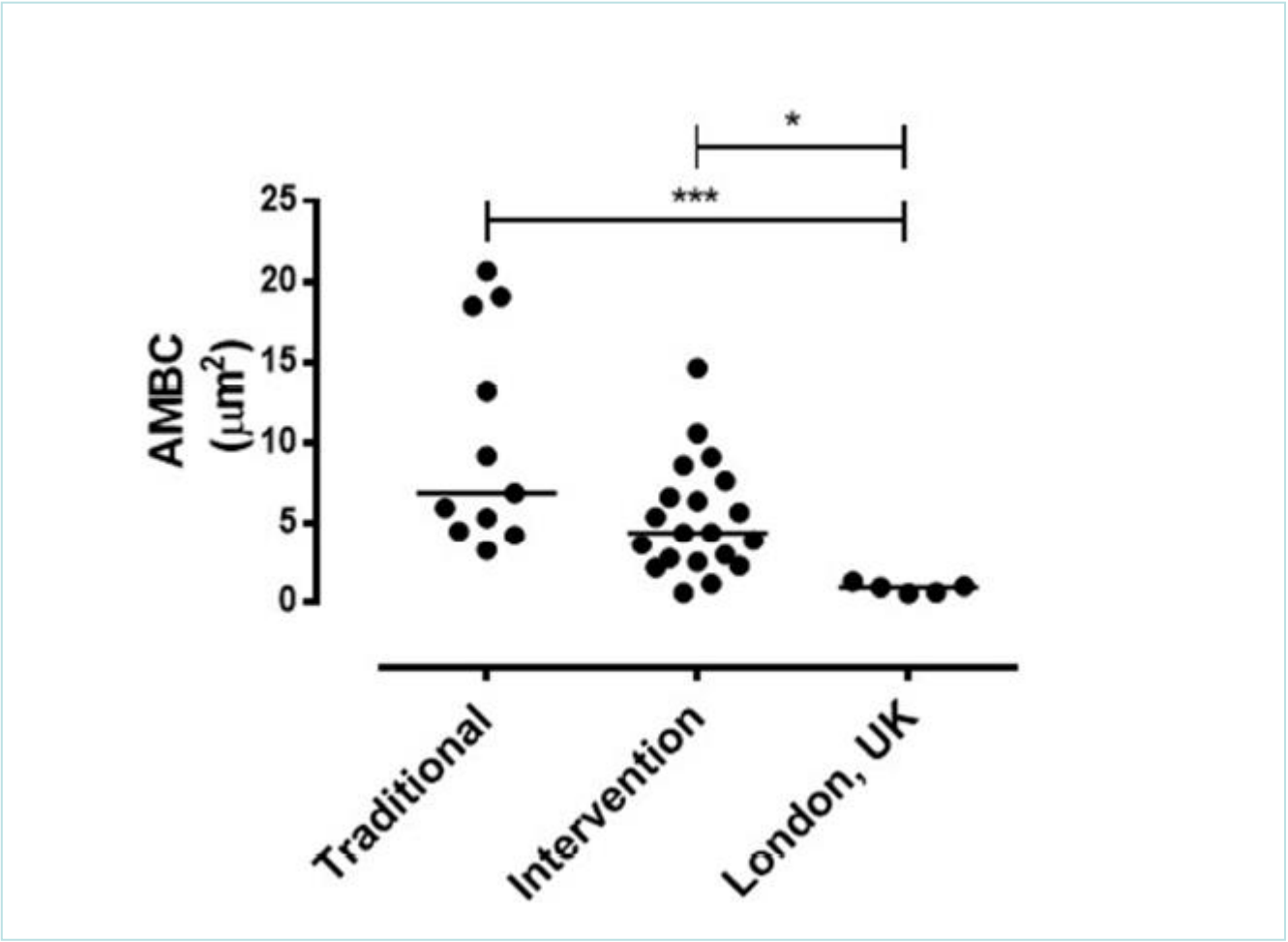


Cremasco *Environmental Research* 2019

A cleaner burning biomass-fuelled cookstove intervention to prevent pneumonia in children under 5 years old in rural Malawi (the Cooking and Pneumonia Study): a cluster randomised controlled trial

Lancet 2017

Sci Total Environ 2018



Sci Total Environ 2018

Khartoum, Sudan

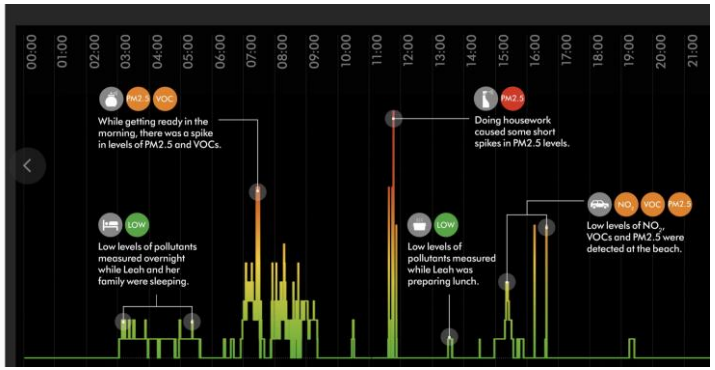
City	Contribution of Windblown Dust to Total $PM_{2.5}$ Concentration
Bamako, Mali	87%
Gombe, Nigeria	83%
Khartoum, Sudan	80%
Marrakesh, Morocco	80%
Accra, Ghana	65%
Oyo, Nigeria	61%

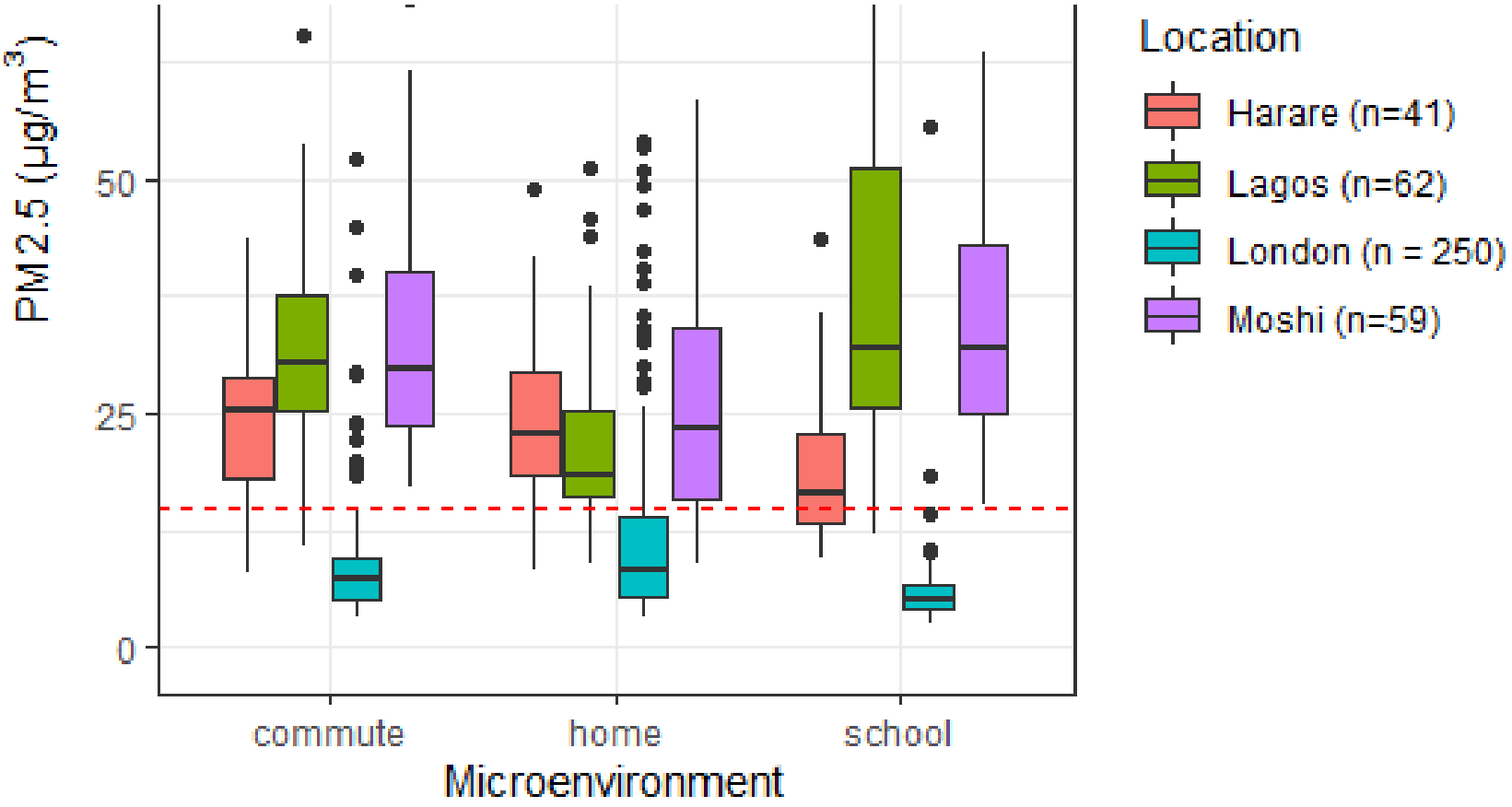
- **4-day data**
  - GPS tracker and sensors for PM_{10}, $PM_{2.5}$ & NO_2
  - daily activity diary and GPS readings
  - morning and evening peak flow and FEV_1

Did you have any of these symptoms/problems today? (please tick ✓)	Yes:	No:
I used reliever inhaler	☐	☐
I had asthma symptoms such as shortness of breath, tight chest, coughing or wheezing	☐	☐
I woke at night with asthma symptoms	☐	☐
I feel like I can't keep up with my normal day-to-day activities	☐	☐
I have a cold or chest infection	☐	☐

How did you get *from* school today? (tick relevant boxes ✓)

Walking	☐	Car	☐	Minibus	☐	Train	☐
Bicycle	☐	Bus	☐	Motorbike or Scooter	☐	Tuk-tuk or cycle rickshaw	☐
Other:							



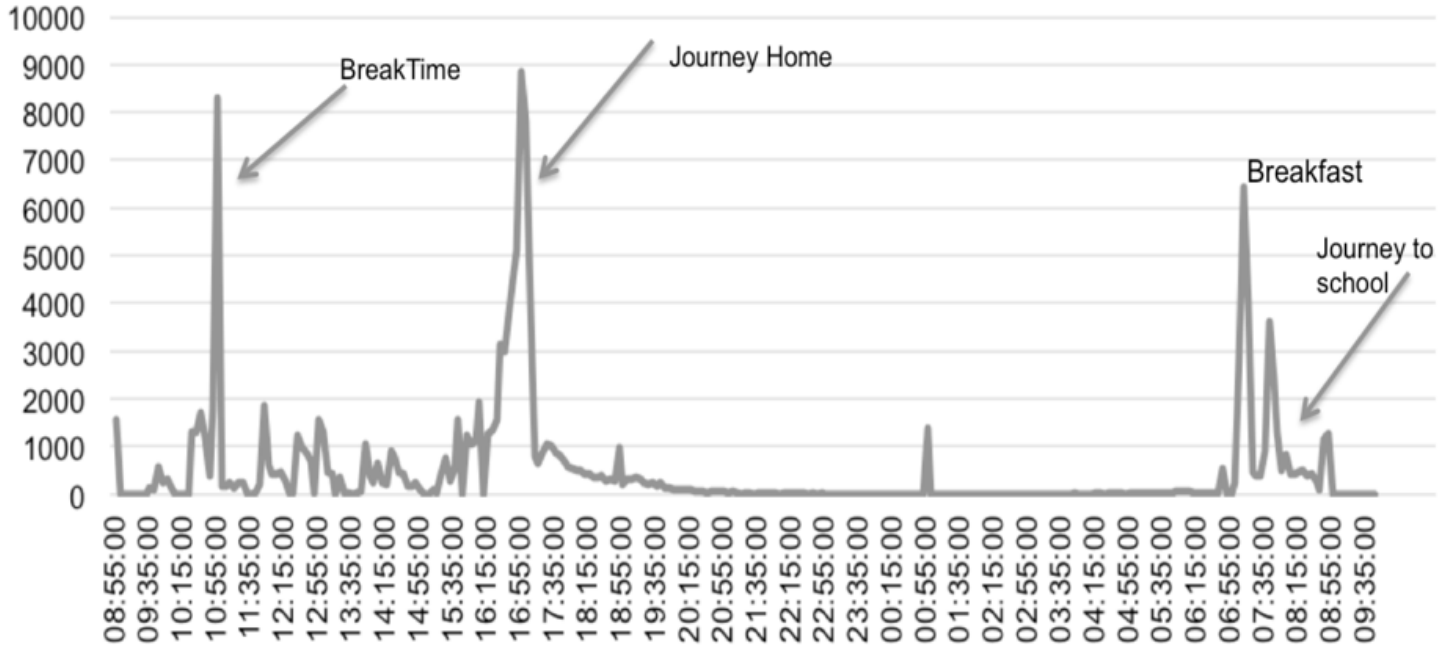


unpublished

Advice

- low pollution routes
- indoor air
- advice to patients and public

Figure 1 - An example of a child's exposure to air pollution over 24 hours



https://www.unicef.org.uk/publications/the-toxic-school-run/

AIR QUALITY STRATEGY TO REDUCE CORONAVIRUS INFECTION

All Party Parliamentary Group Air Pollution

JUNE 2020

appg Air Pollution

Evening Standard

NEWS SPORT BUSINESS EVENTS ES MONEY CULTURE INSIDER THE ESCAPIST MORE

NEWS › LONDON

London's dirty air increases risk of catching Covid-19, Queen Mary University research finds

VIEW COMMENTS

Cold Spring Harbor Laboratory

bioRxiv

THE PREPRINT SERVER FOR BIOLOGY

bioRxiv posts many COVID19-related papers. A reminder: they have not been formally peer-reviewed and should not guide health-related behavior or be reported in the press as conclusive.

New Results

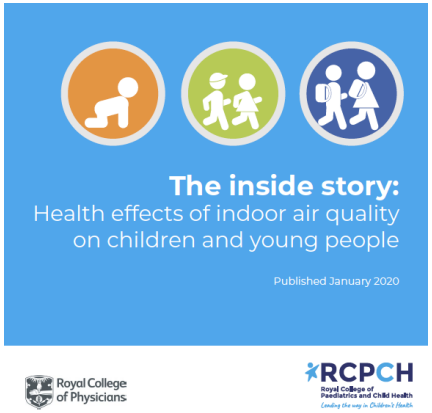
Follow this preprint

Traffic-derived particulate matter and angiotensin-converting enzyme 2 expression in human airway epithelial cells

L Miyashita, G Foley, S Semple, J Grigg

doi: https://doi.org/10.1101/2020.05.15.097501


ODOURS
VOLATILE CHEMICALS FROM FURNITURE AND CONSTRUCTION MATERIALS
WHY DOES INDOOR AIR MAKE US SICK?
NANOSIZED POLLUTION PARTICLES FROM OUTDOORS
FIBERS
FINE PARTICLES AND CHEMICALS FROM HUMANS AND PROCESSES
MOULD TOXINS



Birth and infancy

- Respiratory problems – wheeze, rhinitis, atopic asthma, respiratory infections
- Low birthweight and pre-term birth

Pre-school

- Respiratory problems – wheeze, allergies, asthma, risk of respiratory diseases and pneumonia
- Eczema and atopic dermatitis
- Greater hyperactivity, impulsivity and inattention

School age

- Respiratory problems – wheeze, rhinitis, asthma, throat irritation, nasal congestion, dry cough
- Eczema, dermatitis, conjunctivitis, skin and eye irritation
- Reduced cognitive performance, difficulty sleeping

Awaab died aged just two (Image: MEN Media)

NEWS | POLITICS | FOOTBALL | CELEBS | TV | MONEY | ROYALS

Inside the 'disgusting' mouldy home family tried to leave before death of son, 2

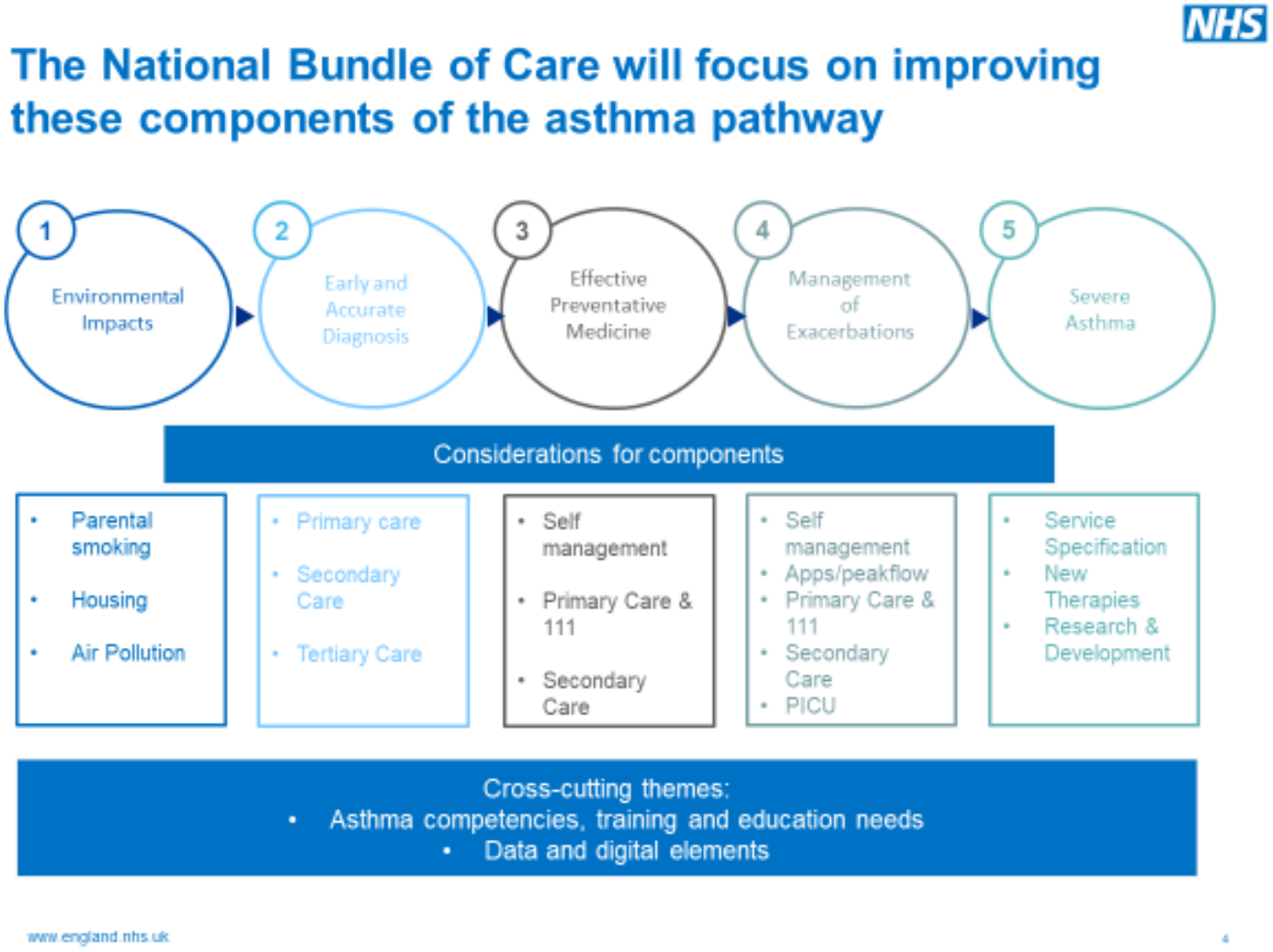
Awaab Ishak died days after his second birthday. He had lived at the flat on the Freehold estate in Rochdale all his life despite his families pleas to their landlord about mould

By Kelly-Ann Mills, News Reporter & Stephen Topping
15:16, 5 Nov 2022

Pollutionwatch Air pollution

How high fuel bills can worsen air pollution in our homes

Mould can grow if there's not adequate ventilation or heat – and burning wood has big impact on indoor air quality



https://www.england.nhs.uk/publication/national-bundle-of-care-for-children-and-young-people-with-asthma/

National Standards of Care

Air pollution

EI 1 - All healthcare professionals working with CYP with expected or diagnosed asthma should understand the sources and dangers of air pollution with this cohort and ensure they discuss these risks and potential mitigation strategies with them. Integrated care systems should ensure staff are equipped with the tools that will enable them to do this

EI 2 - CYP, parents and carers should always receive information on how they can manage asthma with regards to air pollution. Information should be accessible in such a way that is appropriate to that CYP, this may include live updates through digital apps. Advice around air pollution and activity is shared on the Department for Environment, Food and Rural Affairs

https://www.england.nhs.uk/publication/national-bundle-of-care-for-children-and-young-people-with-asthma/

Indoor Air Quality

EI 4 - All healthcare professionals working with CYP with expected or diagnosed asthma should understand the risks associated with poor indoor air quality with this cohort and ensure they discuss these risks with them as part of their personalised asthma action plan. Integrated care systems should ensure staff are equipped with the tools that will enable them to do this

EI 5 - Severe and Difficult to Treat Asthma Services should agree criteria for recommending rehousing CYP when the environment is thought to be critical. ICS CYP asthma leads should share these criteria with local authority housing departments.

Parental Smoking

EI 6 - All healthcare professionals working with CYP with expected or diagnosed asthma should understand the risks associated with parental smoking with this cohort and ensure they discuss these risks with them.

EI 7 - Parents and carers should be offered support to quit smoking and ICS' should ensure staff are equipped with the tools that will enable them to do this. All clinicians managing CYP with asthma should be able to refer parents into smoking cessation service.

https://www.england.nhs.uk/publication/national-bundle-of-care-for-children-and-young-people-with-asthma/

advice for high pollution days?

- **Reduce strenuous, outdoor exercise.** if possible, keep doing your exercise indoors in a well-ventilated room or gym.
- **Stay away from pollution hotspots** such as main roads and busy road junctions.
- If you cycle, run or walk as part of your commute, **use back streets** away from the bulk of vehicle congestion.
- Make sure you **carry your reliever inhaler with you** if you use one.
- If you have asthma, **use your preventer inhaler regularly**.

https://www.blf.org.uk/support-for-you/air-pollution/tips

TOWER HAMLETS TOGETHER
Delivering better health through partnership

Air pollution can worsen asthma symptoms – take action today

www.cleanairhub.org.uk/tower-hamlets

TOWER HAMLETS TOGETHER

Delivering better health through partnership

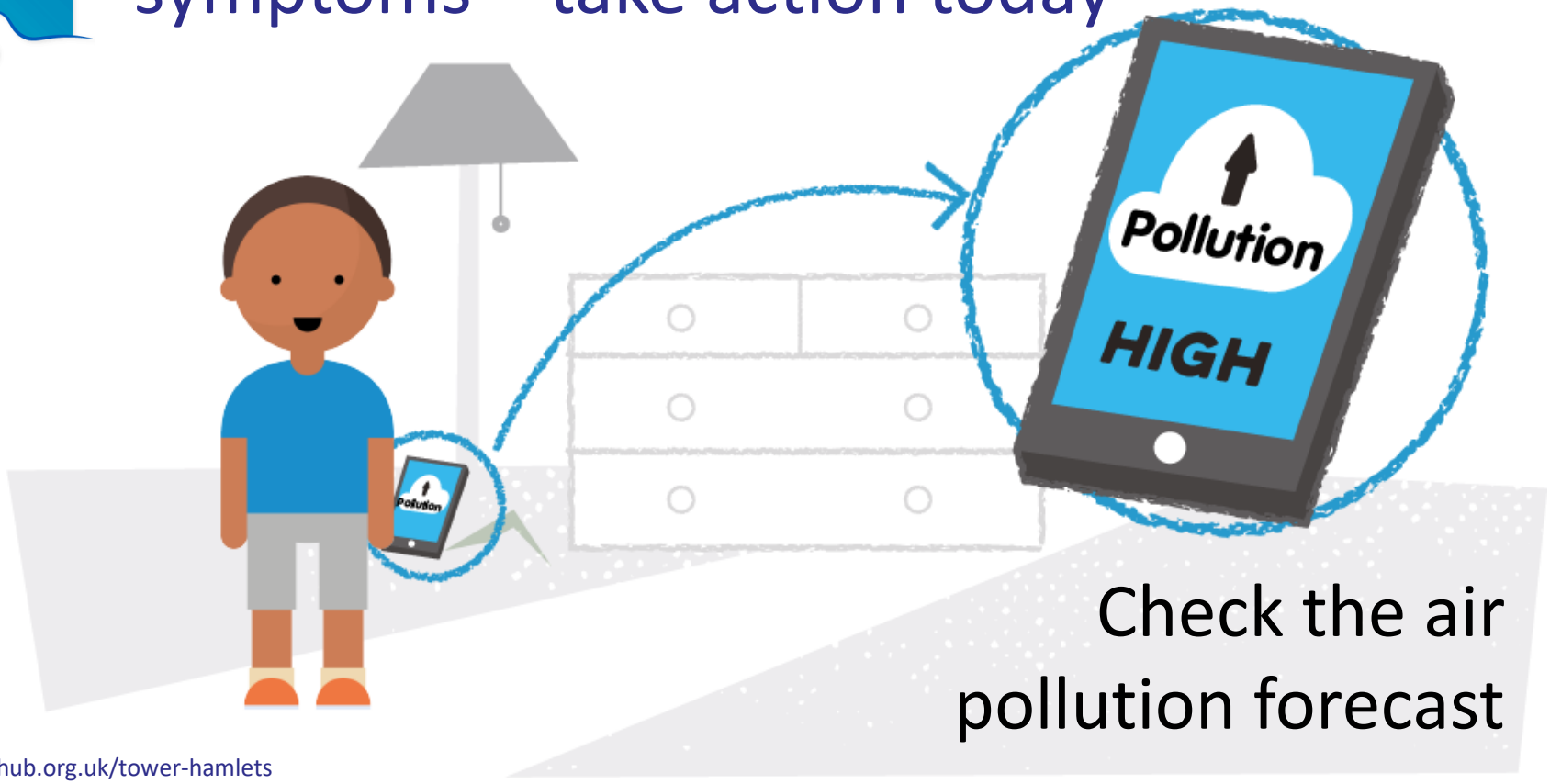
Air pollution can worsen asthma symptoms – take action today

Leave the car behind

www.cleanairhub.org.uk/tower-hamlets

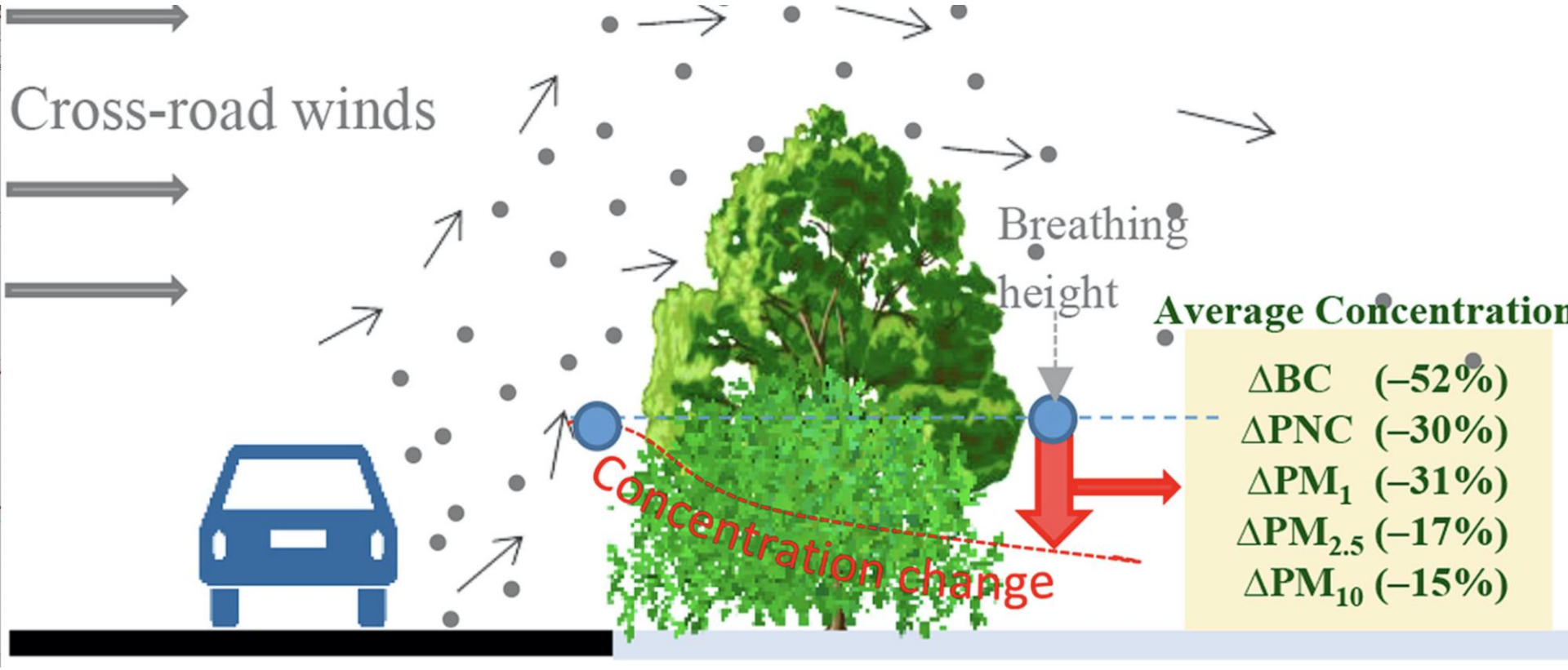
TOWER HAMLETS TOGETHER
Delivering better health through partnership

Air pollution can worsen asthma symptoms – take action today



Check the air pollution forecast

www.cleanairhub.org.uk/tower-hamlets



https://doi.org/10.1016/j.atmosenv.2018.12.036

My air pollution plan:

Plan out the actions that you and your family can take to reduce the impact of air pollution on your health	**On all days**	**On high pollution days**
I will use my inhaler as recommended by my GP or asthma nurse	❑	❑
I will treat air pollution the same way I treat other asthma triggers	❑	❑
We will walk, cycle or scoot to school	❑	❑
We will look up quieter routes to avoid roads with heavy traffic	❑	❑
We will turn on the extractor fan when cooking	❑	❑
We will swap our cleaning products to low chemical options	❑	❑
We will open the window when cooking	❑	❑
We will open the windows when cleaning	❑	❑
We will always turn the engine off when our car is stationary	❑	❑
If we paint, we will check it is labelled "low VOC"	❑	❑
We will leave the car at home when we can	❑	❑
We will ask people not to smoke in our home	❑	❑

This leaflet was designed in collaboration with:
children with asthma, their families, GPs and clinicians.
Thank you to Tower Hamlets Together and Global Action Plan as the original creators.

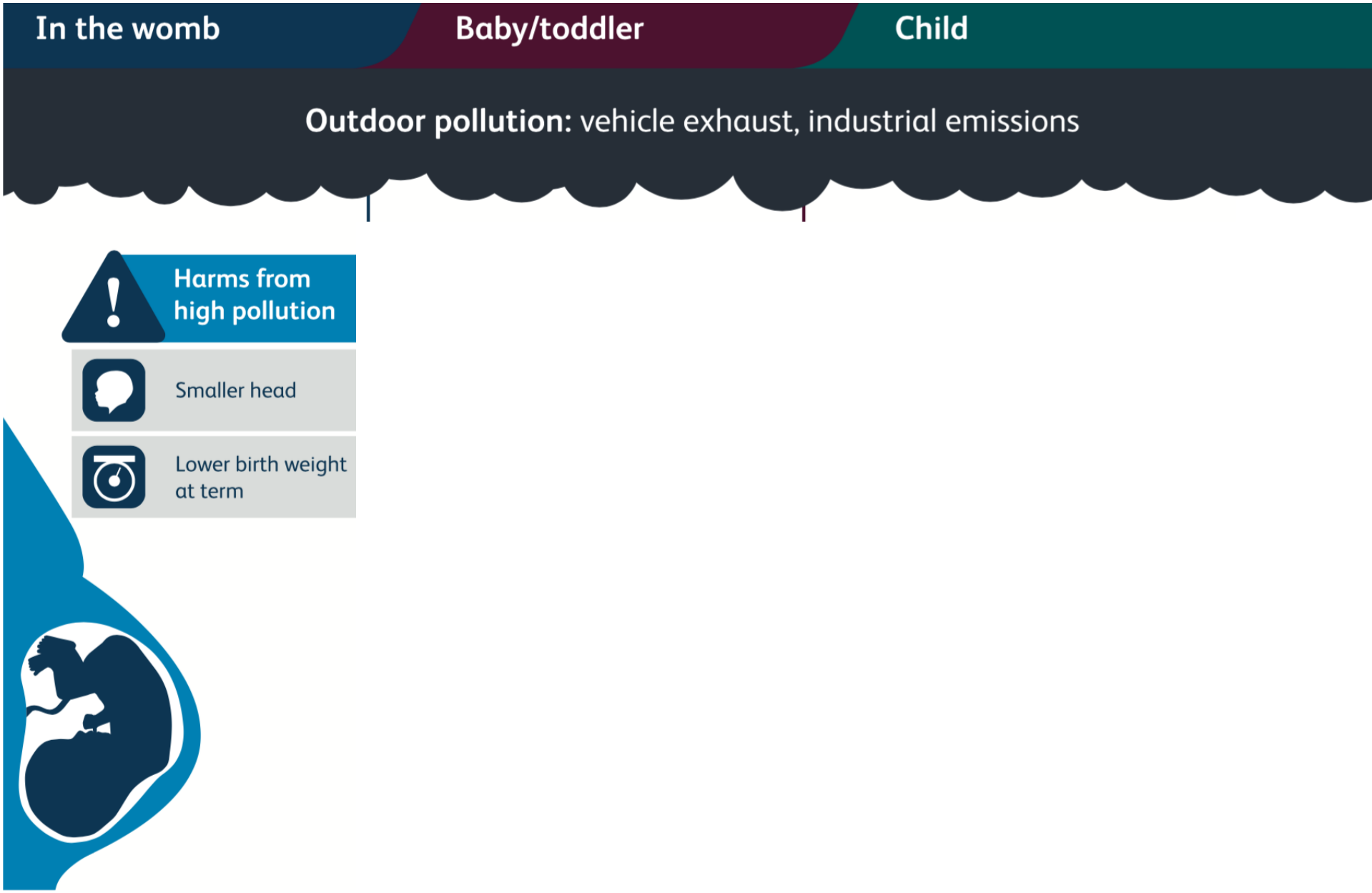
Royal College of Physicians

RCPCH
Royal College of Paediatrics and Child Health
Leading the way in Children's Health

Every breath we take: the lifelong impact of air pollution

Report of a working party
February 2016

https://www.rcplondon.ac.uk/projects/outputs/every-breath-we-take-lifelong-impact-air-pollution



The inside story:
Health effects of indoor air quality on children and young people

Published January 2020

Royal College of Physicians

RCPCH
Royal College of Paediatrics and Child Health
Leading the way in Children's Health

Chapter 5

Air pollution and respiratory inequality: lessons from high-income countries

Jonathan Grigg

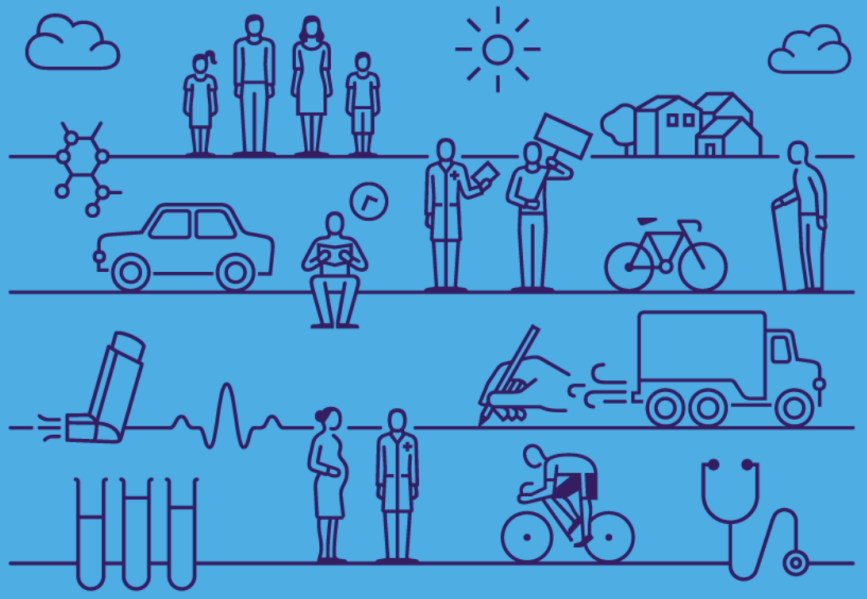
Blizard Institute, Queen Mary University of London, London, UK

Corresponding author: Jonathan Grigg (j.grigg@qmul.ac.uk)

Cite as: Grigg J. Air pollution and respiratory inequality: lessons from high-income countries. *In:* Sinha IP, Lee A, Katikireddi SV, et al., eds. Inequalities in Respiratory Health (ERS Monograph). Sheffield, European Respiratory Society, 2021; pp. 000–000 [https://doi.org/10.1183/2312508X.10003622].

advocacy

DOCTORS AGAINST DIESEL



Doctors Against Diesel is an evidence-based campaign led by doctors, nurses and health professionals.

Our mission is to reduce the impacts of air pollution on children's health.

Tackle toxic air before it's too late to save children's health, doctors tell May

Clean London
Evening Standard Investigation

EXCLUSIVE

Nicholas Cecil
Deputy Political Editor

MORE than 220 doctors today warned that time was "running out" to tackle Britain's toxic air scandal and protect a generation of young children.

The medics, including more than 100 from London, wrote to Theresa May urging her to start phasing out diesel vehicles as soon as possible in order to cut harmful fumes on the streets of the capital and other cities and towns.

"A national diesel reduction initiative, led by Government, will represent a major public health advance," they said. "However, time is running out. Without urgent action, emissions from diesel vehicles will cause irreversible lung damage to the current generation of children."

They highlighted the "strong and growing" evidence of a wide range of health impacts over lifetimes from nitrogen dioxide (NO2) and black carbon – soot – emissions.

"For example, in infants and children there is strong evidence, including data from children in London, that exposure to fossil fuel-derived air pollution stunts lung growth," they said.

They highlighted that 45 per cent of nitrogen oxide emissions in Greater London come from road transport.

Plea: Theresa May was urged to begin phasing diesel cars from the road

"Modelling has shown that, alongside other measures, the percentage of cars that are diesel will need to be reduced from 57 per cent to five per cent of the total if Greater London is to become compliant with legal limits on NO2 emissions," they said.

Ministers have shied away from a nationwide diesel car scrappage scheme – arguing that air pollution is largely an urban problem – or from changing vehicle excise duty to discourage motorists from buying diesel models.

However, the more than 280 doctors, nurses and other health professionals who signed the letter called for national action to cut the number of diesel cars, vans, taxis and light trucks.

In the letter drawn up by campaign group Doctors Against Diesel, they emphasised that there were now 585 Air Quality Management Areas across Britain, meaning that while most town halls had a statutory duty to take action on illegal levels of air pollution their hands were tied because they had no powers to ban diesel vehicles.

Professor Jonathan Grigg, professor of paediatric respiratory and environmental medicine at Queen Mary University of London, said: "In London, we know that diesel engines are a major and unnecessary cause of air pollution along our roads.

"Cutting diesel emissions would have an immediate impact on children's personal exposure and improve their long-term health."

Professor John Middleton, president of the UK Faculty of Public Health, said: "Diesel... is linked to health effects that begin before birth and extend throughout the life course, from childhood lung development and asthma, to increased risk of heart disease, stroke, lung cancer and dementia.

"It is time for diesel to be recognised as the health emergency that it is."

Scientists estimate that the death toll in London from NO2 and small particulate pollution is up to 9,400 a year, with many more people suffering health problems when toxic air peaks such as in mid-January.

Dr Isobel Braithwaite, a junior doctor at the children's unit at the North Middlesex Hospital in Tottenham, said: "I've seen a lot of patients, including children, come to A&E with asthma attacks, which are much more likely when pollution levels are higher."

Dr Rajive Mitra, a cycling GP in north Lambeth, said: "I'd advise people heading out onto London's busier streets to try to walk on quieter roads and walk away from the side of the road."

@nicholascecil

Editorial Comment Page 14


Jonathan Grigg
Professor of Paediatric Respiratory and Environmental Medicine at Queen Mary University, London

conclusions

- major adverse health effects of air pollution
  - long- and short-term exposure
  - outdoors and indoors
- need to detoxify the breathed environment to maintain children's lung health

Thank you