
Evidence of Health and Health Service Impacts of Local Interventions to Tackle Outdoor Air Pollution

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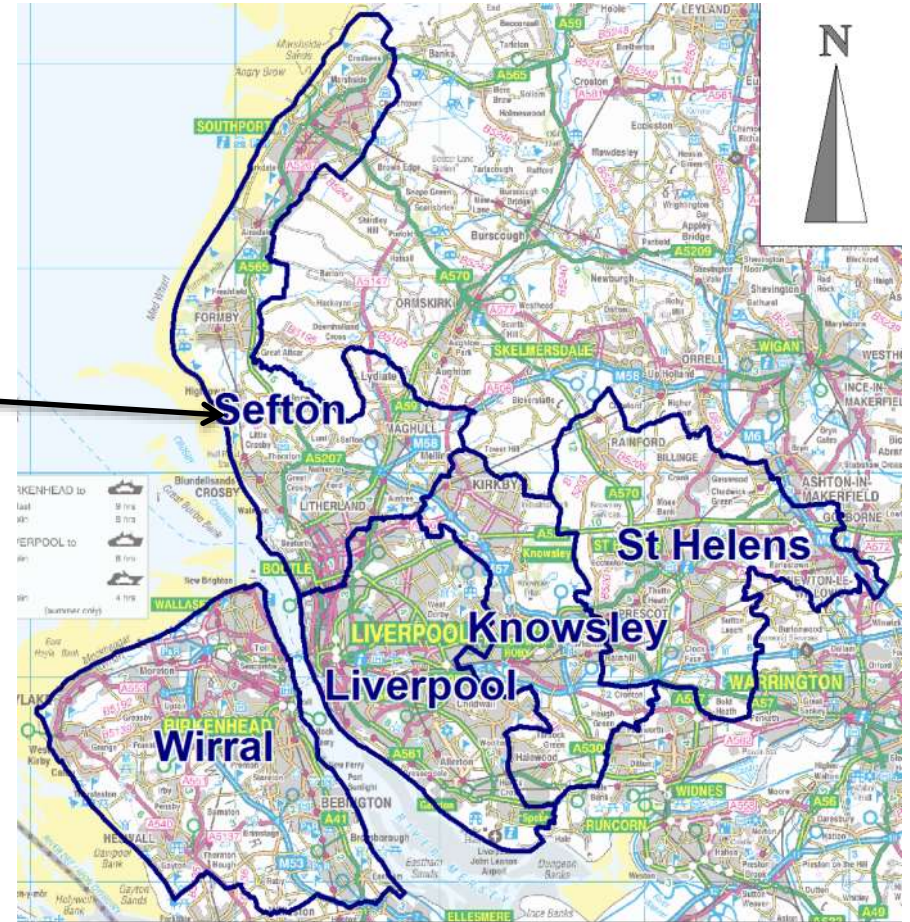


Presentation Content

- Context
 - Air pollution in Merseyside and Sefton
 - Why this evidence review was commissioned
- Evidence review
 - Methodology
 - Findings
- Discussion, conclusions and next steps



Merseyside - Sefton - Locality

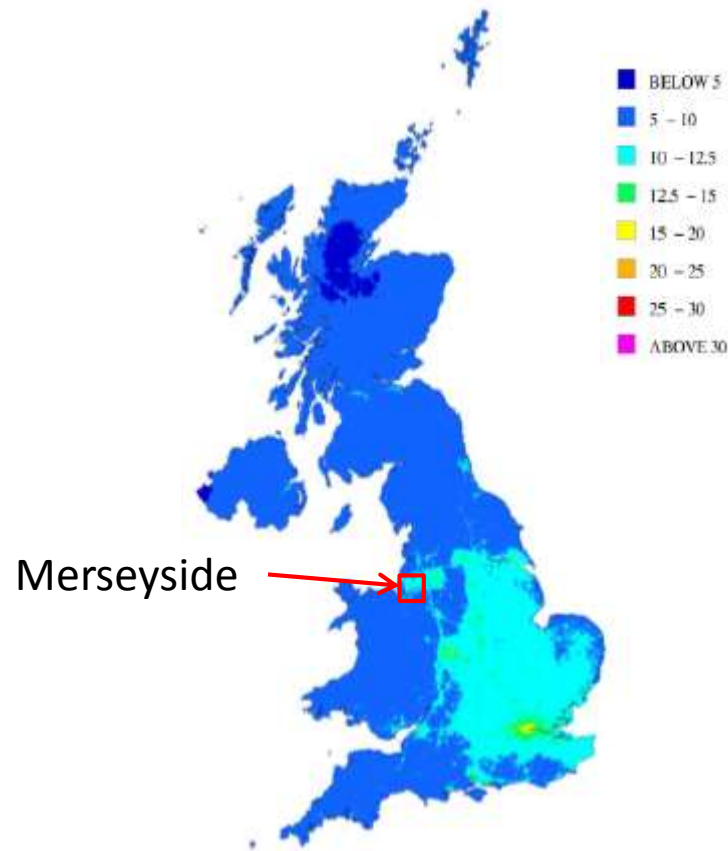


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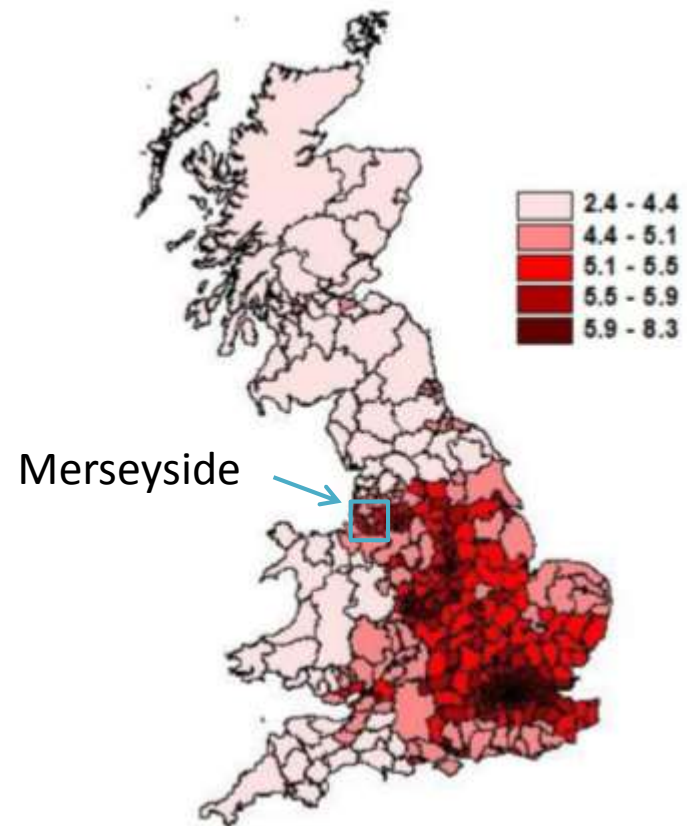


Merseyside – PM_{2.5}

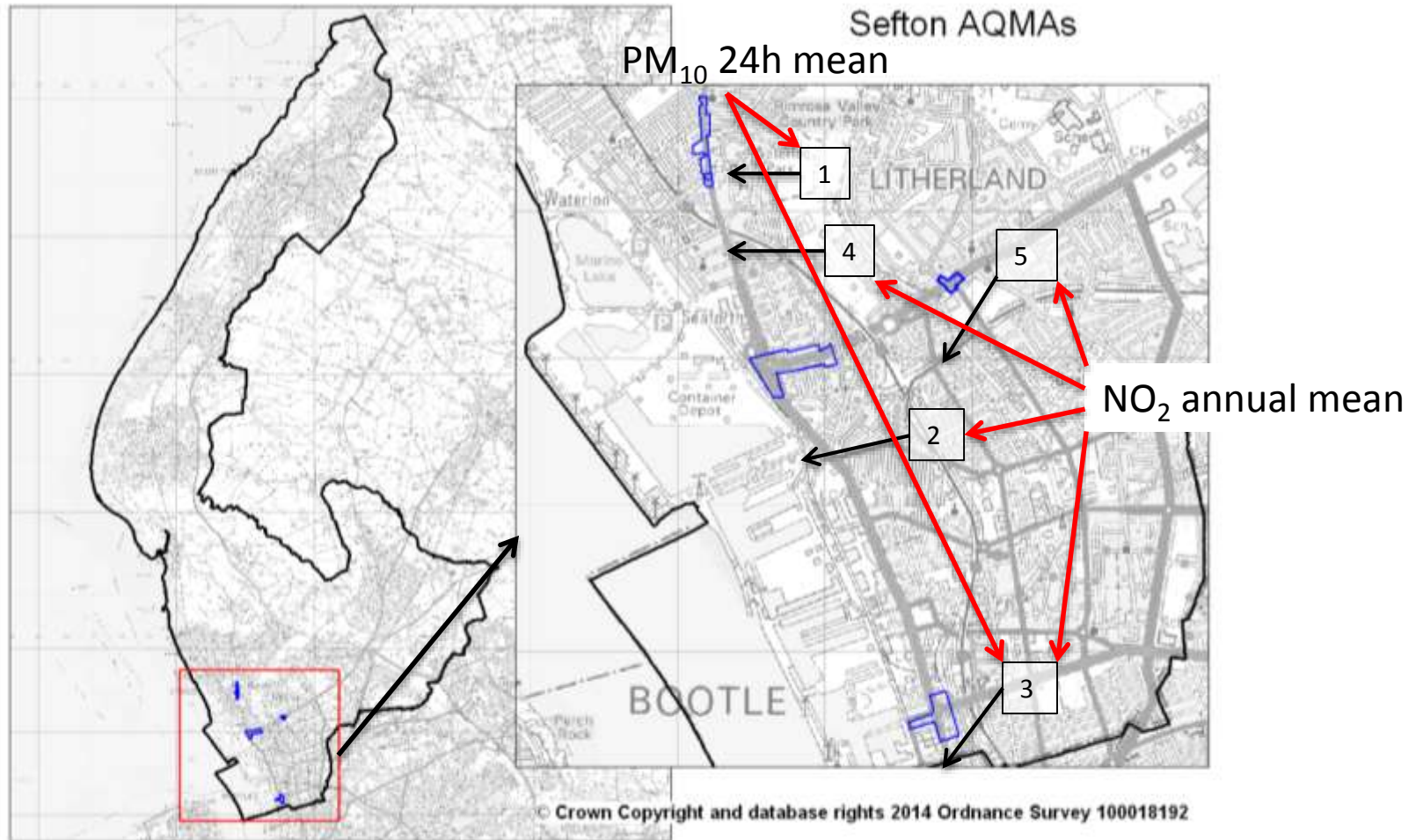
Annual mean ambient PM_{2.5} concentrations (2010)



Fraction of mortality attributable to anthropogenic PM_{2.5} (PHOF)

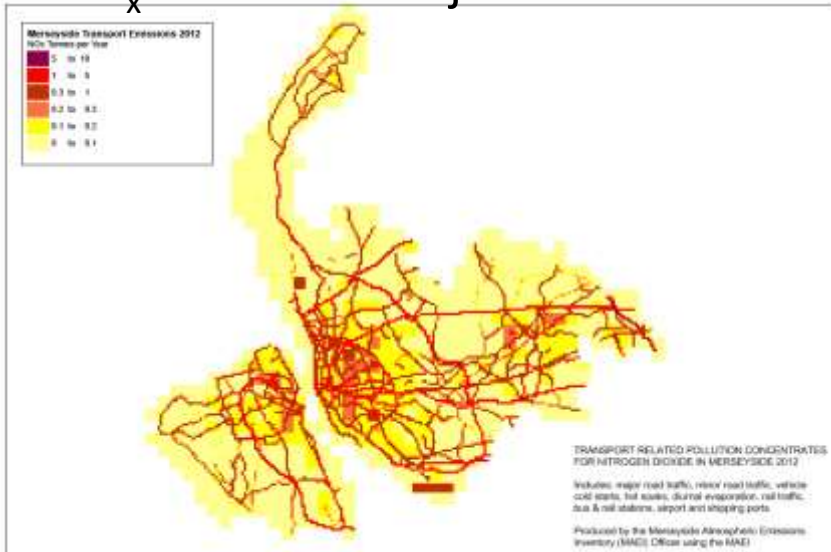


Sefton – Air Pollution - AQMAs

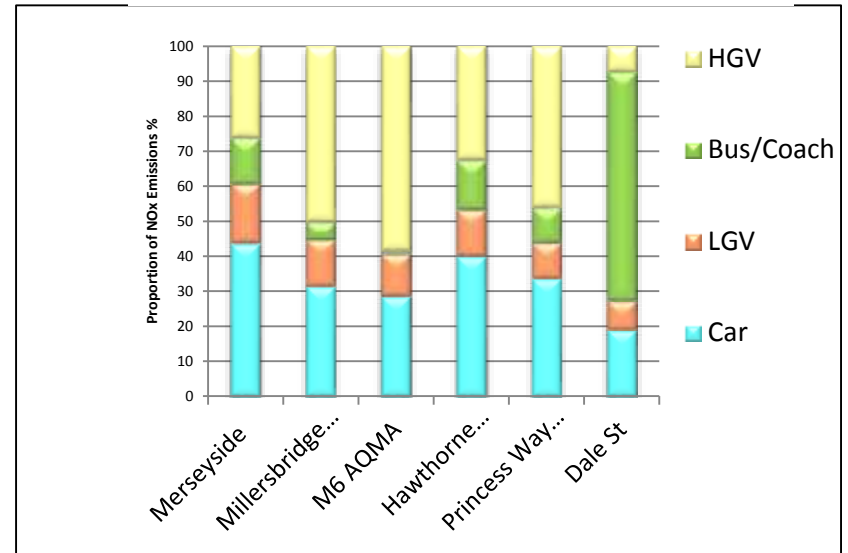


Sefton – Air Pollution – Sources

NO_x Emissions Major Roads 2012



NO_x emissions by Vehicle Type at various locations



Health impacts of air pollution – local?



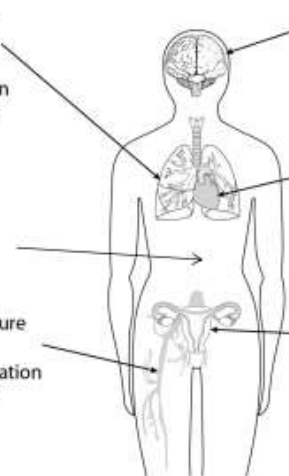
Short term exposure to fine particles



Asthma
Lung function
Admissions
Death



Organs of the human body that can be affected by air pollution

- 
- Respiratory mortality
 - Respiratory symptoms
 - Rhinitis/Pneumonia
 - Airway inflammation
 - Decreased lung function
 - Decreased lung growth
 - Lung cancer
- **Metabolic disorders**
 - **Diabetes**
 - **Liver Disorders**
- Changes in blood pressure
 - Endothelial function
 - Increased blood coagulation
 - Systemic inflammation
- Stroke
 - Diseases of the central nervous system
- Cardiovascular mortality
 - Cardiovascular hospital admission
 - Changes in heart rate variability
 - ST-segment depression
- Premature birth
 - Decreased birth weight
 - Decreased foetal growth
 - Intrauterine growth retardation
 - Decreased sperm quality

HelmholtzZentrum münchen
German Research Center for Environmental Health

Updated from Peters et al. JOEM 2011



Evidence Review

Air pollution and health

an association that is well documented:

e.g. in 2010, up to 140,743 life-years lost in London due to NO2 and PM25

What can be done?

Literature

Guidelines for local action from e.g. DEFRA; Public Health England and WHO

Do interventions work?

We focussed on **evaluating local air pollution interventions** in terms of effects on:

- **health** and
- **health service use**

Findings

Few studies examining the association between **interventions to reduce air pollution** and **health impacts**

Of these, most use **health benefit modelling** - a technique developed due to practical difficulties in evaluation.

Range of studies:

- Active travel and low carbon driving
- Low Emission Zones (LEZ)
- Speed Management Zones
- Congestion Charging
- Natural Gas
- Low Carbon Electricity Production
- Cumulative interventions



Active travel and low carbon driving

Health effects per million population in 1 year compared with business as usual

London estimates	Lower carbon emission vehicles alone	Increased active transportation alone
Premature deaths Decreased by	17	530
Years of life lost Decreased by	160	5188
Disability adjusted life years Increased by	160	7332



Co benefits: increased physical activity; community cohesion; road safety; reduced travel poverty; reduced congestion; climate change mitigation.



Low Emission Zones

London LEZ: no health impacts demonstrated yet

German LEZ: upgrading vehicle fleet = \$1b
health benefits = \$2b

Rome LEZ: residents along busy roads gained 3.4 days/person (i.e. 921 YLG per 100 000 population)

Amsterdam: average gain of 0.2 months of life expectancy



Speed Management Zones

Improvements in air quality and health: 2 studies

Rotterdam,

of those living within 400m:

- 85% gained up to 1 month life expectancy,
- 15% gaining 1-3 months



Barcelona

- decrease mortality rates by around 0.6%
- increase life expectancy by 0.15 months
- 40 fewer deaths each year



Congestion Charging

London Congestion Charge

gains of 183 years of life per 100,000 population
overall 1,888 years of life were gained

Stockholm congestion charging

reduced emissions estimated to save five life-years
per year

Natural Gas

Chile

switching to compressed natural gas for public transport
—> reduced urban PM emissions
—> 36 avoided premature mortalities per year



Cumulative Interventions

New Haven (US): Range of interventions applied, which led to:

- Large reductions in NO_x → significant improvements in health outcomes
- Modest reductions in PM → significant decrease in numbers of CHD and asthma hospitalisations within small areas

Detroit (US): Range of interventions targeted in areas of high population density → predicted 130 avoided deaths and 16 avoided asthma hospitalisations in 2020

National Policy

e.g. **China's 'Blue Sky' programme:** regulation of industry combined with local initiatives. Led to improvements in urban air quality, resulting in a 50% reduction of the prevalence rate of bronchitis amongst schoolchildren.



Discussion, conclusions and next steps

- Complexity, confounding, collaboration
- Health benefit modelling
- Building the evidence base
- Usefulness to prompt debate, discussion, engagement



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