



Air Pollution and Health in Northern Ireland

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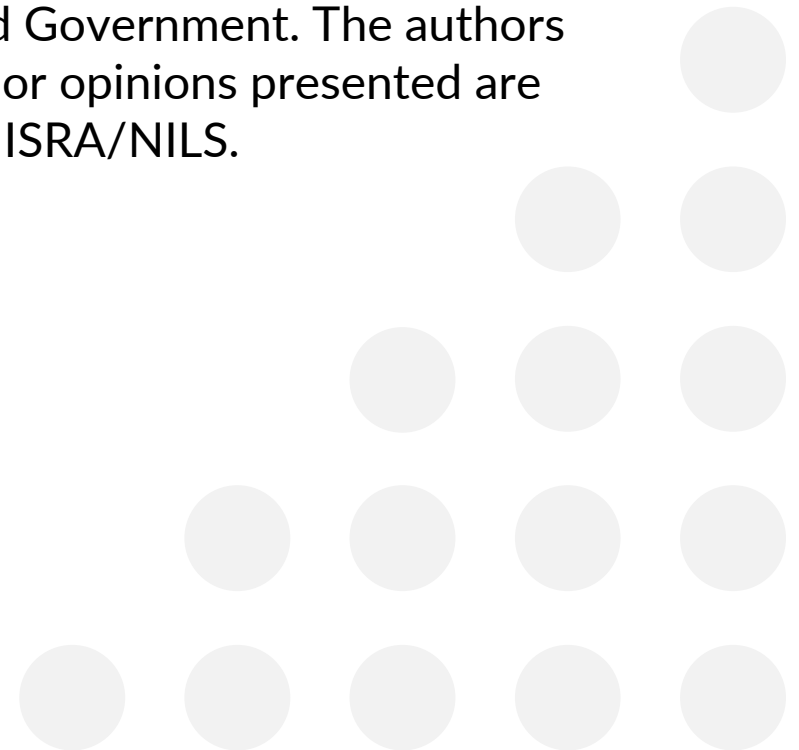
Research Team

- Professor Duncan McVicar (Queen's Management School)
- Professor Dermot O'Reilly (Centre of Excellence for Public Health)
- Dr Mark McGovern (Rutgers School of Public Health)
- Dr Babak Jahanshahi (Queen's Management School)
- Dr Neil Rowland (Queen's Management School)



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- Funding through Administrative Data Research Northern Ireland



Overview

- Research Questions
- Data
- Preliminary Results – Air Pollution and Self-reported health
- Impact



Research Questions

What are the health effects of outdoor air pollution in Northern Ireland?

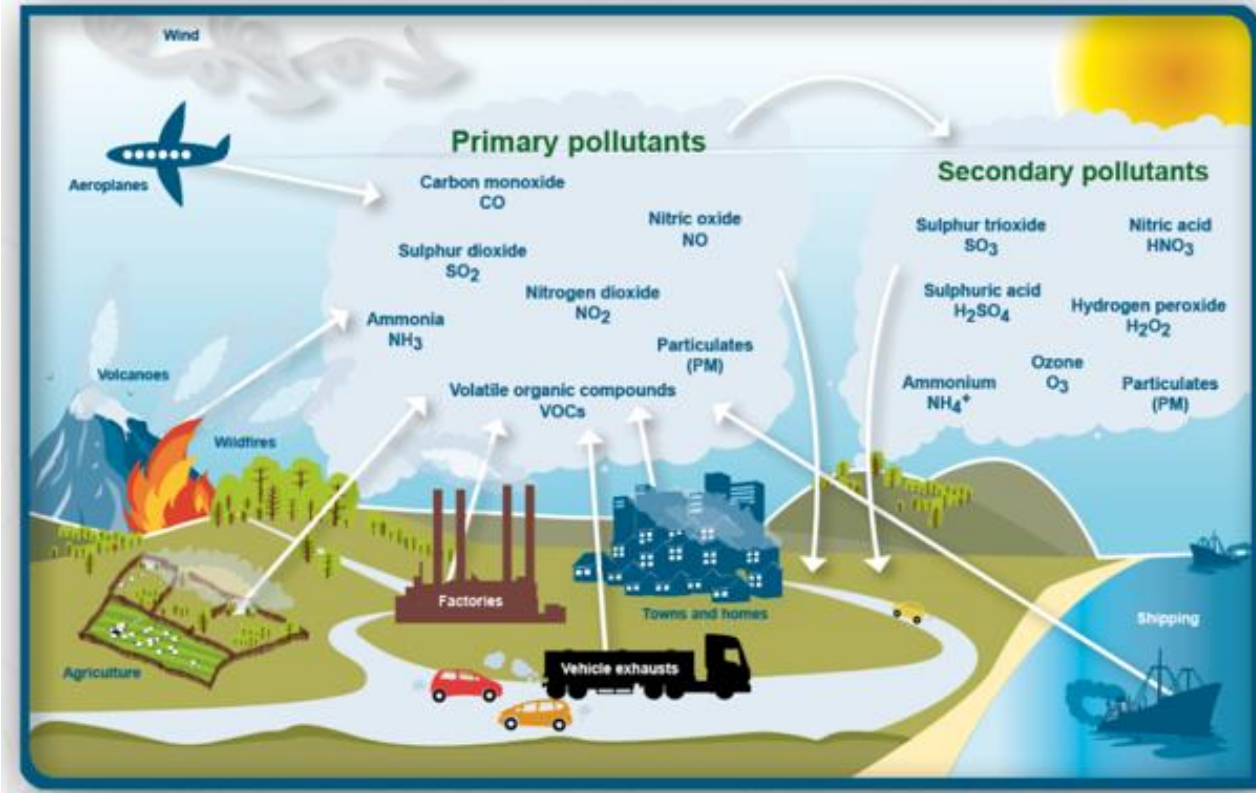
Are people exposed to higher levels of pollution more likely to:

- Report worse health outcomes?
- Die younger?
- Have lower birth weight when born?
- Receive medication for treating:
 - Diabetes?
 - Parkinsonism or Dementia?
 - Cardiovascular- or Respiratory-related illnesses?



Why carry out this study?

Air Pollution



Health Impacts

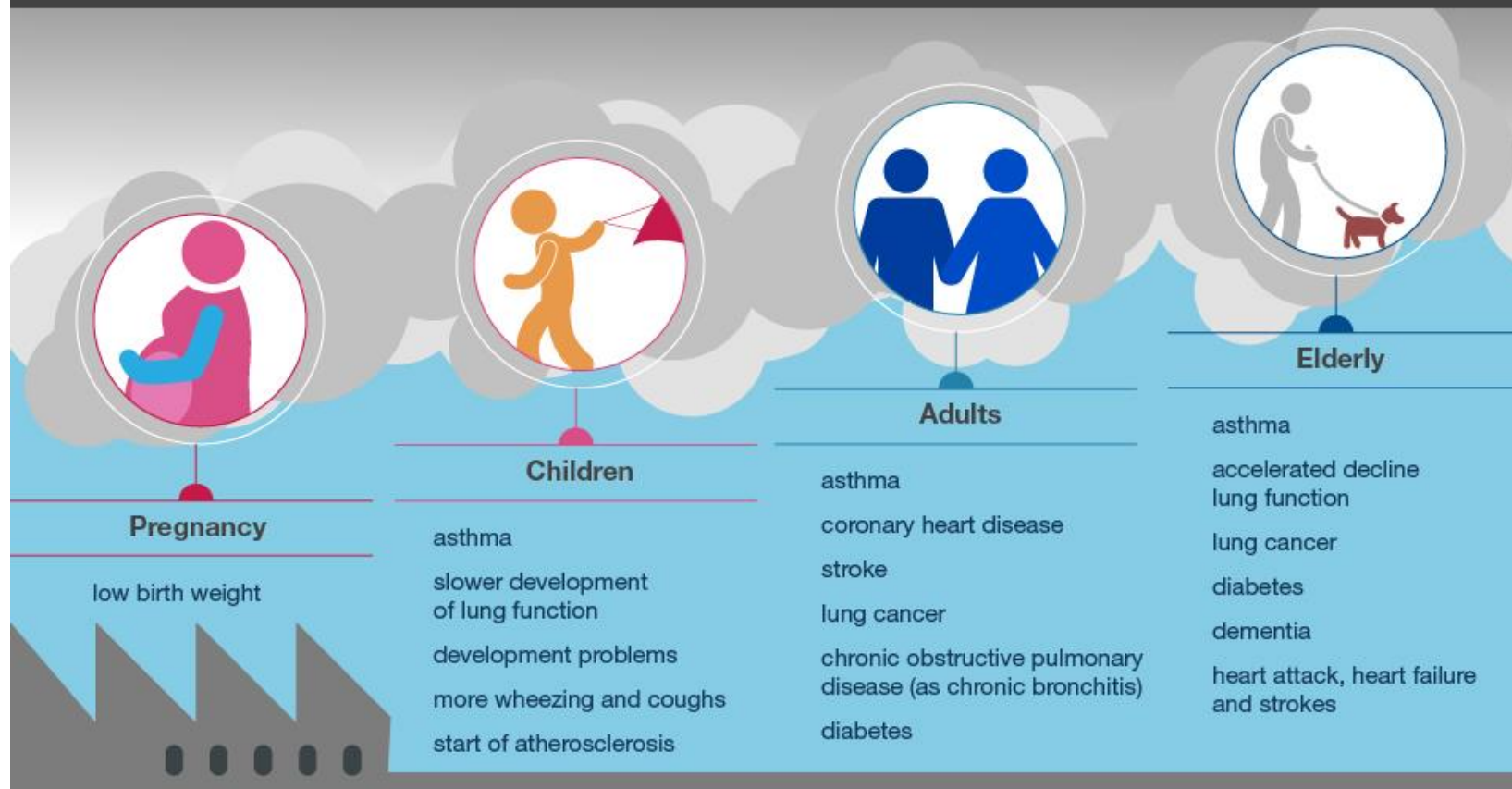
- In the UK, poor air quality is the largest environmental risk to public health (PHE, '18)
- Strong evidence of links with coronary heart disease, stroke, respiratory disease and lung cancer, and asthma exacerbation – particularly for fine particles (PM 2.5)
- The effects of long-term exposure are equivalent to 28,000-36,000 deaths per year
- It may also affect the development of other conditions, e.g., dementia and diabetes.

Who will benefit?

- Currently there are no studies for this part of the UK:
 - We provide representative evidence to inform policymaking decisions
 - We provide information to the public to inform choices (see Dashboard)
- Wider benefit:
 - We use rich data to assess the impact of long periods of exposure (up to 10 years)
 - We analyse less commonly studied outcomes, e.g., dementia, diabetes, Parkinson's



Air pollution affects people throughout their lifetime

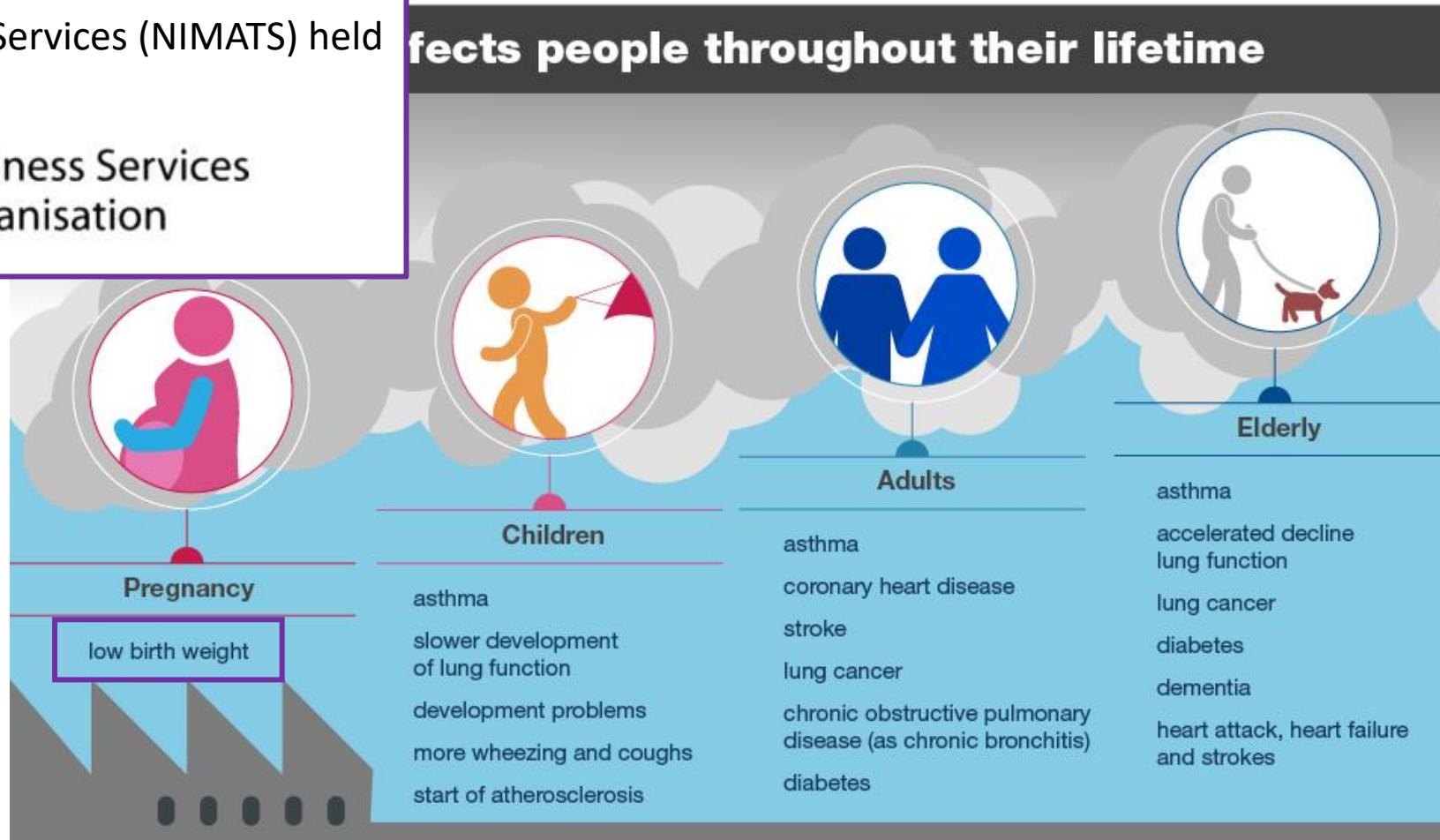


Infant Health Project

Linking modelled 1x1km air pollution data to birth records in the NI Maternity Services (NIMATS) held by the BSO



Health Matters

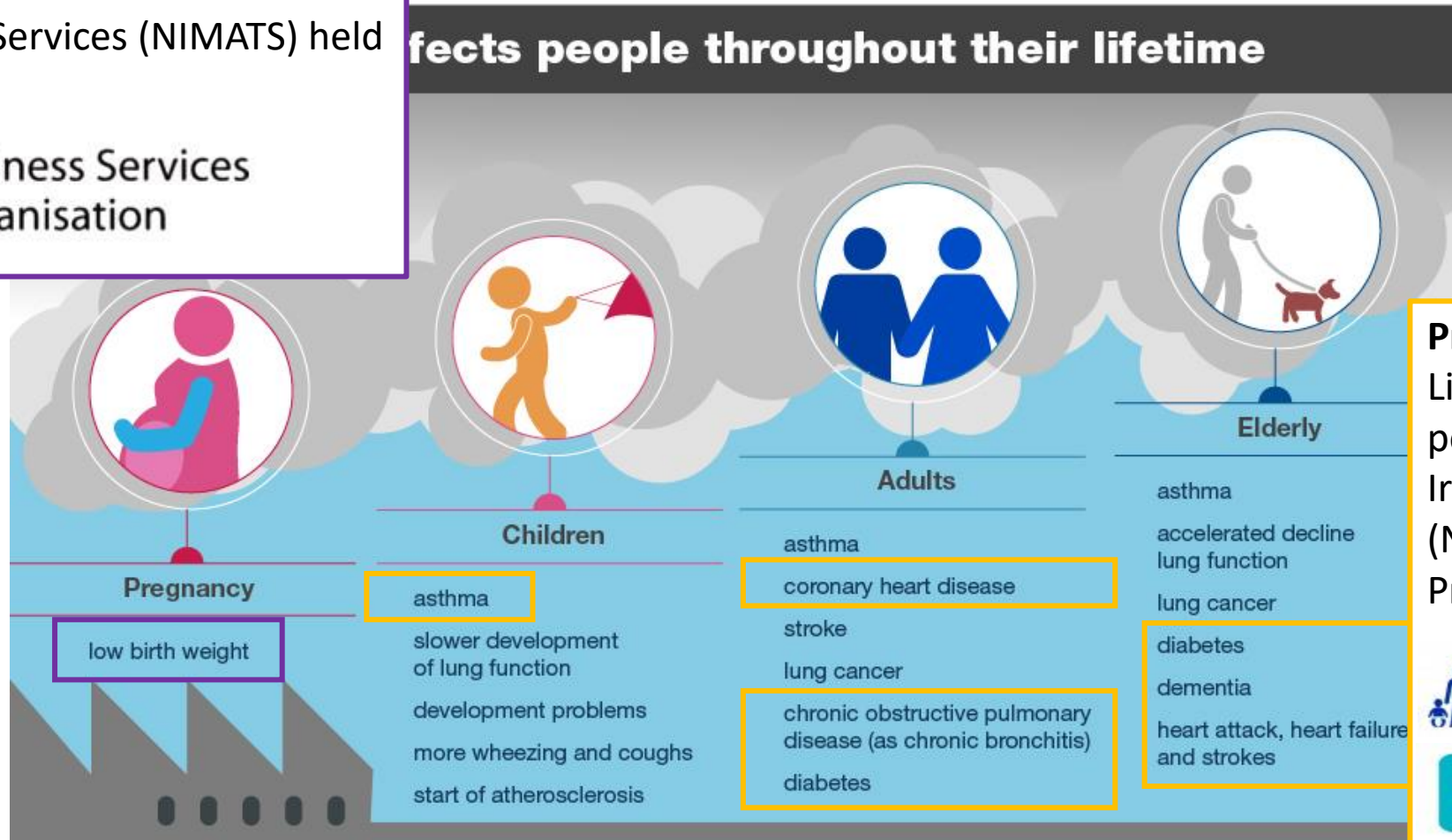


Infant Health Project

Linking modelled 1x1km air pollution data to birth records in the NI Maternity Services (NIMATS) held by the BSO



Health Matters



Prescriptions Project

Linking modelled 1x1km air pollution data to the Northern Ireland Longitudinal Study (NILS) and the Enhanced Prescribing Database (EPD)



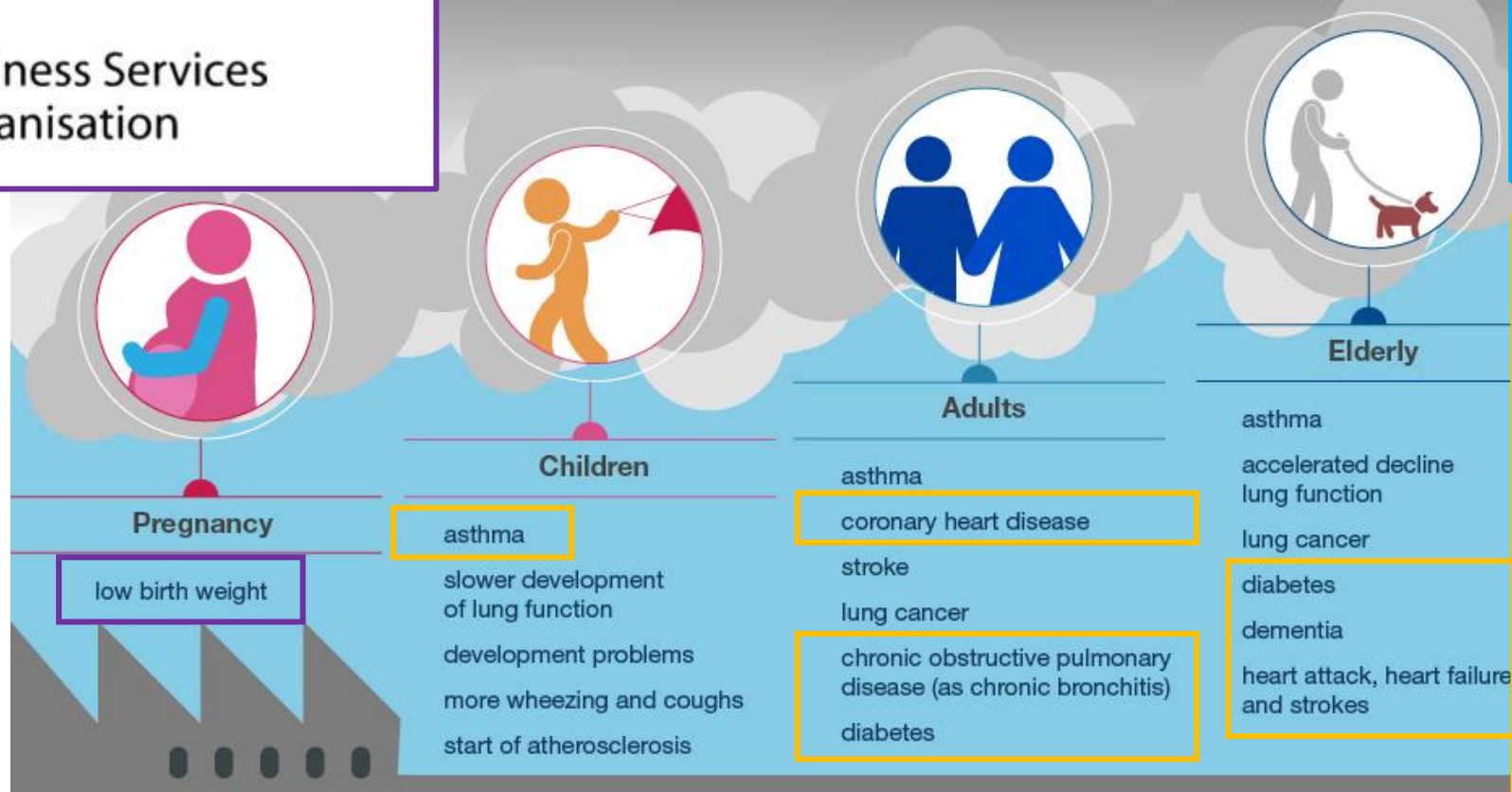
Infant Health Project

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Health Matters

Affects people throughout their lifetime



Census Health and Mortality

Linking modelled 1x1km air pollution data to the Northern Ireland Longitudinal Study (NILS)



Prescriptions Project

Linking modelled 1x1km air pollution data to the Northern Ireland Longitudinal Study (NILS) and the Enhanced Prescribing Database (EPD)



Data Application and Access

Data contain a variety of (anonymized) information about individuals. Protecting the confidentiality of subjects' information is important.

NILS:

- All project members are ONS Accredited Researchers
- Develop a research proposal and submit a project application to the NILS Research Approvals Group (RAG)
- If granted, data are accessed in the NISRA secure environment located in Belfast – this is a strictly controlled setting with policies, protocols and procedures to ensure data confidentiality, including statistical disclosure checks applied to intermediate and final outputs.

NIMATs:

- A similar process exists but the data are analysed in the BSO Safe Haven located in Belfast.

Model Description – Air Pollution and Self-Reported Health

Key variable: Average air pollution exposure 2001-2010 (PM2.5)

April 2001
Census

April 2011
Census

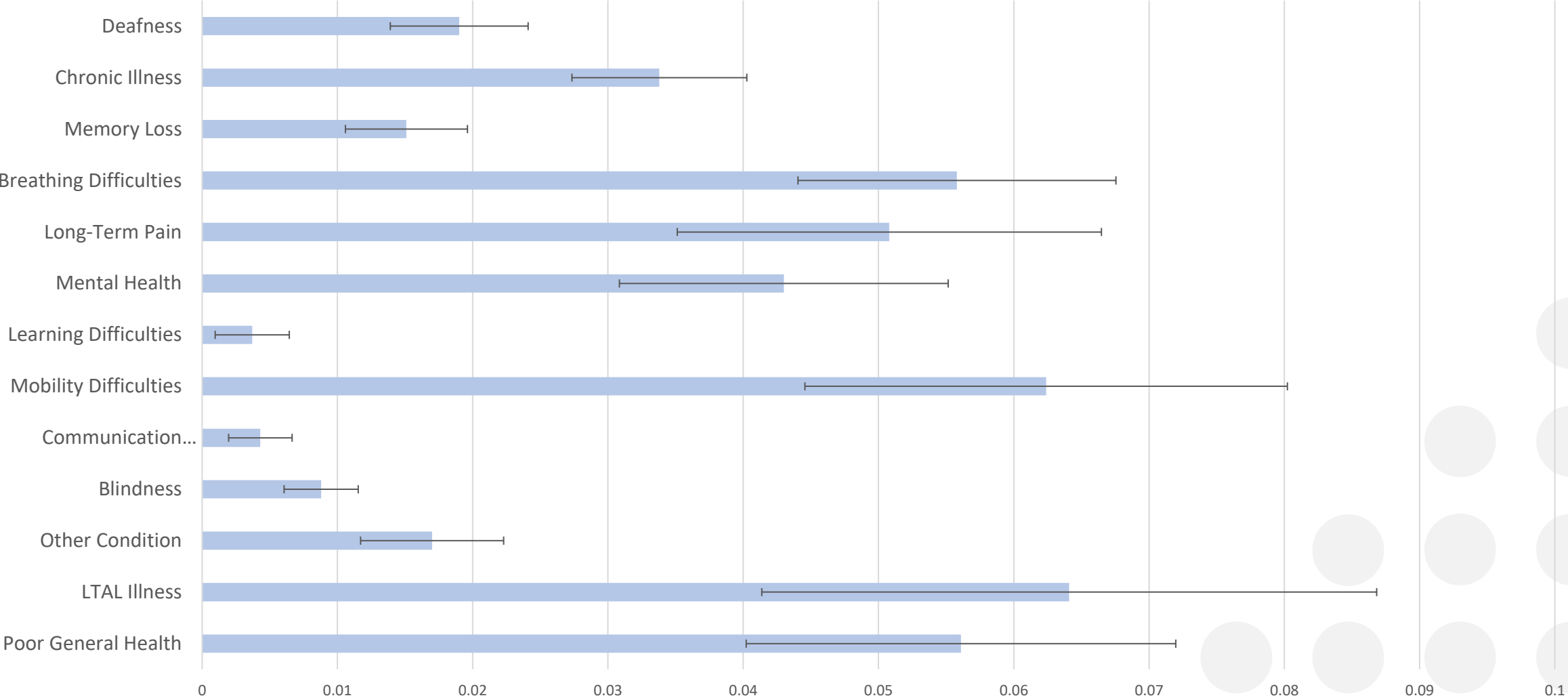
Background characteristics:

- **Demographics:** Age group, gender, marital status, country of birth, religion
- **Health:** General health, presence of a long-term activity limiting illness
- **Socioeconomics:** Education, economic status, National Socioeconomic Classification
- **Household:** tenure, number of children, family type, cars
- **Area:** Multiple Deprivation Measure decile

Health outcomes:

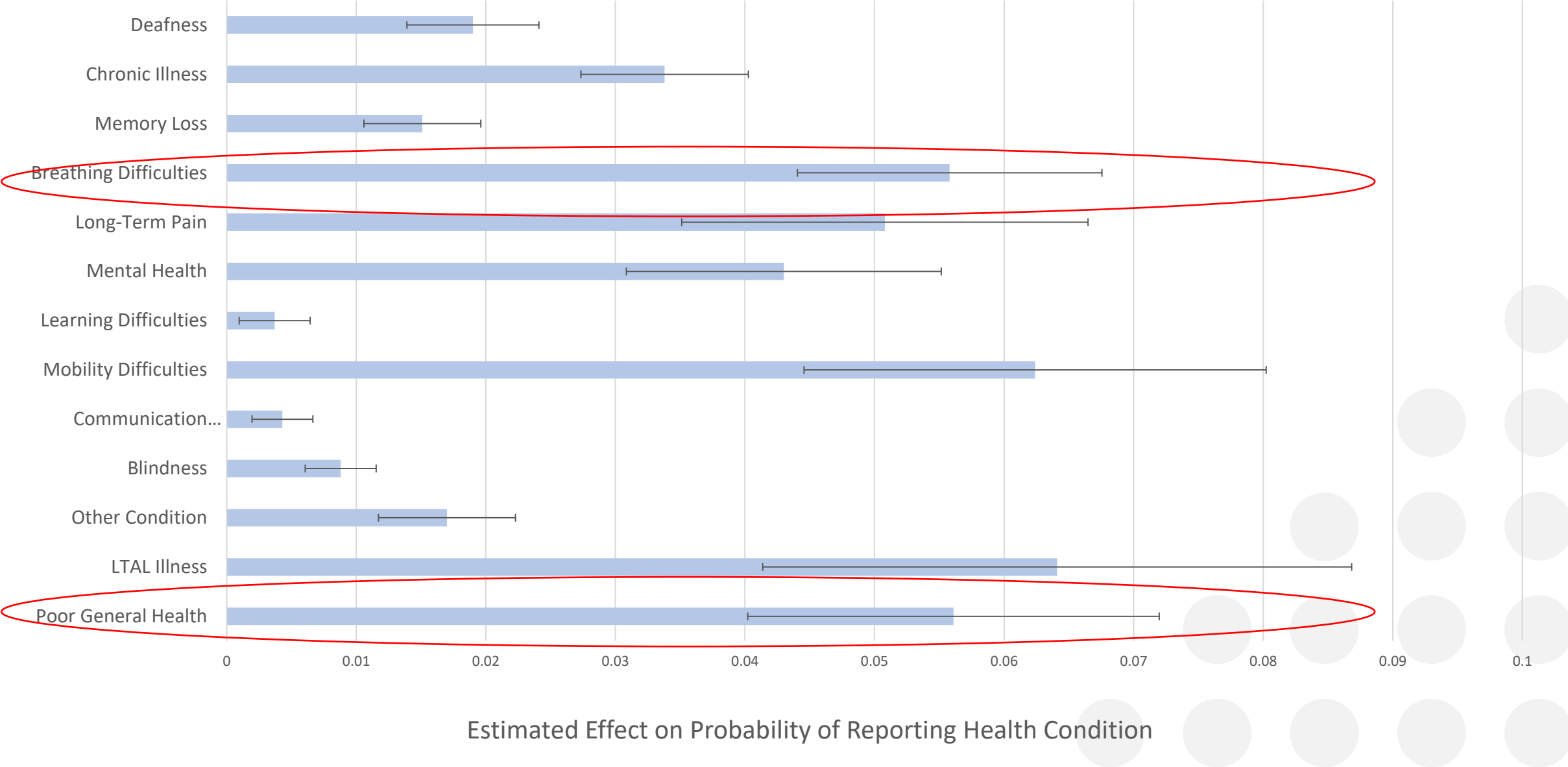
- General health: poor/v. poor
- Limiting illness/disability: yes / no
- Long-term conditions:
 - Breathing difficulties
 - Blindness / sight loss
 - Deafness
 - Communication difficulties
 - Learning difficulties
 - Mental health condition
 - Long-term pain
 - Chronic illness
 - Memory loss
 - Any other condition
 - Mobility difficulties

Estimated Association Pollution & Health

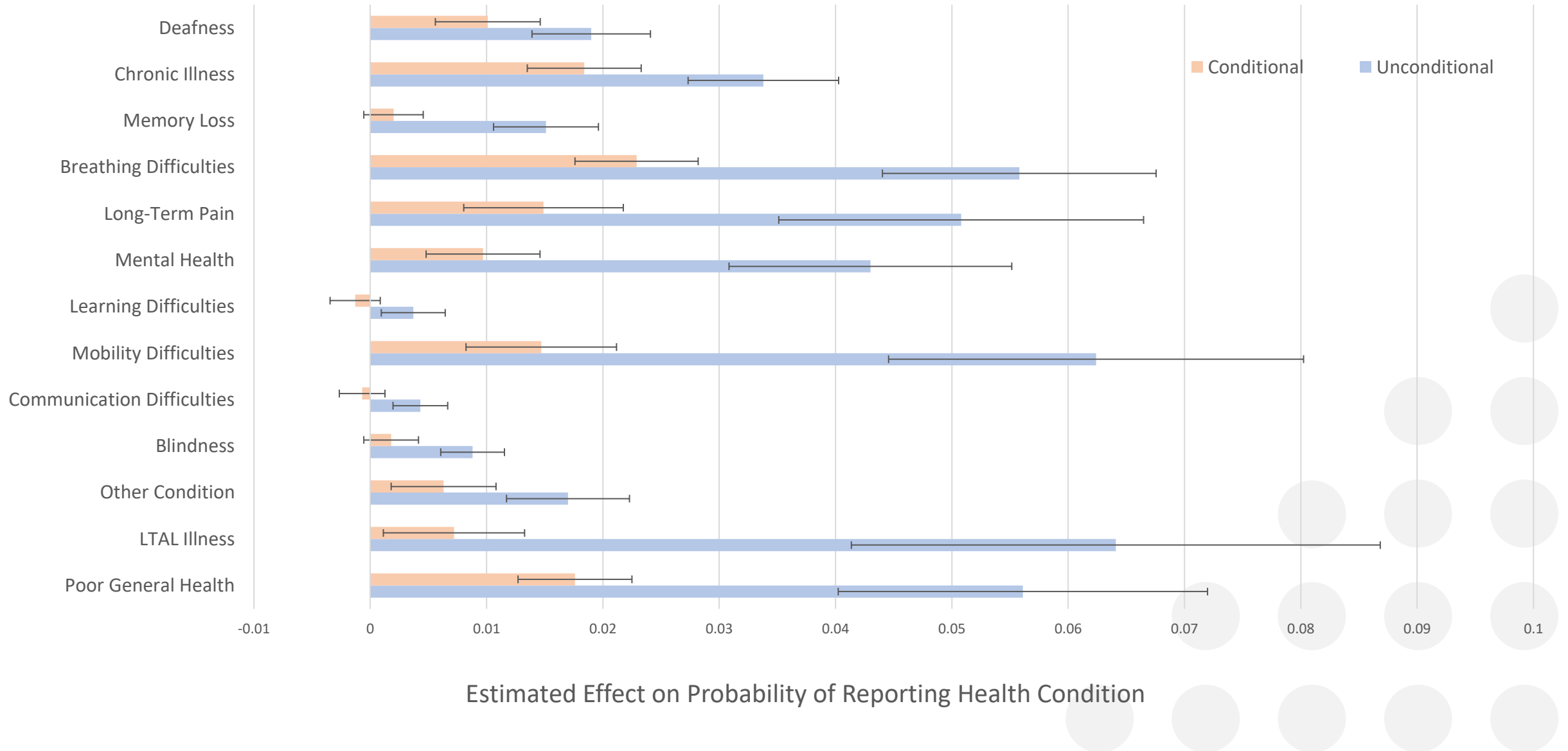


Estimated Effect on Probability of Reporting Health Condition

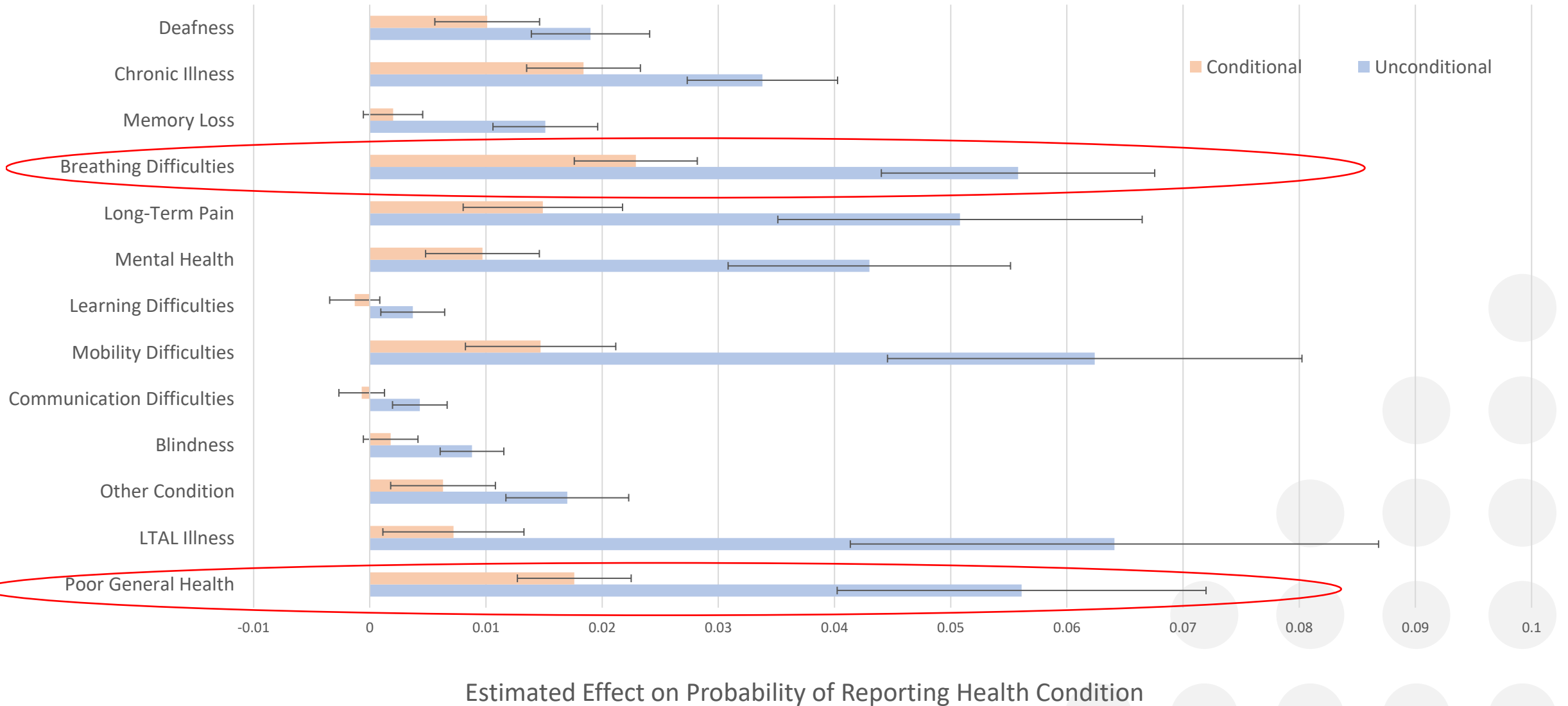
Estimated Association Pollution & Health



Estimated Association Pollution & Health



Estimated Association Pollution & Health



Summary and Implications

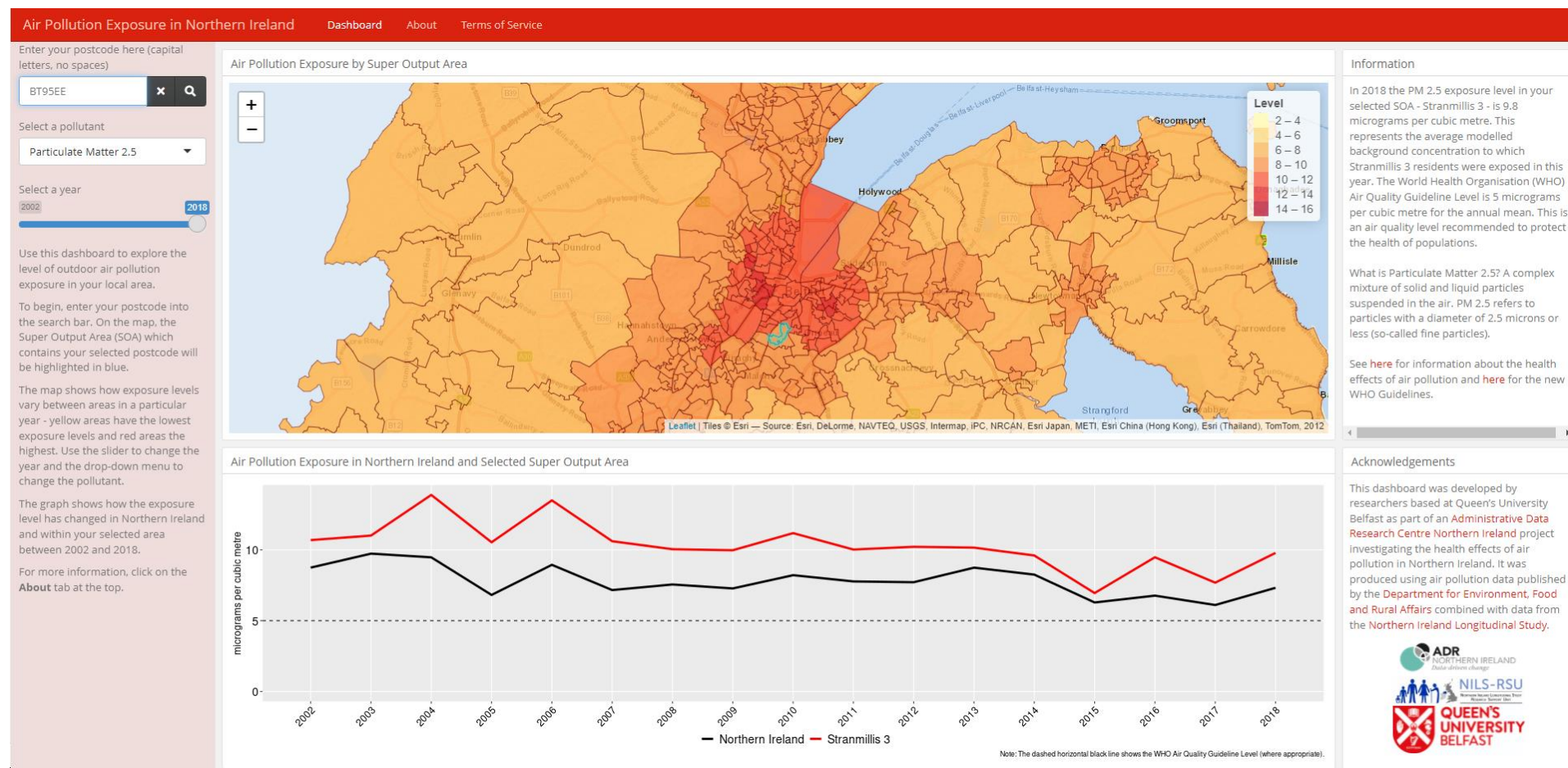
- We use NILS data to show strong statistical associations between long-term exposure to ambient PM2.5 air pollution and multiple health outcomes in Northern Ireland
- When we account for other differences between those who live in high and low pollution areas these associations weaken and in some cases even disappear
- No matter what we 'throw' at the model, however, some associations remain robust, likely because air pollution impacts detrimentally on these aspects of health in NI
- If this is the case, then further reductions in outdoor air pollution in NI can lead to improved health in the population, including reductions in the number of people experiencing breathing difficulties and reductions in chronic illness like heart disease

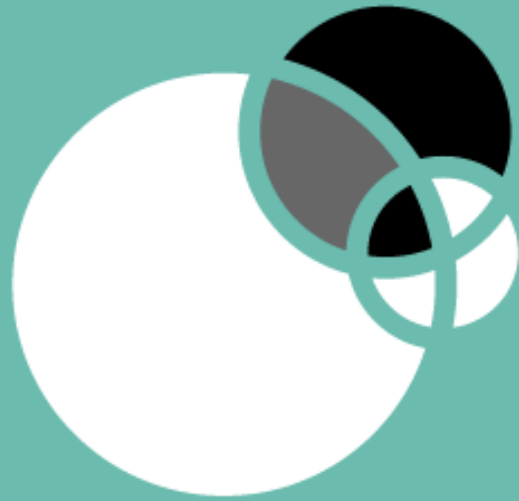
Impact – Engagement

- Project Steering Committee is briefed on findings and contributes to different stages of the research process
- Positive engagement with the charitable and political sectors and the wider public:
 - NI Assembly All Party Group on Lung Health, with Asthma UK / BLF
 - NI Executive Agriculture Minister Edwin Poots MLA and officials to discuss air quality issues, with Asthma UK / BLF
 - ‘Better Data for Cleaner Air’ webinar run through the ESRC Festival of Social Science

Impact – Online Dashboard

https://adr2020.shinyapps.io/Air_Pollution_Dashboard_for_Northern_Ireland/





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Thank you for listening

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Appendix



Economic
and Social
Research Council



**QUEEN'S
UNIVERSITY
BELFAST**



Datasets

Northern Ireland Longitudinal Study (NILS)

- Data-linkage project linking Census and administrative data for 28% of NI population
- Person-level data on demographics, address, births and deaths, self-reported Census responses, e.g. health status, socioeconomic status

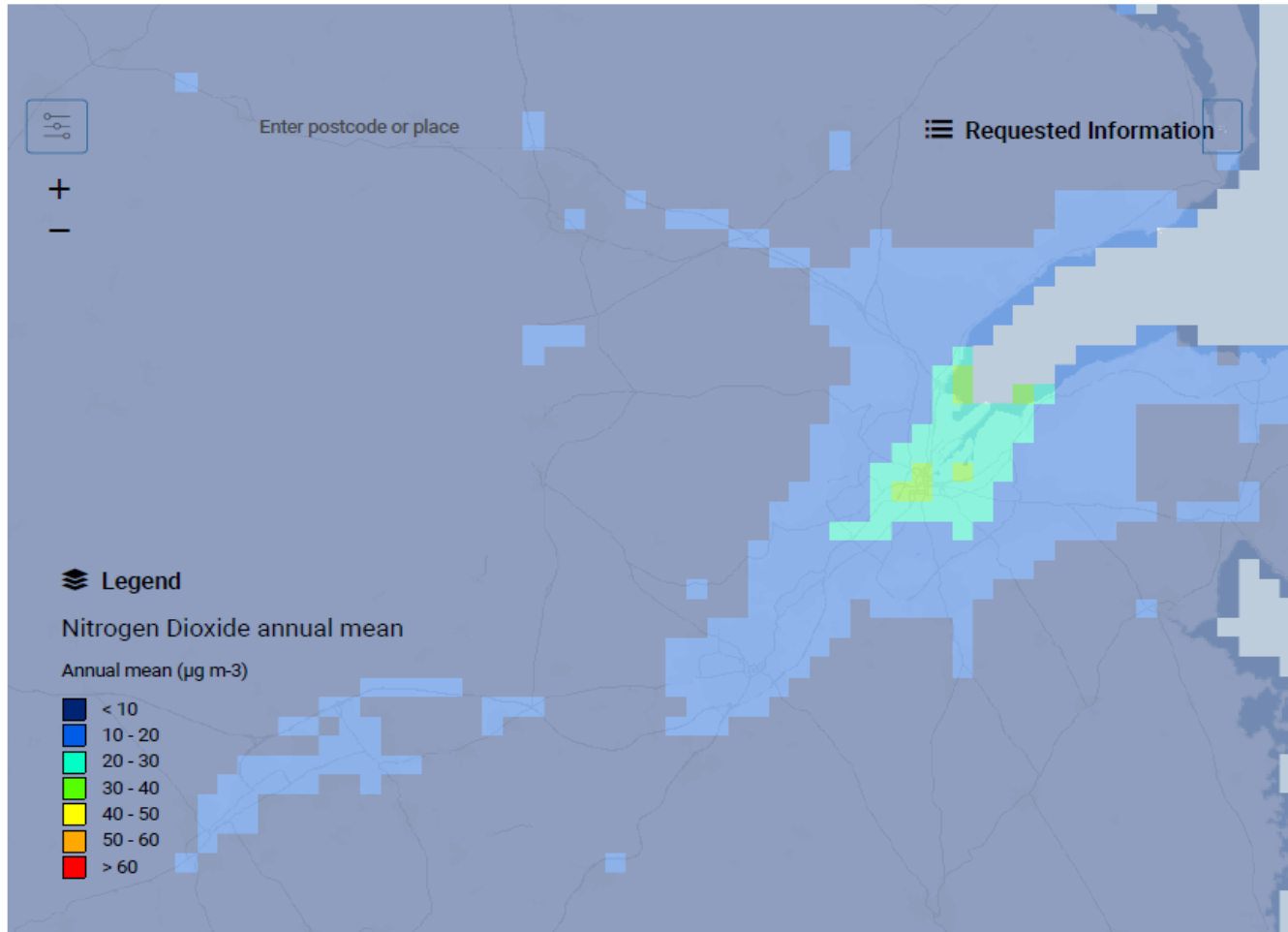
Enhanced Prescribing Database (EPD)

- Records of all primary care prescriptions dispensed in NI
- Linked to NILS to measure health via prescriptions used to treat various illnesses

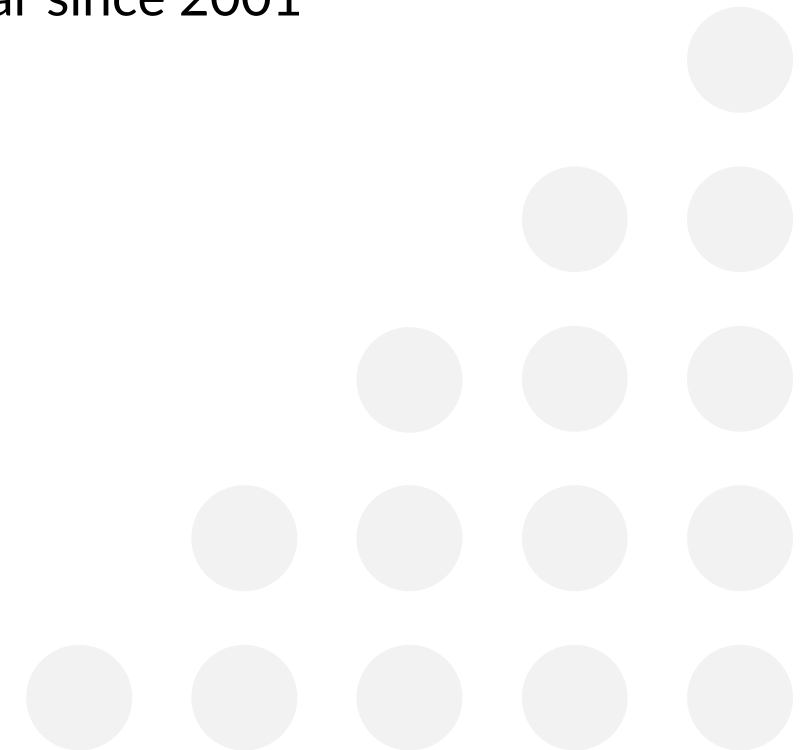
Northern Ireland Maternity Services (NIMATs)

- Records relating to the maternity process for all births in NI hospitals
- Demographic and clinical information on mothers and infants, e.g. birth weight

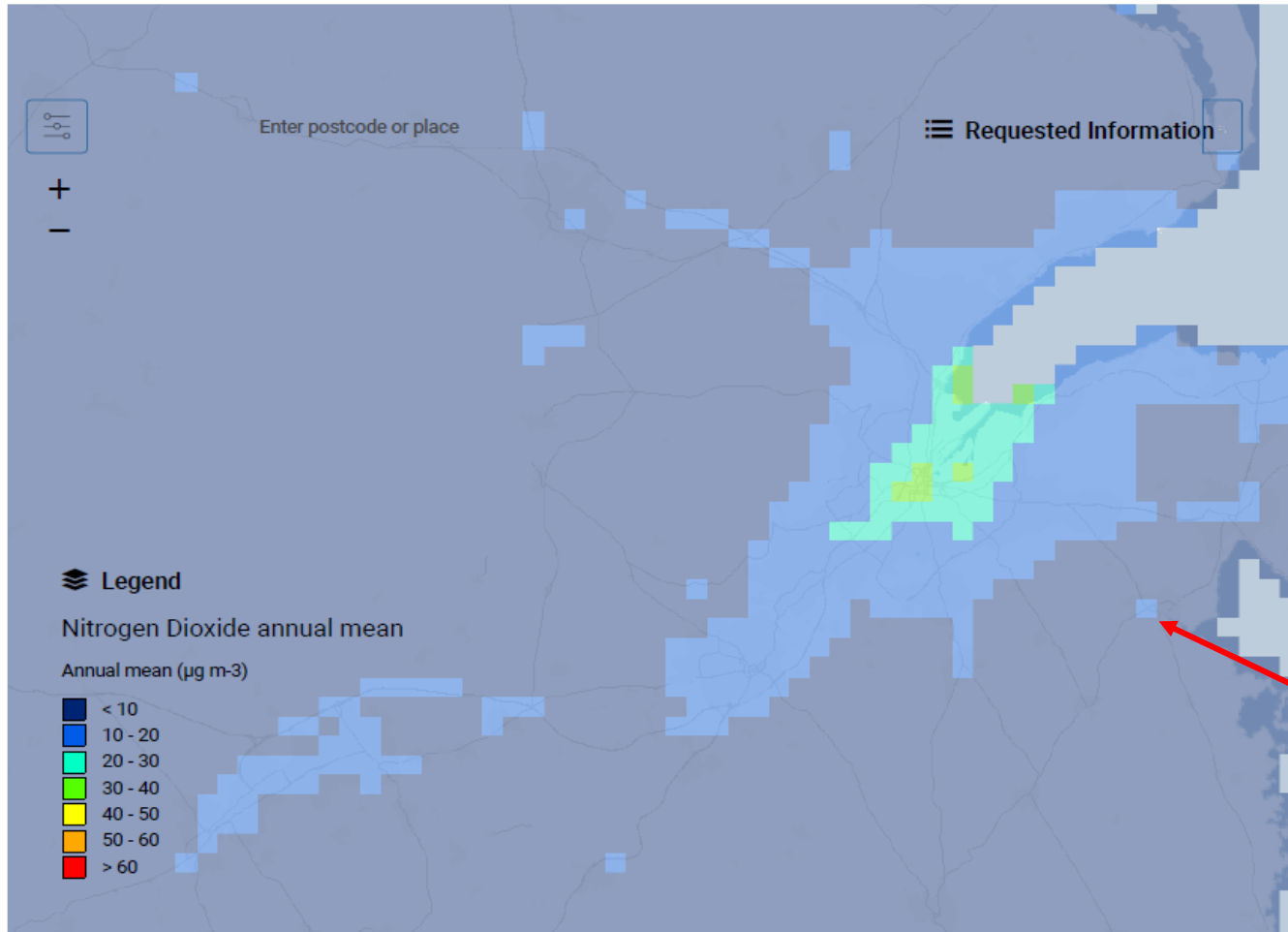
Example: Linking Air Pollution levels to NILS Members



- Map showing modelled Nitrogen Dioxide concentration in and around Belfast (2012), at a 1x1 km grid square resolution
- NILS contains NILS members' (anonymised) residential address in April and October every year since 2001



Example: Linking Air Pollution levels to NILS Members



- Map showing modelled Nitrogen Dioxide concentration in and around Belfast (2012), at a 1x1 km grid square resolution
- NILS contains NILS members' (anonymised) residential address in April and October every year since 2001
- NILS members living within the same 1x1km grid square in 2012 are assigned the same Nitrogen Dioxide concentration

