

Data Insights_

The effect of exposure to air pollution on health and mortality

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Ambient air pollution is the biggest environmental risk factor worldwide and a leading environmental cause of early death in the United Kingdom (UK). Research suggests that the breathing of polluted air is associated with the development and exacerbation of various health conditions, and the cost of treating such conditions is substantial. Our research exploits individual-level longitudinal data to investigate, for the first time in Northern Ireland (NI), the link between health outcomes (including mortality) and long-term exposure to ambient pollution between 2001 and 2018.

What we did

In the first stage of this project we have constructed, with help from the Honest Broker Service and the Northern Ireland Longitudinal Study (NILS) Research Support Unit, a rich, individual-level, longitudinal data set to study pollution and health outcomes in NI. This data set links annual air pollution data for eight separate pollutants at the 1km grid square level covering the whole of NI from 2001-2016, with NILS data, which tracks a 28% representative sample of the NI population from 2001-2018 and links with prescriptions data, measured at six-monthly frequency and drawn from the Enhanced Prescriptions Database. Using these data we have constructed, for the first time in NI, three population-weighted measures of pollution exposure for each year since 2001: for NI as a whole, for different geographies within NI, and for different socio-demographic groups within NI.

Why it matters

Quantifying levels of health pollution and in particular the health costs of pollution is critical to assist policymakers in designing, monitoring and evaluating interventions that aim to improve public health. Bespoke evidence for NI on the relationships between ambient air pollution and a wide range of health outcomes will help the design and targeting of interventions to help the Department of Health NI meet its objectives relating to Programme for Government (PfG) *Outcome 4: We enjoy long, healthy and active lives: reducing preventable deaths and healthy life expectancy at birth*. Similarly, this research can support the Department of Agriculture, Environment and Rural Affairs (DAERA's) efforts to achieve PfG *Outcome 2: We live and work sustainably – protecting the environment*, and Belfast City Council's (BCC's) efforts to improve air quality in Belfast. Some of the more internationally innovative aspects of the project (in particular estimating the statistical relationship between air pollution exposure and specific health conditions such as diabetes, dementia and Parkinson's disease) also have potential for policy and societal impact much more widely.

What we found

- We generated detailed population-weighted annual average ambient air pollution levels, for several key pollutants, both at the NI-wide level and at various disaggregated geographical levels. This allowed us to take account of differences in population density in different parts of NI and their changes over time.
- We found that in NI as a whole, estimated population-weighted average levels of Benzene, Nitrogen Dioxide, Nitrogen Oxide, Particulate Matter (PM) 10 and PM2.5 have shown a long-term improvement despite an uptick in 2018. Levels of roadside pollution for Benzene, CO, NO2 and PM10 have also trended downwards through time, while constantly high levels of PM2.5 are evident mainly in the Belfast area.
- Based on 2001 Census characteristics, levels of PM2.5, Nitrogen Dioxide and Sulphur Dioxide vary little by education level, economic status, community background and National Statistics Socio-economic Classification. There is little variation according to self-reported general health or whether people report having a long-term limiting illness or not.

What next?

In the next stage of the project, we will use our data to explore the statistical relationships between air pollution exposure and mortality, and air pollution exposure and receipt of medicinal prescriptions for medications prescribed to treat diabetes, dementia, Parkinson's disease, respiratory-related illnesses, and cardiovascular-related illnesses.

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