

Air Pollution and Respiratory Health in the UK: Where the Evidence Stands

Where the UK evidence on air pollution and respiratory health actually stands, and what a joined-up surveillance system would take.

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Air pollution remains a serious respiratory health hazard in the UK — even though several major pollutants have fallen substantially over the past two decades. The picture, however, is mixed, and understanding it matters for anyone working in environmental health, public health surveillance, or local air quality management.

The Pollution Picture Is Uneven

Not every pollutant is moving in the same direction:

- **Nitrogen dioxide (NO₂)** has fallen sharply in urban areas over the last decade, reflecting cleaner vehicles and traffic policy.
- **PM₁₀** has also declined, though more gently, with some year-to-year variability driven by weather.
- **PM_{2.5}** — the fine particulate matter most closely linked to health harm — continues to edge downward nationally, though the most polluted roadside locations remain stubbornly above target.
- **Ozone**, by contrast, has been *rising* in urban areas — a known side-effect of falling nitrogen oxide levels changing the underlying atmospheric chemistry.
- **Sulphur dioxide** is now a minor domestic issue, having fallen dramatically since the 1990s with the decline of coal.

The takeaway: national averages are improving, but a single-pollutant view is no longer sufficient. Ozone's upward drift means "pollution is falling" is true and misleading at the same time.

The Health Burden Is Still Large

Despite improving air quality, the health impact remains substantial. Long-term exposure to particulate air pollution is officially estimated to contribute to a meaningful share of adult mortality in England each year, with UK government guidance continuing to describe the annual toll of human-made air pollution in the tens of thousands of deaths. Respiratory conditions remain widespread: asthma and COPD affect millions of people on GP registers, and emergency hospital admissions for asthma, COPD, pneumonia and bronchiolitis number in the hundreds of thousands annually.

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What UK Research Actually Shows

Recent UK epidemiological studies reinforce the case for taking this seriously:

- A large England-wide study of childhood asthma emergency admissions found a clear increase in admissions tied to short-term rises in NO₂, with stronger effects in boys and during colder months.
- An Oxford study of adult asthma admissions found admission risk rising in step with monthly NO₂, PM_{2.5} and PM₁₀ levels — showing that routine, everyday air quality changes affect hospital demand, not just extreme pollution episodes.
- UK Biobank data linked long-term PM_{2.5}, PM₁₀ and NO₂ exposure to higher COPD prevalence, with the strongest associations in lower-income and at-risk groups.
- Several older but still-relevant UK studies show consistent (if sometimes modest) associations between pollutants and both respiratory hospital admissions and GP consultations.

Across these studies, the most consistently vulnerable groups are children with asthma, people with COPD, and residents of more deprived or heavily trafficked areas.

A Strong but Fragmented Surveillance System

The UK's environmental monitoring is genuinely strong: hundreds of automatic air quality stations feed hourly data into national networks, alongside specialist networks for hydrocarbons, rural pollutants and local hotspot monitoring. Health surveillance is similarly rich — GP registers, hospital records, mortality statistics and syndromic surveillance systems all exist.

The core opportunity isn't about collecting more data — it's about connecting what already exists.

Environmental and health data systems are currently built on different timescales (environmental data can be near-instant; health outcome data is often annual), different geographies, and different governance rules — particularly around linking identifiable health data to environmental exposure at a personal level.

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SECTION 05

What International Models Show Is Possible

International comparisons are instructive. The US CDC's Environmental Public Health Tracking Network integrates environmental and health data in one platform. The European Environment Agency provides harmonised, comparable pollution data across countries. The WHO offers a standardised burden-of-disease tool for translating pollution levels into estimated health impact. Canada's Air Quality Health Index converts pollution forecasts into simple, actionable public health messaging.

The common thread: these systems succeed not by centralising everything into one database, but by standardising indicators and metadata across systems that remain separately owned.

SECTION 06

What a Better UK System Would Look Like

The evidence points toward a practical, phased approach rather than a costly rebuild — closing the gap between environmental and health data is achievable through shared standards, agreed metadata, and a governance model that allows privacy-appropriate linkage between the two, starting with pilots in high-burden areas before wider rollout. The specific design of that system — which functions to prioritise first, how to sequence it, and what it should cost — is the kind of detail we work through with individual clients and commissioning bodies.

The Bottom Line

The UK has the underlying data and research base to build a genuinely joined-up environmental-health surveillance system. What's missing is integration, not evidence. For local authorities, health bodies and environmental teams, the immediate opportunity is smaller and more achievable than a national overhaul: aligning existing air quality and health datasets around shared definitions, timescales and geography — so that "what's happening to air quality" and "what's happening to respiratory health" can finally be read as one picture, not two.

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