

Air Quality and Health in Birmingham

Summary:

Air pollution is the biggest environmental threat to people living in Birmingham.

In 2024 fine particulate pollution caused up to 740 early deaths and nitrogen dioxide up to 600 early deaths among those living in Birmingham.*

The people hit hardest are often those who contribute the least to the problem.

Air quality and health harms

Air quality in Birmingham is shaped by a complex mixture of pollutants and the chemical reactions that occur between them. Air pollutants originate from both outdoor and indoor sources and can move between indoor and outdoor spaces. Overall air pollution exposure is influenced by both outdoor and indoor pollutants. The key pollutants of public health concern are outlined below.

Particulate Matter

Particulate Matter – or “PM” refers to tiny solid or liquid particles in the air which are classified by diameter.¹ Fine PM_{2.5} (particles that measure 2.5 micrometres in diameter or smaller) is concerning as it reaches into the deep regions of the lungs, passes through the blood capillaries and harms many tissues and organs in the body.²

In 2024 the annual average PM_{2.5} concentration in Birmingham was 7.8 µg m⁻³.³

Common PM_{2.5} sources in Birmingham are:

- **Domestic Combustion:** Home heating is one of the largest sources of fine particulate matter (PM_{2.5}). A study led by the University of Birmingham shows that heating homes using woodburning is a major contributor to PM_{2.5} in the region, accounting for one fifth of total PM_{2.5} mass.⁴ Cooking, burning candles, and using incense, also releases pollutants. As a result, air pollution levels inside homes can be higher and more variable than those outdoors.⁵
- **Road Transport:** Road transport generates PM from both exhaust and non-exhaust sources – from brake, tyres, and road surface wear. As petrol and diesel vehicles are replaced with electric alternatives, tailpipe emissions are decreasing. However, non-exhaust particles remain a concern.⁶
- **Industry:** Diesel-powered equipment such as excavators and generators also produces PM, as well as dust from demolition and earth-moving activities.
- **Rail Transport:** Diesel trains contribute to PM pollution in enclosed stations such as Birmingham New Street.⁷

We need to see immediate and coordinated actions to curb emissions from woodburning stoves and open fires.

Professor Zongbo Shi, University of Birmingham

* Hall, J. et al (2026). Climate Health Explorer. Web publication/site, WM-Net Zero, University of Birmingham.
<https://doi.org/10.48352/pure.bham.31370801>

Secondary PM is formed in the atmosphere when gases react with one another. Birmingham is affected by secondary PM_{2.5} pollution from ammonia (including from agriculture) and oxidation of Volatile Organic Compounds, NO_x and SO₂. Secondary inorganic aerosol (made up of ammonium sulphate and ammonium nitrate) makes up ~35% of total PM_{2.5} with an additional contribution from organic sources.⁴ Much of this comes from outside Birmingham, including from the European continent.

Nitrogen Dioxide (NO₂)

NO₂ is an invisible gas produced primarily from burning fossil fuels in vehicle engines, home boilers, and industry. Key NO₂ pollution sources are high temperature combustion processes, from vehicle exhaust, power generation and heating.⁸

The annual average concentration of NO₂ in Birmingham was 15 µg m⁻³ in 2024.³

Air Quality, Health & Equity

Air pollution affects people of all ages – including babies, children, adults, and older residents. It harms health, reduces quality of life, and makes existing inequalities worse. Breathing polluted air over many years can slow children's lung development, raise the risk of heart disease and stroke in adults, and contribute to poor pregnancy outcomes, including low-birthweight babies.²

The World Health Organization (WHO) identifies there is no safe level of air pollution.⁹ This means that even if pollution stays within UK legal limit values, breathing polluted air can still harm people's health.

Every year in Birmingham, air pollution contributes to poor health and early loss of life (*Figure 1*).

Research led by the University of Birmingham has estimated that in 2024:¹⁰

- PM_{2.5} caused *up to* 740 early deaths, 400 childhood asthma cases, 260 strokes and 270 heart disease cases.
- NO₂ caused *up to* 600 early deaths and 500 childhood asthma cases.

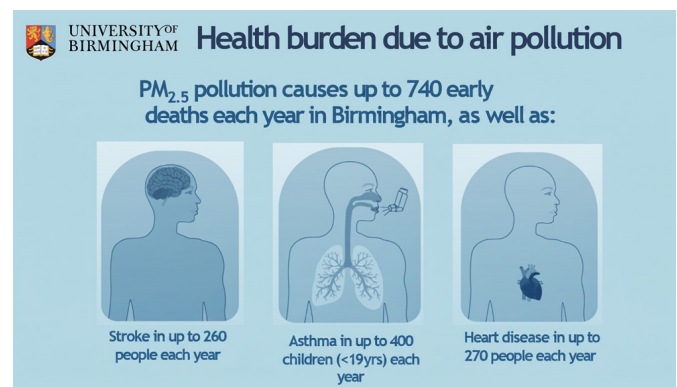


Figure 1: Health impacts of air pollution in Birmingham (2024)

These health harms are not spread evenly. The highest burden of childhood asthma occurs in wards around Birmingham's city centre, where vulnerabilities are greatest (*Figure 2*).³

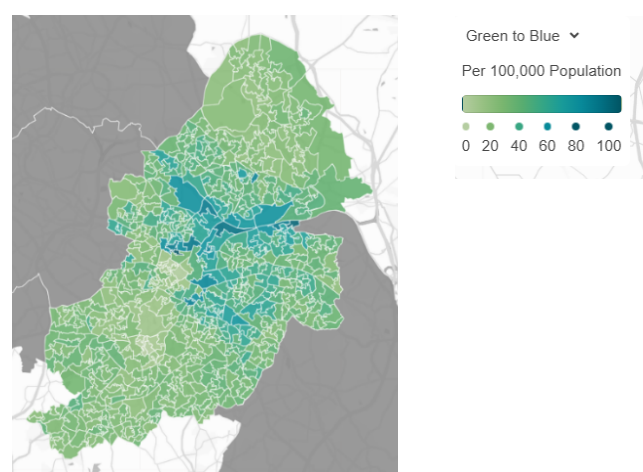


Figure 2: Map shows childhood asthma cases per 100,000 population due to NO₂ pollution (2024).

The Legal Framework: How the rules work

Air quality legislation in England work at several levels.¹¹ International agreements set the overall direction, and national laws turn these into the specific air quality targets that must be met. Local authorities are legally responsible for delivering these targets.

This means local authorities must take action to reduce pollution where legally required. If the required targets are not met or the local authority fail to take appropriate steps, the Secretary of State can issue a formal “Directive”. This is a legal instruction telling the local authority exactly what actions it must take and is required by law to comply.

The Local Air Quality Management (LAQM) system is the main way local councils keep track of air pollution. It was set up by the Environment Act 1995 and is overseen by Defra. The system works in a repeated cycle: councils monitor air quality, assess the results, and then act as needed.

Every year, councils must produce an Annual Status Report (ASR). This report goes to the Secretary of State. The ASR shows how well the council is meeting air quality goals and highlights any new or changing sources of pollution. The report must also be published online so the public can see it.

If the ASR shows that air pollution limits are being broken or are likely to be exceeded, the council must declare an Air Quality Management Area (AQMA). This is an area where pollution levels are too high or are expected to become too high. After declaring an AQMA, the council has 18 months to create an Air Quality Action Plan, which sets out what they will do to reduce pollution. Progress on this plan is then included in future ASRs.

The whole of Birmingham has been declared an AQMA for NO₂ since 2006, mainly due to emissions from traffic. The City’s current Air Quality Action Plan covers the years 2021 to 2026. A new action plan is in the process of being created and will focus on NO₂ as per the legal duty but will also have regard to reducing PM_{2.5} emissions. At a West Midlands Combined Authority (WMCA) level the Air Quality Framework Implementation Plan is seeking to deliver coordinated action to address PM_{2.5} pollution across the region.¹²

What has been done so far and next steps?

In 2021, Birmingham City Council introduced a Class D Clean Air Zone (CAZ) in the city centre to reduce roadside NO₂ levels to achieve legal compliance in the shortest possible timeframe. The CAZ does not ban vehicles, but it charges people driving the most polluting cars, vans and lorries to discourage use. Within the first year of its implementation, roadside NO₂ levels within the zone have fallen by up to 3.4%.¹³ Despite this progress NO₂ levels still widely exceed WHO Global Air Quality guidelines.

Evidence from London shows that larger and more ambitious low-emission zones can improve air quality, reduce illness, and save more than £37 million each year in public health costs.¹⁴ However, Birmingham’s CAZ is much smaller, covering a population of around 67,000 in a city of 1.1 million people. To achieve bigger health and air-quality benefits, further future-proofed action to address a wider range of air pollution sources is needed.

Birmingham is also a Smoke Control Area, which means it is illegal to release smoke from your chimney unless you use Defra-approved fuels and certified appliances.¹⁵

To maximise health benefits and monetary savings, Councillors can consider taking further action to make Birmingham's air cleaner. This can include:

- **Replacing fossil fuel** powered private and public transport with cleaner electric and/or hydrogen powered alternatives
- **Reducing car use** and encouraging more walking, cycling, and use of public transport.
- **Replacing gas boilers** in homes and businesses with cleaner alternatives such as electric heat pumps.
- **Helping residents understand air pollution** and local solutions – including Clean Air Zone and Smoke Control Area rules.
- **Helping people to change behaviour** and improve air quality in their homes.
- **Working jointly across portfolios** to protect vulnerable people and reduce inequalities.
- **Working jointly with the WMCA** to support action across the region.

Further Reading

-  [Clean Air Hub | Global Action Plan](#)
-  [Air Quality Hub](#)

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Contact

WM-Net Zero
University of Birmingham
Edgbaston
Birmingham, B15 2TT
Email: wm-netzero@contacts.bham.ac.uk

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