

What we think about:

Air pollution

Rebuilding lives after stroke

Stroke
Association



Air pollution is an emerging risk factor for stroke due to its ability to thicken blood as well as narrow and harden arteries.^{1,2}

Short and long term exposure to air pollution can increase the risk of developing hypertension, one of the biggest risk factors for stroke.^{3,4} It is also estimated that air pollution is responsible for 14% of all stroke-related deaths and around **11,000 deaths from heart attack or stroke** in the UK annually.^{5,6}

Ahead of the COP26 conference in Glasgow the World Health Organisation (WHO) urged members to tackle these harmful emissions. The UK's current limit for PM_{2.5} is one a half times the limit recommended by the WHO.⁷

The NHS, the largest employer in Britain, also has plans to become the first net zero national health service. They plan to reduce air pollution from many of its sources as set out in the NHS England Long Term Plan that will reduce business mileages and fleet air pollutant emissions by 20% by 2023/4.⁸ Governments across the UK need to go further to reduce the levels of air pollution to protect the health of the nation and help reduce the risk of stroke.

Key points

- Short and long term exposure to air pollution can increase the risk of having a stroke.
- There needs to be clear, accessible public information about when and where high levels of air pollution are present so vulnerable groups like stroke survivors and those with heart conditions can protect their health.
- Governments across the UK need to commit to meeting the recommendations in the current World Health Organisation (WHO) guidelines and improve air quality to help minimise the risk of strokes.

What is Air pollution?

Air pollution is any substance in the air that can harm you when you breathe it in. There are two types: outdoor air pollution and household pollution. Outdoor pollution is made up of gases and small particles such as:

- nitrogen dioxide (NO₂)
- sulphur dioxide
- ozone
- particulate matter (PM_{2.5} or PM₁₀)

Sources of outdoor pollution include road transport, industrial processes and energy generation while household pollution comes from the fuel used for cooking and heating our homes.

Levels of air pollution are of particular concern in built up areas like towns and cities where there are large numbers of vehicles which are a large source of both nitrogen dioxide and particulate matter.

In a landmark case air pollution was ruled as the cause of death in a nine-year-old girl which drew attention to what is becoming a growing public health concern. Exposure to air pollution contributed to **5.5 million deaths worldwide** in 2016.⁹ Air pollution is also responsible for **between 28,000 and 36,000 deaths in the UK** annually.¹⁰

What's the issue?

Short- and long-term exposure to air pollution can increase risk of stroke

- Public Health England called air pollution “the largest environmental risk to public health”¹¹ and it’s known to reduce life expectancy due to the links with cardiovascular and respiratory diseases.
- The body of evidence which shows the link between air pollution and stroke is growing due to the negative impact on our cardiovascular health. In 2019, particulate matter pollution was one of the five leading risk factors for stroke deaths and disability combined globally.¹²



It has also been estimated that a $1\mu\text{g}/\text{m}^3$ reduction in fine particulate matter could **prevent 16,500 strokes** over an 18 year period.¹³

- There have been studies which have looked at the effect of short-term exposure to air pollution. In one review it was found that it

can increase the risk of having an intracerebral haemorrhage.¹⁴ Another 2015 study found a strong association between short-term exposure to gaseous (except ozone) and particulate air pollution and stroke hospital admissions as well as stroke deaths.¹⁵

- A systematic review of a number of relevant studies with more than 2.2 million people found a link between long term exposure to particulate matter ($\text{PM}_{2.5}$) and incidence of stroke.¹⁶ There was also a study looking at a cohort of Danish nurses which found an increased risk of stroke with high long-term exposure to air pollution.¹⁷
- The Committee on the Medical Effects of Air Pollutants (COMEAP) also found that there’s evidence which supports a link between air pollution and high blood pressure¹⁸ which is one of the key risk factors for stroke.¹⁹

Air pollution can increase the risk of stroke for those with existing heart conditions



For those who have existing heart conditions such as atrial fibrillation, the risk of having a stroke can increase due to exposure to air pollutants.

If you have atrial fibrillation, you are five times more likely to have a stroke already and atrial fibrillation contributes to just under 20% of all strokes in the UK.²⁰

- One American study found an association between $PM_{2.5}$ and the risk of having an ischemic stroke in people with atrial fibrillation.²¹ The researchers from this study found that for every 6% increase in the levels of particulate matter ($PM_{2.5}$), the risk of stroke for adults with atrial fibrillation increased by 8%. This is worrying as there are 1.2 million adults living with atrial fibrillation.²²

Air pollution can also increase the risk of mortality in stroke survivors

- Furthermore, there is evidence to suggest that stroke survivors are a possible vulnerable group to air pollution, especially those who have had an ischemic stroke.²³ One study using data from the South London Stroke Register found that exposure

to $PM_{2.5}$ increased the risk of mortality up to 5 years after the first stroke.²⁴ Another study found a link between living close to traffic related pollution and a high mortality rate in stroke survivors.²⁵ Therefore, it may be beneficial to target information about air pollution to certain groups like stroke survivors so they can be aware of the risks and know of ways they can mitigate them.

Air pollution levels are still high across the UK

- The World Health Organisation (WHO) released their updated its Air Quality Guidelines in September 2021 to help protect the world population from the damaging effects of air pollution.²⁶ The WHO recommends that particulate matter pollution, $PM_{2.5}$ shouldn't go above an annual mean of $5 \mu\text{g}/\text{m}^3$ and an annual mean of $15 \mu\text{g}/\text{m}^3$ for PM_{10} .²⁷
- However, London has a high level of PM_{10} and levels of $PM_{2.5}$ are also high in London and the Midlands.²⁸
- The annual mean limit value for NO_2 ($40 \mu\text{g}/\text{m}^3$) was exceeded in five zones in the UK which included Greater London Urban Area, Greater Manchester Urban Area and South Wales.²⁹
- Even though levels of $PM_{2.5}$ and PM_{10} have fallen between 2010 and 2019 (11% and 10% respectively) there's still more to be done as there is not really a safe level of air pollution.³⁰

What needs to happen?

The Stroke Association is calling on Governments across the UK to:

- Ensure air pollution levels across all four nations in the UK are in line with the current WHO recommendations.
- Improve public awareness of air pollution and the risks so that people can make informed choices i.e., avoiding areas where air pollution is particularly high at certain times.
- Accelerate plans for a net zero future by committing to net zero policies that benefit air quality e.g., encouraging people to use alternative forms of transport to cars like walking, cycling and public transport.
- Support local authorities in adopting measures which improve air quality in their areas i.e. promoting use of DEFRA's Air Quality Grant programme.

England

We would like to see Integrated Care Systems using their Green Plans to improve air quality and creating goals that are even more ambitious than the national ambitions to achieve net zero by 2050. We want ICSs to be leading by example by taking every opportunity to improve air quality in their local areas.



Scotland

The Scottish Government has released its second strategy to tackle air pollution, Cleaner Air for Scotland 2 - Towards a Better Place for Everyone 2021. Since the first strategy published in 2015 they have put in place a national PM_{2.5} monitoring network, made a commitment to reducing motor vehicle kilometres by 20% by 2030 and included the WHO guideline value for PM_{2.5} in their domestic legislation.³¹ We welcome this strategy and would like to see them take the necessary steps to fulfil these commitments as soon as possible within the stated timeframe.

Wales

The Welsh Government published its first plan on how they will improve air quality in 2020, Clean Air Plan for Wales: Healthy Air, Healthy Wales. This strategy includes a 10-year pathway which is structured around four core themes; People; Environment; Prosperity; Place.³² We welcome the milestones and actions within this plan to improve the air which will have a positive impact on the health of the nation. However, we would like to see a Clean Air Act passed within the Senedd so that delivery of the Clean Air Plan can be supported by the necessary legislation. Welsh Labour, Welsh Conservatives, the Welsh Liberal Democrats, and Plaid Cymru need to work together to prioritise clean air legislation to improve air quality and reduce the risk of stroke from air pollution.



Northern Ireland

Northern Ireland's Department of Agriculture, Environment and Rural Affairs has published a public discussion document in advance of developing its first Clean Air Strategy: A Clean Air Strategy for Northern Ireland – Public Discussion Document.³³ We look forward to seeing this strategy published and hope that it is ambitious in its approach to reducing air pollution.

Glossary

COP26: 2021 United Nations Climate Change Conference

Particulate Matter (PM): A term used for a mixture of solid particles and liquid droplets in the area, some of which can be harmful to our health. Even though they can have serious health implications they are very small in size.

PM₁₀: When the particles are less than 10 micrometres in diameter.

PM_{2.5}: When the particles are less than 2.5 micrometres in diameter.

µgm³: A unit of concentration for air pollutants (Micrograms per cubic meter)

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The WHO recommends that particulate matter pollution, PM_{2.5} shouldn't go above an annual mean of 10 µg/m³ and an annual mean of 20 µg/m³ for PM₁₀. However, the UK (except Scotland) currently has higher limits for fine particulate matter which are 40 µg/m³ annual mean for PM₁₀ and 25 µg/m³ for PM_{2.5}
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When stroke strikes, part of your brain shuts down.

And so does a part of you. Life changes instantly and recovery is tough. But the brain can adapt. Our specialist support, research and campaigning are only possible with the courage and determination of the stroke community. With more donations and support from you, we can rebuild even more lives.

Donate or find out more at **stroke.org.uk**

Contact us

We're here for you. Contact us for expert information and support by phone, email and online.

Stroke Helpline: **0303 3033 100**

From a textphone: **18001 0303 3033 100**

Email: **helpline@stroke.org.uk**

Website: **stroke.org.uk**

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