



What we think about:

# Air pollution

Rebuilding lives after stroke

**Stroke**  
Association

# Background

Air pollution increases your risk of stroke.<sup>1</sup> Governments across the UK must do more to reduce all types of air pollution.

Air pollution is a broad term that covers two main types. The first is 'particulate matter' (PM) which describes tiny amounts of solids or liquids in the air, such as dust. The second type covers harmful gases such as carbon monoxide. Put simply, air pollution is anything in the air that can harm you.

Air pollution damages our health. It contributes to an estimated 21% of stroke deaths worldwide<sup>2</sup> and in England alone, experts predict it will contribute to around 106,000 strokes by 2035.<sup>3</sup> Encouragingly, levels of most types of air pollution in the UK have fallen in recent decades.<sup>4</sup> However air pollution is often worse in cities and near sources of pollution, such as roads and fossil fuel power stations, and emissions continue to pose a risk to people's health. This can be seen most clearly in big cities such as London, which breached European and UK air quality limit for an entire year up to 2019, and consequently where air pollution is an important political issue.<sup>5</sup>

Air pollution increases your risk of stroke in two main ways:

- Short term exposure to air pollution can increase your immediate risk of having a stroke if you have existing risk factors, such as high blood pressure, atrial fibrillation (AF) or diabetes. There is evidence to show that more people have a stroke after incidents of smog.<sup>6</sup> A study in America in 2006 showed that the poorer the air quality, the higher number of stroke admissions to hospital per day.<sup>7</sup> While research into exactly why short term exposure leads to stroke is still ongoing, it points to the possibility that it increases blood pressure or constricts blood vessels.<sup>8</sup>
- In the long term, the effects of air pollution build up over time so the longer you're exposed, the higher your risk of stroke.<sup>9</sup> Research into long-term exposure to air pollution is also limited but recent research has indicated that tiny particulate matter (specifically the smaller PM<sup>2.5</sup>) can enter the lungs and may even get into the bloodstream, ultimately reaching internal organs. This increases the chance of a blood clot forming which can travel to the brain and cause a stroke.<sup>10</sup>

It's encouraging that the UK Government has published its Clean Air Strategy<sup>11</sup> which pledges to match the World Health Organisation (WHO) standards for air quality, and covers the whole of the UK.<sup>12</sup> Commitments to address the health-related impact of air pollution have also been included in:

- The Government's Prevention Green Paper which applies to England,<sup>13</sup> includes a commitment to improve awareness of pollution sources and to better understand the long term impact of air pollution through data and monitoring;
- the Department of Health and Social Care's 'Prevention is better than the cure' paper;<sup>14</sup>
- NHS England's Long Term Plan, which pledges to reduce emissions from NHS sources;
- The Health Secretary's 2018 commitment to review the impact of air pollution, looking into how many cases of disease could be prevented, and where the focus should be;<sup>15</sup>
- The Environment Bill introduced to Parliament in October 2019.<sup>16</sup>

Scotland also has a dedicated strategy to tackle air pollution, 'Cleaner Air for Scotland'.<sup>17</sup> We look forward to seeing ambitious air pollution strategies from both Northern Ireland<sup>18</sup> and Wales<sup>19</sup>, particularly as by its very nature air pollution cannot be fixed by a single country.

However, plans alone are not enough and the Government should consider making any commitments to improve air quality to WHO levels legally binding, such as Scotland has done with setting PM<sup>2.5</sup> at WHO levels within their air pollution strategy.<sup>20</sup> Legal commitments will ensure action is taken that prevents more strokes.

Tackling air pollution (specifically P.M<sup>2.5</sup> and Nitrogen Dioxide (NO<sub>2</sub>)) won't just prevent strokes. Air pollution contributes to many other conditions including asthma, diabetes, cancer, heart disease and dementia. In 2016 the Royal College of Physicians estimated that the annual cost of air pollution to the UK was over £20bn, highlighting the heavy economic cost to individuals and society.<sup>21</sup>

We also want to see better availability and promotion of information about when and where there are high levels of air pollution. This will help people to protect themselves from harm, for example by choosing a less polluted commute to work or school. This is particularly important for stroke survivors, many of whom will be living with other health conditions too.

# Q & A

## Q. Where can I find more information about how polluted the air is where I live and work?

A. Take a look at **UK-Air.defra.gov.uk**, run by the UK Government. It provides an air pollution forecast and can be personalised to your location.

## Q. What can I do to reduce my risk from air pollution?

A. Air pollution is harmful so it's important to avoid exposure as much as possible. The British Lung Foundation has some advice which may help to protect yourself from the effects of air pollution. These include staying away from pollution hotspots, avoiding strenuous exercise in areas outdoors, and trying to get to work before rush hour.<sup>22</sup>

You can **find out more here**.

If you are concerned about how much air pollution you are exposed to, or the impact it is having on your risk of stroke or your health in general please talk to your GP.

## Q. What actually is in air pollution?

A. Air pollution covers a lot of different things that are in air that can harm you. It can be present indoors, and includes pollutants such as cigarette smoke, smoke from gas or wood stoves, paint, cleaning supplies, and some building materials. It can also be present outdoors, and is caused by things like vehicles, power plants, industry and fossil fuels. Air pollution falls into two broad categories, depending on whether the pollution is caused by particles or gases.

The first is airborne particulate matter (PM). Particulate matter is grouped into two different sizes, PM<sub>10</sub> and PM<sub>2.5</sub>. PM<sub>10</sub> describes particles such as those produced by road dust, construction work and industrial emissions. PM<sub>2.5</sub> is mainly produced by the combustion of fossil fuel, including motorized road traffic, power plants, industrial and residential heating using oil, coal or wood.

The second is gases in the air that are damaging to health. These are ozone (O<sub>3</sub>), sulphur dioxide (SO<sub>2</sub>), carbon monoxide (CO), and nitrogen oxides including nitrogen dioxide (NO<sub>2</sub>) and nitrogen oxide (NO<sub>x</sub>). These come from a variety of sources. For example, SO<sub>2</sub> is mainly produced in fossil fuel power plants, whilst NO<sub>x</sub> mainly originates from motorised road traffic, residential heating, power generation and industrial sources.<sup>23</sup>

**Q. Why does air pollution increase your risk of stroke?**

**A.** There is ongoing research into exactly what air pollution does to our bodies that increases the risk of stroke. Much of the research is looking at the smaller PM<sub>2.5</sub> and how it can get into our blood through our lungs. We regularly update our policies, so we'll keep monitoring the research and update this policy with any new information as necessary.

**Q. What is the Stroke Association doing to prevent strokes?**

**A.** We want to see a world with fewer strokes.

We will continue to focus on high blood pressure and atrial fibrillation as diagnosing and managing these conditions can have a huge impact on preventing stroke. Atrial fibrillation is often asymptomatic (has no symptoms) yet increases stroke risk five-fold.<sup>24</sup> High blood pressure is a risk factor in nearly all strokes. However, diagnosing and treating high blood pressure can significantly reduce the chance of you having a stroke.<sup>25</sup>

We're working with NHS England, stroke survivors, professionals and various stakeholders on the National Stroke Programme, which we co-chair with NHS England. The Programme aims to help deliver the ambitions within the NHS Long Term Plan to prevent 150,000 strokes, heart attacks and cases of dementia over the next decade. It also includes commitments to prevent over 10,000 strokes through better treatment for the nearly 100,000 people with known atrial fibrillation and improve the management of 3.6m patients with high blood pressure and cholesterol.<sup>26</sup>

**Q. When will this policy be reviewed?**

**A.** December 2020.

# References

- <sup>1</sup> A., Shah, et al Short Term exposure to air pollution and stroke: systematic review and meta-analysis BMJ 2015 Available: <https://www.ncbi.nlm.nih.gov/pubmed/25810496>
- <sup>2</sup> GBD 2015 Risk Factors Collaborators. Global, regional, and national comparative risk assessment of 79 behavioural, environmental and occupational, and metabolic risks or clusters of risks, 1990-2015: a systematic analysis for the Global Burden of Disease Study 2015. Lancet 2016 Available: <https://www.ncbi.nlm.nih.gov/pubmed/27733284>
- <sup>3</sup> Public Health England, Health Matter: Air Pollution Available: <https://www.gov.uk/government/publications/health-matters-air-pollution/health-matters-air-pollution>
- <sup>4</sup> Department for Environment, Food and Rural Affairs, Defra National Statistics Release: Air quality statistics in the UK 1987 to 2018. Available: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/796887/Air\\_Quality\\_Statistics\\_in\\_the\\_UK\\_1987\\_to\\_2018.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/796887/Air_Quality_Statistics_in_the_UK_1987_to_2018.pdf)
- <sup>5</sup> London Air Quality Network (LAQN), <https://www.londonair.org.uk/LondonAir/general/news.aspx?newsId=2clsQZWiKLVkYFiScEAp8s>
- <sup>6</sup> A., Shah, et al Short Term exposure to air pollution and stroke: systematic review and meta-analysis BMJ 2015 <https://www.bmj.com/content/350/bmj.h1295>
- <sup>7</sup> Dominici F, Peng RD, Bell ML, Pham L, McDermott A, Zeger SL, et al. Fine particulate air pollution and hospital admission for cardiovascular and respiratory diseases. JAMA. 2006 Available: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3543154/>
- <sup>8</sup> A., Shah, et al Short Term exposure to air pollution and stroke: systematic review and meta-analysis BMJ 2015 <https://www.bmj.com/content/350/bmj.h1295>
- <sup>9</sup> Strategy
- <sup>10</sup> K., K., Lee et al Air Pollution and Stroke Journal of Stroke 1018 Available: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5836577/>
- <sup>11</sup> Clean Air Strategy 2019 Available: <https://www.gov.uk/government/publications/clean-air-strategy-2019/clean-air-strategy-2019-executive-summary>
- <sup>12</sup> World Health Organisation <https://www.who.int/airpollution/en/>
- <sup>13</sup> GOV.UK 'Advancing our health: prevention in the 2020s' July 2019 Available: <https://www.gov.uk/government/consultations/advancing-our-health-prevention-in-the-2020s/advancing-our-health-prevention-in-the-2020s-consultation-document>
- <sup>14</sup> Department of Health and Social Care 'Prevention is better than cure' November 2018 Available: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/753688/Prevention\\_is\\_better\\_than\\_cure\\_5-11.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/753688/Prevention_is_better_than_cure_5-11.pdf)
- <sup>15</sup> <https://www.theguardian.com/environment/2019/may/11/matt-hancock-launches-study-into-deadly-poison-of-air-pollution>
- <sup>16</sup> HM Government, Government introduces ground-breaking Environment Bill (October 2019). Available: <https://www.gov.uk/government/news/government-introduces-ground-breaking-environment-bill>
- <sup>17</sup> Cleaner air for Scotland: annual progress report 2016 (June 2017) Available: <https://www.gov.scot/publications/cleaner-air-scotland-road-healthier-future-annual-progress-report-2016/pages/3/>
- <sup>18</sup> BBC news article
- <sup>19</sup> National Assembly for Wales, Research Briefing: Air Quality (February 2018) or <http://www.assembly.wales/Research%20Documents/18-009/18-009-Web-English.pdf>
- <sup>20</sup> Cleaner air for Scotland: annual progress report 2016 (June 2017) Available: <https://www.gov.scot/publications/cleaner-air-scotland-road-healthier-future-annual-progress-report-2016/pages/3/>
- <sup>21</sup> Royal College of Physicians, Every breath we take: the lifelong impact of air pollution (February 2016). Available: <https://www.rcplondon.ac.uk/projects/outputs/every-breath-we-take-lifelong-impact-air-pollution>

- <sup>22</sup> British Lung Foundation 'How can I protect myself from air pollution' Available: <https://www.blf.org.uk/support-for-you/air-pollution/tips>
- <sup>23</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5836577/>
- <sup>24</sup> Savelieva I, Bajpai A, Camm AJ (2007). Stroke in atrial fibrillation: Update on pathophysiology, new antithrombotic therapies, and evolution of procedures and devices. *Annals of Medicine* 39: 371-391.
- <sup>25</sup> British Heart Foundation, Public Health England, Stroke Association, Royal College of General Practitioners, Primary Care Leadership Forum, Blood Pressure UK and British and Irish Hypertension Society (2016). High blood pressure: How can we do better? Data collated and visualised by the National Cardiovascular Intelligence Network (NCVIN) in Public Health England. Available: <http://bit.ly/2ju4O31>
- <sup>26</sup> NHS England Long Term Plan <https://www.england.nhs.uk/long-term-plan/>, National Stroke Programme (2019). Available: <https://www.stroke.org.uk/get-involved/campaigning/nhs-long-term-plan>.



**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](https://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](mailto:helpline@stroke.org.uk)**

Website: **[stroke.org.uk](https://stroke.org.uk)**

---

Rebuilding lives after stroke

**Stroke**  
Association