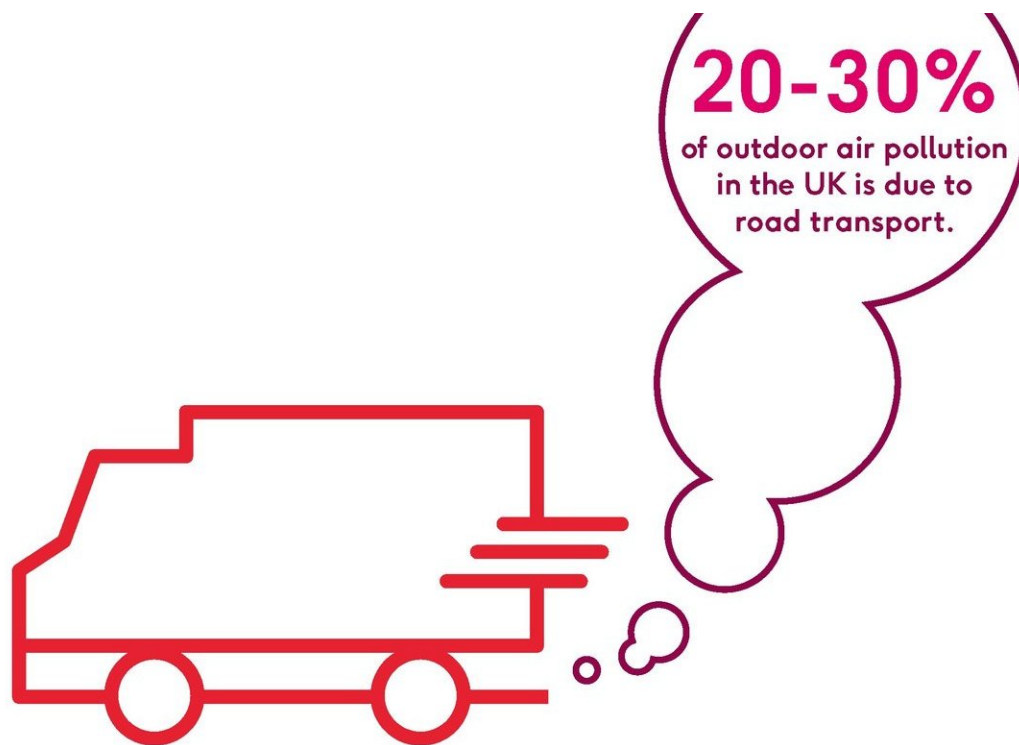


# New UK research links even low levels of air pollution with serious changes in the heart

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Research from the UK has found that people exposed to even low levels of air pollution have heart remodelling, similar to that seen in the early stages of heart failure. Credit: British Heart Foundation

Researchers have found that people exposed to air pollution levels well within UK guidelines have changes in the structure of the heart, similar to those seen in the early stages of heart failure. The research was part-

funded by the British Heart Foundation (BHF) and is published in the journal *Circulation*.

A team of scientists, led from Queen Mary University of London by Professor Steffen Petersen, studied data from around 4,000 participants in the UK Biobank study. Volunteers provided a range of personal information, including their lifestyles, health record and details on where they have lived, so the research team were able to remove patients with underlying [heart](#) problems, or those who had moved house during the study. Participants also had blood tests and health scans. Heart MRI (magnetic resonance imaging) was used to measure the size, weight and function of the participants' hearts at fixed times.

Even though most participants lived outside major UK cities, there was a clear association between those who lived near loud, busy roads, and were exposed to nitrogen dioxide (NO<sub>2</sub>) or PM<sub>2.5</sub>—small particles of [air pollution](#)—and the development of larger right and left ventricles in the heart. The ventricles are important pumping chambers in the heart and, although these participants were healthy and had no symptoms, similar heart remodelling is seen in the early stages of [heart failure](#).

Higher exposures to the pollutants were linked to more significant changes in the structure of the heart. For every 1 extra µg per cubic metre of PM<sub>2.5</sub> and for every 10 extra µg per cubic metre of NO<sub>2</sub>, the heart enlarges by approximately 1% .

Air pollution is now the largest environmental risk factor linked to deaths in England. Globally, [coronary heart disease](#) and stroke account for approximately six in ten (58%) deaths related to [outdoor air pollution](#) . This research could help explain exactly how and why air pollution affects the heart.

In the study, average annual exposures to PM<sub>2.5</sub> (8-12µg per cubic

metre) were well within UK guidelines (25µg per cubic metre), although they were approaching or past World Health Organisation (WHO) guidelines (10µg per cubic metre). The WHO has said that there are no safe limits of PM2.5. The participants' average exposure to NO2 (10-50µg per cubic metre) was approaching and above the equal WHO and UK annual average guidelines (40µg per cubic metre).

Ahead of the UK Government's consultation on their draft Clean Air Strategy closing on 14 August 2018, the British Heart Foundation want to ensure the public's heart and circulatory health is at the centre of discussions.

The Strategy commits to halving the number of people in the UK living in areas where PM2.5 levels exceed WHO guidelines (10 µg per cubic metre) by 2025, but ultimately the charity would like to see this action go further to reduce the health impacts of toxic air as quickly as possible.

Dr. Nay Aung who led the data analysis from Queen Mary University of London said:

"Although our study was observational and hasn't yet shown a causal link, we saw significant changes in the heart, even at relatively low levels of [air pollution exposure](#). Our future studies will include data from those living in inner cities like Central Manchester and London, using more in-depth measurements of heart function, and we would expect the findings to be even more pronounced and clinically important.

"Air pollution should be seen as a modifiable risk factor. Doctors and the general public all need to be aware of the their exposure when they think about their heart health, just like they think about their blood pressure, their cholesterol and their weight."

Professor Jeremy Pearson, Associate Medical Director at the British Heart Foundation, which part-funded the study said:

"We can't expect people to move home to avoid air pollution—Governments and public bodies must be acting right now to make all areas safe and protect the population from these harms.

"What is particularly worrying is that the levels of air pollution, particularly PM2.5, at which this study saw people with heart remodelling are not even deemed particularly high by the UK Government—this is why we are calling for the WHO guidelines to be adopted. They are less than half of UK legal limits and while we know there are no safe limits for some forms of air pollution, we believe this is a crucial step in protecting the nation's heart health.

"Having these targets in law will also help to improve the lives of those currently living with heart and circulatory diseases, as we know they are particularly affected by air [pollution](#)."

**More information:** Association between ambient air pollution and cardiac morpho-functional phenotypes: Insights from the UK Biobank population imaging study, Aung et al. *Circulation*, 2018.

Provided by British Heart Foundation

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