

Adults living in areas with high air pollution are more likely to have multiple long-term health conditions: Study

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Exposure to traffic related air pollution is associated with an increased likelihood of having multiple long-term physical and mental health

conditions, according to a new study of more than 364,000 people in England.

Led by researchers from Institute of Psychiatry, Psychology & Neuroscience (IoPPN), King's College London, this is the largest study worldwide to examine whether [air pollution exposure](#) is linked with the occurrence of multiple long-term health conditions.

Multimorbidity is defined as the presence of two or more physical or [mental health conditions](#), and affects 27 percent of adults in UK [primary care](#). It increases the use of healthcare services and the costs of primary and secondary care, but its association with air pollution has not been studied in the UK until now.

Published in *Frontiers in Public Health* the study showed that high levels of traffic-related air pollution—fine particulate matter 2.5 (PM_{2.5}) and nitrogen dioxide (NO₂)—were associated with an increased risk of having at least two long-term health conditions. The strongest associations were observed for co-occurring neurological, respiratory, cardiovascular and common mental health conditions such as depression and anxiety.

According to Dr. Amy Ronaldson, Research Associate at Institute of Psychiatry, Psychology & Neuroscience (IoPPN), King's College London and first author on the study, "People with more than one long-term health condition have a lower quality of life and greater dependence on the [healthcare system](#). Our... research has indicated that those people that live in areas of higher traffic-related air pollution are at greater risk of having multiple health conditions. The study does not prove that air pollution causes multimorbidity, but it does warrant further research in this area. It could be that simple measures to reduce traffic levels could potentially improve lives and lessen the pressure on our healthcare systems."

Researchers analyzed data from UK Biobank—a large-scale biomedical database and research resource containing anonymized genetic, lifestyle and health information from half a million UK participants, aged between 40 and 69 years. Participants were assessed for 36 physical and five mental health chronic conditions. Multimorbidity was defined as the presence of two or more of these conditions.

Physical and mental health data from UK Biobank in 2010 were linked with the estimated concentration of air pollution at the residential address of the participants.

The study found that those participants exposed to higher concentrations (above $10\mu\text{g}/\text{m}^3$) of [fine particulate matter](#) had a 21 percent increased risk of two or more co-occurring conditions compared to those exposed to concentrations below $10\mu\text{g}/\text{m}^3$.

For participants exposed to above $30\mu\text{g}/\text{m}^3$ of NO_2 , the research showed a 20 percent increased risk of having two or more co-occurring conditions compared to those participants that were exposed to concentrations of NO_2 below $20\mu\text{g}/\text{m}^3$.

Amongst those with multiple conditions, increased exposure to both $\text{PM}_{2.5}$ and NO_2 was linked to a greater severity of the co-occurring conditions.

Dr. Ioannis Bakolis, Reader at IoPPN, King's College London and senior author on the study, said, "How air pollution affects multiple organs and systems at the same time is not yet fully understood, but there is some evidence that mechanisms such as inflammation, oxidative stress and immune activation could be triggered by air particulates, which can cause damage to the brain, heart, blood, lungs and gut.

"Our study suggests that it could be through shared mechanisms that air

pollution negatively impacts several body systems and increases the likelihood of people developing multiple long term health conditions. More research is needed to understand just how air pollution affects the different bodily systems, but it may be that tackling [air pollution](#) could help prevent and alleviate the debilitating impact of multiple long-term health conditions."

Researchers identified several patterns in the associations: The strongest links were primarily between conditions relating to the respiratory system (asthma, [chronic obstructive pulmonary disease](#)) as well as the cardiovascular system (atrial fibrillation, coronary heart disease, heart failure) but also to neurological and common mental conditions (stroke, substance abuse, depression, anxiety).

More information: Associations between air pollution and multimorbidity in the UK Biobank: A cross-sectional study, *Frontiers in Public Health* (2022). DOI: [10.3389/fpubh.2022.1035415](https://doi.org/10.3389/fpubh.2022.1035415) , www.frontiersin.org/articles/10.3389/fpubh.2022.1035415/full

Provided by King's College London

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