

# Air pollution linked to higher glaucoma risk

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Acute angle closure glaucoma of the right eye (intraocular pressure was 42 in the right eye). Credit: James Heilman, MD/Wikipedia

Living in a more polluted area is associated with a greater likelihood of having glaucoma, a debilitating eye condition that can cause blindness, finds a new UCL-led study in the UK.

People in neighbourhoods with higher amounts of fine particulate matter [pollution](#) were at least 6% more likely to report having glaucoma than those in the least-polluted areas, according to the findings published in *Investigative Ophthalmology & Visual Science*.

"We have found yet another reason why air pollution should be addressed as a public health priority, and that avoiding sources of air pollution could be worthwhile for [eye health](#) alongside other health concerns," said the study's lead author, Professor Paul Foster (UCL

Institute of Ophthalmology and Moorfields Eye Hospital).

"While we cannot confirm yet that the association is causal, we hope to continue our research to determine whether air pollution does indeed cause glaucoma, and to find out if there are any avoidance strategies that could help people reduce their exposure to air pollution to mitigate the [health risks](#)."

Glaucoma is the leading global cause of irreversible blindness and affects over 60 million people worldwide. It most commonly results from a build-up of pressure from fluid in the eye, causing damage to the optic nerve that connects the eye to the brain. Glaucoma is a neurodegenerative disease.

"Most [risk factors](#) for glaucoma are out of our control, such as older age or genetics. It's promising that we may have now identified a second risk factor for glaucoma, after eye pressure, that can be modified by lifestyle, treatment or policy changes," added Professor Foster.

The findings were based on 111,370 participants of the UK Biobank study cohort, who underwent eye tests from 2006 to 2010 at sites across Britain. The participants were asked whether they had glaucoma, and they underwent ocular testing to measure intraocular pressure, and spectral-domain optical coherence tomography imaging (a laser scan of the retina) to measure thickness of their eye's macula (central area of the retina).

The participants' data was linked to air pollution measures for their home addresses, from the Small Area Health Statistics Unit, with the researchers focusing on [fine particulate matter](#) (equal or less than 2.5 micrometres in diameter, or PM2.5).

The research team found that people in the most-polluted 25% of areas

were at least 6% more likely to report having glaucoma than those in the least-polluted quartile, and they were also significantly more likely to have a thinner retina, one of the changes typical of glaucoma progression. Eye pressure was not associated with air pollution, which the researchers say suggests that air pollution may affect glaucoma risk through a different mechanism.

"Air pollution may be contributing to glaucoma due to the constriction of blood vessels, which ties into air pollution's links to an increased risk of heart problems. Another possibility is that particulates may have a direct toxic effect damaging the nervous system and contributing to inflammation," said the study's first author, Dr. Sharon Chua (UCL Institute of Ophthalmology and Moorfields Eye Hospital).

Air pollution has been implicated in elevated risk of pulmonary and cardiovascular disease as well as brain conditions such as Alzheimer's disease, Parkinson's disease and stroke. Particulate matter exposure is one of the strongest predictors of mortality among air pollutants.

This study adds to previous evidence that people in urban areas are 50% more likely to have glaucoma than those in rural areas, suggesting now that air pollution may be a key contributor to that pattern.

"We found a striking correlation between particulate matter exposure and glaucoma. Given that this was in the UK, which has relatively low particulate matter pollution on the global scale, [glaucoma](#) may be even more strongly impacted by air pollution elsewhere in the world. And as we did not include indoor [air pollution](#) and workplace exposure in our analysis, the real effect may be even greater," said Professor Foster.

**More information:** Sharon Y. L. Chua et al for the UK Biobank Eye and Vision Consortium. The Relationship Between Ambient Atmospheric Fine Particulate Matter (PM2.5) and Glaucoma in a Large

Community Cohort *Investigative Ophthalmology & Visual Science*  
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