# New research links air pollution to increased risk of childhood myopia and advocates for urban air quality improvements



Air pollution is emerging as a significant and previously underappreciated risk factor for children's eyesight, with new research indicating that exposure to harmful pollutants such as nitrogen dioxide (NO₂) and fine particulate matter (PM₂.₅) may contribute to the development and progression of myopia, or short-sightedness. A study led by the University of Birmingham examined data from 30,000 school-aged children to explore how environmental, genetic, and lifestyle factors influence visual development. The findings suggest children living in areas with cleaner air tend to have better vision, with younger primary school children being especially sensitive to air pollution levels.

Professor Zongbo Shi, who co-supervised the study and is affiliated with the University of Birmingham, underlines that “clean air isn’t just about respiratory health—it’s about visual health too.” This pioneering work identifies air pollution alongside genetics and screen time as a meaningful and modifiable risk factor for childhood myopia, suggesting that improving air quality could be a valuable public health strategy to protect children's eyesight, particularly during critical developmental years.

The biological mechanisms behind this link relate to how polluted air induces inflammation and oxidative stress in the eyes, reduces exposure to beneficial sunlight—which is essential for healthy eye growth—and triggers chemical changes that alter the eye's shape, fostering the development of myopia. Complementary research supports these findings; for example, a retrospective cohort study involving over 4,000 children found a dose-response relationship between exposure to pollutants like PM₂.₅, carbon monoxide, and ozone and myopic progression. Similarly, a large ecological study utilizing data from over half a million Chinese students demonstrated that poorer air quality correlates closely with a higher prevalence of reduced visual acuity.

Importantly, the Birmingham-led study indicates that interventions aimed at reducing exposure to outdoor air pollutants could be particularly effective if implemented early, before myopia becomes severe. Measures such as installing air purifiers in classrooms, establishing “clean-air zones” around schools, and limiting traffic during school drop-off and pick-up times could alleviate exposure to harmful emissions and support visual health in children. Dr Yuqing Dai, co-author of the study, points out that “while we can’t change a child’s genes, we can improve their environment,” adding that early action could mitigate the rise in myopia, which is associated with severe eye problems later in life.

The urgency of addressing air pollution's impact on children's health is underscored by broader public health concerns. Nitrogen dioxide and other traffic-related pollutants are not only linked to respiratory issues but now to vision problems, raising the stakes for tackling urban air quality. In London alone, more than 120,000 children were hospitalised with breathing difficulties in 2024, amidst ongoing legal battles over emissions-cheating devices installed in diesel vehicles. Campaign groups highlight that excessive pollution from these cars continues to harm children’s health daily, exacerbating the long-standing diesel emissions scandal revealed in 2015.

A series of additional studies reinforce the link between air pollution and various eye conditions beyond myopia. For instance, prolonged exposure to NO₂, PM₂.₅, and carbon monoxide has been implicated in astigmatism development. Furthermore, air pollutants may worsen allergic conjunctivitis and cause corneal injuries that promote eye growth abnormalities. These findings collectively highlight air pollution's multifaceted role in ocular health, mediated by inflammatory and oxidative stress pathways and disruptions in light exposure—key factors in the normal development and function of the eye.

Given this mounting evidence, experts advocate for stricter air quality controls and innovative urban planning solutions to protect children’s eyesight alongside their respiratory health. The intersection of environmental protection and healthcare is becoming increasingly evident, and safeguarding clean air emerges not only as an ecological imperative but a critical strategy for preventing vision loss and promoting overall child development.

### 📌 Reference Map:

* Paragraph 1 – [[1]](https://www.independent.co.uk/news/health/air-pollution-children-harm-eyesight-b2829816.html), [[2]](https://www.birmingham.ac.uk/news/2025/air-pollution-is-harming-childrens-eyesight)
* Paragraph 2 – [[1]](https://www.independent.co.uk/news/health/air-pollution-children-harm-eyesight-b2829816.html), [[2]](https://www.birmingham.ac.uk/news/2025/air-pollution-is-harming-childrens-eyesight), [[7]](https://pubmed.ncbi.nlm.nih.gov/36031679/)
* Paragraph 3 – [[1]](https://www.independent.co.uk/news/health/air-pollution-children-harm-eyesight-b2829816.html), [[3]](https://pubmed.ncbi.nlm.nih.gov/40368946/), [[4]](https://pubmed.ncbi.nlm.nih.gov/39903915/)
* Paragraph 4 – [[1]](https://www.independent.co.uk/news/health/air-pollution-children-harm-eyesight-b2829816.html), [[2]](https://www.birmingham.ac.uk/news/2025/air-pollution-is-harming-childrens-eyesight)
* Paragraph 5 – [[1]](https://www.independent.co.uk/news/health/air-pollution-children-harm-eyesight-b2829816.html)
* Paragraph 6 – [[6]](https://arxiv.org/abs/2310.08843), [[7]](https://pubmed.ncbi.nlm.nih.gov/36031679/)
* Paragraph 7 – [[1]](https://www.independent.co.uk/news/health/air-pollution-children-harm-eyesight-b2829816.html), [[5]](https://pubmed.ncbi.nlm.nih.gov/38535942/), [[7]](https://pubmed.ncbi.nlm.nih.gov/36031679/)

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## Bibliography

1. <https://www.independent.co.uk/news/health/air-pollution-children-harm-eyesight-b2829816.html> - Please view link - unable to able to access data
2. <https://www.birmingham.ac.uk/news/2025/air-pollution-is-harming-childrens-eyesight> - A study by the University of Birmingham reveals that exposure to lower levels of air pollutants, specifically nitrogen dioxide (NO₂) and fine particulate matter (PM₂.₅), is linked to children's uncorrected visual acuity. The research suggests that reducing exposure to these pollutants could help slow the progression of myopia, a condition where distant objects appear blurry. The study highlights that primary school students are especially sensitive to air pollution, with younger children showing the greatest improvements in vision when exposed to cleaner air. The findings advocate for interventions such as installing air purifiers in classrooms and creating 'clean-air zones' around schools to protect children's eyesight.
3. <https://pubmed.ncbi.nlm.nih.gov/40368946/> - A retrospective cohort study involving 4,399 children aged 6-12 years found a clear dose-effect relationship between exposure to air pollutants like PM₂.₅, carbon monoxide (CO), and ozone (O₃) and changes in refractive error. The study concluded that exposure to these pollutants increases the risk of myopic progression in children, emphasizing the need for better air quality control measures to protect children's eye health and prevent myopia progression.
4. <https://pubmed.ncbi.nlm.nih.gov/39903915/> - An ecological study using data from the Chinese National Survey on Students' Constitution and Health (CNSSCH) involving over 500,000 students aged 7-22 years found nearly linear positive dose-response relationships between air quality index (AQI), air pollutant concentrations, and the prevalence of reduced visual acuity. The study suggests that regions with more polluted air tend to have a higher prevalence of reduced visual acuity, with exposure to PM₂.₅ being an important risk factor for myopia among children and adolescents.
5. <https://pubmed.ncbi.nlm.nih.gov/38535942/> - A systematic review and meta-analysis of 12 studies found that exposure to PM₂.₅ and NO₂ is associated with an increased incidence of vision disorders. The study concluded that ambient air pollution, particularly PM₂.₅ and NO₂, may increase the incidence of vision disorders, with children and adolescents being more susceptible than adults.
6. <https://arxiv.org/abs/2310.08843> - A longitudinal study involving 127,709 individuals aged 4-27 years from nine cities in Guangdong Province, China, found significant associations between astigmatism and exposure to carbon monoxide (CO), nitrogen dioxide (NO₂), and particulate matter (PM₂.₅) over time. The study concluded that greater exposure to NO₂ and PM₂.₅ over longer periods aggravates astigmatism, highlighting the need for measures to reduce air pollution to protect eye health.
7. <https://pubmed.ncbi.nlm.nih.gov/36031679/> - A review article discusses the effects of air pollution on myopia, highlighting that ambient air pollution may aggravate allergic conjunctivitis symptoms and cause corneal injury, leading to peripheral hyperopia defocus and stimulating eyeball growth. The article also discusses potential mechanisms linking air pollution to myopia, including the reduction in ultraviolet exposure and retinal dopamine release, as well as systemic inflammation and oxidative stress caused by pulmonary inflammatory factors and reactive oxygen species entering the blood circulation.