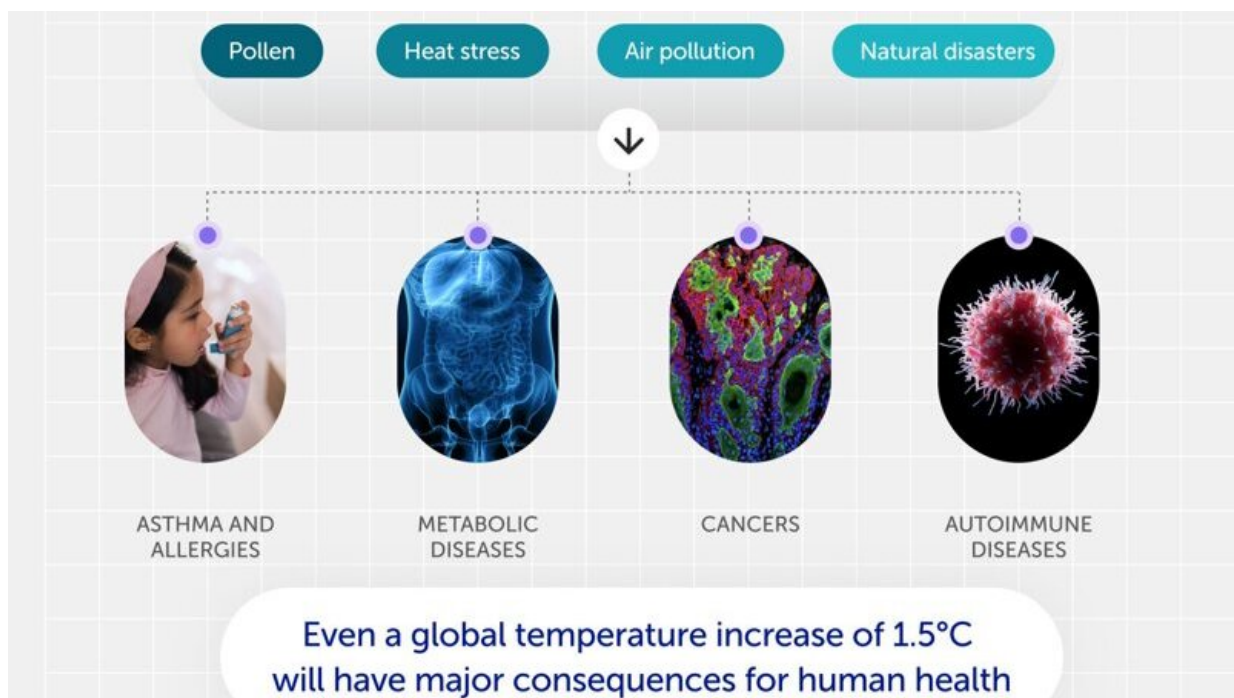


Scientists call for urgent action to prevent immune-mediated illnesses caused by climate change and biodiversity loss

April 4 2024



Climate change is associated with a rise in immune-mediated diseases. Credit: Agache et al/Frontiers

The ecosystems we live in don't work the way they used to—and that's bad for our health. Climate change, pollution, and falling biodiversity are all damaging our immune systems. The lack of positive environmental

exposures to build the strength of our immune systems, and the increasing negative exposures that attack those systems, are combining to cause a dramatic rise in immune-mediated diseases like asthma and cancer.

Measures to protect against this could have a very powerful return on investment: an estimated \$1 spent on [climate change mitigation](#) saves \$3 on [health care costs](#). A global team of researchers writing in *Frontiers in Science* call for [urgent action](#) to safeguard a healthy future.

"Increased emission of pollutants has led to fundamental changes in our environment," said first author Prof Ioana Agache of the Transilvania University of Brasov, Romania, and co-chair of the European Academy of Allergy & Clinical Immunology's Guidelines on Environmental Science for Allergy and Asthma.

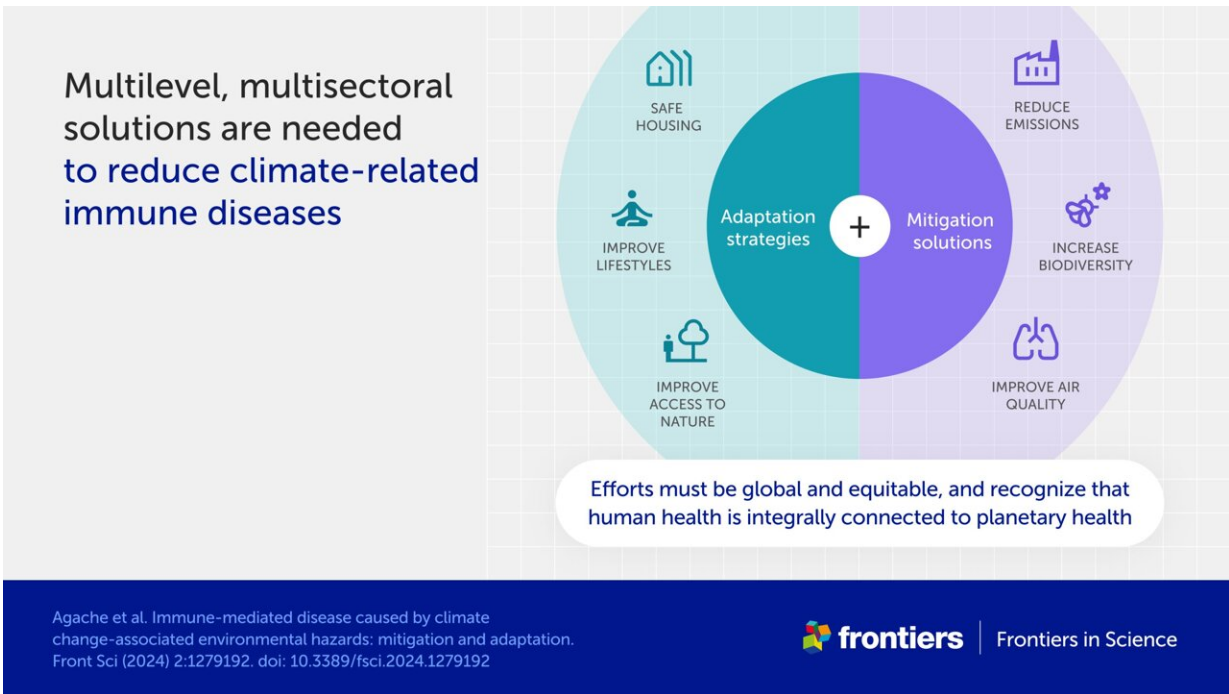
"From an evolutionary perspective, the immune system is constantly molded to respond to the environment and maintain health; however, the recent changes have been too rapid for our immune system to adequately adapt."

Planetary health is preventive health

The effects of anthropogenic climate change and pollution on our bodies are complex, but a crucial factor is the damage they inflict on our immune systems. These develop over time in response to environmental factors—positive or negative.

Being exposed to toxic pollutants damages the epithelial barrier, leading to immune dysregulation, which leads to autoimmune disorders and cancer. Meanwhile, a lack of exposure to suitable biodiversity means that immune systems are not properly calibrated, driving up the rates of allergies and asthma. Rising temperatures alter pollen seasons, so that the

season starts earlier and lasts longer, and that the pollen released provokes stronger allergic reactions, increasing the prevalence and severity of pollen allergies.



Multilevel, multisectoral solutions are needed to reduce climate-related immune diseases. Credit: Agache et al/Frontiers

Climate change is increasing the frequency and severity of natural disasters, with significant secondary health impacts. Higher temperatures increase the probability of wildfires, which release air particulate matter and other pollutants.

These pollutants can spread for hundreds of kilometers and linger long after the fire has been put out, contributing to immune dysregulation and worsening a range of health issues. They also contribute to [global](#)

[warming](#), increasing the probability of future wildfires.

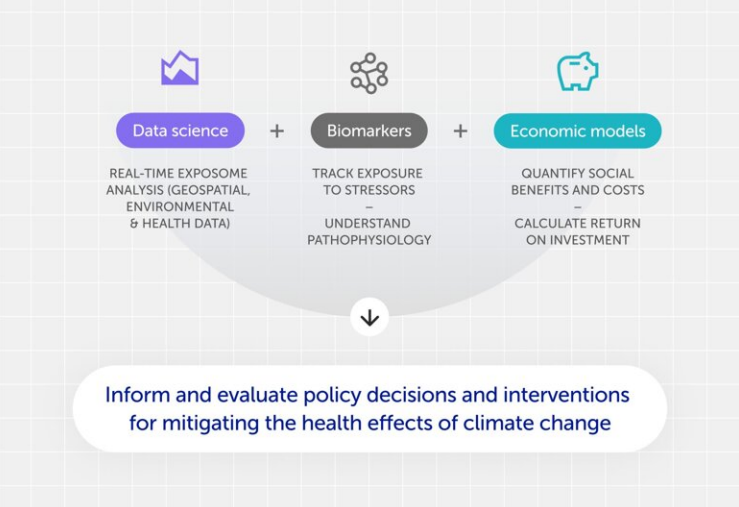
"As a physician-scientist, I have seen first-hand how air pollution from wildfires affect respiratory health," said Prof Kari Nadeau of Harvard University, senior author. "I have also seen the impact of lengthening pollen season and increased pollen allergenicity on allergies and asthma."

These impacts fall most heavily on the most vulnerable members of society. An inadequate diet, a lack of access to the natural environment, and a lack of safe, clean housing all increase the chances of developing immune-mediated diseases. Measures to fight the health impacts of climate change must explicitly include equity, to ensure a global recovery from a global threat.


Adapt and mitigate

The scientists call for a two-pronged approach: adapt to climate change by improving diets, housing, access to nature and [agricultural practices](#), and mitigate its impact by cutting emissions, improving air quality, and fostering environmental biodiversity. To take effective action, however, we need data to inform new measures and track the progress of existing ones.

We need better measures of climate change impacts on human health



Agache et al. Immune-mediated disease caused by climate change-associated environmental hazards: mitigation and adaptation. *Front Sci* (2024) 2:1279192. doi: 10.3389/fsci.2024.1279192

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We need better measures of climate change impacts on human health. Credit: Agache et al/Frontiers

Agache and colleagues focus on three key data initiatives: biomarkers, [economic models](#), and data science techniques. Biomarkers will track immune-mediated diseases like cancer caused by air pollution, while new economic models can quantify the harm done by climate change and the cost benefits of remedial action. Meanwhile, data scientists are developing new approaches for unraveling the multifactorial influences of our altered environment on our immune systems.

"The impacts of climate change are complex, with multifaceted effects," said Dr. Vanitha Sampath of Harvard University, author. "AI can assist with the convergence and analysis of disparate datasets to identify threats and inform remediation."

"It is clear that planetary health and human health are interconnected," concluded Nadeau. "I hope by sharing current knowledge on how our actions adversely affect planetary and human health, and some of the actions we can take to adapt to and mitigate these changes, we can empower individual citizens as well as local, national, and international organizations to work towards a better future."

More information: Immune mediated disease caused by climate change-associated environmental hazards: mitigation and adaptation, *Frontiers in Science* (2024). [DOI: 10.3389/fsci.2024.1279192](https://doi.org/10.3389/fsci.2024.1279192)

Provided by Frontiers

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