

# SMOKE & MIRRORS

## Poor Air Quality Is an Invisible Threat

By Brian Justice

**T**he extraordinary reach of smoke from the 2023 Canadian wildfires made the news and raised collective awareness about poor air quality and its dangers. Many health issues are caused or aggravated by air pollutants, and the negative effects are on the rise. In fact, poor air quality causes 6.5 million deaths around the world every year, and the rate has increased over the past two decades.<sup>1</sup>

Air pollution's causes are both natural and human made<sup>1</sup>:

- Smoke
- Volcanic ash
- Gases from decomposing matter
- Vehicle emissions
- Fuel oils
- Natural gas
- Manufacturing byproducts

However, other, more systematic dangers exist too, cautions Adrian M. Pristas, MD, the corporate medical sleep director at Hackensack Meridian Health Monmouth Sleep and Pulmonary Associates in Hazlet, New Jersey.

“Certainly, people with respiratory compromise are going to be more susceptible to the effects on their underlying lung disease,”

he says. “There’s plenty of data to show that there are downstream consequences, including overwhelming the medical system, especially [because] these vulnerable people cannot accommodate these stresses on short notice without some kind of plan to stay free and clear of air pollution.”

### Air Apparent

Common pollutants can have serious consequences:

**Ammonia** is a pungent, colorless gas originating from agricultural processes, cigarette smoke, and cleaning products. Even small amounts can irritate the eyes, nose, throat, and respiratory tract, and larger quantities are poisonous.<sup>2</sup>

**Carbon monoxide** is an odorless, colorless, and tasteless toxic gas emitted from vehicles, propane heaters, fireplaces, ovens, forest fires, and power plants. It interferes with a body’s ability to deliver oxygen to organs and, in high concentrations, can be deadly.<sup>2</sup>

**Nitrogen dioxide** is formed via the oxidation of nitric oxide and can take the form of acid rain, which damages soil and water. Nitrogen dioxide negatively affects the respiratory system, increasing risks of stroke.<sup>2</sup>

**Ground-level ozone** forms in reaction to other pollutants. It reduces lung function, damages vegetation, and is a major component of smog.<sup>2</sup>

**Particulate matter** is airborne liquid and solid particles from traffic, construction, power plants, heaters, and more. It is linked to cardiovascular and respiratory diseases, and ultrafine particles pose even greater health risks because they can penetrate the respiratory and circulatory systems, damaging the lungs, heart, and brain.<sup>2</sup> Fine particulate matter (PM 2.5) is 30 times finer than human hair and causes most air pollution health effects in the United States.<sup>1</sup>

Many may think poor air quality is a danger only outdoors, but significant dangers exist inside too.

Americans typically spend 90% of their time indoors, where concentrations of pollutants can be 2–5 times higher than those outdoors.<sup>3</sup> More vulnerable populations, including infants, older people, and individuals with cardiovascular or respiratory conditions, tend to spend even more time inside. Indoor pollutant levels are also rising because of the increased use of synthetic building materials, furnishings, personal care items, pesticides, household cleaners, and even energy-efficient building designs, which may lack proper ventilation.<sup>3</sup>

## Air on the Safe Side

The U.S. Environmental Protection Agency (EPA) established the Air Quality Index (AQI) to inform people about daily air quality. It assesses the concentration of ground-level ozone, particulates, carbon monoxide, nitrogen dioxide, and sulfur dioxide via over 1,000 pollution monitors nationwide. The index ranges from 0 to 500. Below 100, the air quality is generally safe. However, when the index is higher, outdoor air poses risks to older adults, children, and people with heart or lung conditions, and an index exceeding 200 is deemed very unhealthy.<sup>6</sup>

Access to this data—and more—is readily available through the AirNow website, a comprehensive overview of local, state, national, and global air quality information. An interactive map allows users to access air quality data for specific areas. It uses the AQI and—in collaboration with the EPA, the National Oceanic and Atmospheric Administration, the National Park Service, NASA, the Centers for Disease Control and Prevention, and other air quality agencies—delivers air quality information for over 500 U.S. cities, American embassies and consulates around the world, Canada, and Mexico.<sup>7</sup>

### As I Live and Breathe

Certain populations may be more vulnerable to the effects of air pollution:

**Children.** The Children's Health Study at the University of Southern California found that elevated air pollution levels contribute to increased short-term respiratory infections and thus more school absences. Children engaged in multiple outdoor sports in high ozone areas and those who live near busy roads are more likely to develop asthma. Children with asthma exposed to high air pollutant levels are also more prone to bronchitis.<sup>1</sup>

**Older Adults.** Researchers at the University of Washington have established a compelling connection between air pollution and dementia. Conversely, another multiyear investigation demonstrated that *improved* air quality is associated with a decreased risk of dementia in older women.

Air pollution has also been implicated in various neurological disorders, including Parkinson disease, Alzheimer disease, and osteoporosis. Long-term exposure to traffic-related air pollution significantly accelerates the onset of physical disabilities among older adults, especially among racial minorities and those in medically underserved communities.<sup>1</sup>

This discrepancy concerns Curtis Brown, a visiting senior practitioner in residence at the Virginia Commonwealth University L. Douglas Wilder School of

Government and Public Affairs. "Health care professionals may be seeing patients who come from communities that have been historically marginalized," he says. "Understanding why they are suffering promotes trying to find solutions and developing a sense of empathy."

**Pregnant People.** Smoke poses particular risks to pregnant people, many of whom have reduced lung capacity. Research also suggests that exposure to air pollution during the first two trimesters might be linked to gestational diabetes. The dangers extend to the developing fetus, with an increased chance of low birth weight, miscarriage, and stillbirth. A worldwide assessment revealed that air pollution may have played a role in nearly 6 million premature births in 2019.<sup>4</sup>

### Slow Burn

A recent review in *BJPsych Open* highlights the impact of poor air quality on mental health, noting links to depression, anxiety, psychosis, and other neurocognitive disorders. Notably, children and adolescents may face exposure to these pollutants during critical stages of their mental development, increasing their vulnerability to severe and lasting mental health issues. While poor air quality is already associated with adverse physical health outcomes and diseases, the connection between air pollutants and mental health has previously received comparatively limited attention.<sup>5</sup>

Increasingly poor air quality creates cascading effects of ongoing issues, notes Matty McElwain, CMA (AAMA), who works at Methodist HealthWest Sports Medicine in Omaha, Nebraska.

"I've noticed that with the decreased air quality, people with asthma have increased pain levels," she says. "When the body is stressed and you can't breathe, you start noticing more pain, and the higher the stress level, the higher the pain levels too. More patients are having to get intercostal nerve blocks to help with their breathing."

Paula Schubert, CMA (AAMA), who works at Hancock Health in Greenfield, Indiana, organizes referrals for a consortium of health care providers and has seen an uptick in those she makes to pulmonologists. "It's gone from five or six a year to 15," she says.

With the continual increase in adverse health effects from poor air quality, continuing to raise awareness about its effects can help protect high-risk populations and inspire advocating for decreasing and regulating pollutants in the future. ♦

### References

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