Even low-level air pollution may harm health

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Staying Healthy

A new scientific report supports research suggesting that even low levels of pollution — well below the current national regulatory cutoffs — may harm our health.

Outdoor air pollution stems largely from the burning of fossil fuels (coal, gas, oil), which generate noxious gases, smog, and soot. Smog, which makes air look hazy, is created by ground-level ozone. Soot is fine particles — you may see a dusting of soot on a windowsill, for example. The burning of fossil fuels is a major contributor to climate change that occurs over years, but it has more immediate health effects.

How can air pollution affect our health?

Research links increased levels of fine particles in the air that are tiny enough to be easily inhaled (called PM2.5) to more hospitalizations for heart disease, stroke, diabetes, and pneumonia. It also worsens existing lung disease, known as chronic obstructive pulmonary disease (COPD), and may cause other serious health problems. Both long-term exposure and short-term exposure seem to matter to our health.

A 2021 study looked at global models of pollution levels and risk assessments of the world population over 14 years. It tied fossil fuel alone to nearly nine million premature deaths worldwide in 2018 — that's one in five deaths — including more than 350,000 in the United States. Most of these deaths are due to heart attacks and strokes.

People with underlying health conditions like asthma, heart disease, or diabetes, older adults, and people who live in low-income communities, which are often situated near polluting sources, are among those who are more likely to be harmed by air pollution.

How does low-level pollution affect us?

In the US, air pollution has improved quite a bit since the passage of the 1970 Clean Air Act. Current air quality standards set by the Environmental Protection Agency (EPA) spell out a certain annual threshold of particulates aimed at protecting health. But as we learn more about complex relationships between pollution and our ecosystem, growing evidence suggests that harm may occur at PM2.5 levels lower than the current standard.

The new Health Effects Institute report (note: automatic download) studied 68 million older Americans from all but two states across the US over a 16-year period.

The researchers had set themselves an incredibly challenging question to answer. There are innumerable variables to calculate: an individual's exposure to pollution based on where they live, the independent contribution of the major air pollutants separately, health and behavior confounders that factor into mortality, and more.

The numbers are shocking. Just three out of 10 American adults are active enough to stay healthy and fit, and nearly four out of 10 admit they aren’t active at all, despite reams of research proving that exercise is a powerful preventive, and sometimes an antidote, for disability and illness. Which side of this divide are you standing on — and why? Maybe you’re not sure what blend of exercise is best. Or perhaps you know exactly what you need to do, but your workouts have become so humdrum that it’s harder than ever to dig up the energy to do them. Do you want to jump-start your sputtering exercise program? Or are you stuck on a plateau and wishing you could kick it up to the next level?

The study drew on Medicare demographic and mortality data from more than 68 million Americans ages 65 and older. Calculations of yearly average pollution exposures came from multiple sources, including the EPA Air Quality System monitoring and satellite-derived data.

The authors adjusted for many factors known to affect health, such as socioeconomic status, smoking, and body mass index. They developed several statistical models, all of which demonstrated similar results: between 2000 and 2016, death rates rose by 6% to 8% for each incremental increase in PM2.5 exposure.

Just how small were these increases in exposure to air pollution? Particle pollution is measured in micrograms per cubic meter of air (andmu;g/m3). Each time exposure levels rose by 10 µg/m3, death rates also rose by 6% to 8%. Excess deaths occurred even at low levels of PM2.5 exposure (2.8 µg/m3), which is well below the current EPA standards cutoff. The study authors estimate that adjusting the cutoff down from the current level of 12 µg/m3 to 10 µg/m3 could save more than 143,000 lives over 10 years.

What are the limitations of this study?

One limitation is that the variety of data are compiled at different levels: the individual, zip code, and county level. For example, pollution exposure is estimated in clusters by zip code. Yet someone living near a highway may have higher exposure than another person living further from the highway in the same zip code.

Additionally, the groups with the lowest PM2.5 exposure most likely exclude many cities and include a higher proportion of rural areas. Rural areas tend to be less dense, have fewer air quality data points, and may have zip codes spanning greater distances. Details like these may affect the certainty of conclusions that can be drawn. Nonetheless, this study has many groundbreaking features with sound science.

Staying healthy: The bottom line

Air pollution is known to contribute to disease and death. Now we have more evidence suggesting that this is true even at low levels of pollution. Currently the US is considering whether to adjust regulatory cutoffs for annual fine particulate matter pollution known as PM2.5 to protect human health.

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But don't wait. You can take steps described in my previous blog post to reduce your exposure (and contribution) to pollution, and thus your health risks. And some of these steps have the added benefit of combatting climate change and improving planetary health.

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