

Current air pollution standards tied to higher heart risks

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Long-term exposure to air pollution is tied to an increased risk of having a heart attack or dying from heart disease—with the greatest harms impacting under-resourced communities, new Kaiser Permanente

research shows.

The study, published February 24 in *JAMA Network Open*, is one of the largest to date to look at the effects of long-term exposure to fine particle air [pollution](#), which is emitted from sources such as vehicles, smokestacks, and fires. Fine particle air pollution, also known as PM_{2.5}, are [fine particles](#) that are 2.5 micrometers in diameter or smaller. The research lends support to current efforts to make the country's air pollution standards more stringent.

"We found that people exposed to fine particulate air pollution have an increased risk of experiencing a heart attack or dying from [coronary heart disease](#)—even when those exposure levels are at or below our current U.S. air quality standards," said lead author Stacey E. Alexeeff, Ph.D., a research scientist and biostatistician at the Kaiser Permanente Division of Research.

"Our work has the potential to play an important role in ongoing national conversations led by the Environmental Protection Agency on whether—and how much—to tighten air quality standards to protect the public from pollution's effects."

The study included 3.7 million adults who were members of Kaiser Permanente in Northern California from 2007 to 2016 and had lived in California for at least one year. The researchers tied each adult's address to a specific geographical location—a process known as geocoding—to establish annual average exposure to fine particle pollution so it could be linked to annual PM_{2.5} exposure data. Then they identified the patients diagnosed with a heart attack or who had died from heart disease or cardiovascular disease.

The Environmental Protection Agency's current annual regulatory standard for fine particle air pollution PM_{2.5} is 12 micrograms per cubic

meter, on average, over a year. Long-term exposure to fine particle air pollution $PM_{2.5}$, is a known risk factor for cardiovascular disease. That's why the EPA initially instituted air quality standards.

The study found that $PM_{2.5}$ exposure at a concentration between 12.0 and 13.9 micrograms per cubic meter was associated with a 10% increased risk of experiencing a heart attack and a 16% increased risk of dying from heart disease or cardiovascular disease compared to concentrations less than 8 micrograms per cubic meter.

Heart disease is a condition that develops when cholesterol builds up inside the heart's arteries, preventing the heart from getting the blood and oxygen it needs. Cardiovascular disease is a broad category covering all the diseases that can affect the heart and blood vessels, such as heart failure, stroke, and peripheral artery disease.

In January 2023, the EPA announced a proposal to tighten the annual $PM_{2.5}$ standard by reducing the acceptable level to between 9.0 to 10.0 micrograms per cubic meter. The EPA said it was advising this change because the current standard did not adequately protect [public health](#) under the guidelines required by the Clean Air Act.

The study also looked at diagnoses of heart attacks and deaths from heart disease and cardiovascular disease in people whose exposures were below the current standard of 12 micrograms per cubic meter. The study showed a 6% increased risk of heart attack and a 7% increased risk of death from heart disease in adults exposed to air pollution at moderate concentrations of 10.0 to 11.9 micrograms per cubic meter compared to low concentrations of less than 8.0 micrograms per cubic meter.

This suggests people would see health benefits if the new standard were 10.0 micrograms per cubic meter or less.

Additional analyses found that the increased risk of heart attacks persisted even at concentrations of 8.0 to 9.9 micrograms per cubic meter compared to concentrations below 8.0 micrograms per cubic meter. This suggests the U.S. would see fewer heart attacks if the new standard were reduced to 8.0 micrograms per cubic meter.

"This is one of the largest studies to date to look at the impact of air pollution on [heart disease](#)," said senior author Stephen Sidney, MD, MPH, a research scientist at the Division of Research.

"Importantly, Kaiser Permanente's electronic health records made it possible for us to account for other factors that might increase a person's risk of having a [heart attack](#) or developing cardiovascular disease, such as smoking status, body mass index, or having other illnesses, such as diabetes. This allows us to be confident in our conclusion that fine particle air pollution has adverse associations with cardiovascular health."

The study also showed that neighborhood [socioeconomic status](#) was tied to pollution exposure and the risk of [cardiovascular disease](#). "We found strong evidence that neighborhood matters when it comes to exposures to this type of air pollution," said co-author Stephen Van Den Eeden, Ph.D., a research scientist at the Division of Research.

"The strongest association between exposure to [air pollution](#) and risk of cardiovascular events in our study was seen in people who live in low socioeconomic areas, where there is often more industry, busier streets, and more highways."

The researchers say their findings add important new information to ongoing policy discussions. "Our study clearly adds to the evidence that the current regulatory standards are not sufficient to protect the public," said Dr. Alexeeff.

"Our findings support the EPA's analysis that lowering the standard to at least 10.0 micrograms per cubic meter is needed to protect the public. Our findings also suggest that lowering the standard to 8.0 [micrograms](#) per cubic meter may be needed to reduce the risk of heart attacks."

More information: Stacey E. Alexeeff et al, Particulate air pollution and cardiovascular events: a retrospective cohort study of 3.7 million adults using electronic health records, *JAMA Network Open* (2023).

Provided by Kaiser Permanente

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