

Reconsidering the Public Health Standards for PM2.5

Docket ID No. EPA-HQ-OAR-2015-0072

On Jan. 6, 2023, the Environmental Protection Agency formally announced that it is reconsidering the public health standard that it set for PM2.5 because it is concerned that the standard is not protective enough. EPA announced a proposed decision to revise the primary annual PM2.5 standard from its current level of 12.0 $\mu\text{g}/\text{m}^3$ to within the range of 9.0 to 10.0 $\mu\text{g}/\text{m}^3$. EPA invited the public to submit comments by March 28, 2023 about the proposed standard the Administrator should establish.

The Clean Air Act requires EPA to set national air quality standards for particulate matter and five other pollutants considered harmful to public health and the environment (the other pollutants are ozone, nitrogen oxides, carbon monoxide, sulfur dioxide and lead). The law also requires EPA to periodically review the standards to ensure that they provide adequate health and environmental protection, and to update those standards as necessary. By reconsidering the rule for particulate matter, EPA is fulfilling its mandate to consider the latest scientific evidence to set a standard protective of public health.

The Clean Air Board of Central Pennsylvania¹ is a nonprofit organization dedicated to providing residents of central Pennsylvania with a voice on air quality matters. The Clean Air Board was formed in the fall of 2005 after over 100 Cumberland County physicians signed and published an open letter in the local newspapers informing the community of the growing danger of air pollution. Initially a small group of people of faith gathered to support the physicians in educating our community and advocating for cleaner air. We have grown to include not only that faith community, but also business leaders, teachers, lawyers, parents, and the medical community. Our mission includes advocating for public policies which would reduce air pollution to enable Pennsylvanians to breathe cleaner air.

The Clean Air Board supports EPA's efforts to revise and improve PM2.5 air quality standards. The proposal to revise the primary (health based) annual PM2.5 standard from its current level of 12.0 $\mu\text{g}/\text{m}^3$ to within the range of 9.0 to 10.0 $\mu\text{g}/\text{m}^3$ is an important step in protecting the public

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health. However, we agree with the American Lung Association that the annual standard should be set at 8.0 µg/m³ and the 24-hour standard should be set at 25 µg/m³ because even low levels of particulate matter pollution can cause serious health effects. As the Lung Association noted in its public response to EPA’s announcement of the reconsideration proposal: “Current science shows that stronger limits are urgently needed at the levels of 8 µg/m³ for the annual standard and 25 µg/m³ for the 24-hour standard to protect vulnerable populations.”² EPA acknowledges that since it completed its last review of the PM NAAQS in 2012, thousands of new scientific studies have demonstrated the dangers of exposure to PM_{2.5}.

The United States has fallen behind other public health organizations in establishing particulate matter standards. PM_{2.5} standards more protective than the current EPA standards have been advocated by the World Health Organization (WHO) since 2005. Since the publication of the WHO Global Update 2005, there has been a marked increase in evidence on the adverse health effects of air pollution, built on advances in air pollution measurement, exposure assessment and an expanded global air pollution database. New epidemiological studies have documented the adverse health effects of exposure to high levels of air pollution in low- and middle-income countries. Studies in high-income countries with relatively clean air have reported adverse effects at much lower levels than had previously been studied.

After a systematic review of the accumulated evidence, in 2021 WHO adjusted almost all the Global Air Quality Guidelines (AQGs) levels downwards to protect the health of populations, by reducing levels of key air pollutants, some of which also contribute to climate change.

In the WHO press release, dated Sept. 22, 2021, WHO noted that every year, exposure to air pollution is estimated to cause 7 million premature deaths and result in the loss of millions more healthy years of life. In children, this includes reduced lung growth and function, respiratory infections and aggravated asthma. In adults, ischemic heart disease and stroke are the most common causes of premature death attributable to outdoor air pollution. Evidence is also emerging of other effects such as diabetes and neurodegenerative conditions. Disease attributable to air pollution is on a par with other major health risks such as unhealthy diet and tobacco smoking.

² [Lung Association Responds to Proposed Updates to National Particle Pollution Standards | American Lung Association](#)

Table 3.26 from the WHO Guidelines below shows a comparison of the 2021 Air Quality Guidelines compared to the 2005 Guidelines.

Table 3.26 Recommended 2021 AQG levels and 2005 air quality guidelines³

Pollutant	Averaging time	2005 air quality guideline	2021 AQG level
PM _{2.5} , µg/m ³	Annual	10	5
	24-hour ^a	25	15
PM ₁₀ , µg/m ³	Annual	20	15
	24-hour ^a	50	45
O ₃ , µg/m ³	Peak season ^b	–	60
	8-hour ^a	100	100
NO ₂ , µg/m ³	Annual	40	10
	24-hour ^a	–	25
SO ₂ , µg/m ³	24-hour ^a	20	40
CO, mg/m ³	24-hour ^a	–	4

^a 99th percentile (i.e. 3–4 exceedance days per year).

^b Average of daily maximum 8-hour mean O₃ concentration in the six consecutive months with the highest six-month running-average O₃ concentration.

Like the EPA rulemaking process for setting NAAQS, the development of WHO guidelines adheres to a rigorous process of reviewing and evaluating evidence and involves several groups of experts with well-defined roles. A guideline development group defines the scope and key questions of the guidelines, and develops the recommendations, based on the distilled evidence provided by the systematic review team. In addition, an external review group provides valuable comments, while the WHO steering group, composed of WHO staff from all regions, oversees implementation of the project. For the AQGs, more than 500 papers were identified for

³ WHO global air quality guidelines: Particulate matter (PM_{2.5} and PM₁₀), ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide [Internet]. Geneva: World Health Organization; 2021. 3, Recommendations on classical air pollutants. © World Health Organization 2021.

systematic review and synthesized to get the most up-to-date evidence for establishing the new AQG levels.

As WHO noted, air pollution is one of the biggest environmental threats to human health, alongside climate change. Improving air quality can enhance climate change mitigation efforts, while reducing emissions will in turn improve air quality. By striving to achieve these guideline levels, countries will be both protecting health as well as mitigating global climate change.⁴

Our continental neighbors to the north currently implement a more protective PM_{2.5} standard. The Canadian Ambient Air Quality Standards for PM_{2.5} are achieved when annual metrics are 8.8 micrograms per cubic metre (µg/m³) or lower, and the 24-hour metrics are 27 µg/m³ or lower. These standards have been in place since 2020.⁵

EPA's Clean Air Scientific Advisory Committee (CASAC) has made recommendations to the Administrator on the annual standard for PM_{2.5} and the 24-hour standard. All CASAC members agree that the current level of the annual standard is not sufficiently protective of public health and should be lowered. "With regard to the primary annual PM_{2.5} standard, the majority of the CASAC concluded that the level of the standard should be revised within the range of 8.0 to 10.0 µg/m³, while the minority of the CASAC concluded that the primary annual PM_{2.5} standard should be revised to a level of 10.0 to 11.0 µg/m³".⁶

Regarding the level of the annual PM_{2.5} standard, the majority of CASAC members found that an annual average in the range of 8-10 µg/m³ would be appropriate. The range of 8-10 µg/m³ is supported by placing more weight on:

- epidemiologic studies in the United States that show positive associations between PM_{2.5} exposure and mortality with precision among populations with mean concentrations likely at or below 10 µg/m³;
- epidemiologic studies in the United States showing such associations at concentrations below 10 µg/m³ and below 8 µg/m³;

⁴ WHO global air quality guidelines. Particulate matter (PM_{2.5} and PM₁₀), ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide. Executive summary. Geneva: World Health Organization; 2021. Licence: CC BY-NC-SA 3.0 IGO.

⁵ [Air quality - Canada.ca](https://www3.international.gc.ca/air-quality/qualite-air/qualite-air-eng.aspx)

⁶ Clean Air Scientific Advisory Committee letter to EPA Administrator Regan, March 18, 2022, p. 2

- Canadian studies, some of which show such associations at concentrations below 10 $\mu\text{g}/\text{m}^3$ and below 8 $\mu\text{g}/\text{m}^3$;
- a meta-analysis of 53 studies, 14 of which report such associations at concentrations below 10 $\mu\text{g}/\text{m}^3$ down to $\mu\text{g}/\text{m}^3$;
- protection of at-risk demographic groups;
- evidence consistent with no threshold and a possible supra-linear concentration- response function at lower levels;
- recognition that the use of the mean to define where the data provide the most evidence is conservative since robust data clearly indicate effects below the mean in concentration response functions;
- and consideration that people are not randomly distributed over space such that populations in neighborhoods near design value monitors are exposed to the levels indicated at those monitors and likely to be more at risk. ⁷

In addition, long term exposure to low levels of PM_{2.5} pollution can adversely affect older people. A recent major study, published in 2022 by the Health Effects Institute, investigated adverse health effects from long term exposure to ambient air pollution.⁸ The research team conducted analyses of the exposure-health connection and presented results from three newly developed causal inference approaches and two traditional regression approaches for estimating the risk of dying associated with long-term exposures to the pollutants. Findings were consistent across all five analyses. The team reported a 6% to 8% increased risk of mortality per 10 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) increase in PM_{2.5} exposure across the different analyses, with stronger associations at exposure levels well below the current annual standard of 12 $\mu\text{g}/\text{m}^3$. The authors adjusted for many factors known to affect health, such as socioeconomic status, smoking, and body mass index.

⁷ Clean Air Scientific Advisory Committee letter to EPA Administrator Regan, March 18, 2022, p. 3

⁸ Assessing Adverse Health Effects of LongTerm Exposure to Low Levels of Ambient Air Pollution: Implementation of Causal Inference Methods Francesca Dominici, Antonella Zanobetti, Joel Schwartz, Danielle Braun, Ben Sabath, and Xiao Wu. Research Report 211, Health Effects Institute, Boston, Massachusetts, January 2022

In the final EPA Regulatory Impact Analysis Report, dated Dec. 2022, EPA noted that revising the annual PM_{2.5} standard to 9 µg/m³ would change the air quality designation for relatively few counties in the US. One of the areas affected is in Pennsylvania - Delaware County in southeast Pennsylvania.⁹ This urban area is affected by major sources of air pollution, which can affect at-risk groups. Regardless of designation, we urge state and federal agencies to intensify their efforts to reduce pollution in this area.

Short-term air pollution is a persistent problem. The 24-hour standard is the basis for EPA's Air Quality Index (AQI) that is used to communicate daily air pollution levels to the public. Using EPA's AirNow tool, the public is informed about air quality forecasts and pollutant levels in their community. The Air Quality Index, as currently implemented, suggests that only exposures of more than 35.5 µg/m³ are unhealthy for sensitive groups and designated code orange. Days with PM_{2.5} levels from 12.1 µg/m³ to as high as 35.4 µg/m³ are labeled "moderate" or "yellow" days. This may lead to an inaccurate picture of the health risks of daily exposure to PM_{2.5} for vulnerable populations. EPA can change this inaccurate picture by revising the 24-hour standard and by resetting the breakpoints in the AQI.

The Lung Association states: "A stronger 24-hour standard is also important to better inform the public when air pollution levels are unhealthy. The NAAQS are the basis for EPA's air quality index (AQI), which people nationwide use to plan their activities based on the air quality forecast that day. Right now, EPA's outdated 24-hour standard means that people may be told that the air outside is safe to breathe on a day when it is not."¹⁰ We agree. EPA needs to propose a stronger 24-hour standard that is consistent with what we know about short-term health consequences. There is substantial epidemiologic evidence from both morbidity and mortality studies that the

⁹ Table ES-9 Summary of Counties by Bin that Still Need Emissions Reductions for Proposed Alternative Primary Standard Levels of 10/35 µg/m³ and 9/35 Bin Area Counties

¹⁰ [Lung Association Responds to Proposed Updates to National Particle Pollution Standards | American Lung Association](#)

current standard is not adequately protective. This includes three U.S. air pollution studies with analyses restricted to 24-hour concentrations below 25 µg/m³.¹¹

EPA acknowledges that a majority of CASAC members favor lowering the 24-hour standard. The Executive Summary to the Proposed Rule states “With regard to the primary 24-hour PM_{2.5} standard, the majority of the CASAC concluded that the primary 24-hour PM_{2.5} was not adequate and that the level of the standard should be revised to within the range of 25 to 30 µg/m³. . . .”

We are particularly concerned about the impact of short-term PM_{2.5} pollution on children and people with asthma or other respiratory illnesses. Children are more vulnerable to the health effects of PM_{2.5}, and people with asthma are more likely to experience attacks when they are exposed to high levels of PM_{2.5}. A 24-hour standard set at 25 µg/m³ would help to protect these vulnerable populations.

As we learn more about complex relationships between pollution and our ecosystem, growing evidence suggests that harm may occur at PM_{2.5} levels lower than the current standard. Based on the scientific evidence examined by EPA and new studies being released, we need to move toward ambient air quality standards based on the best health science to protect the public. For these reasons, the Clean Air Board supports an annual standard set at 8.0 µg/m³ and a 24-hour standard set at 25 µg/m³.

¹¹ Clean Air Scientific Advisory Committee letter to EPA Administrator Regan, March 18, 2022, p. 3

Thank you for your consideration of these comments.

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