

EPA Proposes Short-Term National Ambient Air Quality Standards for Nitrogen Dioxide and Roadside Monitoring Program



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In brief

For the first time in over 35 years, the U.S. Environmental Protection Agency (EPA) has proposed changes to the national air quality standard for nitrogen dioxide (NO₂) a widespread, noxious air pollutant. The National Ambient Air Quality Standards (NAAQS) define what constitutes air that is safe to breathe and drive air pollution cleanup programs. EPA has proposed adding a new one-hour standard to the existing annual standard. EPA also has proposed establishing a roadside monitoring network to track expected higher levels of NO₂ along major highways.

Recent research shows that the current annual average standard set in 1971 fails to protect the health of children, older adults and people with asthma and of people who live and work near major highways. EPA accepted public comments on the proposal until September 14, 2009, and held public hearings on August 3, 2009 in Arlington, VA and August 6, 2009 in Los Angeles. EPA is under a court order to issue final standards by January 22, 2010.¹

What is nitrogen dioxide?

Nitrogen dioxide is a gaseous air pollutant composed of nitrogen and oxygen. NO₂ forms when fossil fuels such as coal, oil, gasoline or diesel are burned at high temperatures. NO₂ also contributes to the formation of particle pollution and ozone. NO₂ converts in the atmosphere to nitrate aerosols, a prime component of fine particle pollution. Fine particles are associated with serious health effects ranging from respiratory problems to premature death. Nitrogen oxides also are a building block of ozone smog, a major respiratory irritant that also increases the risk of premature death.

What are the sources of nitrogen dioxide emissions?

Each year manmade sources in the U.S. emit 19.4 million metric tons of nitrogen oxides from sources, mainly from burning fuels. On-road sources like cars, trucks, and buses are the largest sources of emissions, followed by power plants, diesel-powered heavy construction equipment and other movable engines, and industrial boilers. Emissions of nitrogen dioxide are slated to decline as regulations on many of these sources are phased in future years.

¹ *Center for Biological Diversity et al. v. Johnson* (D.D.C) Civ. No. 05-01814.

Where do high NO₂ concentrations occur?

EPA found the highest concentrations of outdoor NO₂ in large urban regions such as the Northeast corridor, Chicago and Los Angeles.² Levels are highest on or near heavily travelled roadways. NO₂ can be a problem indoors, as well. Kerosene or gas space heaters and gas stoves also produce substantial amounts of nitrogen dioxide, and if unvented, can lead to higher levels indoors than outdoors.

What are the health effects of nitrogen dioxide air pollution?

Nitrogen dioxide causes a range of harmful effects on the lungs:

- Increased inflammation of the airways;
- Worsened cough and wheezing;
- Reduced lung function;
- Increased asthma attacks;
- Greater likelihood of emergency department and hospital admissions; and
- Increased susceptibility to respiratory infection, such as influenza.³

What is the evidence of short-term health effects, unregulated by the current annual standard?

EPA found evidence of such harm and summarized the findings in the Integrated Science Assessment, following extensive review by the Clean Air Scientific Advisory Committee (CASAC). That assessment concludes:

“The strongest evidence for an association between NO₂ exposure and adverse human health effects comes from epidemiologic studies of respiratory symptoms and ED [emergency department] visits and hospital admissions. These new findings were based on numerous studies, including panel and field studies, multipollutant studies that control for the effects of other pollutants, and studies conducted in areas where the whole distribution of ambient 24-hour average NO₂ concentrations was below the current NAAQS level of 0.053 ppm (53 ppb) (annual average). The effect estimates from the U.S. and Canadian studies generally indicate a 2-20% increase in risks for ED visits and hospital admissions. Risks associated with respiratory symptoms were generally higher.”⁴

- **Clinical studies** provide clear evidence of harm to people with asthma who breathed NO₂ for 30 minutes to 1-hour while they were exercising. NO₂ enhances the responsiveness of the airways to allergens. This airway hyperresponsiveness—a narrowing of the airways in response to various stimuli—is a hallmark of asthma. Clinical studies typically include only mildly asthmatic

² U.S. EPA. Risk and Exposure Assessment to Support the Review of the NO₂ Primary National Ambient Air Quality Standard. EPA-452/R-08-008a, November 2008, p. 15. (Hereinafter REA) Available at:

http://www.epa.gov/ttn/naaqs/standards/nox/data/20081121_NO2_REA_final.pdf

³ U.S. EPA. Integrated Science Assessment for Oxides of Nitrogen -- Health Criteria. EPA/600/R-08/071. July 2008. (Hereinafter ISA) Table 5.3-1. p. 5-5. Available at:

<http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=194645>

⁴ U.S. EPA. ISA. p. 5-15.

adults. In setting standards, safety factors must be incorporated to account for potential effects on infants, children, and those with moderate or severe asthma or other respiratory disease.

- **A meta-analysis** using individual level data from **19 clinical studies** reported that 66 percent of subjects experience an increase in airway responsiveness following 1-hour exposures to 100 ppb NO₂, the lowest level studied.⁵
- **Epidemiological studies** provide convincing evidence that short-term NO₂ concentrations affect respiratory symptoms and increase the likelihood of emergency and hospital admissions for respiratory diseases at levels below the current standard.
 - Epidemiological studies found effects at far lower concentrations than the clinical studies—with mean 24-hour concentrations in the range of 3 to 50 ppb for emergency department and hospital admission studies.⁶
 - For respiratory symptoms, studies found positive associations where median 24-hour average concentrations ranged from 18-26 ppb,⁷ and where the mean NO₂ level was 32 ppb for a 4-hour average.⁸
 - A study in southern California provided evidence of an association between NO₂ and asthma symptoms with 98th percentile 1-hour daily maximum NO₂ concentrations of 50 ppb, and mean concentrations of 24 ppb.⁹
- The **California children's health study** found that long-term exposure to nitrogen dioxide was associated with stunted lung function growth in children.¹⁰

Who is at greatest risk?

Children, older adults, and people with asthma or other lung disease and people with cardiovascular disease are at greatest risk. In addition, people who work, live or attend school along major highways also face increased risk.¹¹ These include

⁵ U.S. EPA ISA, Table 3.1-3.

⁶ U.S. EPA ISA, p. 5-11.

⁷ Schildcrout JS, Sheppard L, Lumley T, Slaughter JC, Koenig JQ, Shapiro GG. Ambient air pollution and asthma exacerbations in children: an eight-city analysis. *Am J Epidemiol* 2006; 164: 505-517.

⁸ Mortimer KM, Neas LM, Dockery DW, Redline S, Tager IB. The effect of air pollution on inner-city children with asthma. *Eur Respir J* 2002; 19: 699-705.

⁹ Delfino RJ, Zeiger RS, Seltzer JM, Street DH, McLaren CE. Association of asthma symptoms with peak particulate air pollution and effect modification by anti-inflammatory medication use. *Environ Health Perspect* 2002; 110: A607-A617; and Thompson R, Jenkins S. Memo to the NO₂ NAAQS Review Docket, "Air Quality Statistics for Cities Referenced in Key U.S. Nitrogen Dioxide Epidemiology Papers."

¹⁰ Gauderman WJ, Avol E, Gilliland F, Vora H, Thomas D, Berhane K, McConnell R, Kuenzli N, Lurmann F, Rappaport E, Margolis H, Bates D, Peters J. The effect of air pollution on lung development from 10 to 18 years of age. *N Engl J Med* 2004; 351: 1057-1067.

¹¹ U.S. EPA, ISA, Chapter 4, Section 4.3.

millions of people. For example, there are an estimated 22.9 million people, including 6.7 million children, with asthma in the U.S.¹²

What's at stake?

Millions of Americans are unprotected by the current standards. Children and adults with asthma should be free to work outdoors or participate in outdoor recreation without fear that air pollution concentrations will trigger asthma attacks that send them to the hospital. Children who live near busy highways should not risk their future ability to breathe because the pollution kept their lungs from fully developing.

What did EPA propose?

- Add a new one-hour NO₂ standard to the existing annual standard
 - Establish a one-hour NO₂ standard at a level between 80-100 ppb. EPA is also taking comment on levels above and below this range, specifically 65 ppb to 150 ppb.¹³
 - Set the form of the standard as the 99th percentile (or 4th highest) of 1-hour daily maximum concentrations, based on the average of 3 years of monitoring data.
 - Retain the current annual average NO₂ standard of 53 ppb. All the areas of the U.S. currently comply with this standard.

- Add a monitoring network near major highways
 - Add 165 new NO₂ monitoring sites within 50 meters of major highways in cities with at least 350,000 residents.
 - Continue monitoring area wide concentrations in cities with a least 1 million residents.
 - Put the monitoring network in place by January 2013, and areas must attain the standards by January 2022/2023 (five years after nonattainment designations.)

- As an alternative to the proposed approach, EPA is requesting comment on supplementing the current annual standard with a community-wide 1-hour NO₂ standard in the range of 50–75 ppb. This option would not entail additional monitoring of traffic pollution, where NO₂ pollution is highest.

¹² Centers for Disease Control and Prevention. National Center for Health Statistics. National Health Interview Survey Raw Data, 2007. Analysis performed by American Lung Association Research and Program Services using SPSS and SUDAAN software.

¹³ Based on current monitoring data, only Chicago is projected to violate a 1-hour standard of 100 ppb. Phoenix, Los Angeles, Riverside, Denver, Buffalo, New York, Essex and Union County New Jersey, and Imperial County, California are the only areas projected to violate a 1-hour standard of 80 ppb, based on 2005-2007 data. Source: EPA analysis, "Design Values (Average 1-Hour 99th Percentiles over 3 Years) by County for Nitrogen Dioxide, available at: <http://www.epa.gov/air/nitrogenoxides/actions.html#jun09>

What standards did the CASAC recommend?

The Clean Air Scientific Advisory Committee, or CASAC, is a panel of expert scientists who review the scientific evidence and make recommendations on the standards to EPA. In a December 2008 letter,¹⁴ CASAC recommended that EPA:

- Establish a new 1-hour daily maximum NO₂ standard below 100 ppb.
- Link the form of the standard to the level. For instance, for a 50 ppb standard, a 98th percentile form would be acceptable. For a higher standard, a more stringent form (e.g. 99th percentile) is necessary.
- Retain the current annual average standard for NO₂ to protect children from effects on lung function growth.
- Modify monitor siting requirements to measure the highest concentrations which are found near busy roads.

What changes does the American Lung Association support?

The National Ambient Air Quality Standards must protect public health, including the health of sensitive populations, with an adequate margin of safety. Under the Clean Air Act, standards must be set based strictly on protection of public health without regard for cost, technical feasibility, estimated exposures, numbers of nonattainment areas, or other factors.

The Lung Association recommends that the EPA:

- **Establish a one-hour standard of 50 ppb or below.** A short-term standard at that level would reduce the likelihood that children with asthma would end up in the emergency room because of a serious asthma attack.
- **Establish the roadside monitoring network** to detect maximum concentrations, and keep that requirement in regardless of the level of the standard. The level of the standard must depend on what is necessary to protect human health, not on the existence of a monitoring network.
- **Strengthen the annual average standard** to protect against harm from long-term exposure. The California annual average air quality standard for NO₂ is 30 ppb, as compared to the current federal standard of 53 ppb.

What is the timeline for the proposed regulation?

EPA is on a court-ordered schedule for the review of the NO₂ standard. By January 22, 2010, EPA must issue the final rule setting the standard.

Where is more information available?

General information about NO₂ is available at:

www.epa.gov/air/nitrogenoxides/

The proposed regulation, draft Regulatory Impact Assessment, EPA maps, and briefing materials are available at:

¹⁴ See CASAC letter of December 16, 2008 at:
[http://yosemite.epa.gov/sab/sabproduct.nsf/WebCASAC/9C4A540D86BFB67A852575210074A7AE/\\$File/EPA-CASAC-09-003-unsigned.pdf](http://yosemite.epa.gov/sab/sabproduct.nsf/WebCASAC/9C4A540D86BFB67A852575210074A7AE/$File/EPA-CASAC-09-003-unsigned.pdf)

www.epa.gov/air/nitrogenoxides/actions.html

More detailed information including links to the ISA, REA, and CASAC reviews is available at:

www.epa.gov/ttn/naaqs/standards/nox/s_nox_index.html

The official docket complete with all background materials, public comments, and interagency correspondence is available at:

www.regulations.gov -- search for Docket Number: EPA-HQ-OAR-2006-0922