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Revising the National Ambient Air Quality Standard for Lead

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Summary

The Administrator of the Environmental Protection Agency (EPA), under a court order to review the National Ambient Air Quality Standard (NAAQS) for lead, announced his decision October 16, 2008, reducing the standard by 90%, from 1.5 micrograms per cubic meter ($\mu g/m^3$) to 0.15 $\mu g/m^3$.

NAAQS are standards for outdoor (ambient) air that are intended to protect public health and welfare from harmful concentrations of pollution. In strengthening the lead standard, the Administrator has concluded that protecting public health and welfare requires much lower concentrations of lead pollution in ambient air than the level previously held to be safe. Lead particles can be inhaled or ingested, and, once in the body, can cause lower IQ and effects on learning, memory, and behavior in children. In adults, lead exposure is linked to increased blood pressure, cardiovascular disease, and decreased kidney function.

Regulation of airborne lead is often described as one of the key successes of the Clean Air Act and of the Environmental Protection Agency. In 1970, when lead was widely used as a gasoline additive, emissions of lead nationwide totaled 224,100 tons. Lead was also present then in many consumer products, and thus was emitted to the air from industrial processes and waste incinerators. The phasing out of lead from gasoline, paint, and other products, as well as stricter controls on industrial emissions, reduced lead emissions 99%, to 1,300 tons in 2007.

The reduction in lead emissions and ambient concentrations led some to suggest that there was no longer a need for an ambient air quality standard for lead. Others, including the Clean Air Scientific Advisory Committee (CASAC), an independent panel of scientists who advise the EPA Administrator, concluded that the old NAAQS (established in 1978) was far too lenient, that lead in ambient air still poses a threat to public health, and that the NAAQS needed to be significantly strengthened. CASAC recommended that the standard be reduced from 1.5 $\mu g/m^3$ to no higher than 0.2 $\mu g/m^3$. In promulgating a more stringent NAAQS, the Administrator agreed with the scientists' recommendation, rejecting the argument that the standard is no longer needed.

The Administrator's decision followed a multi-year review of the science. To implement the new standard, EPA and the states will first identify nonattainment areas (expected to occur no later than January 2012), following which there will be a 5-10 year-long implementation process in which states and local governments will identify and implement measures to reduce lead in the air. EPA has also proposed expanding the monitoring network for lead. At present, at least 24 of the 50 states, including some with major sources of lead emissions, have no lead monitors at all. Under the new regulations, all 101 metropolitan areas with populations greater than 500,000 will be required to have monitors as will the estimated 135 areas that have sources of lead emissions greater than or equal to one ton per year. Whether EPA will provide funds to the states to establish the new monitoring network is an issue that Congress may be asked to address.

Contents

List of Figures

Revising the National Ambient Air Quality Standard for Lead

Introduction

On October 16, 2008, EPA Administrator Stephen Johnson announced his final approval of a more stringent National Ambient Air Quality Standard (NAAQS) for lead. The publication of the revised standard in the *Federal Register*, expected within a few weeks, is the final step in a multi-year review process. A range for the standard was proposed in the *Federal Register*, May 20, 2008, beginning a public comment period that ran through August 4. Public hearings took place on June 12 in St. Louis and Baltimore.[1]

When the previous standard for lead was promulgated in 1978, lead was a widespread air pollutant. Eighty to ninety percent of it was emitted by the nation's automobiles and trucks, a majority of which ran on leaded gasoline. Leaded gasoline was gradually phased out in the 1970s, 1980s, and early 1990s, and both emissions and concentrations of lead in the air plummeted. Emissions fell more than 98% from 1980 to 2007. Ambient concentrations (the quantity of lead in the air) fell by 94%.[2] As of March 12, 2008, only two areas with a combined population of 4,664 people had air that remained in violation of the 1978 lead NAAQS.[3]

These developments have led some to suggest that there is no longer a need for an ambient air quality standard for lead. Others, including the independent scientific advisory panel that advises EPA's Administrator, concluded that the 1978 NAAQS was far too lenient, that lead in ambient air still poses a threat to public health, and that the NAAQS needed to be significantly strengthened as the result of the current review. In promulgating a new standard, the Administrator agreed with his scientific advisers, lowering the standard to 90% below the 1978 standard.

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[1] The review was the subject of a consent decree in Missouri Coalition for the Environment v. U.S. EPA, 2005 Westlaw 2234579 (E.D. Mo. September 14, 2005).

[2] Historical data on lead emissions come from various years of EPA's *National Air Quality and Emission Trends Reports* (titles vary somewhat from year to year), which can generally be found at [http://www.epa.gov/air/airtrends/reports.html]; 2007 emissions data and ambient concentrations are from U.S. EPA, Office of Air Quality Planning and Standards, "October 2008 Final National Ambient Air Quality Standards for Lead, General Overview," pp. 6 and 8, at [http://www.epa.gov/air/lead/pdfs/20081015presentation.pdf].

[3] The two areas are East Helena, Montana, and Herculaneum, Missouri, both of which have been the site of lead smelters. The East Helena smelter closed in 2001. The Herculaneum smelter continues to operate. For additional information, see U.S. EPA, Greenbook, at [http://www.epa.gov/oar/oaqps/greenbk/lindex.html].

This report provides background on NAAQS, the process used to establish them, the factors leading to the reduction in lead emissions, the proposed and final changes to the lead standard, as well as information regarding the potential effects of the revision.

The Role of NAAQS in Improving Air Quality

What Are NAAQS? NAAQS are standards that apply to ambient (outdoor) air pollutants that exhibit two characteristics: (1) they may reasonably be anticipated to endanger public health or welfare; and (2) their presence in the air results from numerous or diverse mobile or stationary sources.[4] The Clean Air Act provides for two types of NAAQS: primary standards, "the attainment and maintenance of which in the judgment of the [EPA] Administrator ... are requisite to protect the public health," with "an adequate margin of safety"; and secondary standards, necessary to protect public welfare, a broad term that includes damage to crops, vegetation, property, building materials, etc.[5]

NAAQS are at the core of the Clean Air Act, even though they do not directly regulate emissions. In essence, they are standards that define what EPA considers to be clean air.

Implementing a NAAQS. Once a NAAQS has been set, EPA uses monitoring data and other information submitted by the states to identify areas that exceed the standard and must, therefore, reduce pollutant concentrations to achieve it. After these "nonattainment" areas are identified (which EPA estimates will occur by January 2012 at the latest for the new lead standard), state and local governments must produce State Implementation Plans outlining the measures they will implement to reduce pollution levels and attain the standards. Lead nonattainment areas will have five years after their designation to actually attain the standard, with a possible extension of five more years.

As will be noted in more detail later, most areas of the country do not monitor lead concentrations in ambient air. Thus, in addition to strengthening the lead standard, the Administrator expanded the requirements for lead monitoring. Installing the additional monitors and compiling up to three years of data to determine compliance is the main reason that implementing the new standard is likely to be a lengthy process.

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[4] Authority to establish NAAQS comes from both Sections 108 and 109 of the act (42 U.S.C. 7408 and 7409); this definition of criteria pollutants is found in Section 108. The authority and procedures for controlling the sources of criteria pollutants are found throughout Titles I, II, and IV of the act. Pollutants that are less widely emitted are generally classified as "hazardous air pollutants" and are regulated under a different section of the act (Section 112).

[5] The Clean Air Act's definition of welfare is found in Section 302(h) of the act (42 U.S.C. 7602(h)).

Other Pollution Control Measures. In addition to requiring states to submit implementation plans, EPA also acts to control many of the NAAQS pollutants wherever they are emitted, through national standards for products that might emit them (particularly fuels) and through emission standards for new stationary sources (e.g., lead smelters).

The NAAQS Review Process

Schedule for Review. The Clean Air Act requires the agency to review each NAAQS every five years. That schedule is rarely met, but it often triggers lawsuits that force the agency to undertake a review. In the case of lead, the last review of the NAAQS was completed in 1978.[6] The Missouri Coalition for the Environment and others filed suit against EPA over its failure to complete a review in 2004, and a consent decree established the schedule EPA followed in reviewing the standard.[7] The schedule required EPA to propose any revision of the standard by May 1, 2008, and to promulgate a final decision by October 15, 2008.

How the Process Works. Reviewing an existing NAAQS is a long process.[8] As a first step, EPA scientists review the scientific literature published since the last NAAQS revision, and summarize it in a report known as a Criteria Document or Integrated Science Assessment. Generally, there are hundreds or thousands of scientific documents reviewed, covering such subjects as environmental concentrations, human exposure, toxicology, animal studies and animal-to-human extrapolation, epidemiology, effects on vegetation and ecosystems, and effects on man-made materials.[9] A second document that EPA prepares, the Staff Paper or Policy Assessment, summarizes the information compiled in the Criteria Document and provides the Administrator with options regarding the indicators, averaging times, statistical form, and numerical level (concentration) of the NAAQS.

To ensure that these reviews meet the highest scientific standards, the 1977 amendments to the Clean Air Act required the Administrator to appoint an independent Clean Air Scientific Advisory Committee (CASAC). CASAC has seven members, largely from academia and from private research institutions. In conducting NAAQS reviews, their expertise is supplemented by panels of the nation's leading experts on the health and environmental effects of the specific pollutant or pollutants under review. These panels can be quite large. The current lead review panel has 15 members, in addition to the 7 statutory members of CASAC. CASAC and the public make suggestions regarding the membership of the

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[6] 43 *Federal Register* 46246, October 5, 1978.

[7] As mentioned earlier, the schedule was set by the consent decree in Missouri Coalition for the Environment v. U.S. EPA, 2005 Westlaw 2234579 (E.D. Mo. September 14, 2005).

[8] For a discussion of the process, and of changes to the process that EPA is now implementing, see CRS Report RL33807, *Air Quality Standards and Sound Science: What Role for CASAC?*, by James E. McCarthy.

[9] EPA indicates that more than 6,000 new studies on lead health effects, environmental effects, and lead in the air have been published since 1990.

panels on specific pollutants, with the final selections made by EPA. The panels review the agency's work during NAAQS-setting and NAAQS-revision, rather than conducting their own independent reviews.

Adding or Deleting NAAQS Pollutants. The pollutants to which NAAQS apply are generally referred to as "criteria" pollutants. Six pollutants are currently identified as criteria pollutants: ozone, particulates, carbon monoxide, sulfur dioxide, nitrogen oxides, and lead. The EPA Administrator can add to this list if he determines that additional pollutants meet the act's criteria (endangerment of public health or welfare, and numerous or diverse sources); he can delete them if he concludes that they no longer do so. Whether lead still met these criteria was one of the issues EPA considered in its review of the standard.

Lead Emission Reduction: Success, but Not Generally Due to NAAQS

The reduction of lead emissions is often described as one of the key successes of the Clean Air Act and of the Environmental Protection Agency. In 1970, emissions of lead totaled 224,100 tons. By 2007, emissions had been reduced 99%, to 1,300 tons.[10]

Little of that success is attributable to the setting of a NAAQS, however. The agency did not set a NAAQS for lead until 1978 (by which time lead emissions had already declined about 40%), and it established the NAAQS then only as a result of a lawsuit filed by the Natural Resources Defense Council and others.[11] After promulgating the NAAQS, the agency did not identify nonattainment areas until 1991. The great bulk of the lead reductions "occurred prior to 1990," according to EPA.[12] So, in general, the reduction of lead in ambient air did not come about as a result of the 1978 NAAQS, or in the manner prescribed by Title I of the Clean Air Act, wherein nonattainment areas are identified and the states or areas in which they are located submit to EPA State Implementation Plans that identify local and national measures that will be implemented to help such areas reach attainment.

Most of the reduction was a side-benefit of other Clean Air Act programs, especially the regulation of emissions from new automobiles, beginning in the 1970s. In order to meet more stringent requirements for emissions of hydrocarbons, nitrogen oxides, and carbon monoxide, which took effect in 1975, the auto industry installed catalytic converters on new cars. Gasoline with lead additives would have fouled the

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[10] U.S. EPA, *National Air Quality and Emission Trends Reports*, and October 2008 NAAQS General Overview, both cited previously.

[11] NRDC v. Train, 411 F. Supp. 864 (S.D.N.Y. 1976) aff'd., 545 F. 2d 320 (2d Cir. 1976). EPA was ordered to list lead as a criteria pollutant and to develop NAAQS. The agency listed lead March 31, 1976, and on October 5, 1978, established a NAAQS for lead.

[12] U.S. EPA, *Review of the National Ambient Air Quality Standard for Lead: Policy Assessment of Scientific and Technical Information, OAQPS Staff Paper*, November 2007, p. 2-5, at [http://www.epa.gov/ttnnaaqs/standards/pb/data/20071101_pb_staff.pdf].

catalytic converters, rendering them useless; so, in anticipation of the converters' widespread adoption, EPA mandated the sale of unleaded fuel in the early 1970s, and eventually banned the use of lead in gasoline entirely.

Being a metal, lead remains in the environment even though emissions have declined. Thus, although human exposure to lead has declined, it has not done so by as much as the decrease in emissions would suggest.[13] Furthermore, research conducted since the 1970s suggests that lead has significant health impacts at levels well below those previously considered safe.

Current sources of emissions include utility and other boilers, leaded fuel still used in some general aviation airplanes, trace lead contaminants in diesel fuel and gasoline, lubricating oil, iron and steel foundries, primary and secondary lead smelters, hazardous waste incinerators, and about 30 smaller categories of sources.[14] In addition, there continues to be exposure from lead particles in soil or dust re-suspended in the atmosphere as a result of vehicular traffic, construction, agricultural operations, and the wind.[15]

EPA's New Lead NAAQS

EPA has decided to deal with the remaining issue of lead in ambient air by both strengthening the lead NAAQS and by expanding the network of monitors that are used to measure attainment.

The Primary Standard. The primary (health-based) standard, promulgated in 1978, has been 1.5 micrograms per cubic meter ($\mu g/m^3$) averaged over three months. With the exception of two small areas (one in Montana, one in Missouri), the United States has attained this standard, but the current review found evidence of health effects at the levels of exposure currently experienced by much of the U.S. population. The Staff Paper reported "significant associations between Pb [lead] exposures and a broad range of health effects," including, in children, neurological effects, notably intellectual attainment, attention, and school performance, with "long-term consequences over a lifetime."[16] The Staff Paper also reported effects on the immune system, with "increased risk for autoimmunity and asthma."[17] In adults, the Staff Paper found associations between lead exposure and "increased risk of adverse cardiovascular outcomes, including increased blood pressure and incidence

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[13] The supporting documentation for the new standard states that the median concentration of lead in children's blood dropped 89%, from 15 micrograms per deciliter (µg/dL) in the late 1970s to 1.6 µg/dL in 2003-2004. See October 2008 NAAQS General Overview, previously cited, p. 7.

[14] *OAQPS Staff Paper*, previously cited, Table 2-2, p. 2-7.

[15] Ibid., p. 2-10.

[16] Ibid., p. 3-22.

[17] Ibid.

of hypertension, as well as cardiovascular mortality."[18] Lead exposure also was associated with reduced kidney function, with adverse impacts enhanced in those with diabetes, hypertension, and chronic renal insufficiency.

As a result, both EPA staff and the CASAC recommended strengthening the NAAQS. According to the Staff Paper:

> Staff concludes that it is appropriate for the Administrator to consider an appreciable reduction in the level of the standard, reflecting our judgment that a standard appreciably lower than the current standard could provide an appropriate degree of public health protection and would likely result in important improvements in protecting the health of sensitive groups. We recommend that consideration be given to a range of standard levels from approximately 0.1-0.2 $\mu g/m^3$ (particularly in conjunction with a monthly averaging time) down to the lower levels included in the exposure and risk assessment, 0.02 to 0.05 $\mu g/m^3$.[19]

CASAC concurred, stating in a January 22, 2008 letter that it "... unanimously affirms EPA staff's recognition of the need to substantially lower the level of the primary NAAQS for Lead, to an upper bound of no higher than 0.2 $\mu g/m^3$ ...."[20]

The Administrator agreed that the primary NAAQS should be substantially lowered, choosing a level of 0.15 $\mu g/m^3$.

The Administrator also proposed two options for revising the averaging time and form used to determine whether an area meets the standard. Instead of the former not-to-be-exceeded form, based on quarterly (3-month) averages of lead concentrations, the proposal would have either revised the current averaging form to clarify that it applies across a three-year span (i.e., to demonstrate attainment, an area would need to show quarterly readings lower than the standard for 12 consecutive quarters); or the proposal would revise the measure to the second highest monthly average in a three-year span. According to agency staff, this latter form would better capture short-term increases in lead exposure, while allowing the average from one bad month (perhaps resulting from unusual meteorological conditions) to be disregarded. The agency noted that "control programs to reduce quarterly mean concentrations may not have the same protective effect as control programs aimed at reducing concentrations in every individual month."[21]

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[18] Ibid.

[19] Ibid., pp. 5-44 to 5-45.

[20] "Clean Air Scientific Advisory Committee's Review of the Advance Notice of Proposed Rulemaking (ANPR) for the NAAQS for Lead," Letter of Dr. Rogene Henderson, Chair, CASAC, to Hon. Stephen L. Johnson, Administrator, U.S. EPA, January 22, 2008, p. 5, at [http://yosemite.epa.gov/sab/sabproduct.nsf/427DE71C7D43AFDC852573D8006FB5BC/$File/EPA-CASAC-08-007-unsigned.pdf].

[21] U.S. EPA, National Ambient Air Quality Standards for Lead, Proposed Rule, 73 *Federal Register* 29236, May 20, 2008.

CASAC also recommended that consideration be given to changing from the calendar quarter to the monthly averaging time. In making that recommendation, CASAC emphasized support from studies suggesting that blood lead concentrations respond at shorter time scales than would be captured completely by quarterly values.[22]

The Administrator chose neither of these options. Instead, the agency will use a rolling three-month average, evaluated over a three-year period: any three-month average exceeding the standard will be considered a violation of the NAAQS. For a nonattainment area to be subsequently redesignated to "attainment," the area would have to have three years of rolling three-month averages that met the standard. This is somewhat more stringent than the previous averaging time (calendar quarters), but not as protective as the second highest monthly average would have been.

As shown in **Figure 1**, 17 counties have monitors showing nonattainment using the new standard. (By comparison, only portions of two counties violate the old standard.) As will be discussed in more detail below, less than 3% of the nation's counties have active lead monitors. Thus, more counties may be found in nonattainment once the monitoring network is expanded.

The Secondary Standard. As part of its current review, EPA also assessed the secondary (public welfare) NAAQS for lead. The secondary standard has been identical to the primary standard. The agency concluded that:

> A significant number of new studies have been conducted since 1978 that associate lead pollution with adverse effects on organisms and ecosystems. However, there is a lack of evidence linking various effects to specific levels of lead in the air.[23]

Lacking such evidence, the Administrator continued the practice of making the secondary standard identical to the primary standard.

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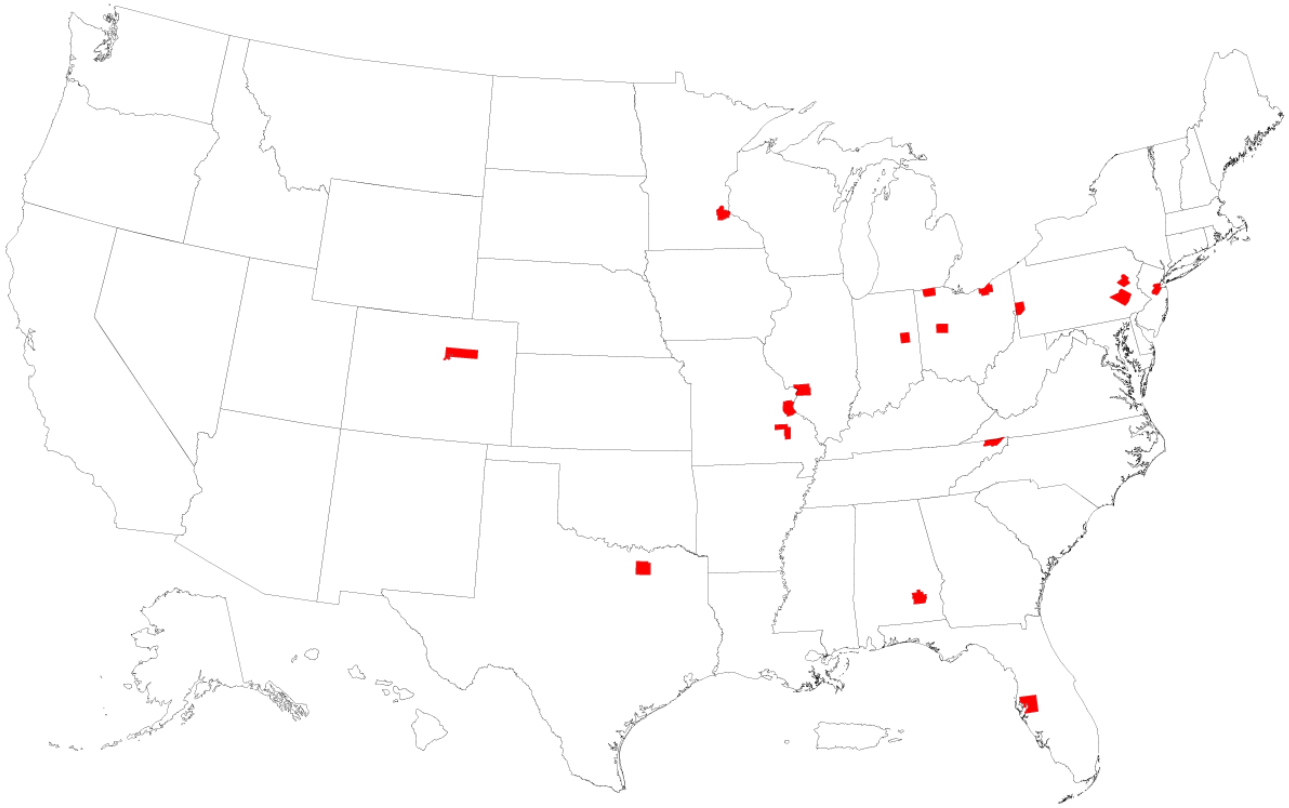
[22] Ibid.

[23] U.S. EPA, "Fact Sheet: Proposed Revisions to the National Ambient Air Quality Standards for Lead," p. 3 at [http://www.epa.gov/air/lead/pdfs/20080501_factsheet.pdf].

Figure 1. Counties with Monitors Violating the 2008 Lead Standard of 0.15 micrograms per cubic meter (µg/m^3)



Notes

1. 18 of 111 monitored counties violate the 2008 lead standard of 0.15 micrograms per cubic meter (µg/m³) measured as total suspended particulate matter (TSP).
2. These estimates are based on the most recent air quality data available (2005– 2007). EPA will not designate areas based on these data, but likely on data from 2007-2009 or 2008-2010.
3. The existing monitoring network for lead is not sufficient to determine whether many areas of the country would meet the revised standards of 0.15 µg/m3. EPA is re-designing the national lead monitoring network to allow assessment of compliance with the revised standards.
4. Monitored air quality data is available from the Air Quality System at http://www.epa.gov/ttn/airs/airsaqs/

Source: U.S. EPA.

Expanding the Lead Monitoring Network. Besides finding that the 1978 NAAQS is inadequate to protect public health and welfare, EPA's review concluded that "[t]he current monitoring network is inadequate to assess national compliance with the proposed revised lead standards."[24] Only 70 of the roughly 3,000 counties in the United States (2.3%) have active lead monitors, leaving many areas of the country without any means of determining whether they are in violation of the lead NAAQS.[25] Twenty-four entire states, including some with major sources of lead emissions, have no lead monitors.[26]

Under the old (1978) standard, this was not much of an issue. There were, at one time, about 900 lead monitors in operation; but, as lead emissions decreased and as the monitors showed consistent attainment of the standards, many of the monitors were shut down or removed. With a substantially more stringent standard, however, it cannot be assumed that areas without monitors are still in attainment.

The locations of monitors and of the major sources of lead emissions are shown in **Figure 2**. The figure shows that large sources of emissions in Alaska, Arizona, Arkansas, Florida, Illinois, Indiana, Iowa, Kansas, Michigan, Mississippi, Nebraska, New York, Oklahoma, Tennessee, Texas, Utah, Virginia, Wisconsin, and other states appear to be located more than 100 miles from the nearest ambient monitor.

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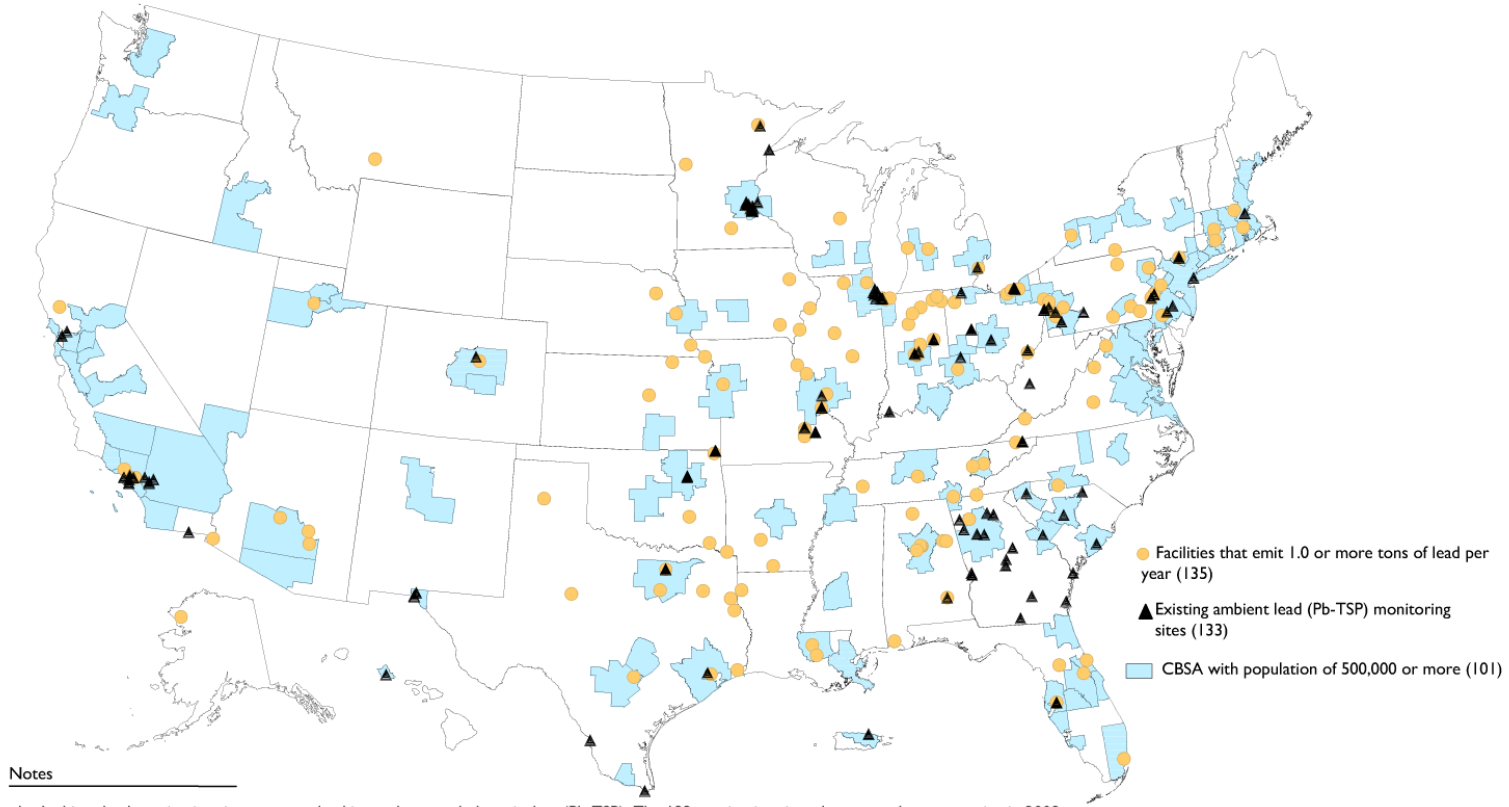
[24] U.S. EPA, "May 2008 Proposal, National Ambient Air Quality Standards for Lead, General Overview," Text Slides, at [http://www.epa.gov/air/lead/pdfs/20080501_text1.pdf], p. 17.

[25] In the support documents for the proposed and final NAAQS, EPA provided several different estimates of the number of counties with active monitors, ranging from 86 to 111. Further communication with the Office of Air Quality Planning and Standards produced a final estimate of 70 counties with a total of 133 active monitors. The reason for the discrepancies is that there are a number of counties that have (or had) monitors that were switched off after years of showing attainment with the 1978 NAAQS. In these cases, there may be data for older time periods, but the agency does not know with certainty whether the areas would be in attainment of the new standard. Personal communication, October 23, 2008.

[26] In support of the lead NAAQS proposal, EPA produced a map of the United States showing the locations of lead monitors and of sources emitting more than 5 tons of lead per year. The map showed that several of the states without monitors have large sources of lead emissions. Arkansas, for example, has two of the 12 largest stationary sources of lead in the United States (those with lead emissions exceeding 5 tons per year), but no ambient lead monitors. Montana, which has one of the two nonattainment areas for the 1978 lead standard, also has no ambient lead monitors. Similarly, large sources in Oklahoma, the Texas panhandle, and other locations appear to be located more than 100 miles from the nearest ambient monitor. Additional data on monitor locations, confirming that 24 states have no monitors, was provided by EPA's Office of Air Quality Planning and Standards, May 6, 2008. See also "EPA to Seek Comment on Increasing Air Monitors as Part of Lead Rulemaking," Daily Environment Report, November 29, 2007, p. A-10.

Figure 2. Locations of Current Ambient Lead Monitors, Largest Stationary Sources of Lead Emissions, and Metropolitan Areas with Populations of 500,000 or More



Notes

1. Ambient lead monitoring sites measure lead in total suspended particulate (Pb-TSP). The 133 monitoring sites shown are those operating in 2008.
2. The current monitoring network for lead is not sufficient to determine whether many areas of the country would meet the 2008 lead standards. EPA is re-designing the nation's lead monitoring network to allow assessment of compliance with the revised standard. EPA is requiring Pb-TSP monitors in areas near lead sources with emissions greater than or equal to 1.0 ton per year, and a monitor in every urban area with population of 500,000 or greater.
3. The emissions estimates used to develop this map are based on EPA's 2002 National Emission Inventory (NEI) with modifications documented in Tom Pace's 05/01/08 memorandum and Marion Hoyer's 05/12/08 and 05/14/08 memoranda to the docket.

Source: U.S. EPA.

To address this shortfall, EPA proposed — in addition to the revised lead NAAQS — to require monitors near all sources of lead that exceed a threshold of between 200 and 600 kilograms (441 to 1,323 pounds) of emissions per year. The agency also proposed to require a small network of monitors to be placed in urban areas with populations greater than one million to gather information on the general population's exposure to lead in the air.

In the final rule, the Administrator chose thresholds different than proposed: he set the source threshold at one ton of emissions rather than 200-600 kilograms, and required monitors in urban areas with populations of 500,000 or more rather than one million. The final choice appears to have reflected concerns by industry groups, including the Battery Council International, who argued that emphasis should be placed more on exposure-oriented monitoring than on specific sources of emissions.[27] According to press reports, the White House Office of Management and Budget weighed in at the last minute in support of the change in emphasis.[28]

The states remain free to install more monitors than EPA requires, if they believe that the effects of industrial sources with less than one ton of emissions should be monitored; but finding the money to do so may be difficult at a time when many of the states are experiencing a shortage of revenues. EPA estimates the initial cost of the required network at $4.5 million, and the operational costs at $3.5 million annually. Even finding this amount may pose challenges in some states, potentially causing delays in implementation of the new standard.

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[27] See, for example, "Industry Says Urban Monitoring Key to Final EPA Lead NAAQS Decision," *Inside EPA Clean Air Report*, October 2, 2008. The results of the new monitoring may indicate which of the categories of monitor locations is more likely to detect nonattainment, and whether further changes in emphasis are warranted. EPA emissions data indicate that about 55% of lead emissions come from point sources, with the remaining 45% coming primarily from aviation gasoline (see October 2008 NAAQS General Overview, previously cited, p. 9). Emissions from the latter category might correlate with areas that have general aviation airports, or, more broadly, urban areas.

[28] According to OMB Watch, a draft of the rule attached to an October 13, 2008 e-mail from EPA to OMB stated that the emissions threshold would be set at 0.5 tons per year and the urban area cutoff at one million. (The draft is available at [http://www.ombwatch.org/regs/PDFs/half-ton_excerpt.pdf].) In changing the emissions threshold to 1 ton per year, as many as 124 areas with sources emitting between 0.5 tons and 1 ton per year were exempted from required monitoring. In changing the urban area threshold, on the other hand, 49 areas were added. Thus, overall, 75 fewer areas were required to monitor as a result of the changes. See"EPA to Reduce Airborne Lead," *OMB Watch*, October 21, 2008, at [http://www.ombwatch.org/article/articleview/4390].

Issues Raised by the NAAQS Review

Perhaps the two largest issues raised during the lead NAAQS review process — whether a NAAQS was still needed, and whether the Administrator's proposed range of standards reflected the scientific advice he received — have now been resolved, with little remaining controversy. CASAC and EPA staff both concluded that airborne lead still meets the NAAQS criteria (endangerment of public health or welfare, and numerous or diverse sources). Rather than support the deletion of lead from the list of criteria pollutants, they concluded that lead in ambient air still poses a threat to public health, that the old NAAQS (established in 1978) was far too lenient, and that the 1978 NAAQS needed to be significantly strengthened.[29] The Administrator agreed.

A second major issue was whether the proposed range of standards (as opposed to the final, promulgated version) was supported by the available science. The range proposed by the Administrator, while substantially stronger than the 1978 standard, would have allowed him to set a final NAAQS 50% higher (i.e., less stringent) than the least stringent level recommended by both EPA's scientific staff and by the independent CASAC panel. Given uncertainties in the science (particularly the estimated correlation between airborne lead and blood lead levels and the uncertainties in the concentration-response functions — i.e., the effect that changes in blood lead levels have on IQ), the Administrator stated in the May 2008 proposal that his decision would be supported by the science at any point in the proposed range of 0.10 to 0.30 $\mu g/m^3$.[30]

His final choice (0.15 $\mu g/m^3$) fell within the range recommended by EPA staff and CASAC, and, thus, appears less likely to provoke controversy. At that level, the standard is supported by the staff's conclusions, which were themselves based on the review of more than 6,000 scientific studies, and by the unanimous conclusions of the 22-member CASAC review panel.

There are, of course, some who wanted weaker or stronger standards. In comments on the proposed range, some commenters expressed disappointment that the Administrator did not consider the potential economic impacts in making his choice.[31] These comments were echoed by the Association of Battery Recyclers (ABR), following the Administrator's decision: in press reports, an ABR representative stated that the new standard "potentially threatens the viability of the

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[29] EPA staff conclusions are found in the Office of Air Quality Planning and Standards Staff Paper at [http://www.epa.gov/ttn/naaqs/standards/pb/data/20071101_pb_staff.pdf]. See especially pp. 5-43 to 5-45. CASAC's conclusions can be found in a March 27, 2007 letter from its Chair, Dr. Rogene Henderson, to Administrator Johnson, at [http://yosemite.epa.gov/sab/sabproduct.nsf/989B57DCD436111B852572AC0079DA8A/$File/casac-07-003.pdf].

[30] U.S. EPA, National Ambient Air Quality Standards for Lead, Proposed Rule, 73 Federal Register 29243, May 20, 2008.

[31] See, for example, "Environmentalists Push New Lead Standard; Industry Warns of Consequences for Business," *Daily Environment Report*, August 28, 2008.

lead recycling industry."[32] The Clean Air Act does not allow the consideration of costs or economic impacts in the setting of NAAQS, however — a point underlined by the Supreme Court in a unanimous 2001 decision,[33] and repeated by the agency in announcing the final decision. Thus, the Administrator appears to have been on firm ground in rejecting economic arguments.

Others, including EPA's Children's Health Protection Advisory Committee (CHPAC), argued for a stronger standard.[34] CHPAC cited evidence that lead exposure at low levels poses even greater harm per unit of lead than does exposure at higher levels, and argued that the standard should be set at 0.02 $\mu g/m^3$, almost an order of magnitude below the Administrator's final choice.[35]

Despite that recommendation, criticism has been muted in the wake of the Administrator's decision, with most environmental groups expressing support. A typical reaction was that of Dr. John Balbus, a member of CHPAC and the Chief Health Scientist on the staff of the Environmental Defense Fund: "While EPA's own analysis justifies an even lower lead standard, this tenfold reduction will go a long way to protecting children most at risk from airborne lead.... It's refreshing to see the agency follow the science and the advice of its experts in making this decision."[36]

Costs and Benefits of the New Standard

Although the Administrator is prohibited from taking costs or economic factors into consideration in setting a NAAQS,[37] the agency generally does prepare a Regulatory Impact Analysis (RIA) for information purposes, and to comply with an executive order.[38] The RIA analyzes in detail the costs and benefits of new or revised

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[32] Robert N. Steinwurtzel, a lawyer for the Association of Battery Recyclers, as cited in a "E.P.A. Toughens Standard on Lead Emissions; Change Is the First in 3 Decades," New York Times, October 17, 2008.

[33] Whitman v. American Trucking Associations, 121 S. Ct. 903 (2001).

[34] EPA's Children's Health Protection Advisory Committee (CHPAC) is a body of researchers, academicians, health care providers, environmentalists, children's advocates, professionals, government employees, and members of the public who advise EPA on regulations, research, and communication issues relevant to children.

[35] Letter of Melanie A. Marty, Chair, Children's Health Protection Advisory Committee, to EPA Administrator Johnson, June 16, 2008, re Proposed Rulemaking for the NAAQS for Lead, at [http://yosemite.epa.gov/ochp/ochpweb.nsf/content/61608.htm/$file/61608.pdf].

[36] Environmental Defense Fund, "New EPA Lead Standard Significantly Improved to Protect Kids' Health," Press Release, October 16, 2008, at [http://www.edf.org/pressrelease.cfm?contentID=8688].

[37] Although costs can't be considered in setting the NAAQS, costs *can* be considered by the states in developing their State Implementation Plans, i.e., the regulations by which they will bring nonattainment areas into attainment.

[38] Executive Order 12866 and OMB Circular A-4 require regulatory agencies to assess the (continued...)

NAAQS standards. The agency released an RIA for the final lead standard as part of the final regulatory package, October 16, 2008.

The RIA presented a range of both costs and benefits from the new standard, assuming full implementation of control measures in 2016. Both the cost and benefit ranges were large, and EPA stressed that "there are important overall data limitations and uncertainties in these estimates."[39] In general, costs and benefits may be understated, because the study developed estimates only for the 17 counties that currently have monitors showing nonattainment. Until new monitors are installed, the agency has no way of estimating how many additional areas will be affected by the standard, but the RIA emphasizes that "... there may be many more potential nonattainment areas than have been analyzed in this RIA."[40]

Costs. The cost estimates ranged from $150 million annually in 2016 to as much as $2.8 billion, 19 times as much. The difference is attributable to EPA's inability to demonstrate attainment of the standard in all areas through the application of identified control technologies. The RIA states:

> For the selected standard of 0.15 $\mu g/m^3$, over 94% of the estimated emission reductions needed for attainment are achieved through application of identified controls, and less than 6% through unspecified emission reductions. Identified point source controls include known measures for known sources that may be implemented to attain the selected standard, whereas the achievement of unspecified emission reductions requires implementation of hypothetical additional measures in areas that would not attain the selected standard following the implementation of identified controls to known sources.[41]

The known controls are estimated to cost $130 million to $150 million annually, depending on the discount rate chosen. But the unspecified emission controls are estimated at from $20 million to $3.1 billion annually depending on the methodology used.

A key feature of EPA's analysis is that it assumed all emission reductions would come from controls on *point source* emissions (e.g., smelters, foundries, incinerators, etc.). But, according to the agency, 45% of emissions come from aviation fuel. In October 2006, EPA received a petition from Friends of the Earth to reduce or

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[38] (...continued)
benefits and costs of selected regulatory options, as well as one less stringent and one more stringent option. OMB Circular A-4 also requires both a benefit-cost, and a cost-effectiveness analysis for rules where health is the primary effect. The RIA for the Lead NAAQS can be found at [http://www.epa.gov/ttn/ecas/regdata/RIAs/finalpbria.pdf].

[39] U.S. EPA, Office of Air Quality Planning and Standards, *Regulatory Impact Analysis of the Proposed Revisions to the National Ambient Air Quality Standards for Lead* (hereafter, "RIA"), at [http://www.epa.gov/ttn/ecas/regdata/RIAs/finalpbria.pdf], p. ES-1.

[40] RIA, p. 7-1.

[41] RIA, p. 6-1.

eliminate lead from aviation gasoline.[42] The agency, in coordination with the Federal Aviation Administration (FAA), is analyzing the petition. The RIA does not address the costs or benefits of such a step.

In addition, the agency notes:

> ...in this RIA we have not accounted for the effect of improvements that tend to occur, such as technology improvement, process changes, efficiency improvements, materials substitution, etc. We believe these typical improvements will tend to result in more cost effective approaches than simply adding extremely expensive pollution controls in many areas by the attainment date of 2016. Many industrial sources of lead emissions emit very small quantities of lead in absolute terms. Our cost modeling shows that some could face significant costs to reduce these low levels of lead, costs which could be prohibitively expensive. Rather than applying additional controls, it may be possible for firms emitting small amounts of Pb [lead] to modify their production processes or other operational parameters, including pollution prevention techniques, which would be more cost effective than adding additional control technology. Such measures might include increasing the enclosure of buildings, increasing air flow in hoods, modifying operation and maintenance procedures, changing feed materials to lower Pb content, measures to suppress dust from tailings piles, etc.[43]

Benefits. The RIA estimates that benefits of the NAAQS will range from $3.7 billion to $6.9 billion annually in 2016 — and, thus, that benefits will outweigh costs at all points in the estimated range. The benefits mostly represent the expected increase in lifetime earnings that would result from children under seven years of age avoiding IQ loss due to exposure to lead. The RIA focuses primarily on children's health effects. It does not attempt to estimate the changes in lead-related health effects among adults. Unquantified health effects include:

- Hypertension
- Non-fatal coronary heart disease
- Non-fatal strokes
- Premature mortality
- Other cardiovascular diseases
- Neurobehavioral function
- Renal effects
- Reproductive effects
- Fetal effects from maternal exposure (including diminished IQ).[44]

It is beyond the agency's capability, at present, to quantify these effects. Thus, the benefits, just like the costs, are subject to substantial uncertainty.

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[42] For the petition, and additional information, see [http://www.epa.gov/otaq/aviation.htm].

[43] RIA, p. ES-4.

[44] RIA, Chapter 5, pp. 1-14.

Issues for Congress

The lead NAAQS appears to be less controversial than the recent NAAQS decisions on ozone and particulate matter, both of which are being challenged in the D.C. Circuit Court of Appeals;[45] but, given the importance of its potential health benefits and the uncertainties regarding both the number of areas affected and the means by which areas will reach attainment, implementation of the NAAQS may continue to be of interest to the committees of jurisdiction in Congress.

An immediate issue will be whether state governments, at a time of fiscal crisis, can find the resources to implement the monitoring network required by the new standard, without which it will not be implemented in many areas expected to be in violation. EPA estimates the initial cost of this network at $4.5 million, and the operational costs at $3.5 million annually. EPA has, in the past, requested funds for the establishment of a monitoring network when a new NAAQS was promulgated. In the current fiscal year, however, the agency — like most of the government — is operating under a continuing resolution that limits its ability to take on new programs. Thus, the states may be left to establish the monitoring network with their own resources, and in some cases, there may be delays in implementation.

[45] For additional information on those rules, see CRS Report RL34057, *Ozone Air Quality Standards: EPA's March 2008 Revision*, and CRS Report RL33254, *Air Quality: EPA's 2006 Changes to the Particulate Matter (PM) Standard*.