Lead in Drinking Water: Washington, DC, Issues and Broader Regulatory Implications

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Summary

Lead from various sources poses a key environmental threat to children's health, and the regulation of lead in drinking water has been a key component of federal efforts to reduce exposures to lead. Lead contamination of drinking water became a major issue in Washington, DC, in 2004, when news reports revealed marked increases in the levels of lead in tap water. The local water authority's failure to effectively inform the public about the high lead levels angered citizens and damaged public trust in the local water supply. These events led policy makers to examine the adequacy of the Environmental Protection Agency's (EPA's) lead in drinking water rule, including the rule's monitoring and public notification requirements, and EPA and state enforcement of the rule. Oversight hearings were held on these issues during the 108th Congress, and legislation to strengthen lead regulation was offered but not enacted. This report reviews issues surrounding the elevated lead levels in DC drinking water and actions to address this problem. More broadly, it discusses the lead regulatory framework, and EPA's national review of the rule and its implementation to determine whether the situation in Washington, DC, denotes a wider problem in need of a broader response. This report will be updated to reflect developments.

Contents

Contacts

Overview

In January 2004, the *Washington Post* reported that the DC Water and Sewer Authority (WASA) had found elevated lead levels in the drinking water of more than 4,000 homes in Washington, DC, during testing done in 2003.[1] Subsequently, water suppliers, local officials, and regulators have undertaken numerous actions intended to respond to citizens' concerns; to abate further exposures to lead from tap water; to identify the cause of the problem; and, ultimately, to reduce the occurrence of lead in DC's water and assess whether similar problems are occurring in other cities.

National Review

To determine whether the problem in Washington, DC, is more widespread and to evaluate the effectiveness of the lead rule, EPA has undertaken a national review of lead monitoring conducted by water systems from 2000 through 2003. As of June 2004, EPA had received monitoring data for 744 (89%) of the 834 systems that serve more than 50,000 persons. EPA reported that 27 (3.6%) of these systems exceeded the action level of 15 parts per billion (ppb) at least once since 2000, and that 12 of 316 systems reported exceeding the action level during the monitoring period ending after January 2003.[2] (These 12 systems serve a total population of 5.2 million people.) Among all systems serving more than 50,000 persons, 66% reported that the highest level observed during any monitoring period since 2000 was less than 5 ppb. EPA also received data for 6,678 (91%) of 7,833 systems that serve from 3,300 to 50,000 people. Of these systems, 237 (3.4%) reported exceeding the action level at least once since 2000, and 76 systems (serving a total population of 5.2 million) reported exceeding the level for a monitoring period ending after January 2003. In this size category, 71% of systems reported that the highest level observed since 2000 was less than 5 ppb.[3] In each size category, 1% of water systems reported exceeding 25 ppb.

Last autumn, news reports of possible manipulation of lead monitoring data by some systems to avoid noncompliance with the lead rule raised concern that a larger number of systems may have exceeded the action level. In response, several Members of Congress asked the EPA Inspector General to examine the adequacy of enforcement of the lead rule, and to determine whether elements of the rule allow data manipulation so that systems remain in compliance. EPA announced that if utilities have violated the law by providing false or misleading data, EPA or the state would take appropriate enforcement actions.[4] However, in its evaluation of the rule and monitoring concerns, EPA did determine that systems needed more guidance for collecting samples and calculating the lead 90th percentile to determine compliance with the rule. In November, EPA issued a memorandum clarifying these requirements. The guidance reflects requirements of the lead rule as currently written and may be modified if EPA decides to revise the rule.

[1] "Water in D.C. Exceeds EPA Lead Limit," Washington Post, January 31, 2004, pp. A1, A11.

[2] EPA's 1991 lead rule required community water systems to conduct initial monitoring by December 1992. The results of the first round of monitoring for systems serving more than 50,000 persons showed that 130 of 660 systems exceeded the lead action level of 15 ppb.

[3] For information on lead action level exceedances for water systems serving populations of 3,300 or more, see http://www.epa.gov/safewater/lcrmr/lead_data.html, visited January 6, 2005.

[4] U.S. Environmental Protection Agency, Agency Statement: Drinking Water and Lead, Oct. 6, 2004.

Health Effects of Lead

Lead exposure is considered a major environmental health threat to young children, because lead affects their developing nervous systems and intellectual and behavioral development. Fetuses and children under six years of age are most at risk. In 1991, the Centers for Disease Control (CDC) adopted a blood lead level of concern for children of 10 micrograms per deciliter (μg/dl) in response to evidence associating adverse health effects with blood lead levels above that level. Recent studies indicate that blood lead levels below 10 μg/dl also may be associated with negative effects on children's intellectual development.[5] In adults, lead may increase blood pressure.

Sources of Lead Exposure

Lead is widespread in the environment and can be found in older homes with leaded paint, and in soil, plumbing materials, pottery glazes, pewter, and elsewhere. The main source of lead exposure for children is house dust from lead-based paint; exposure to small amounts of paint dust and flakes can elevate blood lead levels. Another major source is soil contaminated by lead-based paint and past vehicle and industrial emissions.[6] EPA estimates that 10% to 20% of exposure to lead may come from drinking water, but notes that infants who consume mostly mixed formula can receive 40% to 60% of their lead from water if lead levels are elevated in tap water.[7]

Lead is rarely present in water when it leaves a treatment plant. The most common sources of lead in water are lead service lines that connect water mains to homes, lead solder and pipes within homes, and brass plumbing fixtures. Although older homes are most likely to have lead pipes, joints, and solder, new homes may also be at risk, because under the Safe Drinking Water Act, "lead-free" pipes may contain up to 8% lead. These pipes can leach lead for several months following installation. The most common cause of lead in drinking water is corrosion, a reaction between the lead pipes or solder and the water. The corrosivity of water depends on the water's characteristics (such as acidity).

EPA's 1991 Lead and Copper Rule

The Safe Drinking Water Act (SDWA) directs EPA to promulgate National Primary Drinking Water Regulations for contaminants that may pose public health risks and that are likely to be present in public water supplies. These regulations generally include an enforceable numerical standard (maximum contaminant level (MCL)) to limit the amount of a contaminant that may be present in drinking water. If it is not economically and technically feasible to determine the level of a contaminant, EPA may establish a treatment technique in lieu of an MCL (§1412(b)(7)(A)).

[5] R. Canfield et al., "Intellectual Impairment in Children with Blood Lead Concentrations below 10 μg per Deciliter," New England Journal of Medicine, April 17, 2003, v. 348, no. 16, p. 1517.

[6] In 1971, Congress passed the Lead-Based Paint Poisoning Prevention Act, which limited lead in interior paint starting in 1978. In 1973, EPA issued a regulation phasing out lead in gasoline. Since these actions, average blood lead levels (BLLs) in children have declined markedly. According to the CDC, for the period 1976-1980, 88% of children aged 1 through 5 were estimated to have BLLs greater than 10 μg/dl; by 1999-2000, this estimate declined to about 2%.

[7] U.S. Environmental Protection Agency, Lead in Drinking Water, at http://www.epa.gov/safewater/lead/leadfacts.html#tapwater, visited January 6, 2005.

At least once every six years, EPA must review, and revise as needed, each drinking water regulation (§1412(b)(9)).

The 1986 SDWA Amendments directed EPA to issue a new lead regulation, and in 1991, EPA issued the Lead and Copper Rule (56 *FR* 26460, June 7, 1991). This rule replaced an interim lead standard of 50 parts per billion (ppb), which was outdated and not protective of public health. Moreover, the interim regulation did not require sampling at the tap to show compliance with the standard.

In 1988, EPA had proposed a lead rule that would have lowered the MCL for lead to 5 ppb (applied to water leaving the plant) and also would have required a treatment technique (corrosion control) to further reduce lead in water. Many expressed concern with the proposed rule, arguing that a standard applicable at the treatment plant would not indicate the amount of lead in tap water, and that compliance at the tap was essential. EPA and utilities were concerned that an MCL applied at the tap was not workable, because lead in household plumbing could be a major cause of violations—a situation beyond the control of the water system. Some utilities also were concerned that setting an MCL for source water in addition to a treatment technique for corrosion control would result in confusion among the public and the regulated community (56 *FR* 26472).

The final 1991 Lead and Copper Rule (LCR) did not include an enforceable standard (MCL). Instead, the LCR established a treatment technique (corrosion control) to prevent lead and copper from leaching into drinking water. Other requirements include tap water monitoring, public education, source water treatment, and lead service line replacement. Some Members of Congress and environmental groups argued that, because lead is measurable, the law required EPA to establish an MCL rather than a treatment technique. However, EPA concluded that an MCL at the tap was not feasible because lead levels are often influenced by factors beyond the control of the water utility.

The rule generally required all large water systems (serving more than 50,000 people) to conduct corrosion control studies and recommend an optimal corrosion control treatment to the state or EPA. Smaller systems were required to optimize corrosion control when tap water monitoring showed that it was necessary. The state or EPA then approved or designated a treatment as optimal, and water systems were given two years to install optimal corrosion control and one year to conduct further monitoring.

The lead rule also established a lead "action level" of 15 ppb at the tap, based on the 90^{th} percentile level of water samples. Water systems are required to sample tap water in locations that are at high risk of lead contamination (primarily homes with lead pipes and/or lead service lines). The number of samples a water system must take depends on the system's size and the results of earlier testing. Large systems generally must take 100 samples in a six-month monitoring period. However, systems that meet the action level or maintain optimal corrosion control treatment for two consecutive six-month periods may reduce the number of sampling sites (to 50 sites for systems serving more than100,000 people) and reduce collection frequency to once a year. Monitoring may be reduced to once every three years if the 90^{th} percentile lead levels are 5 ppb or lower.

If lead concentrations exceed the action level in more than 10% of samples, the water system has 60 days to deliver an EPA-developed public education program to customers. The education program must contain information about lead's health effects and sources, and explains steps to take to reduce exposure to lead. The water system also must offer to sample the tap water of any

customer who requests it. (The system is not required to pay for sample collection or analysis.) If a water system still exceeds the action level after installing optimal corrosion control treatment and source water treatment, it must replace annually 7% of the lead service lines under its ownership. The water system must offer to replace the privately owned portion of a service line (at the owner's expense).

Addressing Lead in DC Drinking Water

The Safe Drinking Water Act allows EPA to delegate primary enforcement authority (primacy) for the Public Water System Supervision (PWSS) Program to states. States that have primacy oversee water systems and their compliance with federal drinking water regulations. If primacy is not delegated to a state, EPA is responsible for implementing the program. (All states except Wyoming have primacy for the PWSS program.) EPA Region 3 directly implements the program for the District of Columbia. The water systems for the District of Columbia that are overseen by EPA Region 3 are the Washington Aqueduct (owned by the U.S. Army Corps of Engineers), which treats the city's drinking water, and the DC Water and Sewer Authority (WASA), which buys water from the Washington Aqueduct and distributes it throughout Washington, DC. The aqueduct also provides water to several communities in Northern Virginia.

In March 2004, EPA reported that WASA exceeded the action level at the 90th percentile for taps monitored during 6 out of 15 reporting periods since January 1992 (three times before 1994 and three times since 2002). EPA, WASA, and other local officials worked with the Corps of Engineers to determine the cause of the elevated levels. It appears that changes in treatment processes at the Washington Aqueduct made the water more corrosive, causing more lead to leach from lead pipes in the distribution system and from lead plumbing inside homes. In November 2000, the Corps had changed its secondary disinfection treatment from free chlorine to chloramines to comply with a new EPA regulation that placed strict limits on disinfection byproducts. After that, more than 10% of tap water samples taken by WASA exceeded the action level.[8]

As a result of this finding, the Corps of Engineers worked with a technical work group to develop a new corrosion control process. In June, the Corps tested a process that uses orthophosphate, and found no negative effects. This commonly used compound is expected to form a protective coating in pipes and reduce lead leaching. In August, EPA approved use of the process for the entire aqueduct service area and imposed supplemental monitoring and reporting requirements on the affected public water systems.

EPA determined that WASA had failed to comply with numerous sampling, public notification, and reporting requirements contained in the lead rule. EPA and WASA reached a consent agreement requiring WASA to improve its public education program, upgrade its database management systems, and replace more than 1,600 lead service lines.

[8] Studies show that a switch from free chlorine to chloramines can greatly increase lead leaching. Mechanisms that may cause this effect include the following: (1) free chlorine reduces lead solubility compared to chloramine; (2) chloramines can greatly increase lead leaching from brass; and (3) a galvanic connection between lead pipe-lead solder to copper pipe may be involved (effects of chloramine on leaching from new lead pipe do not seem significant). Marc Edwards and A. Dudi, "Role of Chlorine and Chloramine in Corrosion of Lead-Bearing Plumbing Materials," Journal of the American Water Works Association, Oct. 2004, v. 96, n. 10, pp. 69-81.

In response to high lead levels in Washington, DC tap water, the DC Department of Health (DOH) and the U.S. Public Health Service offered blood testing for residents. Through May 2004, 5,331 individuals had been screened. Of that total, 1,954 individuals were from their target population (children under the age of six, and pregnant and nursing women). Within that population, 40 children (2.2%) had elevated lead levels (i.e., 10 μg/dl or higher); 26 lived in homes without lead service lines. All except one of the homes of the children with elevated blood lead levels were found to have dust and/or soil lead levels that exceed federal guidelines.[9] Also, a recent CDC analysis of blood lead levels among DC residents found an overall decline in blood lead levels since 1998. None of the 201 persons tested who live in homes with the highest levels of lead in drinking water (i.e., above 300 ppb) had blood lead levels above CDC's levels of concern.[10]

Regulatory and Congressional Issues

The detection of high lead levels in Washington, DC, tap water, and the failure of officials to effectively notify the public of the detections, renewed congressional interest in examining the adequacy of the lead rule, including its monitoring and public notification requirements and overall enforcement of, and compliance with, the lead rule. During the 108th Congress, the House Energy and Commerce and Government Reform Committees and the Senate Environment and Public Works Committee held hearings on this issue, and bills were introduced to strengthen the regulation of lead in drinking water.

In March 2004, members of the House Government Reform Committee requested that the EPA Administrator review the lead rule. The committee members and others argued that regulatory gaps appear to be undermining the rule's effectiveness in protecting public health. Issues that were raised include the following: (1) monitoring under the LCR may not be broad or frequent enough to indicate the level of lead exposure in a community; (2) allowing 10% of samples to exceed the action level without requiring systems to take steps to reduce lead levels allows known exposures to continue; (3) the rule does not require systems to notify homeowners of monitoring results; (4) systems are given 15 years to replace lead service lines, and once the action level is met in 90% of samples, the system may discontinue this effort; and (5) unlike an MCL, the action level is not enforceable (exceedances of the action level trigger other regulatory requirements). Critics expressed concern that this regulatory structure may have delayed the response to high lead levels in Washington, DC, and could allow significant lead problems to go undetected or unaddressed in cities nationwide.

EPA is conducting a thorough review of the lead rule to determine how well it has worked, whether it is being effectively implemented and enforced, and whether it needs revision. Elements of the rule receiving most scrutiny include the public notification, monitoring, and lead service line replacement requirements. In October 2004, the agency announced that the national data from 73,000 water utilities demonstrated that lead in drinking water is not a widespread problem. However, EPA did determine that systems needed more guidance for collecting samples and calculating the lead 90th percentile to determine compliance with the rule. In November, EPA issued guidance to clarify requirements for lead sampling and calculating compliance. As part of

[9] District of Columbia, Department of Health, Blood Lead Level Screening Results. May 2004.

[10] Centers for Disease Control and Prevention, "Blood Lead Levels in Residents of Homes with Elevated Lead in Tap Water," pp. 268-270.

its effort to address compliance issues, EPA has offered workshops to improve water system compliance, and issued new guidance to states to improve implementation and enforcement of the rule.

As with other drinking water regulations, an issue central to effective implementation of the lead rule is the need for cities to upgrade their water infrastructure. S. 2550, a water infrastructure funding bill reported in the 108th Congress, included provisions to address lead contamination. Similarly, consideration of this issue in the 109th Congress could occur in tandem with discussions of water infrastructure financing legislation. (See also, CRS Issue Brief IB10118, *Safe Drinking Water Act: Implementation and Issues*.)

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