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**EPN Comments on National Primary Drinking Water Regulations for Lead and Copper: Improvements**

Docket No.: EPA-HQ-OW-2022-0801

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The Environmental Protection Network (EPN) harnesses the expertise of more than 600 former Environmental Protection Agency (EPA) career staff and confirmation-level appointees from Democratic and Republican administrations to provide the unique perspective of former regulators and scientists with decades of historical knowledge and subject matter expertise.

EPN appreciates the proposed updates to the Lead and Copper Rule and will provide an important path towards safe drinking water for all. EPN is providing comments on the following issues in the Lead and Copper Rule Improvements (LCRI): Full and Partial Service Line Replacement and Exemptions; Corrosion Controls; School Requirements; Public Education; Enforcement; and Benefits.

**Service Line Replacement**

EPN commends EPA for proposing mandatory full service line replacement for all lead service lines (LSLs) and galvanized requiring replacement service lines (GRRs) under a water system's control within 10 years. We note that under the 2020 Lead and Copper Rule Revisions (LCRR), EPA projected that only 854,000 to 1.3 million LSLs would be replaced over the 35 year period of the rulemaking analysis. That would leave millions of LSLs, accounting for 50% to 75% of the nation's lead contaminated drinking water, in active use in water systems both with and without optimal corrosion control treatment. EPN agrees with EPA that improper implementation of sampling and corrosion control treatment processes in addition to disturbances of LSLs caused by other utilities or heavy traffic would expose the people served by those unreplaced LSLs to unacceptable health risks.

EPN supports EPA's proposed approach of calculating the average annual replacement rate across a rolling three-year period in which systems assess their rate at the end of the first three years and afterwards, adding in the next year to recalculate a new three-year average rate. This rolling average approach allows states to enforce sooner, rather than waiting until the end of the 10th year. EPN recommends that EPA add a requirement that water systems must meet a minimum 10% replacement rate in each of the first three years. This would allow states to enforce earlier than three years after the compliance date. Systems will have the three years prior to the compliance date to get prepared to meet this minimum rate.

EPN supports EPA's proposal to require annual updates of the inventory in order to subtract unknown lines found to be non-lead and add unknown lines found to be LSLs or GRRs. This requirement incentivizes faster identification of unknown service lines and enables states to determine if line replacement can proceed faster than the minimum mandatory rate. EPN recommends that EPA require states, as a condition of primacy, to set shortened replacement deadlines where feasible at any time throughout the replacement program and to notify the water system of that determination in writing. This requirement is critical if annual updates to the inventory indicate fewer lines need replacing or if the system is moving faster than predicted.

EPA proposes allowing a system to get credit for a full service line replacement when a line that is not in active use is physically disconnected, as long as there is a state or local law prohibiting disconnected LSLs and GRRs from being put back into service. EPN is unclear about how EPA defines "physically disconnected," but it should mean disconnecting or plugging the lead service line, not just closing the corporation stop. EPN recommends that in the final rule EPA specifically prohibit reconnection of a service line that is counted as a full line replacement to ensure disconnected LSLs or GRRs are not put back into service in situations where a state or local law is changed to allow this.

EPN supports EPA's proposal to prohibit systems from getting credit for a full line replacement when they line or coat the pipes instead of replacing them. EPN supports EPA's prohibition on partial pipe replacement and especially supports EPA's proposal to prohibit systems from getting credit for a partial line replacement or a test-out situation.

**Exemptions to 10-year Deadline**

EPN agrees with EPA that ample evidence is available demonstrating that a minimum average annual replacement rate of 10%, calculated across a rolling three-year period and corresponding to a 10-year replacement deadline, is feasible as defined in the Safe Drinking Water Act (SDWA) Section 1412(b)(4)(D). EPA estimates that the 10 year deadline is feasible for 96% to 99% of community systems nationwide and proposes two eligibility criteria for systems where it may not be feasible to meet that deadline. EPN supports EPA's proposed requirement that in order to apply for these exemptions, systems can only count the known LSLs and GRRs reported in their baseline inventory. By prohibiting the counting of unknown lines for these exemptions, EPA is incentivizing systems to prioritize identifying unknown lines in the three years before compliance is required.

The first criterion allows an exemption if a water system has a high proportion of LSLs and GRRs relative to their total number of households served. This criterion is for situations where customers must help pay for line replacement and sets an affordability threshold of 0.039 replacements per household per year. EPA estimates that 663 to 2,134 systems (1.3% to 4.3% of systems nationwide) would exceed this threshold.

The second criterion allows an exemption if a water system would need to replace greater than 10,000 service lines per year to meet the 10-year deadline. EPA estimates that three or four systems nationwide may be eligible under this criterion. EPA seeks comment on an alternative annual replacement rate of 8,000 lines which would result in six or seven systems being eligible.

EPN recommends that for the first criterion, EPA defines "households" so that water systems will have specific requirements on how to calculate this. EPN notes that EPA expressed the percentage of systems eligible for this exemption as a percentage of national systems. That percentage should have been expressed as the percentage of LSL systems, which would double the percentages shown and increase concern over the scope of the exemption. EPN recommends that EPA require states, as a condition of primacy, to assess whether a system eligible for one of these exemptions can meet the 10-year deadline or even a shorter deadline. If the state determines the system needs more time, the state should be required to approve the use of a specific alternative deadline.

For the second criterion, EPN recommends that the threshold not be reduced to 8,000 lines because several systems have already demonstrated the ability to replace 10,000 or more lines per year. EPN further recommends that after 10 years, the threshold should be increased to 20,000 lines since by then supply chains will be functioning well, there will be ample contactors, and innovative replacement approaches will have been developed. EPN notes that the proposed compliance date for the final rule allows three years before the 10-year replacement period begins, allowing market forces to correct for shortages in labor and supplies and for states to set up programs to train workers before the replacement program even begins.

**Partial Line Replacement**

EPN supports EPA's proposal to prohibit partial line replacement unless it is conducted as part of an emergency repair or in coordination with planned infrastructure work, excluding infrastructure work solely for LSL or GRR replacement. While we agree with EPA that an outright ban on partial replacement is infeasible as emergency water main replacement may require removal of a portion of an LSL, the risk of increased lead exposure especially from particulate lead is high. In cases where partial replacement is planned in coordination with non-emergency infrastructure work, we support EPA's proposal to require systems to offer to replace the customer-owned portion at least 45 days prior to the scheduled replacement.

We support EPA's requirement that any partial replacement requires risk mitigation measures immediately following replacement and for six months after replacement. These measures include providing pitcher filters or point of use devices certified to reduce lead in drinking water. EPN supports EPA's revised requirement that filters and replacement cartridges be supplied to every occupancy, rather than residence, in order to protect businesses. We also support EPA's requirement that these risk mitigation measures include installing a dielectric coupling separating the remaining service line and the new one to prevent galvanic corrosion unless the new line is plastic. We commend these enhancements not only following full and partial replacement of lead and GRR service lines but also after replacement of a lead connector, inline water meter, and water meter setter. We recommend that EPA require the water system monitor to ensure that the risk mitigation is effective.

EPA proposed that systems must replace lead connectors as they are encountered during LSL and GRR replacement but did not require that they be inventoried and included in the mandatory replacement plan. EPN is concerned about expanding the scope of the inventory because it would take more resources and slow down the process. We suggest that EPA consider recommending Michigan's approach in which a system can choose to: 1) conduct a physical verification for a lead gooseneck and add it to the inventory; 2) rely on a control that was in place demonstrating that lead goosenecks were never used so it would not have to be inventoried; or 3) assume locations with galvanized service lines between the main and curb stop contain (or previously contained) a lead connector and add them to their inventory without physical verification.

EPN is very concerned that EPA lacks the authority to require systems to replace LSLs and GRRs not under their control. Full LSLR is the "best available technology" based on the records for the 1991 LCR and the LCRR, the legislative history on the definition of "feasibility" in the SDWA,[1] and the City of Newark's service line replacement program.[2] Partial replacements are known to raise water-lead levels (WLLs) and

[1] See NRDC and Earthjustice (2023) Letter to EPA, https://www.regulations.gov/document/EPA-HQ-OW-2022-0801-0518
[2] https://www.newarkleadserviceline.com/

lead exposures both immediately and in the intermediate term. It can be many years before WLLs return to pre-intrusion levels. Lead pipes have disproportionately remained in low-income and disadvantaged communities. Partial replacements are most likely to occur where homeowners are unable or unwilling to pay for replacing the part of the lead pipe that reaches the house. Consequently, EPA's proposal has the potential to worsen the disparity in access to safe drinking water. Especially in such locations, EPA should strengthen the disincentives for partial replacements.

Both EPA and water systems themselves acknowledge that public water systems (PWSs) exert control over the entire service line, including the part located under private property, in various ways. For instance, without the owner's permission, PWSs can enter private property to install water meters, read the meters, fix and calibrate the meters, etc. PWSs will enter private property to fix water leaks. Furthermore, EPA can require full LSLR through the authority granted by the SDWA to regulate 'distribution facilities under the control of the operator' of a PWS. EPA states in this proposed rule that "A system's existing authority to access the service line and complete the full service line replacement might provide the system with the legal authority to conduct the service line replacement over the objection of the property owner or resident."

EPA should strengthen pressure on the states and PWSs to avoid partial replacement. We support every action that EPA is proposing to encourage state and local governments to enable full replacement by providing systems with legal, physical access to all LSLs and GRRs. We support EPA's proposal to require: 1) states to notify systems in writing by the compliance date whether any state laws govern a system's access to private property with or without customer consent or agreement to pay; 2) systems to identify in their LSLR plans any state or local laws or water tariff agreement provisions that govern access to conduct full service line replacement; 3) systems to make at least four outreach attempts using at least two different communications methods to gain private property access for full replacement; and 4) systems to conduct annual outreach to non-consenting customers and whenever there is a change in ownership, even after the mandatory replacement deadline has passed.

The Bipartisan Infrastructure Law and other funding sources authorize systems to pay for replacement of LSLs and GRRs on private property. Even when replacement on private property is paid for by a system, state and local laws may require customer consent for line replacement. EPN recommends that EPA add a requirement that systems conduct full line replacement where a system has legal access but property owners or residents deny physical access.

EPN understands that EPA chose not to ban cost-sharing for line replacement in deference to state and local governments that have historically regulated how systems provide and charge for services to customers. We agree that attempts to assert federal authority over how systems charge would be met with protracted legal challenges that could delay implementation of this critical public health rule for years. EPN urges EPA to recommend that all states adopt explicit policies giving PWSs the authority to use ratepayer funds to replace LSLs and GRRs on private property. Six states (Indiana, Michigan, Missouri, New Jersey, Pennsylvania, and Wisconsin) have already enacted such policies which are key to preventing partial line replacements and the ensuing public health risks in communities across the country.

**Deferring Optimal Corrosion Control in Systems that can Remove LSLs Within Five Years**

EPA proposes to streamline the LCRR by deferring optimal corrosion control treatment and re-optimized optimal corrosion control treatment (OCCT) processes for systems that can remove 100% of lead and GRR

service lines within five years of the date the system is triggered into the corrosion control treatment steps. EPA argues that by the time a utility could complete all the steps necessary for determining and implementing OCCT, lead pipes would be removed. EPN supports this proposal in part. For systems that already have corrosion control in place, it seems reasonable to defer re-optimization during the period of pipe replacement, as long as the corrosion control treatment stays in place. However, for those utilities that don't have corrosion control in place, this proposal could subject customers to increased risk. EPA is aware that the physical disruptions of pipe replacement activities will increase WLLs by dislodging protective passivation, leaving unprotected lead pipes in direct contact with the drinking water. Corrosion control treatment is even more necessary then and EPA requires that public education occur during remediation activities. EPN appreciates EPA's point that the process of developing and implementing optimal corrosion control can be time consuming and may not provide timely protection. One possible approach would be to eliminate the pipe test rig requirement for optimization studies for utilities that will remove all their lead and GRR service lines within five years. This would significantly reduce the time and cost of developing the OCCT and is the same relief the rule proposes for all utilities serving less than 10,000 people.

**More Timely Notification of Residential WLLs**

We applaud EPA for requiring water systems to deliver the results of home testing to the residents within three days of sampling, regardless of the levels in the sample.

**Partial Replacement of the LSL Under PWS Control**

EPA only proposes that PWSs must replace the portion of the LSL that is on public property. EPN is concerned that this may inadvertently mandate that LSLs be partially replaced. Partials are well known to raise WLLs and lead exposures both immediately and in the intermediate term. It can be many years before WLLs return to pre-intrusion levels. It is especially likely that either no replacement or only partial replacement will continue to occur in vulnerable communities.

Both EPA and water systems themselves acknowledge that PWSs exert control over the entire service line, including the part located under private property, in various ways. For instance, without the owner's permission, PWSs can enter private property to install water meters, read the meters, fix and calibrate the meters, etc. PWSs will enter private property to fix water leaks. Furthermore, EPA can require full LSLR through the authority granted by the SDWA to regulate 'distribution facilities under the control of the operator' of a PWS.

EPA says, "A system's existing authority to access the service line and complete the full service line replacement might provide the system with the legal authority to conduct the service line replacement over the objection of the property owner or resident."

Furthermore, full LSLR is the "best available technology'" based on the records for the 1991 LCR and the LCRR, the legislative history on the definition of "feasibility" in the SDWA[3], and the City of Newark's service line replacement program[4].

[3] See NRDC and Earthjustice (2023) Letter to EPA, https://www.regulations.gov/document/EPA-HQ-OW-2022-0801-0518
[4] https://www.newarkleadserviceline.com/

We recommend EPA strengthen pressure on the states and PWSs to avoid partial replacements. The proposal is inconsistent in describing circumstances under which partial replacements are or are not permitted.

Lead pipes have disproportionately remained in low-income and disadvantaged communities. Partial replacements are most likely to occur where homeowners are unable or unwilling to pay for replacing the part of the lead pipe that reaches the house. Consequently, EPA's proposal has the potential to worsen the disparity in access to safe drinking water. Especially in such locations, EPA should strengthen the disincentives for partial replacements.

**First and Fifth Liter Sampling**

We applaud EPA's proposal that water systems sample both first and fifth liter from homes with known or unknown lead service lines and the higher will serve as the compliance determination. This is more likely to reflect the contribution of the lead pipe to residents' exposures. It will also provide better data to the water system on the efficacy of treatment and control efforts.

**Action Level - Implementation and Enforcement**

EPN strongly commends EPA's proposal to lower the Action Level to 10 ppb. However, permitting three exceedances every five years guarantees that 10% or more of the service population can have high lead exposures for extended periods of time. EPN has three concerns:

1. This permits five years of exposure to high WLLs, which is a lot of high exposure.
2. It's a complication, as one exceedance is adequate to require additional action by the PWS.
3. Every single lead action level exceedance should require mandatory POU filters provided for two compliance sampling periods following the exceedance.

**Including Information on Presence of LSLs When Building Ownership Changes**

We commend EPA's proposal that "whenever there is a change in ownership, even after the mandatory service line replacement deadline has passed, the system would be required to offer to conduct the replacement." We also applaud disclosure of information on the presence of lead services, connections, goosenecks, etc. when building ownership is transferred.

**Schools**

Schools and other child-occupied facilities (COFs) are inadequately addressed in this proposal. This is inconsistent both with the science and with EPA's holistic approach in its Lead Strategy. Children spend more of their waking hours in school than anywhere else. They drink more there, too. Based upon children's unique vulnerability to lead's neurotoxicity, the American Academy of Pediatrics has called for a WLL standard of 1 ppb in school drinking water. EPA should strengthen the minimal standards for schools and other COFs delineated in the LCR by increasing both the percent of schools samples and the number of samples taken per school, and focus on schools providing filters certified to reduce lead in water as discussed below.

Large buildings, including schools, have long pipes. WLLs rise in water that has stagnated in pipes for extended periods. Use patterns in COFs present heightened risks of high WLLs due to long periods of disuse over nights, weekends, and vacations[5]. In addition, a study of almost 80,000 samples from schools and other large buildings showed high potential WLLs from stagnation periods as short as 30 minutes due to the long piping[6]. In large buildings, high lead levels can be persistent, reflected by high median values considering all taps, or specific to a few taps in the building. In addition, specific plumbing components, especially water fountains, coolers and 'bubblers', are susceptible to high WLLs.

Lead service lines are unlikely in large buildings due to the water volumes needed. However, despite the ban on plumbing components containing lead instituted in 1986, studies have found that buildings built after that, including schools, may still evidence high WLLs likely due to premise plumbing containing lead[7]. Because monitoring of school water is minimal, high exposures can continue for extended periods, unless detected by happenstance[8]. A five-sample lead testing requirement, where five sequential one-liter samples are taken, may help to identify plumbing component risks[9] but only if the building is not too big and with extreme rigor in sampling. Machine learning techniques using publicly available data may be able to identify schools at risk[10]. Flushing is not always an effective mitigation strategy[11]. In large buildings, clustering appears to occur with high WLLs. For instance, in Massachusetts, approximately 90% of fixtures with lead >15 ppb were clustered in 34% of schools[12]. On the other hand, low WLLs are widely distributed.[13]

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[5] Sathyanarayana S, Beaudet N, Omri K, Karr C. Predicting children's blood lead levels from exposure to school drinking water in Seattle, Washington, USA. Ambulatory Pediatrics. 2006 Sep 1;6(5):288-92.
Triantafyllidou S, Le T, Gallagher D, Edwards M. Reduced risk estimations after remediation of lead (Pb) in drinking water at two US school districts. Science of the total environment. 2014 Jan 1;466:1011-21.
Lambrinidou Y, Triantafyllidou S, Edwards M. Failing our children: Lead in US school drinking water. NEW SOLUTIONS: A Journal of Environmental and Occupational Health Policy. 2010 May;20(1):25-47.
Bryant SD. Lead‐contaminated drinking waters in the public schools of Philadelphia. Journal of Toxicology: Clinical Toxicology. 2004 Jan 1;42(3):287-94.

[6] Deshommes E, Andrews RC, Gagnon G, McCluskey T, McIlwain B, Doré E, Nour S, Prévost M. Evaluation of exposure to lead from drinking water in large buildings. Water research. 2016 Aug 1; 99:46-55.

[7] Carter JA, Erhardt RJ, Jones BT, Donati GL. Survey of lead in drinking water from schools and child care centers operating as public water suppliers in North Carolina, USA: implications for future legislation. Environmental Science & Technology. 2020 Nov 3;54(22):14152-60.

[8] Barn P, Nicol AM, Struck S, Dosanjh S, Li R, Kosatsky T. Investigating elevated copper and lead levels in school drinking water. Environmental health review. 2014 Apr 11;56(04):96-102.

[9] Rome, M.; Estes-Smargiassi, S.; Masters, S. V.; Roberson, A.; Tobiason, J. E.; Beighley, R. E.; Pieper, K. J. Using the Lead and Copper Rule Revisions Five-Sample Approach to Identify Schools with Increased Lead in Drinking Water Risks. *Environ. Sci. Technol. Lett.* **2022**, *9* (1), 84– 89, DOI: 10.1021/acs.estlett.1c00845

[10] Lobo GP, Laraway J, Gadgil AJ. Identifying schools at high-risk for elevated lead in drinking water using only publicly available data. Sci Total Environ. 2022 Jan 10;803:150046.

[11] Barn P, Nicol AM, Struck S, Dosanjh S, Li R, Kosatsky T. Investigating elevated copper and lead levels in school drinking water. Environmental health review. 2014 Apr 11;56(04):96-102. Murphy EA. Effectiveness of flushing on reducing lead and copper levels in school drinking water. Environmental Health Perspectives. 1993 Aug;101(3):240-1.

[12] Rome, M.; Estes-Smargiassi, S.; Masters, S. V.; Roberson, A.; Tobiason, J. E.; Beighley, R. E.; Pieper, K. J. Using the Lead and Copper Rule Revisions Five-Sample Approach to Identify Schools with Increased Lead in Drinking Water Risks. *Environ. Sci. Technol. Lett.* **2022**, *9* (1), 84– 89, DOI: 10.1021/acs.estlett.1c00845

[13] Rome, M.; Estes-Smargiassi, S.; Masters, S. V.; Roberson, A.; Tobiason, J. E.; Beighley, R. E.; Pieper, K. J. Using the Lead and Copper Rule Revisions Five-Sample Approach to Identify Schools with Increased Lead in Drinking Water Risks. Environ. Sci. Technol. Lett. 2022, 9 (1), 84– 89, DOI: 10.1021/acs.estlett.1c00845

Testing each faucet in a COF is time-consuming and expensive; the effect of temperature on WLLs necessitates testing under multiple conditions. Good testing is likely beyond the capacity of most schools and even school systems.

*We recommend that each faucet within a COF that is used for drinking, including water fountains/bubblers, and the kitchen, be outfitted with a filter that will reduce the lead levels.* The PWS should ensure that the filter is properly maintained. The PWS can then work with each school to develop a testing protocol that includes all faucets within the COF that may be used for drinking. Because studies show that in large buildings such as schools high WLLs are likely due to the long piping[14], schools should remove the filters only when no samples exceed 10 ppb under extended stagnation testing even in warm weather. Bottled water is not a sustainable option to a POU device unless complete facility remediation occurs within one calendar year.

**Public Education and Outreach**

EPA proposal made significant additions to public education requirements that water systems must take, including revised requirements and new mandatory health effects language in public notice and Consumer Confidence Report (CCR), notice of lead results, and notice of lead exceedances, with firm deadlines for when such notice must be given. EPN supports EPA's proposal but believes that water systems will continue to not fully complete the monitoring requirements or fully report the results to the public and primacy agency. These water system monitoring and reporting violations need to be better tracked by the primacy agency and EPA as they hide lead levels and underreport lead exceedances and violations from the primacy agency and thus EPA and the public. EPN recommends that EPA add a requirement or explanation that failure to comply with monitoring and reporting violations is high priority, to be reported by the primacy state to the Safe Drinking Water Information System (SDWIS), and requiring follow-up.

**Earlier Notification of Testing Results**

We applaud EPA for requiring water systems to deliver the results of home testing to the residents within three days of sampling, regardless of the levels in the sample.

**Primacy Agency Rule Implementation and Enforcement**

EPA revised and expanded the LCRR special primacy requirements to require primacy agencies to report to EPA the total lead service lines and the date and number of lead service lines replaced and all lead exceedances reported by the water system. EPN recommends that EPA add a primacy requirement that states must report whether the required remedial actions were taken by water systems that experienced an exceedance of the lead action level. EPN supports these new primacy requirements but believes that state reporting to EPA will continue to be incomplete and late until data quality problems with water system reporting to the primacy agency is corrected. EPN recommends that EPA negotiate working agreements with the states to comply with these reporting requirements, including completing and implementing the new SDWIS.

[14] Deshommes E, Andrews RC, Gagnon G, McCluskey T, McIlwain B, Doré E, Nour S, Prévost M. Evaluation of exposure to lead from drinking water in large buildings. Water research. 2016 Aug 1; 99:46-55.

**Benefit Analysis**

We applaud EPA's decision to present-value the costs and benefits of the LCRI. We could not follow through every calculation-train and must assume that EPA consistently applied the calculations to both costs and benefits. While improved over previous cost-benefit analyses, EPA's analysis of the LCRI benefits remains woefully inadequate.

EPA substantially increased the assessed benefits of health endpoints — from one health endpoint (decreased IQ-earnings) to four health endpoints across seven potential physiological systems — and the total estimated benefits have increased 20-fold. Nonetheless, the benefit analysis is conspicuous in its omissions. Most glaring — despite its heavy labor market/capital emphasis — is the omission of productivity losses associated with the limited health endpoints EPA has included. This omission constitutes an intentional bias in quantifying the damages associated with at least preterm births and ADHD. For instance, Doshi et al.[15] (used in the EA) finds that "[o]verall national annual incremental costs of ADHD ranged from $143 billion to $266 billion. Most of these costs were incurred by adults ($105 billion – $194 billion) compared with children/adolescents ($38 billion – $72 billion). For adults, the largest cost category was productivity and income losses ($87 billion – $138 billion)." The Doshi estimates do not include loss of employment or stress-related illnesses.

EPA describes the robust scientific evidence of lead's health damages. "… health endpoints identified using two comprehensive United States Government documents summarizing the literature on lead exposure health impacts. These documents are EPA's Integrated Science Assessment for Lead (ISA) (USEPA, 2013); and the United States Department of Health and Human Services' NTP Monograph on Health Effects of Low-Level Lead (NTP, 2012). Both of these sources present comprehensive reviews of the literature as of the time of publication on the risk of adverse health effects associated with lead exposure. EPA summarized those endpoints to which either the EPA ISA or the NTP Monograph assigned one of the top two [highest causality] tiers of confidence in the relationship between lead exposure and the risk of adverse health effects. These endpoints include cardiovascular effects, renal effects, reproductive and developmental effects [...], immunological effects, neurological effects [...], and cancer."[16]

However, both of these comprehensive reviews are outdated and newer data should be considered. EPA's most recent ISA for lead[17] had already been released for external review at the time this proposal was drafted, with a final version published in January 2024.

In addition, with the almost 20 separate health endpoints across seven separate body systems EPA identified as causally related to lead exposure contained in these comprehensive reviews, why was EPA able to quantify only four? Further, EPA notes that for three of the four quantified benefits, the slopes are steeper at lower levels and several show no evidence of a threshold below which effects cease (IQ, cardiovascular, reduction in birth weight). EPA also describes average U.S. lead exposures from drinking water as low. This indicates that it is precisely the drinking water exposures that are likely to produce the highest benefits.

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[15] Doshi JA, Hodgkins P, Kahle J, Sikirica V, Cangelosi MJ, Setyawan J, Erder MH, Neumann PJ. Economic impact of childhood and adult attention-deficit/hyperactivity disorder in the United States. Journal of the American Academy of Child & Adolescent Psychiatry. 2012 Oct 1;51(10):990-1002.

[16] Economic Analysis of the Proposed Lead and Copper Rule Improvements, p 6-5. https://www.regulations.gov/document/EPA-HQ-OW-2022-0801-0712

[17] EPA. Integrated Science Assessment for Lead. 2023. https://assessments.epa.gov/isa/document/&deid=359536

EPA ascribes several pages to uncertainties in these health estimates and declined to include other endpoints. Does EPA think that the uncertainties in WLLs are principally *higher* WLLs? If not, each of these monetized estimates should be portrayed as a *lower bound* estimate.

EPA has not included all the data that it clearly has. The monetization of cognitive damage referred to as the IQ-earnings matrix is heavily detailed, but the effect on earnings is the delayed damage that is visible in adulthood. The concurrent remediation is compensatory education for the children who have sustained the IQ damage. Using the same exposure-IQ decrement data portrayed in chapter 5 (sections 5.5.1 and 5.5.2) of the EA, EPA could easily estimate the number of children likely to need compensatory remedial education. EPA estimates 297,190 IQ points saved by the LCRI. With a national mean IQ of 100 and with 68% of the U.S. population estimated to have IQs between 85 and 115, assuming that children exposed to lead from drinking water have the same IQ distribution as the rest of the US population, we can assume that a loss of 10 IQ points will drop a child's IQ by almost one standard deviation.[18] Only the children with below average IQs will require compensatory education.

To better assess all the health benefits of EPA's LCRI, we used EPA's exposure and effect estimates from the LCRI (contained in its Economic Analysis), converted all estimates to 2022 dollars, then scaled the omitted health endpoints to include the categories published in the Levin Schwartz 2023 benefit analysis[19] (**Table 1**). The total estimated benefits ($36,772 million in 2022 dollars), while only 10% higher than EPA's estimates, present a much more comprehensive picture of the benefits of the LCRI. Of course, this assessment remains a poor underestimate of the total damages because each monetized endpoint is incomplete; the largest omissions are likely productivity losses and the long-term sequelae of low birthweights.

EPA repeatedly claims an inability to quantify benefits, but not costs. For instance, "because of the lack of granularity in the lead tap water concentration data available to EPA for the regulatory analysis, EPA is unable to quantify the benefits of small improvements in CCT to individuals residing in homes with LSLs/GRR service lines." [20] Nonetheless, EPA does not find either the lack of granularity in the WLL data nor the lack of evidence of a threshold to constitute 'uncertainties' in the cost estimates or a downward bias in the benefits.

In addition to the paucity of monetized health benefits, EPA also refused to include materials benefits associated with required corrosion control. Corrosion control is the control treatment of choice because lead is principally a corrosion by-product in drinking water. EPA's omission of this monetized materials benefit estimation is willful. EPA acknowledges that estimates exist and indeed, EPA first published estimates of avoidable corrosion damage in 1986.[21] The quadrennial American Society of Civil Engineers report card on the state of US infrastructure contains a host of estimates of corrosion damage.[22] In addition, there are at least two international organizations that study corrosion: the National Association of Corrosion Engineers (NACE) and The Association for Materials Protection and Performance. EPA acknowledges that

[18] Omni Health Calculator, available at www.omnicalculator.com › health › iq-percentile
[19] Levin R, Schwartz J. A better cost: benefit analysis yields better and fairer results: EPA's lead and copper rule revision. Environmental Research. 2023 Jul 15; 229:115738.
[20] Economic Analysis of the Proposed Lead and Copper Rule Improvements, p 6-5. https://www.regulations.gov/document/EPA-HQ-OW-2022-0801-0712
[21] Levin R. The benefits of reducing lead in drinking water. 1986, EPA report 230-09-86-019.
[22] Lo S. Report on America's Infrastructure. Defense Transportation Journal. 2018 Aug 1;74(4):17-21.

**Table 1. Monetized benefits of LCRI including those omitted from EPA economic analysis.**

| Body system | Component assessed | Population | Aspect monetized | Monetized unit cost (2022$) | Incidence | Derivation of Incidence Estimate | Total monetized benefit (millions 2022$) |
|---|---|---|---|---|---|---|---|
| **Nervous System Effects** | Cognitive Function Decrements | Children | IQ earnings | $22,400 per IQ pt[a] | 297,190[a] | EPA LCRI | $6,657[a] |
| | Cognitive Function Decrements | Children | Short-term damages (compensatory ed) | $51,500[b] | 15,000 | Scaling[c] | $773 |
| | Behavioral & Conduct Problems | Children | ADHD | $179,000[a] | 4,221[a] | EPA LCRI | $755[a] |
| | Sensory Function Decrements | Children | Auditory impairment | $18,300[b] | 1620 | Scaling[c] | $30 |
| | Internalizing Behaviors | Children | --- | | | | |
| | Cognitive Function Decrements | Adults | Depression | $70,000[b] | 2400 | Scaling[c] | $168 |
| | Psychopathological Effects | Adults | ADHD | $11,000[b] | 20,000 | Scaling[c] | $220 |
| | Psychopathological Effects (alternative) | Adults | Dementia | $31,000[b] | 400 | Scaling[c] | $12 |
| **Cardiovascular Effects** | Hypertension | Adults | Hypertension | $5,700[b] | 100,000 | Scaling[c] | $570 |
| | Coronary Heart Disease | Adults | Coronary heart disease | $19,500[b] | 1500 | Scaling[c] | $29 |
| **Immune System Effects** | Immunological damage | Lifetime | Asthma | $56,000[b] | 2080 | Scaling[c] | $116 |
| **Hematologic Effects** | Decreased Red Blood Cell Survival and Altered Heme Synthesis | Lifetime | Anemia | $3,700[b] | 50 | Scaling[c] | -- |
| **Reproductive & Developmental Effects** | Development | Lifetime | --- | | | | |
| | Birth Outcomes | Childhood & life | Low birth weight | $5[a] | 1.4 mil[a] | EPA LCRI | $6[a] |
| | Male Reproductive Function | Adult | Male reproductive impairment | $66,800[b] | 800 | Scaling[c] | $53 |
| **Cancer** | Cancer | Adult | Lung cancer | $293,000[b] | 5 | Scaling[c] | $0.90 |
| **Mortality** | Cardiovascular | Adult | VSL | $10.4 mil[a] | 2642[a] | EPA LCRI | $27,382[a] |
| **TOTAL** | | | | | | | **$36,772** |

[a] EPA LCRI Economic Analysis
[b] Levin Schwartz 2023 converted to 2022 dollars
[c] Scaling from Levin Schwartz to LCRI exposure estimates

individuals who live or work in buildings without LSL/GRR lines are likely to benefit from the improved monitoring and additional actions to optimize corrosion control.[23] Nonetheless, EPA concludes "EPA did not have sufficient information to estimate these impacts nationally for the proposed rule analysis."

**Discount Rate**

The Office of Management and Budget's (OMB) revised Circular No. A-94[24] states that discounted benefits or costs should be determined using a real discount rate of 2.0 percent if the benefits or costs reflect certainty-equivalent valuations and 3.1 percent if they do not. EPA's proposed rule includes two discount rates: 3% and 7%. EPA should consider only 2% and 3% discount rates and should not include the 7% estimates.

In addition, Circular No. A-4 provides OMB's guidance to federal agencies on the development of regulatory analysis and calls for federal cost benefit analyses to include the fullest range of information on known and anticipated social costs and benefits. EPA has not adhered to this OMB directive.

[23] Economic Analysis of the Proposed Lead and Copper Rule Improvements, p 5-22. https://www.regulations.gov/document/EPA-HQ-OW-2022-0801-0712

[24] https://www.whitehouse.gov/wp-content/uploads/2023/11/CircularA-4.pdf