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February 4, 2024

Administrator Dan Regan
Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Mail Code: 1101A
Washington, DC 20460

RE: re EPA-HQ-OW-2022-0801

Dear Administrator Regan,

The International Society for Environmental Epidemiology (ISEE) is a multidisciplinary, scientific society dedicated to the study of environmental epidemiology and exposure assessment; our membership is drawn from more than 60 countries. Our primary objective is promoting research and disseminating scientific findings focused on the relationships between environmental exposures (e.g., air pollutants, food and water contaminants, metals, etc.) and human health. We are oriented particularly toward improving the science that governments use to guide environmental health policy.

ISEE-North America represents environmental researchers at universities, health and policy organizations, governmental agencies, industrial associations, and public interest organizations from throughout North America. We have comments addressing both overarching issues, as well as specific comments tied to the particulars of EPA's Lead and Copper Rule Improvements (LCRI). Thank you for soliciting input on it.

We have strongly supported EPA's holistic approach in its Lead Strategy. The LCRI could be a strong tool in EPA's arsenal, but serious omissions undermine its effectiveness.

There are many improvements in the LCRI. We commend EPA for

- increasing the regulated universe of lead pipes for replacement to 9 million.
- reducing the time frame of the regulation to 10 years.
- lowering the Action Level (AL) to from 15 to 10 ppb.
- taking both a first- and fifth-liter sample, with the higher level to constitute compliance.
- requiring water systems to deliver the results of home testing to the residents within 3 days of sampling, regardless of the levels in the sample.
- proposing "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."

KEY COMMENTS

We have 11 principal recommendations. Detailed discussions follow.

1. Multiple studies show that within the general population and across numerous health endpoints, water lead levels (WLLs) at current compliance levels have clinical significance. The AL should be reduced to 5 ppb.
2. Omitting schools and other child-occupied buildings from this regulation leaves the most vulnerable part of the population susceptible to uncontrolled lead exposures. The most efficient way to address this is by requiring water systems to install and maintain water filters on all faucets that may be used for drinking within such buildings.
3. Partial pipe replacement should not be permitted. Partial replacements are more likely to occur in low income and disadvantaged communities.
4. EPA should pressure PWSs to replace the entire LSL.
5. EPA should encourage states to give public water systems the authority to use ratepayer funds to replace LSLs and GRRs on private property.
6. To reduce the complexity of the LCRI, a single exceedance of the AL should constitute a violation with resulting public education, point-of-use (POU) requirements, etc.
7. Mandatory POU filters should follow all exceedances.
8. The paucity of monetized benefits, especially health benefits, and the heavy documentation of costs shows evidence of systemic bias.
9. We recommend better tracking of public water system (PWS) water monitoring and reporting results by the State primacy agency, which may include a primacy requirement related to the completeness and accuracy of reporting.
10. EPA must report the full range of materials and health benefits using a 2% discount rate.
11. EPA should prohibit 'gaming' both explicitly and generally, including deleting outliers.

DETAILED DISCUSSIONS

The significance of general population lead exposures from drinking water

The contribution of lead intake from drinking water is underestimated, and largely discounted by EPA. Most lead intake occurs under circumstances below current violations or Action Level exceedances. (Brown et al 2011; Edwards M, 2014; Hanna-Attisha et al 2016; Renner, 2009; Triantafyllidou et al 2007) Drinking water is a major lead exposure-pathway for millions of Americans. The pattern of highest risks is well-known: low income, minority communities, particularly women and young children.

EPA has acknowledged that the 1991 Lead and Copper Rule (LCR) and recent Lead and Copper Rule Revisions (LCRR) are inadequate for preventing unsafe lead exposures from US public drinking water. Moreover, as lead intake from diet, ambient air and other sources has declined, drinking water has become an increasingly larger source for the general population. EPA's own analysis indicates that water lead levels can contribute 10-80% of general population exposures. (Stanek et al 2020.)

Multiple studies show that within the general population and across numerous health endpoints, water lead levels (WLLs) at current compliance levels are risk-predictive with clinical significance.

> Danziger et al. 2021 combined EPA's Safe Drinking Water Information System data with US nationally representative lead exposure and found that dialysis patients in cities with detectable WLLs had significantly worse renal outcomes.
>
> Mulhern et al 2022 found that among 40,742 children in Wake County, North Carolina whether 10% of water samples exceeded 2 ppb of lead in the most recent year prior to the blood test increased the risk of children's blood lead levels (BLLs) ≥2 μg/dL by 42%.
>
> Lu et al 2022 matched the 90th percentile WLLs within the state of Massachusetts with grade 3–8 standardized test scores; a 5 μg/L increase in 90th percentile WLLs in a school district was associated with a statistically significant decrease in the average math test score in the same year.
>
> Gibson et al 2022 found that the risk of higher WLLs in childhood correlated with juvenile delinquency among teens, with the steepest increases in risk at the lowest exposure levels.
>
> Mulhern et al 2023 used machine-learned Bayesian network models to predict building-wide WLL risk in over 4,000 childcare facilities in North Carolina. The models identified a range of variables associated with building wide WLLs, with facilities that serve low-income families, rely on groundwater, and have more taps exhibiting greater risk.

These studies demonstrate that US public water systems complying with EPA's current regulatory requirements present clinically significant lead exposures across diverse body systems. US public drinking water is neither safe nor lead-free.

> **We recommend that EPA more strongly articulate the crucial impact of US lead exposures from US drinking water, even water meeting current EPA standards.**
>
> **Numerous studies demonstrate that drinking water meeting EPA standards is not protective of human health. The AL should be reduced to 5 ppb.**

Schools

Schools and other child-occupied facilities (COFs) are inadequately addressed in the LCRI. 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.

Large buildings, including schools, have long pipes. WLLs rise in water that has stagnated – sat unused -- 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.(Sathyanarayana et l 2006)(Triantafyllidou et al 2014)(Lambrinidou et al.,

2010)(Bryant, 2004) 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.(Deshommes et al 2016) 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 or '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 subsequently, including schools, may still evidence high WLLs likely due to premise plumbing containing lead. (Carter et al 2020) Because monitoring of school water is minimal, high exposures can continue for extended periods, unless detected by happenstance. (Barn et al 2014)
Flushing is not always an effective mitigation strategy. (Barn et al 2014)(E Murphy, 1993)

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 EPA strengthen the minimal standards for schools and other COFs delineated in the LCRR by increasing both the percent of schools sampled and the number of samples taken per school.**
>
> Further, **each faucet that is used for drinking within a COF**, including water fountains/bubblers and the kitchen, **should be outfitted with a filter** that will reduce the lead levels. The Public Water Supply (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 (Deshommes et al 2016), only if NO samples exceed 10 ppb under extended stagnation testing even in warm weather may the school remove the filters. Bottled water is not a sustainable option to a point-of-use device unless complete facility remediation occurs within one calendar year.

Partial lead pipe replacement

EPA only proposes that PWSs must replace the portion of the LSL that is on public property. The most severe health consequence of this is that it mandates that LSLs be partially replaced. Partials are well known to raise WLLs and 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 pipe 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 public water system.

EPA states, “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 (See ``NRDC and Earthjustice 2023 Letter.pdf'' in EPA-HQ-OW-2022-0801), and the City of Newark's service line replacement program (City of Newark, n.d.a).

EPA should 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. PWSs should exert the same effort to replace lead pipes as they do to install or replace water meters.

Finally, EPA acknowledges that 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 to replace 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.

> **We strongly recommend that PWSs accept their responsibility for the entire lead pipe and replace the pipe in its entirety. Partial pipe replacement should be prohibited.**
>
> **EPA should encourage states to adopt explicit policies giving public water systems the authority to use ratepayer funds to replace LSLs and GRRs on private property.**

Exceedances of the Action Level

Permitting 3 exceedances every 5 years guarantees that 10% or more of the service population can have high lead exposures for extended periods of time. We have 3 objections. First, this permits 5 years of exposure to high WLLs, which is a lot of high exposure. 2) It's a complication -- ONE exceedance is adequate to require additional action by the PWS. 3) The action required following an exceedance should be mandatory POU filters to be provided for two compliance sampling periods for every single lead action level exceedance.

> **We recommend that one AL exceedance constitutes an Exceedance and a health-based Violation.**

Bias in reporting on LCRI costs and benefits

EPA’s analysis of the LCRI benefits is improved over EPA’s previous cost-benefit analyses, but it remains inadequate. EPA’s scientific documents, such as the Integrated Science Assessment, determined 16 different health endpoints to be causally related to lead exposure. The Economic Analysis (EA) of the LCRI is conspicuous in its omissions of most benefits, especially health benefits. Most surprising – despite its heavy labor

market/capital emphasis -- is the omission of productivity losses associated with the limited health endpoints EPA has chosen to include. This constitutes an intentional bias in quantifying the damages associated at least with preterm births and ADHD. For instance, Doshi et al., 2012 (used in the EA) finds that "Overall national annual incremental costs of ADHD ranged from $143 billion to $266 billion. Most of these costs were incurred by adults ($105B – $194B) compared with children/adolescents ($38B – $72B). For adults, the largest cost category was productivity and income losses ($87B – $138B)" The Doshi estimates do not include loss of employment or stress related illnesses. Another glaring omission is that the low-birth-weight damage estimate includes only the costs of immediate hospitalization. Estimates of the total costs of low-birth-weight infants show them to be an order of magnitude higher than the hospitalization costs, including parental productivity loss and numerous long-term sequelae for the infant.

For perspective, the cost assessment components (Chapter 4 of the EA plus Appendix B) are 336 pages with Appendix B another 266 pages and an additional 8 pages to compare the LCRI and LCR (Appendix C). The benefit component (Chapter 5 of the EA) is 66 pages long with an additional 12 pages of uncertainties (none in the cost sections!); Appendix D is 27 pages with an additional 17 pages of references to give it oomph. This is indicative of systemic bias.

EPA beatifically 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." P 6-5

Both comprehensive reviews are outdated. EPA's next ISA (USEPA, 2023) has already been released for external review. The 2012 NTP is more than a decade old. Newer data should be included.

Second, with the almost 20 separate health endpoints across 7 separate body systems EPA identified as causally related to lead exposure contained in these comprehensive reviews, why was EPA able to quantify only 4?

Further, EPA notes that for 3 of the 4 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 US 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.

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 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 [corrosion control treatment] to individuals residing in homes with LSLs/GRR service lines." P 6-5 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.

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 US 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 almost a standard deviation (Omni Health Calculator, available at www.omnicalculator.com › health › iq-percentile). 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$, then scaled the omitted health endpoints to include the categories published in the Levin Schwartz 2023 benefit analysis.

Table 1, monetized benefits of LCRI including those omitted from EPA economic analysis.

Body system	**Component assessed**	**Population**	**Aspect monetized**	**Monetized unit cost (2022$)**	**Incidence**	**Derivation of inci est**	**Total monetized benefit (millions 2022$)**
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]	$0.9
Mortality	Cardiovascular	Adult	VSL	$10.4 mil [a]	2642 [a]	EPA LCRI	$27,382 [a]
							$36,772
TOTAL							

Legend: a: EPA LCRI Economic Analysis; b: Levin Schwartz 2023 converted to 2022$; c: scaling from Levin Schwartz 2023 to LCRI exposure estimates

The total estimated benefits ($36,772 million in 2022$), 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.

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. (Levin, 1986, EPA report 230-09-86-019) The quadrennial American Society of Civil Engineers report card on the state of US infrastructure contains a host of estimates of corrosion damage. (Lo 2018.) In addition, there are at least 2 international organizations that study corrosion: the National Association of Corrosion Engineers (NACE) and The Association for Materials Protection and Performance. EPA acknowledges that 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. P 5-22 A. Nonetheless, EPA concludes "EPA did not have sufficient information to estimate these impacts nationally for the proposed rule analysis."

We recommend that EPA present a more comprehensive assessment of the health and materials damage benefits of this proposal including all the health endpoints it has determined are causally related to lead exposure.

Given EPA's description of the dose-response relationships as being most often steeper at lower levels and the lack of comprehensiveness of the estimated health benefits, EPA should present these benefits as LOWER BOUND ESTIMATES.

Poor compliance with the LCR, LCRR and LCRI

Violations of the EPA drinking water standards overall are high. National governmental and even self-reporting show compliance with the LCR and LCRR is particularly poor. The Natural Resource Defense Council (NRDC) reviewed EPA records that documented there were more than 80,000 reported violations of the Safe Drinking Water Act by > 18,000 CWSs serving nearly 77 million people in 2015 alone. (Fedinick et al 2017) Another NRDC survey found that that in 2018-2020, 28 million people were served by over 7,500 drinking water systems with almost 13,000 lead violations. (Fedinick et al 2021) These may underestimate actual violations. An EPA audit from 2008, for example, showed that only 8% of LCR violations were reported to the EPA by the state primacy agency. (EPA 2008) A 2011 Government Accountability Office review confirmed widespread under-reporting of drinking water violations, with only 16-72% of violations reported to EPA. (GAO 2011)

In addition, even knowing the significant underreporting and poor compliance, EPA rarely issues formal enforcement actions for SDWA violations and even less often imposes penalties. For example, NRDC's 2017 analysis of EPA's data found that nearly 9 out of 10 violations were subject to no formal action by the state or the EPA. (Fedinick et al 2017) Even fewer of those reported violations—3.3% —received penalties. (Fedinick et al 2019) (Switzer 2017)

While ISEE supports EPA's proposal, we believe that water systems will continue to poorly comply with 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 mask lead levels and underreport lead exceedances and violations from the primacy agency and thus EPA and the public. ISEE recommends that EPA clarify that failure to comply with monitoring and reporting violations is a high priority, to be reported by the primacy state to the State Drinking Water Information System (SDWIS), and requiring follow-up.

Part of the issue is the complexity and lack of clarity within the LCR, LCRR and now the LCRI. In particular, what constitutes a violation of the LCRI is difficult to discern from reading the proposal. For instance, water supplies are permitted 3 or more exceedances in 5 years before being required to do additional public education or to supply filters even if sampled results show high WLLs. Clearly, exceeding an AL does not constitute an exceedance or a health violation. This also permits 5 years of exposure to high WLLs.

> **A single exceedance of the AL should constitute a violation of the LCRI with resulting public education, POU requirements, etc.** Mandatory POU filters should follow exceedances.

ISEE-NA is concerned that water systems will continue to poorly comply with monitoring requirements or fully report the results to the public and State primacy agency. The LCRI adds reporting requirements for monitoring and lead pipe replacement; we suggest that may make compliance less not more likely.

> **We recommend better tracking of PWS monitoring and reporting performance by the State primacy agency, which may include a primacy requirement related to the completeness and accuracy of reporting.**

Deferring optimal corrosion control in systems that can remove LSLs within 5 years

EPA proposes to streamline the LCRR by deferring optimal corrosion control treatment and re-optimized optimal corrosion control treatment processes for systems that can remove 100% of lead and galvanized requiring replacement (GRR) service lines within 5 years of the date the system is triggered into the corrosion control treatment steps. But the physical disruptions during pipe replacement activities will increase water-lead levels by dislodging protective passivation, leaving unprotected lead pipes in direct contact with the drinking water. Corrosion control treatment is even more necessary then. EPA should only permit the system to cease corrosion treatment after all the lead pipes are replaced.

EPA's awareness of the dangers of disturbing plumbing is evident as it requires that public education occur during remediation activities.

Once a water system has an exceedance or initiates corrosion control for other reasons, corrosion treatment should not cease until all lead pipes are replaced. Tap monitoring should continue throughout this period in order to address potential lead-containing plumbing within the building.

Discount rate

Last year, OMB (Office of Management and Budget) changed the discount rate for federal agencies to use in cost benefit analysis. The discount rate is now 2%.

EPA is required to present costs and benefits using a 2% rate.

Explicitly prohibiting LCR/LCRR/LCRI 'gaming'

Many 'games' are used by utilities and their state and federal overseers to avoid complying with the LCR often under the guise of statistical 'reproducibility', 'reliability', 'controlling variability', 'deleting outliers', etc. to eliminate samples with high WLLs. Probably the most common and simplest game is deleting outliers; in the absence of documented lab contamination or similar, deleting outliers should also be prohibited. "…States have discretion to delete results of obvious sampling errors from this calculation." However, under circumstances such as lead contamination of drinking water where most sample results are expected to be low, any high result can be described as an 'obvious sample error'. State and/or water system need(s) to demonstrate and document the reason for deleting sample results not just "obvious sampling error."

In addition, several methods are used to increase the sampling pool to 'wash' out high sample results. 'Sampling out', where systems test multiple times at a low-lead sampling location at the end of monitoring period to lower their 90th percentile. As ASDWA stated in its comments on the LCRR, "Sampling multiple times at the same location in the same compliance period goes against the goals of both the existing LCR and the LT-LCR."

EPA should prohibit 'gaming' both explicitly and generally, especially deleting outliers.

Thank you for considering our remarks. We are available to discuss any of these issues with you.

Sincerely,

Ronnie Levin, Harvard TH Chan School of Public Health

On behalf of the International Society for Environmental Epidemiology, North American Chapter

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