

OPINION

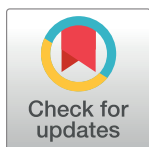
Eliminating lead exposure from drinking water—A global call to action

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Each year, approximately 900,000 people die from exposure to lead [1]. But the full impacts of lead exposure are far more insidious. Lead is a potent neurotoxin that impairs brain function and irreversibly harms children's cognitive development. Any exposure to lead can be damaging. Recent studies estimate that 800 million children globally (approximately 1 in 3) have blood lead concentrations above 5 micrograms per deciliter and that lead exposure may be responsible for 30% of all intellectual disabilities of unknown origin [2, 3]. Lead exposure increases disease burden, estimated at over 21 million disability-adjusted life years (DALYs) yearly, primarily due to cardiovascular diseases and mental disorders. This disease burden attributed to lead has increased globally since 1990, because of population growth and aging [4]. Additional research has shown evidence of a direct dose-response relationship between children's blood lead levels and reductions in IQ which decreases lifetime earnings [5, 6]. This makes lead a public health threat and a key environmental risk factor that exacerbates long-term inequalities affecting especially marginalized groups. Important sources of exposure include batteries, paint, food containers, drinking water systems, and leaded gasoline (now banned in all countries).

Many water systems worldwide, from urban piped systems to small systems such as boreholes, handpumps, and small piped networks, are contaminated with lead and other toxic metals. The source of lead exposure is often system parts which leach lead into drinking water. Lead is found in parts across all system types, including the pipes, taps, and joints in piped systems, as well as in the pumps and fittings of handpump and borehole systems [7, 8]. Lead can even be found in some PVC pipes and fittings [7]. As other sources of lead exposure come under more control, lead from drinking water systems has become increasingly important but has gone largely unaddressed, particularly in low- and middle-income countries (LMICs) where evidence [8] suggests a widespread problem but data and monitoring are sparse.

Lead exposure from drinking water systems is 100% preventable. Action should be taken now to implement no-regret policies and practices that eliminate the use of lead-leaching parts in new drinking water systems, and progressively remediate lead in existing systems—with urgent prevention efforts accompanying progressive remediation. We recommend specific actions by key stakeholders.

Governments and water authorities should adopt drinking-water quality standards for lead based on the WHO guidelines for drinking-water quality (pragmatically set at 10 micrograms/liter based on achievability) and ensure that monitoring of drinking water systems includes lead testing. Governments should also require the use of lead-free or low-lead materials based on international standards (e.g., NSF/ANSI, ASTM, ASME, ISO) [9, 10]. Likewise international specifications should do the same [11]. Product certification and inspection should be required and based on internationally-recognized best practices. Governments can usefully support and require systems for the training and accreditation of professionals; overseeing or inspecting manufacturers, importers, and system installations; setting guidelines or standards for procurement; investing in analytical equipment and capacity-building to perform lead testing; requiring lead testing prior to or as part of system commissioning; and working with water suppliers to monitor changes in the quality or chemistry of water sources that could exacerbate lead leaching from materials. Governments must ensure water suppliers and water users are aware of the risks of lead and actionable steps to reduce those risks.

Water suppliers, drillers, and those responsible for construction, installation, repair, and rehabilitation of systems should adopt procedures to ensure that component parts in water supply systems are safe. Procurement of safe materials, quality control/assurance mechanisms to ensure standards are met, and installation requirements including corrosion mitigation should be established and strengthened. In existing systems, lead-leaching materials should be identified and replaced with safe parts. Any changes in source water or planned changes in water treatment must be evaluated in terms of their possible impact on lead leaching. Monitoring of all water systems must be implemented to identify and address lead contamination. Where lead-leaching parts remain in systems, other remediation actions should be taken including, for example, corrosion mitigation, flushing, and point-of-use treatment.

External support agencies, including funding agencies, UN agencies, standard setting bodies, professional, and civil society organizations, should, in their own work and the work they support, ensure adherence to international or national standards and specifications that use lead-free or low lead materials, and the use of suitable, and safe materials, that are installed and managed by accredited professionals. The international community must continue to work to strengthen standards and guidelines in its support to national governments, service providers, and other stakeholders.

Non-governmental organizations (NGOs) often install, manage, and repair water systems in LMICs so they should ensure that safe materials are used for new systems and lead-leaching materials replaced in existing systems. These should be used as exemplars of cost-effective but safe water systems that other operators can learn from. NGOs can also monitor their water systems, work with local and national suppliers to remove lead from their inventories, and advocate for national regulations.

Guidance to support these efforts is available. The World Health Organization and partners recently released “Lead in drinking-water: health risks, monitoring and corrective actions” [12]. This guide advises governments, implementing partners, and water professionals about assessing risks and recommends specific actions to prevent, mitigate or remediate lead exposure from drinking water supplies. These actions should be considered as part of a broader strategy to eliminate lead exposure from all sources. Some governments have also begun taking steps to address lead in drinking water, such as the recent “Biden-Harris Get the Lead Out Partnership” and the Bipartisan Infrastructure Law to accelerate and fund lead service line replacement in the United States [13]. A recently launched global lead-free water initiative also added aligned commitments to eliminate lead from drinking water systems to the 2023 UN Water Conference’s water action agenda [14].

Existing evidence warrants immediate action to prevent and remediate lead in drinking water systems, but knowledge gaps remain. Additional research to better characterize the prevalence of lead in water systems globally, the relative source contribution of drinking water, the effectiveness of interventions for rural systems, and the health benefits of eliminating lead exposure from drinking water will help accelerate global policy and action.

Action must be taken now to prevent lead exposure from drinking water systems. The health of our children depends on it.

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