Eliminating Childhood Lead Poisoning Worldwide

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Summary

An estimated 815 million children (one in three) around the globe have dangerous levels of lead in their bloodstream, levels high enough to cause irreversible brain damage and impose severe health, economic, and societal consequences. 96% of these children live in low- and middle-income countries (LMICs), where collectively only about $6–10 million from non-governmental organizations is available each year to address the problem. To help eliminate childhood lead poisoning worldwide, the U.S. Federal Government should (1) add blood lead level (BLL) testing to the USAID-led Demographic and Health Survey Program, (2) create a Grand Challenge for Development to end childhood lead poisoning, and (3) push forward a global treaty on lead control.

Challenge and Opportunity

Lead is a potent toxin that causes irreversible harm to children's brains and vital organs. Elevated body lead levels result in reduced intelligence, lower educational attainment, behavioral disorders, violent crime, reduced lifetime earnings, anemia, kidney disease, and cardiovascular disease. Impacts of lead on cognitive development are estimated to cause nearly $1 trillion of income loss in LMICs annually. Adverse health effects related to lead poisoning account for 1% of the global disease burden, causing 1 million deaths annually and substantial disability.

This enormous burden of lead poisoning in LMICs is preventable. It results from a combination of sources of exposure, some of the most important being:

- Lead that is intentionally added to paint, spices, cookware, and cosmetics.
- Lead that contaminates the environment from unsafe lead-acid battery and e-waste recycling practices.
- Lead that contaminates drinking water from pipes.

These sources of lead exposure have been effectively regulated in the United States and other high-income countries, which have seen average blood lead levels in their populations decline dramatically over the last 40 years. To achieve the same success, LMICs will need to prioritize policies such as:

- Regulation limiting the lead content of paint available on the market.
- Regulation of lead-acid battery and e-waste recycling.
- Inclusion of lead parameters in national drinking-water-quality standards.
- Regulation of the use of lead compounds in other locally important sources, such as spices, ceramics, cookware, toys, and cosmetics.
LMICs generally face three major barriers to implementing such policies:

(1) Lack of data on blood lead levels and on the scale and severity of lead poisoning. Most LMICs have no studies measuring blood lead levels. Policymakers are therefore unaware of the extent of the problem and hence unlikely to act in response.

(2) Lack of data on which sources of lead exposure are the biggest local contributors. Causes of lead poisoning vary spatially, but the vast majority of LMICs have not conducted source-apportionment studies. This makes it difficult to prioritize the most impactful policies.

(3) Limited access to equipment needed to detect lead in paint, spices, water, other sources, or the environment. Without needed detection capabilities, regulators cannot investigate the lead content of potential sources, nor can they monitor and enforce regulation of known sources.

These barriers are relatively simple to overcome, and when they are overcome do indeed result in action. As an example, at least 20 LMICs introduced legally binding lead paint regulation after the Global Alliance to Eliminate Lead Paint and its partners helped those countries confirm that lead paint was an important source of lead poisoning. Moreover, addressing childhood lead poisoning is in line with the priorities of the Biden Administration and the U.S. Agency for International Development (USAID). The Administration has already proposed an ambitious $15 billion plan to address childhood lead poisoning in the United States by eliminating lead pipes and service lines. By contributing to global elimination efforts (for only a fraction of what it will cost to solve the problem domestically), the Administration can multiply its impact on reducing childhood lead poisoning. Doing so would also advance USAID’s mission of “advanc[ing] a free, peaceful, and prosperous world”, since a reduction in childhood lead poisoning worldwide would improve health, strengthen economies, and prevent crime and conflict.

Plan of Action

Lead poisoning, from a variety of sources, affects one in three children worldwide. This is an unacceptable situation that demands action. The United States should adopt a three-part roadmap to help LMICs implement and enforce policies needed to achieve global elimination of childhood lead poisoning.

Recommendation 1. Add blood lead level (BLL) testing to the USAID-led Demographic and Health Survey.

USAID, through its Demographic and Health Survey (DHS), is in an ideal position to address the first barrier that LMICs face to implementing anti-lead poisoning policies: lack of data and awareness. The DHS collects, analyzes, and disseminates accurate and representative data on health in over 90 countries. Including BLL testing in the DHS would:
● Make accurate and representative data on the prevalence and severity of lead poisoning in LMICs available for the first time.

● Draw national and international attention to the immense burdens that childhood lead poisoning continues to impose.

● Determine which LMIC populations are most impacted by childhood lead poisoning.

● Motivate interventions to target the most impacted populations and most important sources of exposure.

● Support quantitative evaluation of interventions that aim to reduce lead exposure.

As such, USAID should add BLL testing of children into the DHS Biomarker Questionnaire for all host countries. This could be done in DHS revision for Phase 9, beginning in 2023. Including BLL testing in the DHS is also the first step to addressing the second barrier that LMICs face: lack of data on sources of lead exposure. BLL data collected through the DHS would reveal which countries and populations have the greatest lead burdens. These data can be leveraged by researchers, governments, and NGOs to investigate key sources of lead exposure.

BLL testing of children is feasible to carry out in the context of the DHS. It was successfully piloted in 1998 and 2002 via the DHS presence in India and Uzbekistan, but not rolled out further. Testing can be carried out using finger-stick capillary sampling and portable analyzers, so venipuncture and laboratory analysis are not required. Further, such testing can be carried out by health technicians who are already trained in capillary blood testing of children for anemia as part of the DHS. The testing can be conducted while questionnaires are administered, and results and any follow-up actions can be shared with the parent/guardian immediately. Alternatively, laboratory lead tests can be added onto sample analysis if blood draws are already being taken. Costs are low in both cases, estimated at around $10 per test.

Recommendation 2. Create a Grand Challenge for Development to end childhood lead poisoning.

Childhood lead poisoning in LMICs is dramatically neglected relative to the scale of the problem. Though childhood lead poisoning costs LMICs nearly $1 trillion annually and accounts for 1% of the global disease burden, only about $6–10 million per year is dedicated to addressing the problem. A USAID-led Grand Challenge for Development to end childhood lead poisoning would mobilize governments, companies, and foundations around generating and implementing solutions. In particular, the Challenge should encourage solutions to the second and third barriers presented above: lack of data on sources of lead exposure and limited detection capacity.
Recommendation 3. Push forward a global treaty on lead control.

A global push is needed to put childhood lead poisoning on the radar of decision-makers across the world and spur implementation and enforcement of policies to address the issue. The Biden Administration should lead an international conference to develop a global treaty on lead control. Such a treaty would set safe standards for lead in a variety of products (building on the Global Alliance to Eliminate Lead Paint’s toolkit for establishing lead-paint laws) and recommend regulatory measures to control sources of lead exposure. The success of the UN’s Partnership for Clean Fuels and Vehicles in bringing about global elimination of leaded gasoline illustrates that international political will to act can indeed be generated around lead pollution.

Conclusion

By implementing this three-part roadmap the Biden administration and USAID can make a historic and catalytic contribution towards global elimination of lead poisoning. There is true urgency; the problem becomes harder to solve each year as more lead enters the environment where it will remain a source of exposure for decades to come. Acting now will improve the health, wellbeing and potential of hundreds of millions of children.

Frequently Asked Questions

1. How do we know that childhood lead poisoning is a global problem if there is very little data on it?

Though relatively little investigation has been done on childhood lead poisoning in LMICs, the studies that do exist have consistently shown very high levels of lead poisoning. A recent systematic review identified studies of background levels of childhood lead exposure in 34 LMICs. According to the review, “[o]f the 1.3 billion children (aged 0–14 years) living in the 34 LMICs with acceptable data on background blood lead levels in children, approximately 632 million...were estimated to have a level exceeding the CDC [Centers for Disease Control and Prevention] reference value of 5 μg/dL, and 413 million...were estimated to exceed the previous reference value of 10 μg/dL.” Data collected by the Institute of Health Metrics and Evaluation and analyzed in a joint UNICEF/Pure Earth report published in 2020 similarly concluded that dangerously elevated BLLs affect over 800 million children worldwide.

2. Why are levels of lead poisoning so high in LMICs and what are the sources?

Major sources of lead poisoning in LMICs include paint, spices, cookware, pottery, pipes, cosmetics, toys, unsafe lead-acid battery recycling, unsafe e-waste recycling, and poorly controlled mining and smelting operations. High-income countries like the United States have relatively low levels of lead poisoning due to strong regulations around these sources of lead poisoning. Most high-income countries have, for instance, banned lead in gasoline and paint, set enforceable standards around the lead content of water, and imposed strong regulations around food adulteration. As a
result, median BLLs in high-income countries have declined dramatically (in the United States, from 15µg/dL in the 1970s to <1µg/dL today). LMICs generally lack many of these effective controls around lead exposure and therefore have very high levels of childhood lead poisoning.

3. What policies and interventions need to be in place in LMICs to eliminate childhood lead poisoning?

The most important thing that can be done to tackle the scourge of childhood lead poisoning is to impose source controls that prevent lead from entering the environment or consumer products. Though the relative contributions of different sources to childhood lead poisoning differ by country, effective policies and interventions tend to include:

- Regulations limiting the lead content of paint available on the market.
- Regulation of lead-acid battery and e-waste recycling practices.
- Inclusion of lead parameters in national drinking-water-quality standards.
- Regulation of the use of lead compounds in other locally important sources, such as spices, ceramics, cookware, toys, and cosmetics.

To enforce these policies, LMICs need testing capacity sufficient to monitor lead levels in potential exposure sources and in the environment. LMICs also need BLL monitoring to track the impact of policies and interventions. Fully eliminating childhood lead poisoning will ultimately involve abatement: i.e., removing lead already in the environment, such as by taking off lead paint already on walls and by replacing lead pipes. However, these interventions are extremely costly, with much lower impact per dollar than preventing lead from entering the environment in the first place.

4. Why is global childhood lead poisoning such a neglected issue despite its enormous scale?

An extreme lack of awareness, lack of data, and lack of advocacy around childhood lead poisoning in LMICs has created a vicious cycle of inattention. A large part of the problem is that lead poisoning is invisible. Unlike a disease like malaria, which causes characteristic cyclical fevers that indicate their cause, the effects of lead poisoning are more difficult to trace back.
About the Author

Dr. Lucia Coulter is director and co-founder at Lead Exposure Elimination Project (LEEP), a health-policy NGO working to reduce childhood lead poisoning in LMICs through applied research and targeted advocacy. LEEP works in partnership with local governments, researchers, NGOs, and industry to bring about the implementation of policies that protect children from lead poisoning. Lucia is a Schmidt Futures Innovation Fellow and previously worked as a doctor in acute and emergency medicine in the UK’s National Health Service. She has published peer-reviewed research in the fields of public health and global health and taught as an academic supervisor at the University of Cambridge. She holds a Bachelor of Medicine, Bachelor of Surgery, and a Master’s degree in Natural Sciences from the University of Cambridge.

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