Webinar Report

INTER-SECTORAL EXPERT WEBINAR ON LEAD POLLUTION AND EXPOSURE IN G20 COUNTRIES

Co-organized by Brazil, the European Union, Germany, South Africa, the United States, and hosted by the World Bank

5 November 2024

Purpose of this document

This webinar report provides an overview of the goals and objectives of the *Intersectoral Expert Webinar on Lead Pollution and Exposure in G20 Countries* held on 5 November 2024, the issue of lead pollution, and a summary of the presentations and discussions of the webinar. The webinar agenda is included in Appendix 1 of this report, and the questions and answers from the chat are in Appendix 2. The webinar report and presentations are available online.

Overview

Goal of the Webinar

The *Intersectoral Expert Webinar on Lead Pollution and Exposure in G20 Countries* was developed for G20 government representatives from the environment, health, and development tracks and technical experts across various sectors (including health, development, and environment). The goal of the webinar was for these groups to share knowledge on the issue of lead pollution and exposure and to discuss options to prevent and reduce it in lower- and middle-income countries (LMICs) in the G20. Attendees also included relevant stakeholders that are affected by lead pollution or active in lead pollution prevention and reduction. To spur open discussion the webinar followed Chatham House rules.[1]

Objectives

- Raise awareness within and across the G20 environment, health, and development tracks about the issue of lead sources and exposure;
- Provide information about the sources and impacts of lead exposure and actions to prevent and reduce them; and
- Share experiences about how to address lead sources and exposure in LMICs in the G20.

Issue

Lead is a potent neurotoxin. Exposure to lead, even at very low levels, can have chronic and debilitating effects on multiple body systems leading to personal, societal, and economic

[1] "When a meeting, or part thereof, is held under the Chatham House Rule, participants are free to use the information received, but neither the identity nor the affiliation of the speaker(s), nor that of any other participant, may be revealed." Note: For practical reasons, presenters were identified in the summary of presentations and in responses to questions asked of them by participants.

impacts. Exposure of young children, pregnant women, and elderly people is of particular concern, as lead can impair neurodevelopment and Intelligent Quotient (IQ), as well as increase the death rate of cardiovascular disease. There is no known safe level of lead exposure, and one in three children globally are estimated to have elevated levels of lead in their blood.

Lead exposure is estimated to cause 1.6 million premature deaths per year, primarily due to cardiovascular disease, and some mortality estimates are even higher. The effect on children's cognitive development alone has resulted in economic losses of at least $1 trillion U.S. dollars annually in LMICs. Lead was identified as one of 10 chemicals of significant public health concern globally and an important issue for action by the World Health Organization (WHO) and its Member States in the 2023 World Health Assembly. Estimates by the World Bank show that lead poisoning ranks as the third highest environmental health risk factor globally, potentially accounting for 30 percent of cardiovascular disease associated deaths, surpassing ambient air pollution.

Lead exposure results from a range of sources. Common sources of lead pollution and exposure in LMICs include unsound recycling of lead acid batteries (LABs), paint containing lead, mining and smelting of lead, ceramic and aluminum cookware, contaminated spices, and cosmetics (such as kohl eyeliner); toys, jewelry, and consumer goods; drinking water (via lead fixtures); powders for religious purposes and traditional medicines, lead ammunition and fishing weights, and e-waste recycling. Addressing lead pollution requires coordination across sectors to identify and respond to the burden of exposed populations, prevent new exposures, and remediate existing environmental contamination.

Many sources of lead exposure can be prevented or effectively reduced through laws, regulations, and best practices, anchored in a whole government approach, including private sector involvement and targeted responses. Disparities in led-exposure levels are high between LMIC and high-income countries, as poorer countries and former colonies tend to have higher levels of exposure. Efforts are underway to develop mechanisms for sharing information and galvanizing action on feasible and scalable solutions to reduce lead exposure across a range of sources.

Key Takeaways

Presentations were given by representatives of intergovernmental organizations (IGOs), international non-governmental organizations (INGOs), and G20 members. The presentations focused on two topics: what is currently known about lead exposures and impacts in LMICs and what is being done in countries, including LMICs, to prevent lead exposures. There were several key takeaways from the presentations:

- Lead exposure is one of the highest-ranking risk factors when analyzing the global burden of disease, causing approximately 1.5 million deaths and 34 million disability-adjusted life years (DALYs) globally in 2021. Initial estimates for 2023 are even higher.
- The two primary human health impacts of lead exposure are IQ point losses in children and cardiovascular disease in adults.
- There are significant disparities in lead exposure between LMICs and high-income countries. Populations in LMICs experience IQ point losses and cardiovascular disease mortality to a greater degree because they generally have higher lead exposures; in

2019 it was estimated that blood lead levels – a way to measure exposure to lead – in LMICs were 3.5 times higher than in high-income countries.

- In 2019, 95 percent of IQ point losses from childhood lead exposure occurred in LMICs.
- The average blood lead level reported in 2019 in LMICs was estimated to increase the risk of cardiovascular disease mortality by 50 percent when compared to the risk in individuals not exposed to lead.
- The estimated global cost of lead exposure is as high as the global cost of ambient and household air pollution combined. The cost of IQ point losses from lead exposure in children is estimated at $2.4 trillion (PPP) annually and the cost of cardiovascular disease mortality from lead exposure is $ 7.9 trillion (PPP) annually, corresponding to 1.8% and 5.9% of global gross domestic product (PPP), respectively.
- Sources of lead exposure vary by country, state, city, and even household; sources can include contaminated soil, metal cookware, ceramics, toys, paint, food and spices, water, and cosmetics.
- To identify sources of lead exposure, various methods can be used in tandem such as home-based assessment, rapid market screening, isotopic analysis, and identification and assessment of contaminated sites.
- One organization is implementing programs in LMICs to assess lead exposure and address pollution, including blood lead level testing, exposure source analysis, and source-specific interventions for sources including spices, battery recycling, ceramics, metal cookware, cosmetics, and contaminated site remediation.
- In Brazil, a reverse logistics recycling process was adopted to address lead pollution from wasted lead acid batteries (WLABs); regulated companies guarantee the destination of the waste all the way through the post-consumer stage, with manufacturers being responsible for the full life cycle of the battery, including any damage to the environment.
- In South Africa, standards were set in 2024 to enforce a maximum permissible level of lead in paint (≤90ppm), which include sampling procedures, quality assurance principles, analytical methods, and labeling requirements.
- The Indian government developed the National Biomonitoring Program for Chemical Toxicants and the National Surveillance System to monitor blood lead levels in the population. Inter-sectoral coordination through these programs helps collate available data on lead to develop policy at the ministerial level and build on existing campaigns and policies regarding other pollutants.
- The European Union (EU) recently revised the Industrial Emissions Directive (IED) which creates a framework for competent authorities to set permitting conditions. The IED sets minimum EU-level requirements (Best Available Techniques – BAT), which are developed through a transparent and cooperative process, to address emissions of lead from industrial sources.
- Current challenges for addressing lead pollution and exposure in LMICs include data collection to understand the scope of sources of lead pollution and exposure in the population and developing effective strategies for regulating lead pollution.
- Partnerships comprised of representatives from governments, industry, non-governmental organizations (NGOs), and academia have been developed to accelerate

addressing lead pollution at a country level, such as the newly established Partnership for a Lead-Free Future (PLF).

Summary of Presentations and Discussions

1. Welcome and Overview

Valerie Hickey, World Bank

A welcome message was delivered by Dr. Valerie Hickey, World Bank. Dr. Hickey welcomed speakers and attendees and expressed her gratitude for their efforts in addressing global lead pollution. She also thanked the United States Environmental Protection Agency (US EPA) for their work to convene the expert meeting. She noted that, though pollution is a common topic in practically every international environmental forum, discussion on lead pollution specifically is often missing. Addressing lead is especially important because it can be both part of environmental solutions (e.g., LABs in energy efficient transport or solar systems) and also an environmental and public health issue (e.g., exposure to sources of lead).

Addressing lead pollution is even more necessary given that most lead pollution is entirely preventable, despite the fact that lead can accumulate silently and poison individuals over time which sometimes makes prevention and remediation more difficult. She contended that the lead in paint and cosmetics, for example, is unnecessary and does not add a desirable, material difference to our lives.
Dr. Hickey reiterated that there is no safe blood lead level, and that childhood lead poisoning has both an individual and societal impact resulting in reduced IQ and lost earnings. She relayed that the World Bank is focused on three main efforts: prevention of future lead poisoning through policies and bans, broad surveillance of hotspots to address current pollution and impact and innovating new ways to reduce costs in the consumer chains that already exist. Dr. Hickey concluded by noting that although lead is estimated to be one of the most impactful global risks, the issue can be solved—we have the science and the global framework to address this issue.

Sarah Nelen, European Commission

A welcome message was delivered by Ms. Sarah Nelen, European Commission. Ms. Nelen thanked Ms. Hickey for her introductory comments, in particular her discussion of the importance of addressing global lead pollution and exposure prevention, and what is at stake if it is not addressed. She began her remarks by noting that achieving zero pollution has been recently given priority in global environmental discussions, as noted by Ms. Hickey. Within the European Commission, she noted that biodiversity, the circular economy, and pollution will be high priority areas for the next Commissioner. Ms. Nelen emphasized the EU's focus on prevention as the first line of defense in reducing lead pollution and exposure. In the EU, attention has been given to eliminating the use of lead in products and to transitioning from a linear to a circular economy to minimize the environmental and human health impacts through the life cycle of products. For example, alternative materials to lead could be used in products such as paint or cookware and non-lead-containing batteries could be used in some applications to reduce potential lead pollution and exposure at the source. Ms. Nelen noted that the EU

adopted a policy in January 2021 to restrict the use of lead gunshot in wetlands, with further restrictions being proposed on the use of lead gunshots in hunting, sports shooting, and fishing. In 2023, the EU also adopted restrictions on the use of lead portable batteries and developed requirements for the recovery of lead and the recycling of lead from wasted batteries. On a global scale, she also discussed a project between the EU and the United Nations Environment Programme (UNEP) to support the reduction of environmental and human health risks from lead exposure in LMICs. Ms. Nelen concluded her remarks by stating that she hoped the webinar could provide useful insights for G20 members and LMICs alike, highlighting ways to minimize the impacts of lead pollution and pathways for global and domestic measures.

Mark Kasman, US Environmental Protection Agency

Mark Kasman, Director of the U.S. EPA's Office of International Affairs, noted the significance of the webinar, indicating that it was the first event of its kind for the G20, made possible by the efforts of representatives from the EU, Germany, South Africa, and the United States with support from Brazil. Mr. Kasman stated that the goal of the webinar was to facilitate discussions across the environment, health, and development tracks. In doing so, the webinar would aim to share knowledge, options, and practices to prevent and reduce lead exposure in the G20. He underscored the urgency of addressing lead pollution, highlighting that lead exposure, even at very low levels, can impair children's cognitive development and cause adverse health effects for adults, including cardiovascular disease. He cited the Institute for Health Metrics and Evaluation (IHME), which estimates that lead may cause at least 1.6 million deaths annually.

Mr. Kasman underscored the importance of advancing effective practices to reduce sources of exposure. Particularly, he encouraged the coordinated action of the environment, health, and development sectors by spotlighting the achievements agencies and organizations including the US EPA, United States Agency for International Development (US AID), WHO, and UNEP, and others. Among many accomplishments, he pointed to the crafting of the Model Law and Guidance for Regulating Lead Paint, the launch of the Partnership for a Lead-Free Future, and the G20 Call to Action on Strengthening Drinking-water, Sanitation, and Hygiene Services to combat water pollution, including lead pollution.

Mr. Kasman concluded by applauding the progress that has been made and expressed his enthusiasm for the outcome of the webinar as well as future G20 conversations about lead pollution and exposure.

2. Background on Countries and Regions Most Affected by Lead Poisoning

Global health burden and cost of lead exposure in children and adults

Dr. Michael Brauer, Institute for Health Metrics and Evaluation

Dr. Brauer provided an overview of the estimates of the IHME of the global disease burden and exposure in children and adults attributable to lead that were developed as part of its Global Burden of Disease (GBD) project.

To develop the global burden of disease attributable to lead, IHME estimated IQ point losses in children from lead exposure as well as incidences of cardiovascular disease in adults from accumulation of lead in the bone. Dr. Brauer noted that IQ point losses in children reflect health impacts resulting from more recent exposures to lead while the incidence of cardiovascular disease in adults from accumulation of lead in the bone reflects health impacts from exposures to lead over a lifetime. The incidence of cardiovascular disease in adults from the accumulation of lead in the bone is the main driver of the global disease burden attributable to lead exposure.

To put the impacts of lead exposure into context, Dr. Brauer presented IHME's most recent results from the GBD project. Of the approximately 90 risk factors IHME included in its analysis, lead exposure is one of the highest-ranking risk factors, causing approximately 1.5 million deaths globally and approximately 34 million DALYs globally in 2021.

Dr. Brauer also discussed trends over the last 20 years in global disease burden, highlighting that the disease burden attributable to lead has increased by more than 30 percent. This increase has been determined to be primarily due to the aging of the global population. However, when results are normalized for age distributions in different populations there has been a decrease in age-standardized global disease burden attributable to lead exposure over the last 20 years. This is likely caused by reductions in lead exposure and rates of cardiovascular disease at a global scale, even when considering the increasing rate of individuals with cardiovascular disease caused by the aging population. Therefore, Dr. Brauer emphasized the importance of considering both of these factors when assessing the current global disease burden attributable to lead exposure and how it might change in the future.

To illustrate this point, Dr. Brauer showed a comparison of IHME's estimates of global lead exposure[2] in 2000 and 2021, noting that for much of the world there have been substantial reductions in lead exposures, although there are some areas that continue to have high levels of lead exposures (e.g., South and Central Asia, Sub-Saharan Africa, and Central and South America). Considering the lead exposure results in 2021 alongside IHME's global disease burden estimates in 2021, Dr. Brauer noted that areas in the world with some of the highest rates of disease burden attributable to lead exposures (e.g., Eastern Europe and Central Europe) do not have the highest lead exposures. As such, there are significant disparities in lead exposure between LMICs and high-income countries. In the former, the rates of disease burden attributable to lead are a result of relatively high lead exposures in combination with very high rates of underlying cardiovascular disease in the population. In contrast, LMICs with some of the highest lead exposures (e.g., Sub-Saharan Africa and South Asia) have some of the lowest rates of disease burden attributable to lead because the population is younger and has lower rates of underlying cardiovascular disease.

Diving further into the factors impacting global disease burden attributable to lead, Dr. Brauer presented data on the timing of when lead exposures started to reduce in different parts of the world and how that impacted disease burden across various age distributions of populations from 1990-2022. In high-income countries, younger populations have experienced relatively greater reductions in disease

[2] IHME estimates exposure based on information from blood lead level surveys collected from around the world. In locations and for years where blood lead level data is not available, IHME models blood lead levels based on different variables such as urbanicity of a population, a population's socio-demographic index, and the time since lead was phased out in gasoline to generate a complete estimate of lead exposure globally.

burden attributable to lead compared to younger populations in LMICs due to greater decreases in lead exposures. In contrast, globally, among older populations (e.g., over age 40) past lead exposure reductions have had little to no effect in reducing the disease burden attributable to lead, with some of the oldest populations experiencing an increase in disease burden. This is due to older populations having experienced high levels of lead exposure before exposure reduction measures were implemented, such as the removal of lead from gasoline. As measures to reduce lead exposures were first implemented in high-income countries, older adults in low-income countries experience the highest level of disease burden attributable to lead. Dr. Brauer stated that this information highlights the complex interplay between age, timing of lead exposure reduction measures, and where lead exposure reductions occurred in determining disease burden attributable to lead.

Dr. Brauer then discussed research on the relationship between lead exposure and cardiovascular disease. Commonly, lead's connection with cardiovascular disease has been examined via its impacts on systolic blood pressure (SBP). More recently, evidence has been mounting that suggests there may be a direct relationship between lead exposure and cardiovascular disease that does not work through effects on SBP. IHME conducted an analysis looking at the relationship between cardiovascular disease, particularly ischemic heart disease, and lead exposure using published studies, US data, and National Health and Nutrition Examination Survey (NHANES) data. The data showed that there is moderate evidence of a direct relationship between lead exposure and ischemic heart disease. Subsequently, IHME modeled the direct relationship between lead exposure on ischemic heart disease and the indirect relationship for other cardiovascular diseases. While the results are preliminary for the GBD in 2023, Dr. Brauer noted that lead exposure was associated with a larger estimate of disease burden with approximately 3.8 million deaths (75% via the direct pathway) and 90 million DALYs which would make it the fifth highest ranking risk factor in the global burden of disease. This would put lead exposure's burden of disease on par with particulate matter air pollution and above high body mass index in adults.

In his concluding remarks, Dr. Brauer emphasized that the burden of disease attributable to lead is large, and with new information and methods for estimating the burden of disease, will likely be much higher than previously estimated. While lead exposures globally are decreasing, he emphasized that it is important to know the disease burden attributable to lead is increasing largely because of adult cardiovascular disease and the growth of an aging population that experienced much higher historical exposures. Therefore, it is unclear how much impact reducing lead exposures will have on preventing cardiovascular disease today, given that the lead older adults have accumulated in their bones over a lifetime will still have impacts on their risk of cardiovascular disease. Despite this, he emphasized that reductions of lead exposures today are still important for decreasing the burden of disease for future populations of adults and will benefit children immediately through reductions in IQ point losses.

Bjorn Larsen, Consultant to the World Bank

Mr. Bjorn Larsen provided an overview of his and World Bank staff's estimates of the global health burden and cost of lead exposure in children and adults in a paper by Larsen et. al. (2023).[3]

Mr. Larsen noted that the research focused on estimating global IQ point losses in 2019 among children under 5 years of age and global cardiovascular disease mortality in 2019 among adults. To estimate these health effects, they used country blood lead level estimates from the 2019 GBD. The 2019 GBD showed that blood lead levels in LMICs were 3.5 times higher than in high-income countries. The 2019 GBD also estimated that as many as 28 percent of children and adults in LMICs may have blood lead levels above 10 µg/dL, and 46 percent may have blood lead levels above 5 µg/dL.

For estimating global IQ point losses in children, Mr. Larsen stated that the research relied on a relationship between blood lead levels and IQ point losses presented in Crump et al. (2013).[4] Crump et al. (2013) showed that as blood lead levels increase, IQ point losses increase. Using the 2019 GBD blood lead level data and the relationship in Crump et al. (2013), Mr. Larsen noted that the research paper estimated 765 million IQ points were lost in 2019 among children under 5 years of age, 80 percent higher than a previous estimate in 2013. He noted that when looking at estimated IQ point losses across countries, 95 percent of the global IQ point losses from lead exposure occurred in LMICs. Further, he explained that the average child in LMICs was estimated to lose nearly 6 IQ points in the first years of life. Mr. Larsen pointed to the longer-term impacts from this loss, noting a 12 percent reduction in estimated lifetime income and reduction in 50 percent of the population with an IQ over 120 points.

Mr. Larsen noted that IQ point losses are not the only health effect of lead exposure among children. Lead exposure is also associated with adverse birth outcomes such as low birth weight and pre-term birth. These adverse birth outcomes increase the risk of infant and child mortality and are associated with IQ point losses. IQ point losses have longer-term effects on learning and performance in school, labor force participation, earnings, and ultimately lifetime income and economic productivity.

To estimate global cardiovascular disease mortality in adults from lead exposure, Mr. Larsen stated that they used a relationship between blood lead levels and the risk of cardiovascular disease mortality from large studies conducted in the United States. These studies showed that as blood lead levels increase, the risk of cardiovascular disease mortality increases. He noted that the average blood lead level reported in LMICs increases the risk of cardiovascular disease mortality by 50 percent, as compared to individuals not exposed to lead. Using the 2019 GBD blood lead level data and the relationship established by the United States studies, Dr. Larsen noted that the World Bank's estimate of disease burden in terms of cardiovascular disease mortality of 5.5 million deaths annually attributable to lead exposure was nearly four times greater than the 2021 GBD estimates. He explained that this indicates that lead exposure may be responsible for as much as 30 percent of cardiovascular disease mortality globally. Mr. Larsen explained that the difference in these estimates is because the 2021 GBD only

[3] Larsen, B., E. Sanchez-Triana. 2023. Global health burden and cost of lead exposure in children and adults: a health impact and economic modelling analysis. Lancet Planet Health 7: e831–40. https://doi.org/10.1016/S2542-5196(23)00166-3.

[4] Crump KS, Van Landingham C, Bowers TS, Cahoy D, Chandalia JK. 2013. A Statistical Reevaluation of the Data Used in the Lanphear et al. (2005) Pooled-analysis that Related Low Levels of Blood Lead to Intellectual Deficits in Children. Crit Rev Toxicol. 43(9):785–799. doi: 10.3109/10408444.2013.832726.

included the effect of lead exposure on cardiovascular disease mortality through lead's impact on blood pressure. He added that, in contrast, the World Bank's estimate includes a range of cardiovascular effects from lead exposure such as atherosclerosis and decreased heart rate variability.

In addition, Mr. Larsen indicated that the estimate of the global cost of lead exposure is as high as the global cost of ambient and household air pollution combined. He noted the productivity cost of IQ losses from lead exposure was estimated to be $2.4 trillion (PPP), which is equivalent to approximately 1.8 percent of the global GDP (PPP). He added that the welfare cost of cardiovascular disease mortality from lead exposure was estimated to be $7.9 trillion (PPP), which is equivalent to 5.9 percent of the global GDP (PPP). Assessing costs of lead exposure among countries, Mr. Larsen stated that, in low-income countries, the majority of costs of lead exposure come from IQ point losses. He explained that this was because low-income countries have higher birth rates, and thus larger populations under 5 years of age, and generally higher lead exposures. For low-income countries, this leads to the cost of IQ losses to be substantially higher than the welfare cost of cardiovascular disease mortality. In middle- and high-income countries, the inverse is the case.

Summary of existing information and activities on lead exposure and sources in low- and middle-income countries

Drew McCartor, Pure Earth

Mr. McCartor presented a summary of existing information and Pure Earth activities on lead exposure. Mr. McCartor's presentation focused on the impact of lead pollution in LMICs, as communities in LMICs are exposed to lead at disproportionate rates. Mr. McCartor explained that addressing and mitigating the harmful effects of lead exposure and pollution in LMICs is further complicated by the variety of exposure pathways present. Common exposure sources change by country, state, city, and even household; such sources can include, but are not limited to, contaminated soil, metal cookware, ceramics, toys, paint, foods and spices, water, and cosmetics.

To address the varying exposure sources, Mr. McCartor recommended four methods for identification:

- home-based assessments;
- rapid market screening;
- isotopic analysis, and;
- identification and assessment of contaminated sites.

Mr. McCartor noted that using multiple source assessment methods is important to assess and identify exposure sources of lead. Mr. McCartor discussed the trends in Pure Earth's findings in the populations where home-based assessments of suspected products and environmental media were conducted in homes with elevated blood lead levels. He noted that Pure Earth is in the process of developing an expanded protocol for these assessments to include household-level interventions to replace contaminated goods and retest blood lead levels. The rapid market screening work involved screening consumer goods in 100 markets across 25 countries. Mr. McCartor explained that isotopic analysis could be used to compare the lead isotope in various local sources of exposure with the type of lead isotope found in a blood sample to assess primary exposure sources. Though there are many challenges present in identifying such a wide range of possible exposure pathways, a promising tool is the handheld X-Ray

fluorescence (XRF) analyzer. Mr. McCartor explained that the handheld XRF tool is suitable for home-based assessments given its portability. Other programs currently being implemented by Pure Earth to address lead exposure and pollution in LMICs include blood lead level testing, exposure source analysis, and source-specific interventions for sources including spices, battery recycling, ceramics, metal cookware, cosmetics, and contaminated site remediation.

Lead and Drinking water: Opportunities to reduce exposure and improve health

Jennifer De France, World Health Organization

Ms. Jennifer De France provided a presentation on opportunities to reduce exposure to lead in drinking water being considered by the WHO. She emphasized that the WHO identifies lead as a major contaminant of public health concern that requires urgent action to address by member countries.

She highlighted that the WHO's work on lead in drinking water is focused on three different areas: norms, technical guidance, and community of practice. In terms of norms, Ms. De France noted that since the WHO first developed norms on drinking water quality in 1958, it has included lead. The latest WHO guidelines, published in 2022, include a provisional guideline value for lead in drinking water of 10 µg/L. Ms. De France emphasized that the guideline value is provisional because there has not been a safe level of lead identified. The 10 µg/L guideline value reflects difficulties in achieving lower levels by centralized water treatment, where lead-containing products that come in contact with water are used. Lead contamination in drinking water is primarily from these materials (due to corrosive water effects on lead-containing materials). She noted that this presents an opportunity for primary source prevention as a means of reducing lead in drinking water further, which is a key element for reducing lead exposures. Given the unique nature of lead in drinking water because of the primary source, Ms. De France stated that unique monitoring and management strategies are required for addressing lead as compared to other contaminants in drinking water. Therefore, she highlighted guidance that the WHO developed in 2022 on managing and monitoring lead in drinking water. Lastly, Ms. De France discussed the community of practice work the WHO has been conducting with member countries. In particular, she noted the WHO's international network of drinking water and sanitation regulators, where members of the network have raised the issue of lead in drinking water.

Ms. De France noted that lead in drinking water is a significant concern for the public, highlighting various media reports about lead in drinking water. She emphasized that it is known that lead is harmful, that it is an important issue to address, and that it is preventable, but what is less well known is how prevalent lead in drinking water is. She stated that most of the data on lead in drinking water comes from high-income countries, with a general lack of systematic data on the prevalence of lead in drinking water in LMICs. To fill this gap, Ms. De France noted that the University of North Carolina Chapel Hill is conducting a systematic review and while the study is ongoing, the key takeaway from the data is that lead in drinking water occurs commonly at levels of concern when analyzed across drinking water supply types (e.g., borehole, piped, well) and Sustainable Development Goal (SDG) regions. In terms of the regional data, Ms. De France noted in East and Southeast Asia, there was a large dataset from China that showed very low levels of lead in drinking water, and when those data were removed, she noted that the results for East and Southeast Asia were more similar to the other SDG regions. She also highlighted that for many countries there is no data available on lead in drinking water, but it is likely that lead is a concern in drinking water in these countries too given the importance of lead-

containing parts causing drinking water contamination and that there are often global supply chains of these products.

Further exploring lead-containing products, Ms. De France presented data from five countries (Ghana, Zambia, Uganda, Indonesia, and the Philippines) collected by the International Association of Plumbing and Mechanical Officials (IAPMO). She noted that given the importance of lead-containing parts as a source of lead in drinking water, it points to the need for regulations to minimize lead in various products. The IAPMO data, as Ms. De France highlighted, focused on regulations on lead in fittings and fixtures, piping, and water filtration. She emphasized that the data showed major gaps in what products are regulated among countries, and when products are regulated, the standards are not often mandatory. Additionally, she noted that even when technical standards are mandatory in a regulation there are often issues with enforcement.

Ms. De France concluded by summarizing the implications of the information she presented. She first emphasized that the evidence indicated that lead in drinking water is a global issue, and that primary prevention is a viable option for addressing it. While gaps in the data exist, she emphasized that there is sufficient evidence to act now to address the issue. Actions she highlighted were scaling up water quality monitoring to better understand the issue and to inform remedial action in water supply systems, adequate regulation and enforcement to prevent lead-containing products from entering supply chains, and building multi-stakeholder engagement. In terms of stakeholders, she noted this can include drinking water regulators, standard setting agencies, building authorities, drinking water suppliers, plumbers, property owners, and consumers. She highlighted that the WHO developed a technical brief in 2022 that discusses some of the key actions these different stakeholders can take to address lead in drinking water. She also highlighted other initiatives for addressing lead in drinking water including the globalleadfreewater.org initiative launched in 2023 at the UN Water Conference, the Asia Pacific Economic Committee who is leading the development of a roadmap to formalize plumbing product markets, the G20 call to action on strengthening drinking water, sanitation, and hygiene services , the call to action on strengthening water and sanitation regulatory systems, the SDG target 6.1 on safely managed drinking water services for all, and the PLF. Lastly, Ms. De France emphasized that lead in drinking water needs to be part of the effort to address the lead issue more broadly.

Partnership for a Lead-Free Future

Abheet Solomon, UNICEF

Mr. Abheet Solomon, Senior Adviser at the United Nation's Children Fund, spoke about the PLF. He provided an overview of the campaign, specifying the overarching goal of ending childhood lead poisoning by 2040. To do so, he outlined three key strategies: identifying the human impact of lead exposure, supporting government leadership, and adopting a multi-source mitigation approach. Mr. Solomon argued that, for such strategies to be successful, the partnership must create a broad base of leadership that facilitates multi-sectoral cooperation but, simultaneously, must emphasize country ownership and country-level efforts.

The partnership is comprised of actors and agencies from governments, industry, NGOs, and academia. It is not a global funding mechanism and nor a multilateral agreement. Rather, it is intended to

accelerate the implementation of required strategy, innovation, and technology for addressing lead pollution and exposure at the country level. The role of UNICEF's Secretariat is three-fold: to serve as a host of central knowledge and a resource hub to support country-led efforts; to support coordinated action among partners and mobilize new partners; and to catalyze collective action to amplify global progress and address implementation gaps.

Mr. Solomon noted that 25 governments have already joined the partnership. In collaboration with the US EPA with input from technical contributors, he spotlighted the ongoing development of a toolkit that details specific actions and resources to support lead mitigation and remediation efforts in LMICs. These tools span five categories: assessing childhood lead exposure and its sources; acting decisively across sectors; developing capacities to protect children; toughening measures to reduce lead in the environment; and eliminating exposures causing lead poisoning. Six of the 12 tools are expected to launch by the end of 2024.

The presentation concluded with a mention of a recent report published in Bhutan showing high levels of lead in children. Mr. Solomon underscored that each country should understand its own unique and specific set of sources. In doing so, they can begin taking meaningful steps toward implementing safeguards and prevention strategies.

3. What is Being Done?

Recycling of Used Lead Acid Batteries

Sabrina Andrade dos Santos Lima, Ministry of Environment, Brazil

In her presentation, Ms. Andrade discussed the recycling process for WLABs in Brazil. She began with explaining the reverse logistics recycling process adopted in Brazil in the early 2000s. Under this process, regulated companies guarantee the final destination of each waste all the way through the post-consumer stage. A management entity includes manufacturers, importers, and traders, oversees operations, with support from the Brazilian Institute of Recyclable Energy. Batteries are recycled for lead, plastic, and acid, which have high economic value. Brazil's sectoral agreement sets national and regional collection targets that have been consistently met since 2019.

Ms. Andrade noted the challenges and implemented solutions:

- Traceability**:** Due to contamination issues, strong traceability measures like electronic invoices were implemented, holding manufacturers accountable for environmental damage across the battery lifecycle.
- Logistical Challenges**:** Transport costs are high due to Brazil's size and the concentration of recycling plants.
- Consumer Awareness**:** Public education efforts are ongoing, though awareness remains limited.
- Supervision**:** Oversight is complex, with state-level responsibilities limiting federal enforcement power.

Ms. Andrade concluded with a note that Brazil's laws require a shared responsibility between all stakeholders with manufacturers responsible for the full-life cycle of the battery, including any damage that may happen to the environment.

Addressing sources of lead exposure: focus on educational settings

Dr. Angela Mathee, South African Medical Research Council, South Africa

Dr. Angela Mathee examined lead exposure risks in recreational and educational settings for children – addressing contextual challenges and sources of exposure in South Africa. Among the contextual challenges, Dr. Mathee pointed to the correlation between income and risk of exposure and noted that poverty tends to increase the likelihood of lead exposure. Additionally, South Africa's large informal sector presents its own set of obstacles for understanding, managing, and controlling lead sources.

Turning to specific sources of exposure, Dr. Mathee began by outlining existing standards and regulations in South Africa. As of May 2024, revised standards enforce a maximum permissible level of 90 ppm lead in paint; sampling procedures, quality assurance principles, and analytical methods; and labeling requirements. She highlighted as a main concern the lack of a strategy to address the problem of legacy paint in schools, homes, and other public facilities. She argued that the first step to mitigation is broad surveillance and research efforts to understand the scope of the issue.

Additionally, Dr. Mathee also discussed the importance of cultivating a relationship between urban planners and health, development, and environmental experts. Presently, planners approve housing projects that are in close proximity to exposure sites – particularly mining facilities. As a result, children living closest to these sites have the highest blood-lead levels and the gardens of their homes have the highest soil lead levels. The solution, she proposed, is conducting full health impact assessments as well as creating buffer zones between exposure sites and residential areas. This may be achieved through efforts to facilitate dialogue and relationships between the planning and health sectors.

Surveillance of blood lead levels

Dr. Meera Dhuria, National Center for Disease Control, India

Dr. Meera Dhuria, Assistant Director of India's National Centre for Disease Control, discussed the burden of lead exposure on populations in India. She began by providing an overview of the pervasiveness of lead exposure in India, noting that 320 sites have been identified by the Ministry of Environment, Forest, and Climate as having a high probability of contamination. Further, survey data from UNICEF and Pure Earth also indicates that one-half of children in India have blood-lead levels exceeding 5 µg/dL.

In turn, the National Institute for Transforming India (NITI) Aayog provided a number of policy recommendations that resulted in the National Biomonitoring Program for Chemical Toxicants and the National Surveillance System. The system combines stakeholder mapping, data collection, and population screening. Dr. Dhuria emphasized the importance of inter-sectoral coordination in these programs. They strive to collate available data from partners and collaborators to develop policy at the ministerial level, and they build on existing campaigns and policies regarding other pollutants and harmful substances.

The presentation concluded with a list of challenges and opportunities. Challenges include the cost and availability of labs and tests; limited recycling infrastructure; the difficulty of managing a large informal sector; workforce shortages; low community awareness; and competing political, economic, and

developmental priorities. Opportunities, however, included the wide extent of digital and mobile service reach; a strong universal health program; and general political will.

Lead Prevention and Reduction in Industrial Emissions

Toon Smets, European Commission

Mr. Toon Smets discussed specific policies and strategies implemented by the European Union to prevent and reduce industrial emissions. Further, he examined how such strategies might apply to ongoing efforts to address lead emissions and pollution. His presentation began with a general overview of trends in industrial releases to air and water. Since 2010, Mr. Smets illustrated a significant decline in the emission of pollutants and heavy metal in both air and water. He then pointed to specific legislative milestones that shaped the existing framework for the prevention and reduction of emissions.

In his discussion of lead pollution and prevention, he spotlighted the recently revised Industrial Emissions Directive (IED). The IED, he argued, has helped to create a framework that allows competent authorities to set permitting conditions. Through the Sevilla Process, a key element of the IED, minimum EU level requirements (Best Available Techniques – BAT) are defined in a transparent and cooperative process. Several BATs address the emissions from lead, including those for the non-ferrous metals and waste incineration industries.

4. Discussion of Experiences and Options for Action

After the presentations concluded, Ms. Angela Bandemehr of the US EPA and webinar moderator opened the floor for discussion. The conversation focused primarily on immediate solutions and next steps. Participants emphasized the importance of addressing hazardous waste disposal, pointing to improper recycling of LABs and solar panels.

One participant indicated that smelting waste and improper disposal can be a source of exposure. Participants discussed the need for mitigation strategies to focus on improving disposal treatment and management by engaging industry and private sector stakeholders. Rather than focusing exclusively on the public sector, some argued that engaging the private sector first could be an avenue for faster reform.

Participants also discussed broader theoretical questions. Most prominently, many were interested in how to harmonize ideas and coordinate solutions.

One participant noted the importance of continuing addressing the prevention and minimization of lead exposure and pollution also in future, and notably during South Africa's Presidency of the G20 in 2025.

In her concluding remarks, Ms. Bandemehr stressed the role of the Partnership for a Lead-Free Future. The campaign, she argued, would be a useful forum for coordinating existing efforts, identifying sources, mapping efforts to address lead and developing cross-cutting solutions. She pointed, specifically, to the US EPA's ongoing efforts to develop a model regulation for WLAB recycling. When published, it is envisaged to serve as a resource for LMICs to begin crafting strategies that promote environmentally sound management of WLABs.

In the online chat, a number of topics were discussed. Most comments focused on available technologies, best practices, and regulatory standards. Participants expressed interest in identifying strategies to implement cost-effective solutions and stimulate multi-sector cooperation. These conversations revolved around blood-lead level testing, lead-acid battery recycling, and regulatory frameworks. See Appendix 2 for detailed questions and answers from the chat.

5. Summary and Closing

To close the webinar, Ms. Bandemehr thanked speakers and participants for their attendance. She expressed her optimism about future conversations and actions to address lead exposure, calling the webinar an impetus for future discussions in the G20 forum.

Appendix 1 – Agenda

INTER-SECTORAL EXPERT WEBINAR ON LEAD POLLUTION AND EXPOSURE IN G20 COUNTRIES

Co-organized by Brazil, the European Union, Germany, South Africa, the United States, and hosted by the World Bank

Location:	Online and 1818 H St. N.W., Washington, DC 20433
Date:	5 November 2024
Time:	8:00-10:30 AM Eastern Standard Time (UTC – 5)
Registration Link:	Please register here to participate.

Moderator: Angela Bandemehr, US Environmental Protection Agency

AGENDA

8:00 – 8:15 AM **WELCOME AND OVERVIEW**

- Welcome
  - Valerie Hickey, World Bank (3 min)
  - Sarah Nelen, EU (3 min)
  - Mark Kasman, US EPA (3 min)
- Overview of Agenda and Webinar Objectives (5 minutes)

8:15 – 9:05 AM **BACKGROUND ON COUNTRIES AND REGIONS MOST AFFECTED BY LEAD POISONING**

- Global health burden and cost of lead exposure in children and adults
  - Michael Brauer, Institute for Health Metrics (10 minutes)
  - Bjorn Larsen, World Bank (10 minutes)
- Summary of existing information and activities on lead exposure and sources in low- and middle-income countries, Drew McCartor, Pure Earth (10 minutes)
- Lead and Drinking water: Opportunities to reduce exposure and improve health, Jennifer De France, WHO (10 minutes)
- Partnership for a Lead-Free Future, Abheet Solomon, United Nations Children's Fund (10 minutes)

9:05 – 9:15 AM **QUESTION AND ANSWER SESSION**

9:15 – 9:55 AM **WHAT IS BEING DONE?**

- Recycling of Used Lead Acid Batteries, Sabrina Andrade dos Santos Lima, Brazil Ministry of Environment (10 minutes)
- Addressing sources of lead exposure: focus on educational settings, Angela Mathee, South African Medical Research Council, South Africa (10 minutes)
- Surveillance of blood lead levels, Dr. Meera Dhuria, National Center for Disease Control, India (10 minutes)
- Lead Prevention and Reduction in Industrial Emissions, Toon Smets, European Commission (10 minutes)

9:55 – 10:25 AM **DISCUSSION OF EXPERIENCES AND OPTIONS FOR ACTION**

10:25 – 10:30 AM **SUMMARY AND CLOSING**

Appendix 2: Participant Questions from the Chat

Written questions were posed by participants in the meeting chat throughout the webinar. This section provides a list of the questions as well as answers provided by the presenters and/or other participants in the webinar.

Question 1: Can you test bone lead levels/cumulative lead levels in any other way other than post-mortem?

> **Answer:** Yes, you can measure bone lead levels with an XRF analyzer.

Question 2: Regarding ongoing industrial releases of lead, what is the prevalence of robust release inventories in LMICs or regions?

> **Answer:** Speaking from only our organization's [Pure Earth's] experience, we have not found robust release inventories in the LMICs where we work. In most of these countries, the governments also often lack inventories showing the number, location, and severity of lead-contaminated sites. This is why we have been building our database at contaminatedsites.org.

Question 3: Is the revision of the standard for lead in paint to 90 ppm still underway in Brazil?

> **Answer:** In Brazil, we have a proposed Law 3428/23 to revise the lead limit in paint to 90 ppm. It has been approved by the Constitution Commission and now awaits approval from Congress (both the House of Representatives and the Senate). There is no timeline for when this will occur.

Question 4: One challenge for much of industrial stakeholders is the role of the informal sector in economic activity in most LMICs (especially with consumer products). Can speakers comment on how we might engage them effectively?

> **Answer:** Informal actors, particularly in the waste lead-acid battery (WLAB) and e-waste recycling, can contribute significantly to lead pollution. Regarding LABs, there are several existing and forthcoming resources that touch on the role of informal actors. One is a white paper from the World Economic Forum. UNEP also has a guidance document. UNICEF and US EPA are also developing a collection of tools that address specific lead issues, and one of these tools focuses on policy options to reduce risks from WLAB battery recycling, including options to reduce risks from informal actors. In addition to a tool on WLAB recycling, US EPA is working with UNEP and other key stakeholders on a model regulation for environmentally sound LAB recycling.

Question 5: How can the suggested BAT be implemented in developing countries?

> **Answer** (provided after the webinar)**:** The process to define BAT or similar concepts to prevent and control industrial emissions to air, water and soil has been implemented in countries and regions outside the EU. The OECD has published an overview the BAT-based policy instruments in place in various countries, how they are embedded into national legislation, the pollutants, sectors and activities to which they apply and requirements linked to the use of BAT or similar concepts. Included here is a useful reference.

Question 6: Do the industrial permits require facilities to use a specific BAT listed in the permit or are they just required to meet the limit and they can pick a technology to do so?

> **Answer** (provided after the webinar)**:** The Industrial Emissions Directive sets that BAT conclusions shall be the reference for setting the permit conditions. The techniques listed and described in the BAT conclusions (Commission Implementing Decisions) are neither prescriptive nor exhaustive. Other techniques may be used that ensure at least an equivalent level of environmental protection.

Question 7: Are artisanal or backyard industries a significant source of lead in LMICs? Also, is backyard garbage burning a prevalent activity in these countries?

> **Answer:** Yes, informal industries, particularly WLAB recycling and e-waste recycling, are significant sources of pollution and exposure. We [Pure Earth] have identified and assessed about 1,000 sites contaminated by such sources. We [Pure Earth] estimate there are tens of thousands of such sites that will continue poisoning children for generations until they are remediated.
>
> There is also some research that has been done on open waste burning.

Comment: One participant noted their work in Madagascar, which identified over 9,000 handpumps manufactured and installed by about 50 local artisans as a quite significant source of elevated blood lead levels. They indicated that they have worked with them to change their behavior in removing lead from their pumps.