Global Lead Program

Results, 2020-2023

PURE EARTH

January 2024

Contents

Pure Earth Global Lead Program, Results, 2020-2023

Pure Earth's Lead Program has been instrumental in elevating lead exposure as a priority for action by governments, policymakers, major funders, and other national and global actors. By bringing greater visibility and increased understanding of lead exposure through the generation of new data and evidence on its prevalence, severity, and sources, and through advocacy around impacts and interventions to prevent or mitigate it, the importance of tackling lead exposure is steadily gaining traction. Increased prioritization of the issue is indicated through governmental and other stakeholder actions including: making national declarations, earmarking funds to address lead exposure, and participating long-term collaboration and learning structures such as multidisciplinary (EPA, WHO, UNICEF) working groups.

Aggregated Results: Bangladesh, Georgia, Ghana, India, Indonesia, Mexico, Philippines

- **35 Global Lead Program projects implemented in 31 countries**
- **79 awareness raising events**
- **11,676 BLL tests administered**
- **259 environmental assessments conducted**
    - **217 new toxic/Pb sites entered into TSIP database**
    - **9 detailed site assessments**
    - **33 environmental assessments (non-HBA)**
- **8 home-based assessments (HBA)**
    - **907 homes assessed**
    - **27 market assessments in 25 countries**
    - **415 markets assessed**
    - **>5,800 product samples tested**
- **4 sites remediated**
- **87,350 square meters remediated**

Outcome 1: Increased profile and prioritization of lead exposure at national and global levels through advocacy and awareness raising

Signals from governments and other key stakeholders in the form of funding, policy changes, declarations, and other actions.

BANGLADESH

- In 2020, Pure Earth began organizing a regular meeting of 10+ organizations working on lead poisoning in Bangladesh that includes UNICEF, International Lead Association, UNEP, Dhaka University, ESDO, icddr,b, and Stanford University. This group is now called the **Lead-Safe Bangladesh Coalition** and works collaboratively to reduce lead exposure, raise awareness, and implement solutions. Recently, Pure Earth and coalition partners carried out a **joint media campaign,** to disseminate T**he Lancet Planetary Health** and Pure Earth's **RMS study results**, and to publish 10 action points to mitigate lead pollution.
- In July 2021, Pure Earth Bangladesh and the Department of Environment (DOE) organized a virtual workshop to release their jointly-created **"**Lead Pollution and Health Roadmap**,"** Participants included more than 65 diverse experts from government and non-government institutions. The **DOE committed resources to the issue in the form of 3 officers** to oversee toxic site remediations. In 2021, the **Ministry of Health and Family Welfare's** (MoHFW) Directorate General of Health Services formed a **Technical Implementation Committee to review and advise** on lead exposure activities in Bangladesh. The Committee includes representatives from GoB health programs, INGOs including UNICEF and Pure Earth, and academic partners.
- In March 2023, DGHS with UNICEF introduced **National Guidelines for Case Management and Monitoring and Surveillance System**. Initially adopted in PECP project areas.
- In June-July 2023, Pure Earth completed a pilot study of lead levels in fish, sparking **World Bank interest.** The World Bank is currently considering a Pure Earth proposal **to conduct a larger, countrywide study** of lead levels in fish and vegetables.
- The **Ministry of Environment, Forest and Climate Change (MoEFCC)** is adopting a **multi-sector committee to oversee policy gaps in lead mitigation and policy framework** for enhancing better monitoring of lead. A formal MoU will be signed between MoEFCC, Pure Earth, and UNICEF, expected in 2024.
- Bangladesh's Bureau of Statistics plans to include a **national BLL survey** in the **2024 MICS survey** of 40,000 children, with support from the World Bank. Pure Earth has offered to conduct the follow-up a source assessment study in parallel through Home-Based Assessments.
- The **Ministry of Health and Family Welfare's Sector Plan 2024-2029** includes a **"Lead Prevention Project.** Plan focuses on supporting BLL surveys, awareness, and health system preparedness.
- Bangladesh's **Directorate of General Health Services** is **preparing an environmental health National Action Plan** which addresses lead and other heavy metals. Focused on community awareness and education and preparing health systems to combat lead exposure and establish a referral system, the Plan will be effective from July 2024.
- The **Bangladesh Ministry of Environment, Forest and Climate Change is expected to sign an MOU with Pure Earth and UNICEF** to form a multi-sector committee to oversee policy gaps in lead mitigation and policy framework for enhancing better monitoring of lead.

GEORGIA

- Following a 2018 national BLL survey by the Georgian National Center for Disease Control and Public Health and UNICEF showing 41% of Georgian children had BLLs >5µg/d and that 16% had BLLs >10

μg/dL, Pure Earth helped the GOG identify most prominent sources. Results showed lead chromate was being added to spices, a main exposure source, to enhance color.

- **The GOG swiftly enacted new regulations to target the problem. Lead has now been nearly eliminated from spices in Georgia.**
- **The GOG is now participating in a joint research initiative** with Pure Earth, Georgia National Center for Disease Control and Public Health (NCDC), and the UK Health Security Agency to find out 1) the *current* contribution from spices (and other sources) to lead poisoning among children in two regions of Georgia, and 2) reductions in average BLLs these two regions, potentially as a result of the **2020-2022 regulatory and enforcement interventions.**

GHANA

- On August 24, 2023, following a BLL survey of 3,227 children and follow-up HBAs, Ghana Health Service, UNICEF, and Pure Earth signed a **Declaration of National Action to Reduce Lead Poisoning in Ghana.** It contains 12 recommendations for taking action against lead exposure.
- In August 2023, following public presentation of the BLL and HBA results, **the Environmental Protection Agency of Ghana (EPA) decided to close two non-compliant ULAB facilities in Greater Accra and three non-compliant facilities in the Tema** metropolitan area.
- On September 9, 2023, during a stakeholder workshop, Ghana EPA brought into force its new **Technical Guidelines for the Sound Management of ULABs** to guide and facilitate the compliance monitoring and enforcement in ULAB and metal recycling facilities. The Oeko Institute and the EPA developed the Guidelines during 2021-2023. At the same workshop, **Pure Earth and Ghana Health Service presented the findings** of the BLL survey and Home-Based Assessments.
- On September 15, 2023, the EPA**,** with Pure Earth and Ghana Health Service, held a press conference, **advocating for a national Lead Prevention and Reduction Policy.** The EPA **recommended the establishment of a high-level committee** with the Ministries of Environment, Science, Technology and Innovation; Health; and Local Government and Rural Development to work with Pure Earth and UNICEF to develop the policy.
- In November 2023, following public presentation of Ghana BLL and HBA results, Gravita Ltd., an international LAB/ULAB company with operations in Ghana, decided to hire Pure Earth to assess and create a remediation plan for a contaminated legacy site in Tema.

INDIA

- Following the release of **The Toxic Truth** report, **NITI Aayog** requested that the **National Environmental Engineering Research Institute (NEERI)** and the **Council of Scientific and Industrial Research (CSIR)** conduct a review of The Toxic Truth. NITI Aayog, chaired by the Prime Minister of India, is a **Federal public policy think tank that coordinates strategy, policy, and planning across State and Federal levels.** The NEERI/CSIR report, **Assessment of Lead Impact on Humans and India's Response,** found The Toxic Truth valid and credible and, if anything, that it understated the scope of the problem.
- In October 2022, Pure Earth convened a **Working Group of Indian LAB industry stakeholders** including the **Indian Battery Manufacturers Association, the Society of Indian Automobiles Manufacturers, and relevant government agencies** to produce recommendations, under review by the Central Pollution Control Board, to improve the Battery Waste Management Rules, 2022.
- One potential improvement - concerning the General Sales Tax on LABs - to push ULAB recycling from the informal to the formal sector, falls under the jurisdiction of the Ministry of Finance. The Material Recycling Association of India has provided input to this ongoing conversation.
- In September 2023, multi-sector stakeholders (government, academia, health, medical, international institutions, NGOs) led by Pahle India Foundation established the I**ndia Working Group on Lead Poisoning.**

Members represent **USAID, UNICEF, ADB, NDRC, NEERI, WHO** and others. The India Working Group will focus on policy change.

INDONESIA

- **The Government of Indonesia** has taken up the mantle of contaminated site remediation, incorporating TSIP data collected with Pure Earth into its own national database and conducting contaminated site remediations on its own.
- In March 2023, at the dissemination event of the "Action Plan for Reducing Childhood Lead Poisoning in Tegal Regency 2023-2027," the **Environmental Office announced the approval of IDR 600 million (USD 38k) to remediate the Pesarean contaminated site.** The results of the site assessment served as a f**oundation for the GOI's preparation of an** Environmental Remediation Plan for Pesarean. See: Pesarean: A Journey of Transformation from A Contaminated Site to Tourist Destination.
- In May 2023, the **Regent of Bogor issued a "Letter of Determination of Land Contaminated by Hazardous Waste in the Form of Lead Contaminants that Will Be Remediated."**
- In July 2023, the **Ministry of Environment and Forestry and the Ministry of Health** identified a need for a **cross-sectoral Lead Working Group** to tackle lead pollution. In a follow-up meeting in October, the Ministries discussed the latest public health impact and exposure source data, stakeholders, and a proposed Working Group work plan.
- On July 10, 2023, the **Indonesian Pediatrics Society** issued "Recommendation for Lead Intoxication in Children."
- On October 11, 2023, the **Indonesian Occupational Medicine Association** issued "Recommendation to Control Lead Exposure to Workers and Adults."
- Following the November 10, 2023 launch of the "Strengthening Health Systems to Reduce Lead Exposure" project, the **Ministry of Health's Directorate of Environmental Health signed a cooperation agreement** with Pure Earth Indonesia. An agreement with the MOH's Directorate of Public Health Governance is forthcoming. The launch event was attended by the MOH, MOEF, Indonesian Agency for Research and Innovation, FDA, MOH Center of Policy, WHO, UNICEF, the Indonesian Pediatric Society, the Indonesian Occupational Medicine Association, and the Indonesian Medical Association.
- The **Indonesian Society of Obstetrics and Gynecology** reached out to the OEHRC (Occupational and Environmental Health Research Center) IMERI (Indonesia Medical Education and Research Institute) FKUI (Faculty of Medicine, University of Indonesia) about lead issues. We anticipate this will result in recommendations for pregnant women and infants.
- The **Indonesian Doctors Association established a task force** to control impacts of heavy metal exposure.
- MOH's Directorate of Environmental Health, with support from WHO, is working to **establish a National Poison Center.** Pure Earth Indonesia will support on lead.
- The **MOH, with support from UNICEF, has been training health workers** in Bogor and Tegal Regencies on lead exposure of children and pregnant women.

MEXICO

- Pure Earth Mexico was a leading promoter of systematic BLL monitoring that, in 2018, was adopted through the **National Poll for Health and Nutrition (ENSANUT),** a national representative health survey of 1500 children. Sponsored by the **National Institute of Public Health** and members of its board including **Ministers of the Federal Government, academics, and presidents of health research institutes.** Pure Earth supported the **National Institute of Public Health**'s analysis of lead poisoning prevalence, disease burden, and associated economic costs through provision of necessary lead-testing equipment (LeadCare II kits).

ENSANUT was repeated in 2022. Results have remained stable: 16.8% of children ages 1-4 have BLLs over 5 µg/dL. Traditional leaded pottery is one of the primary sources of exposure.

- Federal Laws exist on BLL limits for occupationally-exposed workers, the public, and pottery production. But these laws lack regulations and processes for enforcement, systematic monitoring, or budget access. Pure Earth's work advocating with the Health Ministry for a Presidential Decree on steps needed to enforce laws - and several of its research papers - have been key in the development of **two government-sanctioned programs** that, if implemented, will secure systematic, countrywide monitoring of lead exposure:
    - **Immediate Action Program for the Reduction of Lead Exposure 2019,** published by the **General Health Council.**
    - **Study for the Reduction of Lead Exposure in Mexico**, published by the **National Institute of Ecology and Climate Change, 2021.**
- **In 2022-2023, six Mexican institutions and two NGOs** signed MOUs and began to **independently replicate or support replication of Pure Earth's model** for transitioning traditional potters to lead-free glazes: the Mexican Institute of Social Security; Universidad Iberoamericana; Monterrey Institute of Technology; Institute for the Promotion of Tabasco Crafts; Museum of Popular Arts, Morelos; Fundación Comunidad, Morelos; Dignicraft; and Innovando la Tradición.

THE PHILIPPINES

- **In 2021,** the Food and Nutrition Research Institute (FNRI) agreed to include BLL testing of up to 3,200 children ages 6-9 and up to 320 pregnant women in 25 of 37 areas covered by the Expanded National Nutrition Survey (ENNS). This effort, supported by USAID, Meridian Bioscience, Clarios Foundation, and HSBC, was **the Philippines' first large-scale representative BLL survey.** The ENNS is a demographic and health survey conducted every five years to collect data on the nutritional and health status of Filipinos and to inform policy decisions. It is a rolling survey covering 160,000 individuals from a total of 117 areas (provinces and highly urbanized cities).
- **The GOP** recently agreed to **institutionalize BLL testing - using its own funds - into the ENNS in all regions in 2023-2024.** Results expected in 2025, pending funding for laboratory analysis.
- In October 2023, **in response to a Senate request for a proposal for the development of a public health surveillance system to track lead exposures,** Pure Earth submitted a proposal for both national and local-level actions to the Office of Senator Pia Cayetano for review.
- **The House of Representatives** (Office of Congressman Fresnedi) **drafted a bill on cookware labeling and monitoring** on which it is currently taking inputs and suggestions. Congressman Fresnedi has also requested concept notes: 1) early BLL detection; and 2) establishment of toxicology centers, which Pure Earth plans to submit in Q4 2023.
- **Following an October 2023** presentation on research findings from the Lancet, Rapid Market Screening, and the ENNS BLL survey and HBA**,** the **Philippine Pediatric Society** is updating its policy statements to include information about protecting children from lead exposure, and will disseminate its new **Prevention Handbook for Children's Health,** which also includes BLL screening of children, at its Annual Convention in April 2024. Local chapters of the Society will support city lead surveillance pilots.
- **Valenzuela** (a BLL survey site), with support of the Office of the Councilor for Health, City Health, and the Philippine Disability Affairs Office, has initiated efforts to form a **Lead Technical Working group** and finalize the **database of children with disabilities that will be BLL tested** (funded by Disability Affairs Office). **Valenzuela City Council has drafted a resolution**, now awaiting inputs and revisions, in support of these initiatives.

- **Muntinlupa** (a BLL survey site) is **drafting a city lead program** in line with the results and recommendations of the survey.
- The **Office of Muntinlupa's Representative in Congress is drafting a bill to tackle the policy gaps in addressing lead contamination and exposures.** Pure Earth has shared research findings, survey results, and potential anchors on existing Philippine laws to support this effort.
- The **National Environmental Health Action Plan 2023 - 2030**, drafted by the Inter-agency Committee on Environmental Health, prioritizes lead exposures as evidenced in 10+ "strategic actionable items."

US Government

The USG can help LMIC governments take action by: raising lead poisoning as an important development issue, helping LMICS create and implement effective policies, and ensuring its bilateral development programs support lead poisoning prevention. Pure Earth and the Global Alliance on Health and Pollution (GAHP) have engaged with the White House, Council on Environmental Quality, US EPA, USAID, US DOS, US FDA and others.

Council on Environmental Quality

- In 2022, the Council on Environmental Quality agreed to create a position in the White House to take the lead agenda forward.

USAID

- Pure Earth directly discussed the scale, sources, and impact of lead poisoning globally with a range of USG officials, leading to USAID's, in 2023, setting up an **internal lead working group** and hiring a **technical advisor to design a strategy** to increase USAID's leadership on the issue. **The head of USAID's Global Health Bureau committed to focus on lead poisoning** in discussions with USAID Missions and LMIC health ministers.

Congress

- In 2021, **two reports from the U.S. House on the widespread contamination of baby food, and a new Consumer Reports study** on contaminated spices led to heightened awareness about how pollution affects the global food supply chain. A bill to address toxins in baby food was introduced but stalled.
- For the first time, **Congress directed funds to specifically reduce lead pollution in LMICs through a total of $6M in FY 2022 and FY 2023 appropriations bills.** Pure Earth commends political leaders, including now-retired Sen Patrick Leahy (VT) and Congresswoman Debbie Dingell (MI), who acknowledged our efforts in "…bringing attention to the severity of childhood lead poisoning worldwide."
- Pure Earth worked with partners to share with Congressional offices key points about the global impact of lead poisoning, and how global lead pollution threatens American children. Our work encouraged the **U.S. Senate to request $4M in FY 2024 foreign assistance appropriations to fight lead poisoning globally.**
- Pure Earth's engagement with the Senate Foreign Relations Committee resulted in staff drafting a Senate Resolution expressing concern about lead poisoning globally, with plans to introduce this year to raise awareness both in Congress and with the Administration.

Presidential Task Force on Environmental Health Risks and Safety Risks to Children

- In 2023, the Task Force added an Inter-Agency Working Group on international lead poisoning challenges. This group, coordinated by the US EPA, is tasked with advancing strategies that emerge from the G7 process to increase US leadership and engagement on the issue.

Global Governance

These efforts draw high level political support for tackling lead pollution at the global level and help build momentum and future action.

World Bank

- In recognition of lead as a neglected development challenge, the World Bank conducted an analysis of the health and economic effects of lead exposure. In September 2023, results were published in **The Lancet Planetary Health**, one of the world's most prestigious health journals. Pure Earth consulted as a reviewer and has been asked to share information about its projects for a forthcoming World Bank ROI analysis and report on different intervention types for a forthcoming publication.

LAB/ULAB industry associations - International Lead Association, EUROBAT, Association of Battery Recyclers and Battery Council International

- Provided **in-kind technical support** for Pure Earth lead exposure mitigation activities associated with industrial activities
- Joined the **PECP platform** as partners.
- Regularly invite Pure Earth to present difficult but welcomed topics at industry conferences. In 2019, Pure Earth's Rich Fuller spoke at the ILA conference about the forthcoming **The Toxic Truth** report. As a result, Clarios formed the Clarios Foundation and approached Pure Earth and UNICEF for a joint grant.
- Have designed a **voluntary third-party audit and certification regime** for member facilities. Invited Pure Earth and other external stakeholders to review and suggest edits to ensure adequate monitoring of environmental performance and safety
- Developed a set of **SOPs for LAB recycling**; originally designed for Ghana but equally applicable in other LMIC contexts.

UNICEF

- Prior to 2020, UNICEF did not have a portfolio in lead work or a focus on environmental health beyond air pollution and climate. Due to the impact of the 2017 Lancet Commission on Pollution and Health, UNICEF's Policy division approached Pure Earth to jointly create a report on pollution and children's health. In discussions about themes, and based on Pure Earth's research on the Global Burden of Disease from childhood lead exposure, both parties agreed the report would have a greater impact if it focused on a single toxin. Hence, **The Toxic Truth** report focused exclusively on lead. The report has been consequential in two key ways: it served as the foundation for a UNICEF's **Healthy Environments for Health Children** program and its new "healthy environments" pillar of its health program; and 2) it's been instrumental in growing the number and breadth of involved stakeholders.

UN/UNEP, via GAHP advocacy for GiveWell

- In February 2022, **UNEP's assembly, UNEA 5.2, passed Resolution 5/8 to establish a Science Policy Panel to further the sound management of chemicals and waste and prevent pollution.** The idea is that this Panel will do for pollution what similar panels have done for climate change and biodiversity, namely focus global public opinion on the urgent need for action and solutions to the global pollution crisis. GAHP built 28+ countries' support to help make this resolution (both its text and its approval) happen. GAHP (and Pure Earth via GAHP) continue to participate in the Panel's Open-Ended Working Group meetings (next one is December 2023 followed by June 2024.) GAHP experts were requested to participate in preparatory meetings for this OEWG process, indicating that GAHP is considered a credible expert in this field.
- Established Global Lead Forum which met in May, June, December 2022.

- Broadened theme of International Lead Poisoning Prevention Week, October 23-39, 2022, beyond lead in paint and **convened speakers from WHO and the Basel Convention.** This is important because previous WHO efforts focused only on lead in paint, preventing wider impacts of lead from a variety of sources from being highlighted by a major actor and influencer in the field - WHO.

European Commission (European Green Deal; Zero Pollution Agenda; various relevant legislation)

- The **EU Zero Pollution Action Plan** (2020) highlights lead pollution's impacts on human health especially for children and calls for a global initiative to eliminate informal ULAB recycling.
- **EU Legislation on End-of-Life Vehicles**
- In 2022, the UK Department for Food, Environment and Rural Affairs **(DEFRA)** requested GAHP participation in a horizon scanning process for global chemicals of concern. GAHP's two proposals, Childhood Lead Poisoning, and Heavy Metals (including lead) in Food, were accepted. The paper was published in May 2023.
- Both of these actions have helped ensure lead pollution and poisoning draws attention of key donors in the development agenda - UK and EU.

MERCOSUR (Mercado Común del Sur)

- 2020 MERCOSUR agenda and action plan included lead poisoning as an issue of concern.
- The **2021-2024 Action Plan on Sustainable Consumption and Production of Chemicals,** the 6th Environment Working Group of **MERCOSUR** included **development of a proposal for the regional sound management of ULABs.**
- In September 2022, as a result of its advocacy work in MERCOSUR and with the German Government, GAHP secured **EUR 95k f**rom BMU to develop dialogue and solutions for the sound management of ULABs in Argentina, Brazil, Paraguay, and Uruguay. As part of this project, GAHP subgranted Pure Earth (EUR 15k) to develop a **"Mass Balance Protocols and Template"** to enable a harmonized and comparable mass balance of lead and ULABs.
- **Brazilian Association of Battery Recycling** (ABRABAT) provided co-funding to convene the October 2022 workshop in Montevideo, Uruguay.
- The four MERCOSUR Ministers of Environment issued a **"Ministerial Declaration"** committing to strengthen regional cooperation and new resources to support implementation of the Action Plan, which gives special attention to the sound management of ULABs. This is the first time LAC nations have formalized dialogue and commitment to finding a solution.
- The **Government of Argentina** requested that GAHP convene a second multi-stakeholder dialogue, which it did in April 2023.
- MOURA (main Argentine LAB producer) expressed interest in engaging other Argentinian LAB producers in dialogue and to take voluntary actions in the country and MERCOSUR framework.

G7, G20, and T20 Engagement

- GAHP engaged in the G20 and G7 processes to elevate the issue of pollution and health and advocate for inclusion of pollution (especially air and lead) and health in their agendas. Efforts centered on G20 Sherpa teams and G20 engagement groups, which produced recommendations to the G20 leaders, under the Italian (2021) and Indonesian (2022) G20 presidency, and the German G7 presidency (2022), principally the Think Tank 20 (T20).
- **Pollution and health referenced in three G7 Communiques:** 2021 and 2022 G7 Ministers of Health in context of One Health; 2022 G7 Ministers of Environment put pollution on par with climate change and biodiversity, included a paragraph dedicated to lead, and requested to hold a G7 workshop on lead in fall 2022 (Berlin). GAHP and Pure Earth participated as experts in this G7 workshop in November 2022.
- On November 21 2023, the **G7 Expert Meeting on Concrete Actions, including Potential Capacity Building and International Cooperation Interventions to Address Lead Pollution and Exposure in**

LMICs was held in Washington, DC. The World Bank presented "Global health burden and cost of lead exposure health impact and economic modeling analysis." Pure Earth presented the findings of its Rapid Market Survey.

Think Tanks

- T20 (Think Tank 20). T20 is the G20 engagement group that brings together the "policy brains" of the world. GAHP published three T20 policy briefs referencing lead pollution. These efforts are important to initiate engagement with a larger global audience outside the usual stakeholders engaged in this issue:
    - **"Targeting Pollution to Improve Health and Mitigate Climate Change: The G20 "Safeguarding the Planet" Agenda - A Call for Action"** (2020)
    - **"Nature-Based Solutions for Climate Change, Clean Energy & Health"** (2021)
    - **"Reducing Transboundary Pollution to Improve Human Health, Protect the Environment and Climate, and Ensure Healthy Food for All"** (2022)
- **Center for Global Development (CGD).** CGD enjoys considerable credibility as a global think tank, with influence over a large variety of stakeholders.
    - A globally recognized think tank, CGD interviewed GAHP and Pure Earth about **The Toxic Truth** report, and issued its own statements and podcast on lead pollution and poisoning. In winter 2022-2023, CGD, GAHP, and Pure Earth joined efforts to draw the attention of the G20 Indian presidency to lead pollution. **CGD** received a GiveWell grant to focus global policy attention on lead pollution. In 2022, GDG launched the global **"Working Group on Understanding and Mitigating the Global Burden of Lead Poisoning."**
    - In October 2023, the Working Group released its **"Final Statement of the Working Group on Understanding and Mitigating the Global Burden of Lead Poisoning,"** asserting that "lead poisoning should be elevated as a top-tier global development challenge." Signatories include representatives from, among others: International Pollutants Elimination Network, NYU School of Public Health, UNICEF, Lead Exposure Elimination Project, Vital Strategies, GAHP, BRAC Institute of Governance and Development, Asian Development Bank, and Open Philanthropy.
- **Rethink Priorities**
    - In May 2021, **Rethink Priorities**, a nonprofit think tank, highlighted the PECP partnership and the urgency of reducing lead exposures in its **"Global Lead Exposure Report."**
    - In May 2021, Rethink Priorities released a second report, **"Exposure to Lead Paint in Low- and Middle-Income Countries."**

The Basel Convention

- In November 2021, GAHP advocated for an update to the Basel Convention Technical Guidelines on the Sound Management of Used Lead Acid Batteries. GAHP participated in the Working Group for the update, which will continue its work in 2023.
- Successfully advocated for inclusion of lead progress indicators within the post-2020 Strategic Approach to the International Chemicals Management process.
- **At the Fifth Meeting of the International Conference on Chemical (ICCM5) in October 2023,** governments adopted a new multilateral agreement and policy framework, the **"Global Chemicals Framework," to replace the Strategic Approach to International Chemicals Management (SAICM),** the former platform through which countries discussed and negotiated chemicals management policies. The new agreement and framework contains 28 specific targets and priorities as well as commitments and guidelines for key sectors. Countries will establish surveillance programs to monitor human exposure to chemicals. This is a major signal to governments about the importance of the type of work Pure Earth does to measure exposure levels. Chemicals management is the only global policy area in which governments and nonprofits regularly interface on equal footing to negotiate agreements. **Lead is included as an "issue of concern," which means funding for LMICs to address lead. Under SAICM,**

only lead paint was eligible. Calls for prevention of illegal trade and trafficking of chemicals and waste, implementation of national legal frameworks, and phase-out of hazardous pesticides. Calls for transition to safer, more sustainable chemical alternatives, responsible chemicals management, and enhancement of transparency and access to information. While the framework is not legally binding, it is a strong nudge. The Framework includes a voluntary fund, managed by UNEP. Germany provided EUR 20M and France EUR 400K to fund a Secretariat.

The WHO

- Under the GAHP and WHO joint Plan of Collaboration, GAHP supported WHO in rollout of its 2021 Guideline for Clinical Management of Exposure to Lead and to collate the evidence base for non-paint sources of lead exposure.
- In fall 2022, GAHP collaborated with several governments to draft and introduce a new agenda item within the **WHO Executive Board on the impact of pollution on human health.** The agenda item was introduced for the 152nd Session of the WHO Executive Board by Canada, Mexico, Peru, Uruguay, and Switzerland. While the agenda item was ultimately *not* adopted by the Executive Board, it was transformed into a **draft resolution for the World Health Assembly** on "the impacts of chemicals, waste and pollution on human health." **This resolution was adopted during the 76th World Health Assembly in 2023.** The resolution acknowledged the impact of lead exposures on cardiovascular disease, quoted The Toxic Truth report, and called for biomonitoring and surveillance programs and for building country capacity for research to inform public health policy.

FUNDING AND RESOURCES

- **$3M**, **USG**, FY 2022 appropriation to address sources of lead exposure in Africa, Asia, Latin America.
- **$8M**, **Open Philanthropies** and **GiveWell,** to reduce lead exposures from spices, cookware and other kitchen sources. Funds a unique activity to research sources of lead exposure across 25 countries through rapid market screenings of household products. Results inform future interventions.
- **USAID, HSBC, Meridian Bioscience, and Clarios Foundation** support to facilitate a large-scale, representative BLL survey of children and pregnant women by the Government of the Philippines.
- **$6.8M**, **Takeda Pharmaceutical Company Limited,** to support health systems strengthening to monitor and address heavy metal exposures in Indonesia, Kyrgyzstan, Colombia, Peru, and Maharashtra, India. **MOUs** with**:** Environmental Health Directorate, Ministry of Health, **Indonesia;** Ministry of Health, Vice-Ministry of Public Health, and the CDC, **Peru;** Ministry of Health, **Kyrgyzstan;** National Health Mission, **Maharashtra, India.**
- **EU 839k**, the **French Facility for Global Environment (FFEM),** to reduce lead pollution and exposure from informal ULAB recycling in Bangladesh.
- **$450k** from an individual donor to establish a "Strategic Policy Fund" to support activities that advance advocacy and policy development related to lead exposure prevention.
- **$150k** in financial and technical support from environmental engineering firms **Roux Associates** (NY) and the **Tauw Foundation** (Amsterdam) for lead reduction activities in Ghana and India.
- In September 2022, the **German Government/BMU** granted GAHP **EU 95k** (CHF 14,700 sub-granted to Pure Earth) to develop solutions for the sound management of ULABs in 4 MERCOSUR countries.
- **$70k** in in-kind technical support to Bangladesh and Indonesia from **Lead Battery 360,** a program established by the International Lead Association, EUROBAT, Battery Council International, and the Association of Battery Recyclers.
- **$60k**, **Schmidt Futures,** to hire a Director of US Policy and Advocacy
- **$32k, Bengal Finance & Investment PVT LTD,** lead source assessments in Tamil Nadu, India.
- **$13.5k, Global Jewelry Initiative,** group of global companies, market assessment in Gujarat, India.
- **$25k, Gravita Ltd, Ghana,** assess contaminated site and produce a clean-up plan

- **GBP 304k, UK/FCDO's** Sustainable Manufacturing and Environmental Pollution program, to develop an economic model and policy recommendations to address lead pollution from substandard ULAB recycling in Bangladesh. With Georgetown University.
- **EUR 20.4M** and committed by **Germany** and **France** to support the voluntary "Global Framework on Chemicals Programme Fund." October 2023.
- **EU 95k** from **BMU Germany** for GAHP & Pure Earth on MERCOSUR.
- **IDR 600M (USD 38k)** approved by the **Environmental Office of Tegal Regency, Indonesia** to remediate Pesearean, a site assessed with Pure Earth support in 2023.
- **$75k, Canada Fund** to support the Circle of Women project in Puebla, Mexico
- **$2k, Hip Give** platform for kiln construction, Mexico
- **$13k**, **Merced Foundation,** to support for work with potters, Mexico
- **$940k**, Clarios Foundation, to support work with potters, Mexico

Major Media Coverage, Briefing Events & Webinars, Videos, Social Media, Conferences, Peer-Reviewed Publications

Pure Earth's **major publications** are a centerpiece of our communications and advocacy efforts. A media campaign and briefing events accompany each major publication. Between major publications, we pitch program accomplishments and write opinion pieces to maintain a steady stream of key message visibility and awareness. Pure Earth receives frequent requests for information from press contacts as the media regards us as a trusted expert on pollution and health issues.

Media Coverage of Major Publications

"The Toxic Truth: Children's Exposure to Lead Pollution Undermines a Generation of Future Potential"

On July 30, 2020, Pure Earth and UNICEF released **The Toxic Truth** report, a groundbreaking investigation that revealed the previously unknown scale of lead poisoning: 1 in 3 children—up to 800 million globally—have BLLs at or > 5 µg/dL. The report was an urgent call to action and led to the launch of Pure Earth's partnership with UNICEF and Clarios Foundation, but more than that, helped **put an invisible issue on the global health map.** As of August 2020, over 900 media articles globally. The report has continued to be referenced in news articles so this number is now higher.

- Estimated reach - 1.8 billion
- Geographic spread of top tier articles: Argentina, Australia, Bangladesh, Colombia, France, Germany, India, Indonesia, Japan, Mexico, Pakistan, Qatar, Russia, South Africa, Spain, UAE, UK, USA
- Examples of top tier coverage: AFP, BBC, BBC Focus on Africa, BBC World Service - Leading story on the BBC World homepage, CGTN, EFE, Foreign Policy's Morning Brief, Guardian, IBT, Independent, NPR, New York Times, Reuters, Telegraph
- Link to PPT of media impact
- Link to full list of articles - Analytics report run by UNICEF comms August 2020

"Blood lead levels in low-income and middle-income countries: a systematic review," Lancet Planetary Health

March 10, 2021 - Press release issued by Pure Earth: New Research Confirms Findings Of Childhood Lead Poisoning Crisis In Low- And Middle-Income Countries

- Earned media coverage - number of articles/stories

    - One major media story in Forbes, "Lead Pollution Affects More Than 632 Million Children In Developing Countries." Estimated reach - 150 million
- Press release views - 1,600
- Geographic spread - 45 countries
- Link to media analytics report on press release

Progress Report on Lancet Commission on Pollution and Health

In May 16, 2022, Pure Earth and other leading environmental health experts published **Pollution and Health: A Progress Update in The Lancet Planetary Health** journal, updating the 2017 Lancet Commission on Pollution and Health.

- Media coverage - 803 articles
- Estimated media reach - 1.5 billion
- Geographic spread - global
- Link to full list of articles

Examples of top tier coverage - See 2022 Lancet Update tab

- The Washington Post. Pollution Caused 1 in 6 Deaths Globally for Five Years, Study Says. May 17 2022
- Bloomberg. Pollution Kills 9 Million People a Year as Fixes Are Neglected. May 17 2022
- Pollution's Fatal Threat Gains Urgency After 9 Million Died in One Year
- NBC News. Pollution's Fatal Threat Gains Urgency After 9 Million Died in One Year. May 17 2022
- The Hill. Pollution Responsible For 1 In 6 Deaths Worldwide: Stud. May 17 2022
- CBS News. Global Pollution Kills 9 Million People Each Year, Study Finds. May 17 2022
- The Associated Press. Global Pollution Kills 9 Million People a Year, Study Finds. May 17 2022
- CNN. One in Six Killed by Pollution Worldwide, Study Finds. May 18 2022
- BBC World News. BBC World News Interview with Pure Earth's Richard Fuller. May 18 2022
- The Guardian. Pollution Responsible for One in Six Deaths Across Planet, Scientists Warn. May 17 2022
- France24. Pollution Behind 1-in-6 Global Deaths in 2019 Study. May 18 2022
- Reuters. Pollution Killing 9 Million People a Year, Africa hardest Hit – Study. May 18 2022
- SPIEGEL Science. Nine Million People Die Prematurely Every Year from Environmental Toxins. May 18 2022
- Daily Mail. Pollution Killed 9 Million People in 2019 – The Equivalent of One in Six Deaths, Major Report Reveals. May 17, 2022

Lancet Planetary Health Journal

September 11, 2023 - The Lancet Planetary Health Journal published, "**Global health burden and cost of lead exposure in children and adults : A health impact and economic modelling analysis**," by Bjorn Larson and Ernesto Sánchez-Triana, PhD. The World Bank asked Pure Earth to assist in a communications campaign to ensure high-level media coverage. We pitched this research along with the release of our **Rapid Market Screening** results. **Top Tier Coverage** that includes both papers

- AFP/France. Lead poisoning causes far more death, IQ loss than thought: study. 9 Sep, 2023
- *Environmental Health News.* Tracking down a poison: Inside the fight for global action on lead. Sep 25, 2023
- *The Examination.* Killing millions and lowering IQs, lead is a greater global threat than previously measured, studies show. Sep 15, 2023
- *VOX.* Lead poisoning could be killing more people than HIV, malaria, and car accidents combined. Sep 14, 2023
- *The Manila Times.* Lead poisoning causes far more death, IQ loss than thought. Sep 13th, 2023
- *Radio France Internationale.* Lead poisoning causes far more death, IQ loss than thought: study. Sep 12, 2023

- Le Monde. Lead poisoning causes far more death, IQ loss than thought: Study. Sep 12, 2023
- Tribune India. Lead exposure likely caused 5.5 million deaths from cardiovascular disease in 2019: Lancet study. Sep 12, 2023
- *Cardiology Today.* Global lead exposure greater CVD risk factor than smoking, cholesterol. *HealioSep 12, 2023*
- *Irish Medical Times.* Health impacts of lead exposure far greater than previously thought, new study suggests. *Sep 12, 2023*

Rapid Market Screening report

September 12, 2023 - Lead in Consumer Goods: A 25-country analysis of lead (Pb) levels in 5,000+ products and foods

- Press release: Pure Earth: First-of-its-Kind Lead Contamination Study Shows High Levels of Lead in Consumer Goods and Foods Produced in Low- and Middle-Income Countries and Available Globally Including in the U.S. - Business Wire Sep 12th, 2023
- Over 200 articles/stories. Link to full list of articles
- Estimated media reach - 357 million combined reach from traditional media and press release
- Top tier coverage from Vox, Agence France Presse (global wire service), Daily Mail, Medscape, Science Alert, The Daily Star, The Manila Times, Financial Express Healthcare, Environmental Health News
- Geographic spread - **Coverage in 40 countries**

Additional Media Coverage, General

83 major media articles about Pure Earth and lead issues from 2020-2023. PE is mentioned in many more, but we list/track key outlets and post on our In the News webpage

Bangladesh

- In September 2023, Pure Earth and the **Lead-Safe Bangladesh Coalition** carried out a **joint media campaign,** to disseminate **The Lancet Planetary Health** and Pure Earth's **RMS study results**, and publish 10 action points. The joint press release received 70+ News coverages including top-tier agencies - Prothom-Alo, Dhaka Tribune, TBS, Financial Express, BBC, Samakal, and Bangladesh Protidin. Samakal, which has 3 million online hits and 0.2 million readership, published an in-depth news article, and interviewed the Minister of the MoEFCC.

India

- More than 400 media hits were reported during this period in India, Times of India, DownToEarth, ThePrint, DeccanChronicle, Financial Express. As part of Pure Earth's ILPPW digital activation campaign, on October 27, 2022, President Richard Fuller sat down with CNBC's Poddar Nisha on "Big Deal" to discuss lead poisoning with leaders of India's battery industry

Ghana

- More than 70 media hits and opinion pieces, 2021-2023, including Business & Financial Times, Africa Spy, JoyOnline (The Multimedia Group), and Graphic Online.

Briefing Events and Webinars, Highlights (23)

HQ/Global, 2020

- April 3: **Pure Earth Virtual Quarantine Q&A: Pandemic, Pollution, and Poverty** with renowned Public Health expert Dr. David Hunter and members of the Pure Earth Global Team, 75 attendees
- April 22: **Earth Day**
  - **Pure Earth Day Breakfast Webinar** - Tackling Childhood Lead Poisoning, 47 attendees

    - Pure Earth Day Lunch Webinar: Protecting the Peruvian Amazon, 67 attendees
    - Pure Earth Day Cocktail Hour Webinar**:** Pandemic, Pollution, and Solutions, 69 attendees
- July 31: launch of new report, A Toxic Truth: Children's Exposure to Lead Pollution Undermines a Generation of Future Potential, 165 attendees
- October 14: virtual launch of Protecting Every Child's Potential - Launch Event

2021

- March 8: **International Women's Day.** Force of Nature Virtual Luncheon with Pure Earth, honoring Charlotte Triefus, Larah Ortega Ibañez, and Mary Collene Daet.
- April 22: **Earth Day.** Two virtual "field trips" to Bangladesh highlighting our lead work and to the Peruvian Amazon highlighting our mercury work. "
- Oct 26: **International Lead Poisoning Prevention Week (ILPPW)**
    - Looking Beyond Paint: Solutions to the Global Lead Poisoning Crisis. Moderated by Dr. Jack Caravanos, speakers included Richard Fuller, Drew McCartor, Promila Sharma, Daniel Estrada, Ana Margarita Garza, Daniel Kass. 131 attendees.
    - In October 2021, during ILPPW, Pure Earth was selected by G Diaries, an award-winning advocacy program of the ABS-CBN Foundation for an episode of World Changers**.**

2022

- March 1: Live Twitter Spaces Event: How do we Protect our Children from Lead and other Heavy Metals in Food? Experts from Pure Earth, NYU, Consumer Reports, Clean Label Project, Center for Global Development, and Global Alliance on Health and Pollution shared insights, discussed solutions, and answered audience questions.
- March 8: **International Women's Day**
    - International Women's Day Force of Nature Luncheon honoring Netzy Peralta, Carol Browner, and Christina Malle. 203 attendees
    - Pure Earth's **Kitchen Cookbook** release with chef Graciela Montaño, Mexican Center for Philanthropy. A collaboration between Mexican women potters and famous chefs from Mexico and India, the cookbook raises awareness about lead exposure from adulterated Indian spices and lead-glazed Mexican pottery.
- April 22: Pure Earth Day 2022: Award-winning actor Matthew Modine presents the Pure Earth Day Virtual World Tour. Alfonso Rodriguez, Elsie Appeadu and Larah Ibanez took viewers on an insider's tour of Colombia, Ghana, and the Philippines to show how they are working with local communities, to protect children and the environment.
- May 19: Global Briefing: Pollution and Health: A Progress Update. Pure Earth, GAHP, and NYU's School of Global Public Health hosted launch events for the Public Health Power Hour podcast: What if Childhood Lead Poisoning Were a Global Priority?
- On May 22, Pure Earth and the **World Heart Federation** presented a Progress Update report during the **World Heart Summit** weekend in Geneva.
- **International Lead Poisoning Prevention Week (ILPPW). Pure Earth Shorts: Films from the Field**, an ILPPW webinar series featuring short documentaries followed by panel discussions and an audience Q&A:
    - October 25: One in 36 Million: How Severe Lead Pollution is Impacting the Health and Future of One Family and How All Stakeholders Can Be Part of the Solution in Bangladesh, 70 attendees
    - October 27: The Lead Rush: Lessons from the Thiaroye-sur-Mer Tragedy: Progress Towards Environmentally Sound Lead Recycling in Africa, 61 attendees
    - November 1: Solving a Toxic Mystery: How a Collaborative Effort Got the Lead Out of Georgian Spices, 56 attendees

2023

- March 8: **International Women's Day.** Pure Earth's Force of Nature event honoring three leaders who received Pure Earth's Force of Nature award: Dani Cutler, Karen Mathiasen, and Alicia Ogawa. Celebrated in-person in NYC and Washington DC, plus virtual watch parties around the world. 125 virtual attendees, 44 in-person attendees in NYC, 15 in-person attendees in DC.
- April 22: **Earth Day.** Earth Day 2023: A Pure Earth Dialogue- Heavy Metals in Our Food: Understanding Risks and Moving Toward Solutions, 125 attendees. Experts from Pure Earth, Consumer Reports, and NYC Department of Health & Hygiene took part in a roundtable and Q&A.
- On September 14, Pure Earth, the World Bank, and CGD co-hosted a briefing, "Groundbreaking Analysis of the World's Top Toxin: Lead," on the World Bank's new estimates of annual deaths caused by lead-related cardiovascular disease, the findings of Pure Earth's global study of 5000+ consumer items; and CGD's working paper on lead exposure and learning outcomes. 333 virtual attendees, 51 in-person attendees
- June 15: Get the Lead Out! A Day Connecting Local and Global Action for a World Free of Lead Poisoning. Pure Earth and CGD co-hosted an event in Washington, D.C. featuring experts from UNICEF, US IPA, CDC, LEEP, and the NYC Dept. of Health.
- On October 24, during **ILPPW**, Pure Earth hosted **"**Strengthening Health Systems to Reduce Lead Exposure: Global Project Launch Webinar," a virtual global launch. Leaders in the five project countries – Colombia, Indonesia, Kyrgyzstan, India (Maharashtra), and Peru – discussed this collaboration with ministries of health to strengthen national healthcare systems to prevent, identify, and treat lead poisoning. 135 virtual attendees.

Bangladesh (19 total)

2021

1. ILPPW Roundtable with DGHS, DoE, and other Stakeholders
2. Photography contest on pollution - CSO project
3. Theater show and prize giving at Naogao - CSO project
4. Theater show and prize giving at Kulaora - CSO project

2022

1. Community and Stakeholder Engagement in Mirzapur
2. World Environment Day - Seminar at DoE with stakeholders
3. ILPPW - Awareness Rally with ESDO
4. ILPPW - National Painting Competition with students from schools partnering with Educo NGO
5. ILPPW - Seminar at Khulna with the District Mayor and Medical professionals
6. ILPPW - Filmshow at Stamford University
7. ILPPW - National Level Seminar with DGHS and MoEFCC

2023

1. Community and Stakeholder Engagement in Mohammadnagar, Khulna
2. Awareness session with Health workers in Khulna Health Complex
3. Awareness session with the students of SSR school and madrassa
4. Household visit, materials distribution and sensitization during GiveWell BLL and HBA
5. Household visit, materials distribution and sensitization during Khulna BLL and HBA
6. World Environment Day Seminar with DoE
7. ILPPW Photography Exhibition
8. Presentation on Lead pollution in Bangladesh at the GlobeMed at Columbia University

India, 2022-2023 (4 total)

- On 11 October, 2022, Pure Earth India, in collaboration with **TERI - The Energy and Resources Institute**, organized a seminar, **"Understanding Lead Poisoning Prevalence in India"** to present The Toxic Truth and review a report from NITI Aayog, "Assessment of Lead Impact on Humans and India's Response." The event was live streamed on Youtube. More than 200 people attended in-person. Over 180 media hits were reported about the event and the issue.
- On 25 April 2023 in New Delhi, Pure Earth and Pahle India Foundation, with Center for Global Development, Asian Development Bank, and UNICEF, convened **"Roundtable on a World Free of Lead Poisoning."** Participants highlighted opportunities for the GOI to fight lead poisoning through its G20 Presidency. The event reached ~47 million people via prominent news outlets.
- On 31 July 2023, Pure Earth, Institute of Environment and Eco-Development, Vital Strategies, and Mahavir Cancer Institute and Research Center convened a conference, **"Understanding Lead Poisoning Prevalence and Solutions in Bihar,"** to share BLL survey and HBA results with state-level stakeholders. Over 60 attendees included Hon'ble Industry Minister Sri Samir Kumar Mahaseth; Ragini Mishra, State Health Society; Department of Health; Bihar State Pollution Control Board; State Environment Impact Assessment Authority; state heads of UNDP, UNICEF, the World Bank. Action items: **establish Interdepartmental Lead Coordination Group** at DOH; **conduct awareness campaign** and **BLL testing** of children and pregnant/lactating women to determine prevalence; **conduct sources analyses** to inform interventions; **eliminate sources.**
- On October 10, 2023, the **India Lead Battery Working Group** met to discuss modifying lead GST tax rates as an incentive for clean recycling, and the Battery Waste Management Rules, 2022 (BWMR). The Central Pollution Control Board is considering Pure Earth's BWMR recommendations. Twenty stakeholders from battery manufacturing and recycling associations, government, and academia participated.

Indonesia, 2023 (3 total)

- On October 23, 2023, Pure Earth Country Director, Budi Susilorini, shared BLL study results of children in exposed areas in Java at an **ILPPW webinar, "Protecting Children from Lead Exposure,"** organized by **Indonesia's Ministry of Health.**
- On November 1, 2023, the **UK Department for Environment, Food and Rural Affairs (DEFRA)** organized an **"Environmental Pollution Forum"** at which Ms. Susilorini presented, "Lead Poisoning: Global Toll and Solutions."
- On November 9, 2023, **Asian Development Bank hosted** an **Asian Impact Webinar** on its new brief, **"How to Stop Automotive Battery Recycling from Poisoning Our Children."** Ms. Susilorini presented "The Remediation of Lead Contaminated Sites in Indonesia."

Mexico, 2022-2023 (8 total)

- **International Women's Day** event, Mexican Center for Philanthropy. March 2022.
- **Arts & Crafts exhibition, Chamber of Restaurants,** Mexico City. March 2022.
- Media presentation of Pure Earth Mexico's work, **Club de Industriales.** June 2022.
- **American School Independence Day Fair.** July 2022 & July 2023.
- **Museum of Popular Arts, Morelos,** March-July, 2023, hosted exhibit, **"Lead-Free Traditional Pottery,"** co-sponsored by Pure Earth and the Government of Morelos. 4020 visitors registered.
- **Earth Day** event, Aura Coyoacán, Mexico City. April 2023.
- Awareness-raising event and **Lead-Free Pottery exhibition**, **Clarios** plants during **Occupational Health Week**, Family Weekend event, and Clarios Day. August 2023.
- **Day of the Dead** event.1090 visitors registered over 5 days. October–November 2023.

Peru and Colombia, 2023 (6 total)

- **Latin America "Lead Exposure" Webinar Series.** Initiative of Pure Earth Colombia and Peru offices, in collaboration with Vital Strategies, Pure Earth México, and the National Center for Epidemiology, Prevention and Disease Control of the Ministry of Health, Peru.
    - **Session 1. August 29, 2023. "Health Effects."** Health effects and global prevalence.
    - **Session 2. September 19, 2023. "Methodologies."** Methodologies to identify lead poisoning and design interventions.
    - **Session 3. October 3, 2023. "Children's Health."** How lead poisoning disproportionately affects the health of children and what can be done to mitigate its effects.
    - **Session 4. November 7, 2023. "Lead Exposure Sources."** Novel research on global and regional sources of lead exposure.
    - **Session 5. November 28, 2023. "Public Policy."** Public policies to address lead exposure and promote collective learning.
- In October 2023, for ILPPW, Pure Earth Colombia, Vital Strategies, and Universidad Nacional de Colombia hosted a **MasterClass,** cardiovascular effects of exposure, with Dr. Ana Navas-Acién.

GAHP, 2020-2022 (16 total)

- October 28, 2020: Lead webinar panel discussion with panelists from WHO, UNICEF, UNEP, Pure Earth, MERCOSUR, and the Basel Convention during Lead Poisoning Prevention Week
- July 8, 2021 – presentation on pollution and health at Berlin Forum on Chemicals and Sustainability: Ambition and Action Towards 2030
- Oct 14-21 2021: 3 regional (South Asia, West Africa, Latin America & Caribbean) webinars organized and moderated by GAHP on lead exposure sources beyond paint. Panelists from WHO, UNEP, Pure Earth, Basel Convention and local and regional public health and research actors. >200 participants across government, civil society, and academic sectors. Recordings here.
- October 19, 2021 – presentation to the World Economic Forum on lead poisoning in LMICs.
- November 22, 2021 ***"Tomorrow Without Toxics Conference,"*** organized by the International Civil Society Conference on Chemicals Management. ***"Behind the Toxic Truth: sources and strategies to eliminate global lead (Pb) exposures"*** panel of experts moderated by GAHP.
- April 1, 2022 presentation at OECD Environment Ministers Conference on impacts of pollution on health. **OECD Key Issues Paper 2022** highlights the impacts of pollution, including lead, on health and economic development.
- April 5, 2022, GAHP hosted "**The Impact of Lead Pollution on NCDs"** webinar at Global Public Health Week, organized by the World Federation of Public Health Associations.
- April 29, 2022, online presentation on impacts of pollution on global health, with a focus on ULABS, at ISPI (Institute for the Study of International Politics) and OECD-hosted **Forum on Climate Change: Rescuing the Green Transition.**
- May 3, 2022, Association of Salvadorian Industries conference, online GAHP presentation on pollution and health, with a focus lead pollution, in Latin America
- May 5, 2022, presented "**Pollution: A Global Health Crisis"** at the **Geneva Health Forum**.
- May 22, 2022, presented on impacts of pollution, especially lead and air, on cardiovascular health at the **World Heart Federation Summit**, Geneva, Switzerland. Allowed data on the burden of disease of lead exposure to reach a new audience of cardiologists.
- July 29, 2022, GAHP was invited to speak at the Mandated Event of Resource Efficiency Dialogue, organized by the Secretariat of EDM - CSWG, MoEF, Indonesia.
- In October 2022, International Lead Poisoning Prevention Week. Executive Director Rachael Kupka was a panelist at a workshop on lead exposure, "Advancing work on lead: lessons learned from the work on lead in gasoline, lead in paint and used lead-acid batteries," with the US EPA, DG Environment of the European Commission, UNICEF and IPEN.

- October 12, 2022, GAHP and Ministry of Environment and Forestry, Indonesia, held a webinar, **"Good Practices of Circular Economy to the Quality of Environment and Health,"** to raise awareness about pollution and the circular economy as a way to reduce pollution.

VIDEOS

Since 2020, 73 videos have been produced addressing different aspects of the lead issue and Pure Earth's work. In 2020, with Clarios grant, we have made progress on a story gathering/storytelling initiative to bring foreground human impacts of lead pollution and poisoning centering the voices and experiences of people in communities severely impacted. This effort has resulted in award winning outcomes.

- **One in 36 million - A Story of Childhood Lead Poisoning in Bangladesh**. Pure Earth's short documentary telling the story of one child's struggle with lead poisoning in Bangladesh wins Grand Prix Prize at World Health Organization's "Health for All" film festival along with a $10,000 prize. Comms lead Mitali Das was interviewed live as part of the globally broadcast awards ceremony.
- **The Lead Rush**. Pure Earth's short documentary follows the story of a community in Senegal that came together after a lead poisoning tragedy to stop future poisoning. By working with the government and Pure Earth, the community was able to clean up their village to protect future generations. The film was nominated as a finalist in the World Health Organization's 'Health for All' film festival, and an Official Selection for the Oregon Documentary Film Festival, Spring 2023, where it was a Best International Film Award Finalist.
- Pesarean: A Journey of Transformation from A Contaminated Site to Tourist Destination. A short video about how Pure Earth's long-term efforts in Indonesia resulted in the successful government-led clean-up of a lead-contaminated site in Pesarean.

SOCIAL MEDIA

- **Blogs -** Since 2020, 45 blog posts have been published on various aspects of the lead pollution issue and Pure Earth's work.
- **Social Media Analytics - Organic (Unpaid) Posts,** Oct 2021 - Nov 2023
    - 2.2K total posts across Linkedin, X (formerly Twitter), Facebook, Instagram
    - 715K impressions
    - 168k users reached
- **Social Media Analytics - Paid Advertising Pilot Campaign.** For the first time, ran a 4-month (Sept - Dec 2022) paid social media (Facebook, LinkedIn, YouTube) advertising campaign focused on Pure Earth brand awareness and issue awareness of heavy metal pollution. Gaining experience and capacity in sophisticated digital marketing tools is key to increasing financial support through larger audiences and wider awareness of the issues and Pure Earth's solutions. **Results:**
    - Impressions: 1.42 million, exceeded goal of 1 million
    - Reached: 907,000
    - Visits to Pure Earth website: 2,955
    - New email subscribers: 340
    - See Detailed analytics on campaign and ad variations and performance

KEY CONFERENCES

- 60th Annual Conference of the Indian Academy of Pediatrics. **February 19-23, 2023, Gujarat, India.** S. Bose-O'Reilly delivered a pre-conference lecture, *"Lead and Mercury: Two Toxic Metals."*
- LEADCON 2023. **May 5-6, 2023. Tirupati, Andhra Pradesh, India.** Pure Earth India's Promila Sharma presented "A Case Study: Multi-stakeholder Collaboration and Cooperation for Reducing Children's Lead Exposure, Rangapuram, Tamil Nadu."
- International Society for Environmental Epidemiology. **September 17-21, 2023. Kaohsiung, Taiwan.** Pure Earth participated via its poster, "Childhood lead exposure and source investigation in Patna,

Bihar, India: Building deeper understanding through international collaboration." (Emily Nash, MPH; Mary Jean Brown, SciD RN; Purvi Patel, MBBS MPH; Promila Sharma)

- Environment, Work and Health in the 21st Century: Strategies and Solutions to a Global Crisis. **October 22-25, 2023, Bologna, Italy.** The conference is organized in Collegium Ramazzini, an academy aiming to advance knowledge of occupational and environmental health. Stephan Bose-O'Reilly presented, *"Lead contaminated consumer products in low and middle income countries: Rapid Market Screening toolbox."*
- 11th International Conference on Children's Health and Environment (INCHES), **October 27-28, 2023. Tashkent, Uzbekistan.** Pure Earth-related presentations: *"Lead & Children's Health," "Assessment of BLLs and potential sources of lead exposure among children in Bihar, India," "Sources of lead exposure among children across 3 regions in Ghana,"* and *"HBA as a Method for Source Identification Strategies to Strengthen Childhood Lead Exposures, Indonesia."*
- 8th International Conference and Exhibition on Indonesian Medical Education and Research Institute (ICE on IMERI 2023), **November 11, 2023. Jakarta, Indonesia.** Main conference topics included "Accelerate Global Phase Out of Lead Exposure." Budi Susilorini presented *"Rapid Market Survey to Identify Potential Lead Exposures from Consumer Goods."*

Peer-Reviewed Publications

- Kazzi, Z., L. Gabelaia, L. Shengelia, L. Sturua, **B. Ericson,** A. Giorgobiani, A. Nadiradze and A. Gamkrelidze (Jan 2020). "Lessons Learned Through the Journey of a Medical Toxicologist While Characterizing Lead Hazards in the Republic of Georgia." J Med Toxicol 16(1): 3-5. 10.1007/s13181-019-00744-9
- Ansari JA, Mahdi AA, Malik PS (Promila), Jafar T. **"Blood Lead Levels in Children Living Near an Informal Lead Battery Recycling Workshop in Patna, Bihar."** J Health Pollut. 2020 Feb 28;10(25):200308. doi: 10.5696/2156-9614-10.25.200308. PMID: 32175179; PMCID: PMC7058140.
- Zajac, L, Kobrosly, RW, Ericson, B, Caravanos, J, Landrigan, PJ, Riederer, AM. (2020). "Probabilistic estimates of prenatal lead exposure at 195 toxic hotspots in low- and middle-income countries." Environ Res 183: 109251. 10.1016/j.envres.2020.109251. April 2020.
- Ericson, Bret, Gabelaia, Levan, Keith, John, Kashibadze, Tamar, Beraia, Nana, Sturua, Lela, and Kazzi, Ziad. **"Elevated Levels of Lead (Pb) Identified in Georgian Spices."** Annals of Global Health. 2020; 86(1): 124, 1–6. DOI: https://doi.org/10.5334/aogh.3044. Sept 2020
- Higgins, M. A., G. A. Robbins, K. R. Maas and G. K. Binkhorst (2020). "Use of bacteria community analysis to distinguish groundwater recharge sources to shallow wells." J Environ Qual 49(6): 1530-1540. 10.1002/jeq2.20150. Nov. 2020
- Tellez-Rojo, Martha Maria et al. **"Análisis de la distribución nacional de intoxicación por plomo en niños de 1 a 4 años. Implicaciones para la política pública en México"** in *Salud Pública de México. vol. 62, no. 6, Nov-Dec* 2020.
- Ericson, B., H. Hu, E. Nash, G. Ferraro, J. Sinitsky and M. P. Taylor (March 2021). "Blood lead levels in low-income and middle-income countries: a systematic review." Lancet Planet Health 5(3): e145-e153. 10.1016/s2542-5196(20)30278-3
- Ericson, B., H. Hu, E. Nash, G. Ferraro, J. Sinitsky and M. P. Taylor (Dec 2021). "All lead exposures matter - Authors' reply." Lancet Planet Health 5(12): e860. 10.1016/s2542-5196(21)00319-3
- NCD Risk Factor Collaboration (NCD-RisC). **"Worldwide trends in hypertension prevalence and progress in treatment and control from 1990 to 2019: a pooled analysis of 1201 population-representative studies with 104 million participants."** Lancet. 2021 Sep 11;398(10304):957-980. doi: 10.1016/S0140-6736(21)01330-1. Epub 2021 Aug 24. Erratum in: Lancet. 2022 Feb 5;399(10324):520. PMID: 34450083; PMCID: PMC8446938.
- Peralta, Netzy et al., with the School of Public Global Health, the Mexican Social Security Institute, the National Institute of Public Health, and the Autonomous University of Morelos. **"Lead Levels in a**

Potters Population and Its Association With the Use of Different Glazes: Cross-Sectional Analysis of the Approved Pottery Program." *Frontiers in Toxicology*. March 7, 2022.

- Policy paper, **"A Science Policy Panel to Catalyze A Global Response to Chemical, Waste and Pollution,"** in Science Diplomacy Review. Vol. 4, No. 1. April 2022. The publishing entity, RIS, is a major think tank in India, with connection to the G20 India office. (GAHP)
- Landrigan, Philip J., et al. **"The Lancet Pollution and Health: A Progress Update."** The Lancet Planetary Health journal. May 16, 2022.
- Brown, M. J., et al. **"Prevalence of elevated blood lead levels and risk factors among children living in Patna, Bihar, India 2020."** PLOS Glob Public Health 2(10): e0000743. Oct. 5, 2022. 10.1371/journal.pgph.0000743
- Belem Trejo-Valdivia, Carolina Lerma-Treviño, Marcela Tamayo-Ortiz, Alejandra Cantoral, José Luis Figueroa, Martín Romero-Martínez, Luz María Gómez Acosta, Daniel Estrada-Sánchez, Netzy Peralta-Delgado, Luis F. Bautista-Arredondo, Martha María Téllez-Rojo. **"Contribución de la exposición ambiental, para-ocupacional y el uso de barro vidriado a la concentración de plomo en sangre en población infantil mexicana (ENSANUT 2022)."** *Salud Pública de México.. Vol. 65.* Num. 6. Nov-Dec 2023.
- **"Espacio público, construcción de comunidad y participación social. Alfarería en San Jerónimo Ocotitlán: la relación entre la salud y la identidad"** in *Diseño Industrial UNAM.* 2023.
- Bautista-Arredondo, Luis F., et al. "**Intoxicación infantil por plomo en México: otras fuentes de exposición más allá del barro vidriado (ENSANUT 2022)"** in *Salud Pública de México, Vol 65 (2023),* an article on lead sources other than leaded glaze that are potentially contributing to child lead poisoning in México.
- Chowdhury, K. I. A. et al (2021). **"Child lead exposure near abandoned lead acid battery recycling sites in a residential community in Bangladesh: Risk factors and the impact of soil remediation on blood lead levels."** Environ Res 194: 110689. 10.1016/j.envres.2020.110689. March 2023.
- Kupka, Rachael et al. **"A Horizon Scan to Support Chemical Pollution-Related Policymaking for Sustainable and Climate Resilient Economies."** Environmental Toxicology and Chemistry. 2023 June; 42(6):1212-1228. Epub 2023 May 8. In 2022, DEFRA requested GAHP participation in a horizon scanning process for global chemicals of concern. GAHP's two proposals, Childhood Lead Poisoning, and Heavy Metals in Food, were accepted.
- Ferraro, G., B. Ericson, A. M. Simons, E. Nash and M. Kabir (2023). "Bovine lead exposure from informal battery recycling in India." Environ Sci Pollut Res Int 30(36): 86122-86137. 10.1007/s11356-023-27811-7. July 4, 2023.
- Caravanos, J., J. Nassif, B. Lanphear, P. J. Landrigan, H. Hu and R. Fuller. "Invited Perspective: An Argument for Changing the Reporting Units for Lead in Blood." Environ Health Perspect 131(9): 91303. 10.1289/ehp12382. 25 Sept 2023

  GBD 2019 Bangladesh Burden of Disease Collaborators. **"The burden of diseases and risk factors in Bangladesh, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019."** Lancet Glob Health. 2023 Dec;11(12):e1931-e1942. doi: 10.1016/S2214-109X(23)00432-1. PMID: 37973341; PMCID: PMC10664824.

Outcome 2: New data and evidence, BLLs

BANGLADESH

- **3,201 BLL tests administered** (2,201 kids, 1,000 pregnant women. Kathgora, Mizapur, Stanford/icddr,b)

Kathgora Remediation Pre-, Post, Ex-Post Remediation BLL survey (UNIDO, EC, USAID)

- 1 hotspot & Intervention site

Pre-remediation, December 2017-January 2018

- 69 children <13 years
- Average BLL, pre-intervention: 19.1 µg/dL (max: 47.5 µg/dL)
- 100% >5 µg/dL, pre-intervention

Post-remediation, November 2018

- Average BLL, post-intervention: 17.2 µg/dL (max: 37.9 µg/dL)
- 100% >5 µg/dL, post-intervention:
- Among the 47 children with *both* pre- and post-intervention BLL tests reduced 20% from 21.3 µg/dL to 17.0 µg/dL at 7 months.

Ex-post-remediation, May 2019

- Average BLL, ex-post-intervention: 14.8 µg/dL (max: 24.6 µg/dL)
- 100% >5 µg/dL, ex-post-intervention
- Among the 25 children with *all three* measurements (pre-, post-, post-/post-), BLLs dropped 35% from a median of 22.6 µg/dL to 14.8 µg/dL after 14 months.

Mirzapur Remediation. Pre- and Post-Remediation BLL survey (USAID, Tauw, Clarios)

- 1 Hotspot / Intervention Site - 90 kids
- 2 Control Sites (1 ULAB hotspot - 41 kids, 1 non-ULAB - 37 kids)

Pre-intervention, January-March 2022

- 168 kids, ages 0-12
- Average BLL, pre-intervention, exposed site: 10 µg/dL
- 89% >5 µg/dL, pre-intervention, exposed site

Post-intervention BLL, June-July 2023

- 168 kids, ages 0-12
- Average BLL, post-intervention, exposed site: 7.9 µg/dL
- % >5 µg/dL, post-intervention, exposed site: not available
- 23% BLL reduction (compared to 7.7% & 12% in control groups (adjusted/weighted by age & sex)

UNICEF/PECP, ULAB & Non-ULAB BLL survey (Clarios)

- **Pure Earth's role was identifying the exposed & non-exposed areas**
- Comparative BLL survey: exposed & non-exposed areas
- 980 children, ages 1-18
- 8 sites, 1 ULAB & 1 non-ULAB site/district (Tangail, Khulna (incl. Mohammad Nagar), Sylhet, Patuakhali)

4 districts, both ULAB & non-ULAB sites, July-September 2022

- Average BLL: 5.63 µg/dL; High: 39.63 µg/dL
- 64.7% >3.5 µg/dL
- 38% >5 µg/dL
- 11% >10 µg/dL

Non-LAB vs. LAB sites

- 22.2% >5 µg/dL, non-ULAB sites
- 55.6% >5 µg/dL, ULAB sites

Stanford/icddr,b, Pre- and Post- 2018-2020 Spice Intervention BLL survey (GiveWell)

- **Pure Earth's role was funding impact assessment of Stanford's spice intervention: analysis of stored, pre-intervention blood (2012-2014) and post-intervention BLL testing (2022-2023)**
- Total: 2,796 (Pre: 898 children, 500 pregnant women. Post: 898 children, 500 pregnant women)
- 3 Cohorts:
    - Munshiganj: 398 children, <5 years
    - WASH B: (Mymensingh, Kishoreganj, Gazipur - 3 rural areas): 500 children, <5 years
    - WASH B: (Mymensingh, Kishoreganj, Tangail, Gazipur - 4 rural areas): 500 pregnant women

Georgia

2018-2019 National Multiple Indicator Cluster Survey (MICS)

- **Pure Earth not involved in MICS but participated in subsequent source analyses**
- National Statistics Office of Georgia (Geostat) with UNICEF support
- 1,578 children, ages 2-7
- Results published 2020

Findings

- Average BLL: 6.6 µg/dL (Max: 51.9 µg/dL)
- 41% >5µg/dL
- 16% >10µg/dL
- 85% of children in Adjara region had elevated BLLs, followed by Guria (73%), Samegrelo-Zemo Svaneti (71%), Imereti/Kvemo Svaneti/Racha-lechkhumi (61%), Samtshke-Javakheti (32%), Tbilisi (30%), Khaketi (25%), Shida Kartli (21%), Mtskheta-Mtianeti (20%), and Kvemo Kartli (18%).

Ghana

- **3,227 people tested** (children)

Ghana / PECP Hotspots & Non-Hotspots BLL survey (Clarios w/ Pure Earth, UNICEF, GHS)

- Comparative BLL survey: exposed & non-exposed areas
- 3,227 children total, ages 12–59 months
- November 2022–January 2023
- Hotspot sites (both industrial & informal) & Non-Hotspot sites in 9 towns in 3 regions: Greater Accra (4 towns), Ashanti (3 towns), Northern (2 towns).

Findings

All sites, both Hotspot & Non-hotspot

- Average BLL: 8.0 µg/dL
- 53.2% >5 µg/dL, across all groups

Hotspots

- Average BLL: 9.5 µg/dL
- 62% >5 µg/dL

Non-Hotspots

- Average BLL: 5.2 µg/dL
- 37.3% >5 µg/dL
- However, in the non-hotspot areas of the Northern Region, *84% of children had BLLs >5 µg/dL* potentially correlated with use of eyeliners.

INDIA

- **1,022 people tested** (952 children, 55 pregnant women, 15 parents)

Patna ULAB Hotspot & Non-Hotspot survey (USAID)

- Comparative BLL survey: exposed & non-exposed areas
- 135 children (67 hotspot, 68 non-hotspot) > 6 years
- Jan-Feb 2020

Findings

Both sites, both Hotspot & Non-hotspot

- Average BLL: 12 µg/dL
- 87% >5 µg/dL
- Mean BLLs of children in hotspot & non-hotspot were not significantly different.

Hotspots

- Average BLL: 10 µg/dL
- 84% >5 µg/dL
- 61% >10 µg/dL

Non-Hotspots

- Average BLL: 13 µg/dL
- 91% >5 µg/dL
- 75% >10 µg/dL

Bihar State Representative BLL survey (GiveWell)

- December 2022 - March 2023
- 697 children, ages 1-5
- 55 pregnant women
- 8 districts

Findings

Children

- Average BLL: 8 µg/dL
- 90% children >5 µg/dL
- 24% children >10 µg/dL

Pregnant Women

- Average BLL: 7.8 µg/dL
- 81.8% pregnant women >5 µg/dL
- 21.8% pregnant women >10 µg/dL

Toxic Site Assessment, BLL Survey, Source Study in 2 Cities, Tamil Nadu (Corporate Donor)

- June 2023
- 120 children (60 per village), ages 0-6
- 15 parents (4 in Coimbatore, 11 in Erode)
- Partners: InSLAR, National Referral Centre for Lead Projects in India

Finding

Coimbatore (3 villages)

- Average BLL: 7.8 µg/dL
- 95% >3.5 µg/dL
- 75% >5 µg/dL
- 18.3% >10 µg/dL

Erode (4 villages)

- Average BLL: 14.1 µg/dLl
- 100% >3.5 µg/dL
- 98% >5 µg/dL
- 65% >10 µg/d

Parents, both villages (15: 3 fathers, 12 mothers)

- Average BLL: 9.2 µg/dl.
- 67% >5µg/dL (73% >5µg/dL in Erode. 50% >5µg/dL in Coimbatore)
- 33% >10µg/dL

INDONESIA

- **701 people tested** (564 children, 137 fathers)

Indonesia / PECP, Hotspots & Non-Hotspot survey (Clarios)

- Comparative BLL survey: exposed & non-exposed areas
- May - August 2023
- 4 Hotspots, 1 Non-Hotspot, Java Island.
- 564 children, ages 12-59 months.
- 137 fathers / male guardians
- Partners: OEHRC IMERI Faculty of Medicine University of Indonesia

BLL Findings:

Pesarean (Hotspot), 80 Children

- Average BLL: 25.94 µg/dL
- 98.7% >5 µg/dL.
- 90% >10 µg/dL
- Average adult BLL: 15.99 µg/dL. 96.55 >5 µg/dL. 68.97% >10 µg/dL

Cinangka (Hotspot), 81 Children

- Average BLL: 19.55 µg/dL
- 98.8% >5 µg/dL.
- 76.5% >10 µg/dL
- Average adult BLL: 24.28 µg/dL. 100% >5 µg/dL. 70% >10 µg/dL

Dupak and Tembok Dukuh (Hotspot), 79 Children

- Average BLL:13.05 µg/dL
- 83.5% >5 µg/dL.
- 53.2% >10 µg/dL
- Average adult BLL: 5.76 µg/dL. 23.08 >5 µg/dL. 15.38% >10 µg/dL

Kadu Jaya (Hotspot), 84 Children

- Average BLL: 17.99 µg/dL
- 98.8% >5 µg/dL.
- 83.3% >10 µg/dL
- Average adult BLL: 7.76 µg/dL. 76% >5 µg/dL. 12% >10 µg/dL

Cinangneng (Non-Hotspotl), 240 Children

- Average BLL: 11.04 µg/dL
- 80% >5 µg/dL.
- 40% >10 µg/dL
- Average adult BLL: 5.89 µg/dL. 54% >5 µg/dL. 4% >10 µg/dL

Mexico

Occupational Risk BLL Tests

BLL tests are performed in potter communities as part of lead-free pottery transition programming. Between 2020–2023, 230 BLL tests were performed in 8 potter communities in 3 states, with an average BLL of 17.69 µg/dL.

- 2020: 40 tests; Average BLL: 30.99 µg/dL
- 2021: 89 tests; Average BLL: 21.08 µg/dL
- 2022: 87 tests; Average BLL: 18.56 µg/d
- 2023: 14 tests; Average BLL: 17.9 µg/dL

Non-Occupational BLL Tests

Between 2021–2023, 363 BLL tests were performed to educate and raise awareness at public events, with an average BLL of 4.3 µg/dL.

- 2021: 51 tests; Average BLL: 4.02 µg/dL
- 2022: 85 tests; Average BLL: 5.54 µg/d
- 2023: 227 tests; Average BLL: 3.9 µg/dL

The Philippines

- **2,932 people tested** (children)

Philippines National ENNS Representative survey

- November 2021 - June 2022
- 2,932 children, ages 6-9
- 25 sites (provinces or highly urbanized cities) in 13 regions from Luzon, Visayas and Mindanao were tested

BLL Findings:

- Average BLL, all children: 1.96 µg/dL (1.42 ug/dL - 38.35 µg/dL)
- 8.76% children >3.5 µg/dL (US CDC health action level)
- 2% children >5 µg/dL
- <1% children >10 µg/dL

Outcome 3: New data and evidence to identify sources of lead exposure

Bangladesh

- **9 new toxic/Pb sites entered into TSIP database**
- **4 detailed site assessments (DSA)** (Kathgora, Mirzapur, Mohammad Nagar, Labanchara)
- **2 environmental assessments (non-HBA)** (Mirzapur, Mohammad Nagar)
- **45 homes assessed, environmental (non-HBA)** (31 Mirzapur, 14 Mohammad Nagar)
- **1 HBA conducted**
- **122 homes assessed, HBA**

TSIP

Kathgora, TSIP

- ISA 2016. DSA 2017-2018
- Hectares assessed: 4
- Number of people exposed: ~300, including ~90 young children
- Average soil lead level: 1400 ppm (n=251); max 119,000 ppm
- 100% soil samples (n=251) >400 ppm, pre-remediation

Mirzapur, TSIP

- ISA 2018 (active smelting). PSA July 2019. DSA Oct-Nov 2019
- Hectares assessed: 4.5
- Number of people exposed: ~1070 people, including 255 young children
- Soil, pre-remediation, Sept. & Nov. 2019
    - Soil-lead levels commonly exceeded 20,000 ppm (Max: >100,000 ppm)
    - Median soil lead levels in different areas of the site (total 107 samples), in ppm: 4769, 907, 1747, 2073, 11,353, 1565, 296, 1128

Mohammad Nagar, Khulna, TSIP

- PSA November 2022. DSA: Jan-Feb 2023
- Hectares: 0.2
- Number of people exposed: ~850
- 132 soil samples
- 17% of soil samples >400 ppm

Labanchara TSIP

- DSA: Feb-March 2023
- Hectares: 3
- Number of people exposed: ~700
- 220 soil samples
- 45% of soil samples >400 ppm

Environmental Assessment (not HBA)

Mirzapur, Environmental Sampling

- Feb-March 2022. Number of samples = 292
    - Soil, child play area: 8.2% >400 ppm
    - Soil, courtyard: 8.7% >400 ppm
    - Soil, roadside: 8.7% >400 ppm
    - Turmeric: 13% >2.5 ppm
    - 31 homes assessed

Mohammad Negar, Environmental Sampling

- April - June, 2023
    - 14 homes assessed

Home Based Assessment (HBA)

UNICEF / PECP, HBA

- **Pure Earth's role was as UNICEF's technical implementing partner.** Shared data w/ UNICEF for analysis in Oct. 2023.
- April - June 2023 - Khulna (including Mohammad Nagar)
- Aug - Oct 2023 - Sylhet and Tangail
- 122 homes, total (47 Khulna (incl 25 Mohammad Nagar), Sylhet (25) & Tangail (50))

- *Data analysis underway*

GEORGIA

- **31 new toxic/Pb sites entered into TSIP database**
- **0 detailed site assessments (DSA) conducted**
- **2 HBAs conducted**
- **36 homes assessed, HBA**
- **2 market assessments conducted**

In 2019, the GOG asked Pure Earth to help identify the most prominent sources of lead exposure. HBAs and market assessments showed lead-adulterated spices were a main source. Based on findings, **GOG swiftly enacted new regulations** to target the problem.

TSIP

- 2021-2022
- 31 ISAs. Main sources - ULAB smelting and repair facilities, car repair shops, mining and ore active and legacy facilities, dye production, other former chemical production sites, landfills.
- 4 sites selected for PSAs
- 2 of these selected for DSAs, May-June 2022, to clarify their potential contribution to elevated BLLs of children living nearby.

HBA

Post-MICS, HBA

- **July 2019 Pure Earth / Ericson Study.**
    - **25 homes** and 4 markets (see below) in 5 regions**.** Total 682 measurements. Cookware (n=53); paint (n=207); soil (n=91); spices (n=128); toys (n=78); and other media (n=125). 61 dust wipes and 15 water samples.
    - **Findings:** lead-adulterated spices main source of lead (Ericson et al., 2020). Median lead concentrations in 6 spices ranged from 4–2,418 times acceptable levels. Median lead concentrations of all other media within internationally accepted guidelines. The issue appeared regional, with western Georgia the most highly affected. Homes in Adjara and Guria were 14x more likely to have lead-adulterated spices than homes in other regions.

- **2020-2021 Pure Earth Georgia**
    - **11 homes** in 5 regions.

Market Assessment

Post-MICS BLL survey, Market Assessments

- **July 2019 Pure Earth / Ericson Study**
    - **30 spice samples** from **4 markets** (1 in Imereti, 1 in Tbilisi, 2 in Adjara) in 2019.
    - **Findings:** Average spice-lead level 600 times higher than the regulatory standard.
- **2020-2022, Stanford / Pure Earth Study**
    - **Partners:** Stanford University, National Disease Control Center, National Food Agency, National Environmental Agency, and UNICEF
    - **Methodology: 765 spice samples** (255/sampling round) from 77 vendors in the largest spice bazaar in each of **29 cities** nationwide (8 admin regions, Tbilisi and Adjara). Additional cities in Adjara due to the high rates of child lead poisoning. Adjara and Imereti were also the focus of

qualitative interviews conducted in 2021 with key business people selling spices. The same cities and bazaars were visited at each of **3 sampling periods:** June 2020-March 2021; April-May 2022; and Nov-Dec 2022.

- **Findings:** Excessively high levels lead, >14,000 µg/g. 10% samples over threshold. 10% of samples from Adjara exceeded the limit of 6 µg/g vs. 1% in other regions.

GHANA

- **42 new toxic/Pb sites entered into TSIP database**
- **1 of detailed site assessments (DSA) conducted** (Bremang)
- **1 HBAs conducted**
- **293 homes assessed, HBA**

TSIP

Ghana/PECP, TSIP

- **42 ISAs** of suspected lead-contaminated sites, 2021, with partner, Mountain Research Institute
- **4 PSAs,** Feb-June 2022: Adukrom, Old Gravita, Ashaiman Fitter Line, and Bremang
- **1 DSA,** August 2022: Bremang. Pure Earth has EPA approval to conduct the remediation.
- Pure Earth has received funding from Gravita, Ltd. to conduct a DSA and risk mitigation plan for the Old Gravita site, Q4 2023.

Bremang, TSIP

- ISA 2021. PSA 2022. DSA, August 2022
- Hectares: 0.5
- Number of people exposed: ~5050
- Min soil lead level: 19 ppm. Max: 598,000 ppm
- Average soil lead level, pre, by sector: 47, 873.5, 300,5, 30 ppm.
- 66% of soils samples over 400 ppm: (46/70)

HBA

Ghana/PECP, HBA

- April 2023
- Number of homes: 293 (9% (n=293) of BLL survey HHs)
- **Assessed:** soil, dust, drinking water, paint, metal and ceramic cookware, cooking spices, cosmetics, sleeping mats, and toys.
- **Findings:** high lead concentrations in soil, metal cookware, and *chilo*, a traditional eyeliner used by ~93% of children assessed in the Northern region. 100% of 8 *chilo* samples >2 ppm; 77% of 293 metal cookware samples >100 ppm; 15% of 33 toy samples >100 ppm; 11% of 293 averaged soil samples >100 ppm; 2% of 41 spice samples >2 ppm; 1% of 170 ceramic samples >100 ppm; 0% of paint samples >1 mg/cm^2; 0% of 129 water samples >5 ppb (non-detect).
- **Findings, Greater Accra,** HBA areas near industrial sites had highest soil lead levels. All children with BLLs >30 µg/dL lived in communities near industrial sites. In the Northern Region, no elevated soil lead levels found, yet 84% of children had BLLs >5 µg/dL. The use of traditional eyeliner (*chilo*) identified as a potential source. Across all regions, metal cookware contained lead, the Northern Region having the highest proportion of metal cookware with elevated lead levels.

INDIA

- **41 new toxic/Pb sites entered into TSIP database**
- **1 detailed site assessments (DSA) conducted** (Vellore)
- **3 environmental assessments (non-HBA) conducted** (Vellore, Coimbatore, Erode)
- **94 homes assessed, environmental (non-HBA)** (Vellore, Combatore, Erode)
- **1 HBAs conducted** (Bihar)
- **155 homes assessed, HBA** (Bihar)
- **0 market assessments conducted** (*Gujarat underway)*

TSIP

Rangapuram, Vellore, Tamil Nadu Hotspot & Non-Hotspot, Trafigura Foundation, TSIP

- ISA - 2012. PSA 2018. DSA - November 2019 - February 2020
- Number of people exposed: ~250 (55 hh/200 residents + ~50 preschool students)
- Average soil lead level at school, pre: 4064 ppm
- Average soil-lead level at residential area, pre: 545 ppm

Toxic Site Assessment, BLL Survey & Source Study in 2 Cities, Tamil Nadu, TSIP

- September 2022 - March 2023
- Partner: Trisakha Foundation
- 30 sites assessed in 16 districts. Two sites, in Erode and Coimbatore, with maximum soil-lead levels of 12,400 ppm and 6,041 ppm, respectively, were selected for further assessments and for BLL testing.

Tauw (2022-2023), Vellore, Tamil Nadu, Field Research, TSIP

- August-September 2022
- 8 ISAs
- 71% (41/58, all sites) of soil samples >400 ppm
    - Site 1: 100% soil samples >400 ppm; Site 2: 100% >400 ppm; Site 3: 100% >400 ppm; Site 4: 75% >400 ppm; Site 5: 37% >400 ppm; Site 6: 66% >400 ppm; Site 7: 100% >400 ppm; Site 8: 27% >400 ppm

Environmental Assessments

Rangapuram, Vellore, Tamil Nadu Hotspot & Non-Hotspot, Trafigura Foundation, Environmental Assessment

- October 2021 & September 2022
- Number of homes assessed: 35
- **Assessed:** homes of children from both intervention and control sites to identify other potential exposure sources like soil, dust, spices, paint, toys, cosmetics, etc.
- **Findings:** Because of generally high BLLs in both intervention and control sites, we know there are underlying contributing sources, however HBA results didn't point to any obvious sources.

Toxic Site Assessment, BLL Survey & Source Study in 2 Cities, Tamil Nadu, Environmental Assessment

- July 2023
- Partners: Trisakha Foundation, Hubert Enviro-Care
- Products tested: spices, cosmetics, foodware, paint, toys, dust, soil, and water.
- **Coimbatore:** 34 homes assessed
- **Erode:** 25 homes assessed
- **Findings:**

- **Cosmetics** (n=132) 14% >reference level of 20 ppm. "Of those," mean = 75 ppm. 25% of HHs with cosmetic samples collected had 1 or more cosmetics products >reference value.
- **Cookware** (n=162) 57% >reference value 100 ppm. Of those, mean = 648 ppm. 89% of HHs with cookware samples collected had 1 or more cookware items >reference value.
- **Spices** (n=206) 12% >reference value 10 ppm. Of those, mean = 60 ppm . 17% of HHs with spice samples had one or more spices >reference value.
- **Toys** (n=93) 11% >reference value 100 ppm. Of those, mean = 1646 ppm.
- **Paint** (n= 161) 1% >reference value of 90 ppm
- **Soil** (n=117) 0% >reference value of 400 ppm
- **Dust** (n=66) 45% >reference value of 15 μg/ft^2.

Stanford Northern India Spice Study 2020-2023

- Spice supply chain and consumer products study in N. India and South Asia: 20 cities in 4 states - 9 cities in Bihar and 11 in total from neighboring states of Uttar Pradesh and Jharkhand. **Pure Earth supported data collection / technical assistance.**

Home-Based Assessments (HBA)

Patna ULAB Hotspot & Non-Hotspot survey (USAID), HBA

- Jan-Feb 2020
- 135 homes (67 hotspot, 68 non-hotspot)
- Tested water, soil, dust, spices, turmeric, paint, plastic items, cosmetics, food, cookware.
- Lead concentrations in environmental samples significantly higher in hotspot households

Findings

Both sites, both Hotspot & Non-hotspot

- 80% HHs were using spices that exceeded the reference level
- 22% of household had elevated lead in dust floor samples
- Metal cookware (n=59) concentrations ranged from undetectable to 8770 ppm, mean 1832.5 ppm

Hotspots

- Households more likely to purchase nationally known brands of spices
- Mean. all spices: 46.8 ppm
- Mean, turmeric: 59.4 ppm
- Mean, soil: 52.9
- Mean, dust, concrete floor: 20.1 μg/ft2

Non-Hotspots

- Households are more likely to purchase loose spices at local markets. Lead in turmeric and other spices significantly higher than hotspot households (52 HHs. vs. 41 HHs for turmeric and 30 vs. 13 HHs for other spices.
- Mean, all spices: 134.5 ppm
- Mean turmeric: 216.9 ppm
- Mean, soil: 29.2
- Mean, dust, concrete floor: 7.7μg/ft2

Bihar 2022-present, GiveWell, HBA

- December 2022 - March 2023
- 155 homes
- Number of items tested: >1200
- **Assessed:** spices (n=306); metallic cookware (n=224); ceramics (n=16), painted surfaces (n=406); toys (n=149), soil (n=110), water (n=25).

- **Findings:** Turmeric had the highest lead levels, max: 4,139 ppm >400 times the FSSAI standard. Half of metallic cookware >1340 ppm, max: 17,400 ppm. Inexpensive, locally produced metal cookware found to contain high lead. 50% of the ceramic samples were >18 ppm. 36% of the painted surface sample found higher lead above limit i.e. >90 ppm. More than 15% of 155 toy samples exceeded the threshold of 90 ppm (max at 154,510 ppm). 50% of soil samples >=17ppm. 50% of water samples>3.4 ppb. I**n a nutshell, spices especially turmeric, inexpensive metallic cookware, toys and local paints were found to have high lead content.**

INDONESIA

- **95 new toxic/Pb sites entered into TSIP database**
- **3 detailed site assessments (DSA) conducted** (Pesarean, Cinangka, Cinangneng)
- **1 HBAs conducted**
- **145 homes assessed, HBA**

TSIP

Indonesia, PECP, TSIP

Nov 2021 - Feb 2022

- **95 ISAs** of ULAB recycling sites, Java and Suma
- Partner: Sepuluh Nopember Institute of Technology Surabaya
- Number of people exposed: 80,166
- 2,669 soil samples tested
- **63% of soil samples >300 ppm**
- In September 2022, the MOEF integrated TSIP data into its national contaminated land inventory and identification database, used to prepare a National Priority List for sites to be remediated by the GOI.

Feb - March 2023

- **4 PSAs,** with Governments of Bogor Regency and Tegal Regency, on villages of: Cinangka, Cinangneng, Ciomas, and Pesarean
- Number of people exposed: 15,932
- 1,363 soil samples
- **58% of soil samples >300 ppm**

Aug - Sept 2023

- Pure Earth Indonesia, with the Bandung Institute of Technology, conducted **DSAs in 3 sites:** Pesarean, Cinangka, and Cinangneng. DSA reports in process.
- 6,100 soil samples
- **Pesarean: 29% >300 ppm**
- **Cinangka: 17.6% >300 ppm**
- **Cinangneng: 25% >300 ppm**
- Bandung Institute of Technology made recommendations for remediation methods and is making a detailed engineering design to facilitate implementation by Governments of Bogor & Tegal Regencies.

HBA

Indonesia, PECP, HBA

- May - August 2023
- Partners: OEHRC, EMRI, University of Indonesia
- **145 homes** in 4 Exposed and 1 Control area on Java Island

- **1,301 items tested** - paint, toys, cookware, foodware, clothes, spices, cosmetics
- **Findings.** Lead found, among other things, in cookware and foodware. Aluminum cookware is a suspected exposure source. Children in exposed areas have 3.85 times higher risk of elevated BLLs compared to those in control areas.

Mexico

- ❖ **28 environmental assessments (non-HBA) conducted**
- ❖ **28 homes/workshops assessed, environmental (non-HBA)**

Pottery measurements, findings

- 2021. 16 items in Tulimán, Guerrero. All tested >reference level of 100 ppm.
- 2022. 40 items in Atlixco de las Flores, Puebla. 1(42.5%) >=reference level of 100 ppm.
- 2023. 146 items in 2 communities (Atlixco de las Flores, Puebla & San Pablo del Monte, Tlaxcala). 2% of 127 in Atlixco de las Flores >100 ppm. 100% of 20 in San Pablo del Monte >100 ppm.

Environmental Assessments, findings

- 2020: 255 soil measurements in 15 pottery workshops in two communities (10 in San Marcos Acteopán; 5 in San Bartolo Cohuécan) in Puebla. 59% >400 ppm.
- 2021: 26 soil measurements in 7 workshops in Tulimán, Guerrero. 0% >400 ppm.
- 2023: 77 soil measurements in 6 workshops in Atlixco de las Flores, Tlaxcala. 79% >400 ppm.

The Philippines

- ❖ **1 HBAs conducted**
- ❖ **21 homes assessed, HBA**

HBA

Philippines ENNS, HBA pilot

- March - May 2023
- 21 homes, BLL survey participants
- **Assessed:** 210 samples of various items tested
- **Findings:** presence in aluminum cookware: 100%, 13-3,626 ppm. Ceramic foodwares: 50%, 11-17,000 ppm. Toys: 28%, 6-1,692 ppm. Paints: 22%, 8-3,555 ppm.

Global

- ❖ **25 market assessments conducted**

Rapid Market Screening 2022-2023

- **25 countries** (3-4 cities/county)
  - Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Ghana, Kenya, Nigeria, Tanzania, Uganda, Bolivia, Colombia, Mexico, Peru, Egypt, Tunisia, Turkiye, Bangladesh, India (Maharashtra, Tamil Nadu, Uttar Pradesh), Nepal, Pakistan, Indonesia, Philippines, Vietnam
- **5,010 products** from 11 categories
- **Categories:** paint, cookware, spices, toys, cosmetics, more
- **30 country desk assessments**

Summary of findings

- Out of a total of 5,007 product samples from 25 countries, 916 (18%) had lead concentrations exceeding the relevant reference level.
- 45% of 310 ceramic foodware samples had lead concentrations exceeding the reference level of 100 ppm; highest concentration = 397,100 ppm in a sample from Bolivia.
- Metallic cookware (518 total samples) had the highest percentage (52%) of samples with lead concentrations > the reference level (100 ppm). One sample from Georgia was >119,500 ppm.
- Plastic foodware (364 samples, mainly bowls and cups) was one of the least contaminated categories among foodware. Highest concentration = 3,300 ppm and only 12% of samples exceeded reference level.
- Out of 815 cosmetics samples from various subcategories, 12% exceeded the reference level (2 ppm), but the highest concentrations reached 637,600 ppm and 1,000,000 ppm (100% lead) and were found in Pakistani kajal/kohl eyeliners.
- Among 781 toys, 13% exceeded the 100 ppm reference level. Azerbaijan had a notably high rate of 69%. The toy with the highest reading, 97,300 ppm, was sampled in Maharashtra, India.
- Paint was divided into 2 subcategories - paints intended for large surfaces and paints intended for crafts and other specialty uses. Of 437 samples of paint for large surfaces, 41% had levels exceeding the reference level (90 ppm). The highest concentration (>800,000 ppm) was found in a sample from Mexico. For art paints, the highest concentration was found in Colombia, 93,500 ppm.
- Out of 1,084 spice samples, 2% had lead levels exceeding the reference level of 2 ppm. The sample with the highest concentration (622 ppm) was turmeric, purchased in Uttar Pradesh, India.
- Among 111 sweets samples, 3%, and among 364 staple dry food samples, 1% exceeded the reference level (0.1 ppm and 0.2 ppm, respectively). However, it's important to note that these reference levels are < the XRF's detection limit.
- Of 54 samples of herbal and traditional medicines, 4% exceeded the reference level 10 ppm.
- Categories with the highest proportion of samples exceeding the reference values were metallic foodware, ceramic foodware, and paints. (unclassified and for large surfaces).
- More than half of the samples of metallic foodware exceeded the reference levels in 17 countries, ceramic foodware - in 9 countries, paints for large surfaces - in 7 countries.
- In Armenia the highest lead content was in a ceramic plate (9280 ppm), in Azerbaijan - paint for large surfaces (12,400 ppm), in Bangladesh - paint of unclassified category (31,360 ppm), in Bolivia - a ceramic cup (397,100 ppm), in Colombia - paint for arts/crafts (93,500 ppm), in Egypt - a ceramic mug (50,600 ppm), in Georgia - metallic spoon (119,500 ppm), in Ghana - baking pan (24,100 ppm), in Maharashtra India - paint for large surfaces (164,000 ppm), in Tamil Nadu India - paint of unclassified category (40,700 ppm), in Uttar Pradesh India - metallic bowl (74,600 ppm), in Indonesia - paint for large surfaces (51,400 ppm), in Kenya - ceramic mug (91,000 ppm), in Kyrgyzstan - ceramic bowl (240, 500 ppm), in Mexico - paint for large surfaces (807,309 ppm), in Nepal - ceramic bowl (9,220 ppm), in Nigeria - ceramic mug (46,000 ppm), in Pakistan - kohl makeup (1,000,000 ppm), in Peru - face paint for kids (128,400 ppm), in Philippines - lipstick (42,350 ppm), in Tajikistan - ceramic plate (266,000 ppm), in Tanzania - ceramic cup (22,300 ppm), in Tunisia - paint for large surfaces (72,000 ppm), in Türkiye - ceramic cup (14,300 ppm), in Uganda - paint for large surfaces (12,600 ppm), in Vietnam - paint for large surfaces (25,505 ppm).

Aluminum Cookware, Leaching and Bioavailability Testing 2023

Given the high prevalence of lead contamination of metallic foodware, Pure Earth conducted further research on aluminum cookware samples from 23 RMS countries to assess: a) their potential to leach lead into food and thus contribute to elevated BLLs; and b) the relationship between lead levels measured by an XRF and lead concentrations released during cooking.

- **Methodology**: The testing method simulated cooking acidic food for an extended period to leach lead from the pots' interior surfaces using a 4% acetic acid solution. A preliminary reference level of 10 µg/L was used to assess lead exposure potential.
- **Results**: Of 102 pots, 52% had lead concentrations in the leachate >10 µg/L while 37% had lead concentrations between 1-9.9 µg/L, and 11% had non-detectable lead in the leachate. Lead concentrations in the leachate and exceedances of the 10 µg/L reference level varied by region, with South Asia and Southeast Asia having the highest number of pots exceeding the reference level (84%), primarily due to pots made from scrap. Pots from Africa had a large portion exceeding the reference level (43%). In contrast, pots from Eurasia and the Americas, which appeared factory-made, had fewer or no exceedances. Maximum (greater than 100 µg/L) and average (between 10-100 µg/L) lead concentrations in leachate by country were analyzed, with Indonesia showing the highest maximum concentration (2,900 µg/L) and average concentration (617 µg/L), followed by Pakistan. The study used modeling to evaluate potential for aluminum pots to be a lead exposure source. Results indicated daily ingestion of food with a lead concentration of ~80 µg/L, which occurred in 21% of pots tested, could lead to elevated BLLs in children, emphasizing the need for interventions to reduce exposure.
- **Findings:** In addition to the leaching studies, RJ Lee Laboratory (RJLG) looked at six pots, three new, and three used, investigating sections of each pot using optical microscopy, scanning electron microscopy, and energy dispersive spectroscopy. Lead present as inclusions dispersed throughout the base metal in all pots. RJLG concluded that with continued use (abrasion and scraping) and further aluminum dissolution, deeper lead inclusions would continue to be exposed for potential leaching. We can infer that lead could continue to leach from a pot during its entire period of use. For the three pots for which we have leaching data, it appeared that the rougher, more "open" the pot surface (lower technology manufacturing?), the higher the lead concentration measured in the leaching tests.

Source Assessment, pending

Georgia isotope radio identification and ranking of sources

- *2023-2024*
- *Partners: Georgia National Center for Disease Control and Public Health (NCDC), UK Health Security Agency*
- *Roti (pilot), Shidi Karti, Guria, regions that are distinct, both geographically and in BLL incidence*
- *BLL testing, environmental sample collection, questionnaires of representative sample.*
- ***Aims: 1) Rank environmental sources of lead exposure** in a regional representative sample of children using isotope ratios. **2) Compare representative sample BLLs to 2018 MICS estimates, taking into account public health interventions implemented 2019-2023** in the two regions; 3) Strengthen NCDC capacity for environmental epidemiology and measurements.*
- *Findings will inform development of interventions aimed at managing the priority sources of exposure. (Background: non-Pure Earth HBA with NCDC & UKHSA of homes of 36 kids in 7 regions with BLL>5µg/dL. BLLs, questionnaires & 528 environmental samples. Found "BLL clustering with spices, tea, paint, then to a lesser degree sand, dust, and soil."*

New Technical Tools and Resources to enable quality data collection

- **Pure Earth's *Programmatic Framework for Lead.*** February 2023.
- **Lead Exposure Reduction and Impact Calculator (LERIC).** (GAHP, PECP) First instrument of its kind to provide user-friendly dropdown menus containing country-specific values to **estimate health and economic impacts in terms of attributable disability adjusted life years (DALYs), Full Scale Intelligence Quotient (IQ) decrement, and associated economic costs** resulting from a given population's exposure to lead in soil or lead-contaminated food sources. The LERIC estimates these impacts from known BLLs

in an exposed population, or indirectly through estimation of BLLs from lead concentrations in soil or food sources based on previously validated models. The tool estimates associated benefits of a full or partial reduction in lead exposure (mainly via site remediation) to a specified population when pre- and post-values are available or can be estimated. **The LERIC is intended to produce relative estimates of health and economic impacts associated with lead exposure based on the best available information.** *As of Q4 2023, awaiting peer review.*

- *"**Assessing Changes in Blood Lead Levels: Study Design Considerations**,"* a user-friendly study design protocol for how to identify test and control groups, conduct baseline and endline BLL surveys, and determine results. (Clarios, GAHP). Jenna Forsyth, Stanford University. August 2021
- In response to a request from MERCOSUR, and with funding from Germany (BMU), Pure Earth and GAHP developed a ***"Protocol to Complete a ULAB and Lead Mass Balance."*** 2022
- ***"Home-Based Source Assessment Protocol."*** October 2023
- ***"Rapid Market Screening Sampling Protocol."*** March 2023
- ***"Guide for Lead-Adulterated Spice Identification and Tracking,"*** prepared by Jenna Forsyth/Stanford University for Pure Earth. May 2021.
- With UNEP, developed "***Guidance Manual for Policymakers and for the Environmentally Sound Management of Waste or ULABs in Africa**,"* a pan-African strategy, providing an overview of steps governments and stakeholders can take to address lead pollution. 2022. In 2020, Pure Earth developed ULAB strategies specific to Burkina Faso and Tanzania.

Outcome 4: Risk mitigation activities implemented, and results

BANGLADESH

- **3 of sites remediated** (Kathgora, Mirzapur, Mohammad Nagar)
- **8.735 of hectares remediated**
- **118 homes remediated** (95 Kathgora, 18 Mirazpur, 5 M. Nagar,)
- **~2200 exposed people benefiting from site remediation**

Kathgora ULAB Hotspot Remediation (UNIDO, EC, USAID)

- November 2017 - March 2018
- People exposed: ~300, including > 100 children
- Hectares remediated: 4
- Homes remediated: 95
- Partners: Stanford University, University of Dhaka, icddr,b

Results, BLLs

- Average BLL, pre: 19.1 µg/dl (max: 47.5 µg/dl)
- Average BLL, post (7 mo after):17.2 µg/dL (max: 37.9 µg/dL)
- **10% BLL reduction after 7 months.** The BLLs of the 47 children with *both* baseline and post-intervention time 1 BLLs reduced **20%** from 21.3 µg/dL to 17.0 µg/dL.
- Average BLL, ex-post (14 mo after): 14.8 µg/dL (max: 24.6 µg/dl)
- **22% BLL reduction after 14 months.** Among the 25 children with *all three* measurements, BLLs dropped **35%** from a median of 22.6 µg/dL to 14.8 µg/dL.

Results, Soil

- Average soil lead level, pre: 1400 ppm (n=251), max: 119,000 ppm
- Average soil lead level, post: 55 ppm (n=67) (April 2018).

- **96% reduction in average soil lead level**
- 100% soil samples >400 ppm, pre
- 0% soil samples >400 ppm, post
- **100% reduction in % of soil samples > 400 ppm**
- Average soil lead level, 3-year follow-up: 125 ppm (August 2021)
- 0% of soil samples >400 ppm, follow-up

Mirzapur ULAB Hotspot Remediation (USAID, Tauw, Clarios)

- December 2021 - May 2022
- Hectares remediated: 4.5
- People exposed: ~1050. ~700, including ~286 children under 7 live there. Another ~350 work in and visit the area.
- Homes remediated: 18
- Partners: Dept. of Environment, Univ. of Dhaka, UNICEF, icddr,b

Results, BLL

- Average BLL, pre (Jan-Mar 2022): 10 µg/dL
- Average BLL, post (June-July 2023): 7.9 µg/dL
- **23% BLL reduction** (vs. 7.7% Control 1 & 12% Control 2 (adjusted/weighted by age & sex))

Results, Soil

- Pre-remediation, Sept., Nov. 2019.
  - Soil lead levels commonly >20,000 ppm (Max: >100,000). Median soil lead levels in different areas of the site (total 107 samples), in ppm: 4769, 907, 1747, 2073, 11,353, 1565, 296, 1128
  - Max values in 2 "burning areas" of site: 15,040 ppm and 37,500 ppm
- 1 year post-remediation, May-June 2023
  - Average soil lead level: **302 ppm.** Max: 5334 ppm
  - 13.8% >400 ppm
  - Max values in 2 "burning areas" of site: 80 ppm and 384 ppm
  - **99.5% and 99% reduction** in max values in 2 "burning areas"

Results, Environmental Assessment

- Pre-remediation, Feb-March 2022, 292 samples
  - Soil, child play area: 8.2% >400 ppm
  - Soil, courtyard: 8.7% >400 ppm
  - Soil, roadside: 8.7% >400 ppm
  - Turmeric powder: 13% >2.5 ppm
- **Findings, post-remediation,** 297 samples
  - Soil, child play area: 5.6% >400 ppm. **31.7% decrease**
  - Soil, courtyard: 4.4% >400 ppm. **49.4% decrease**
  - Soil, roadside: 1.5% >400 ppm. **82.8% decrease**
  - Turmeric powder: 17% >2.5 ppm. **30.8% increase**

Mohammad Nagar, Khulna ULAB Hotspot Remediation

- April - June 2023
- Hectares remediated: 0.135 (1350 m^2)
- People exposed: 850
- Homes remediated: 3
- Partner: University of Khulna

Results, BLL

- Average BLL, pre-remediation: 4.37 µg/dL (Max: 32.95 µg/dL)
- *Full data analysis underway*

Results, Soil

- Average soil lead level (n=132), pre-remediation: 510 ppm
- Average soil lead level, post-remediation: 42 ppm
- **% reduction in average soil lead level: 89%**
- 17% pre-remediation soil samples (n=132) >400 ppm (Max: 12,100 ppm)
- 0% post-remediation soil samples >400 ppm
- **100% reduction in % of soil samples > 400 ppm**

Stanford/icddrb, Pre- and Post- 2018-2020 Spice Intervention BLL survey (GiveWell)

- **Pure Earth's role - funding impact assessment of Stanford's spice intervention: analysis of stored, pre-intervention blood (2012-2014) and post-intervention BLL testing (2022-2023)**
- Total 898 children, 500 pregnant women
- 3 Cohorts:
    - Munshiganj: 398 children, <5 years
    - WASH B cohort (Mymensingh, Kishoreganj, Gazipur - 3 rural areas: 500 children, <5 years
    - WASH B cohort (Mymensingh, Kishoreganj, Tangail, Gazipur - 4 rural areas), pregnant women: 500 children, <5 years
    - *Data analysis underway*

GEORGIA

- After sampling spices from 29 cities in 2020-2021 and finding high levels of adulteration, Pure Earth and Stanford **worked with the Government of Georgia to develop and carry out public awareness campaigns, train food and safety regulators,** and **work directly with spice producers** to ensure they are no longer adulterating spices.
- **Results:** The GOG **enacted new regulations to target the problem. Between 2020-2022:**
    - **100% reduction in spice-lead levels** in Adjara, 96% Tbilisi, 55% Guria, and 76% Imereti.
    - Very high levels **>14,000 µg/g in 2020 reduced to 36 µg/g in final sampling round, 2022.**
    - Lead in spices has been **nearly eliminated in Georgia.**
    - **10% of pre-intervention samples from Adjara over threshold limit** of 6 µg/g vs. 1% in other regions.
    - **1% of post-interventions samples from Adjara over threshold** (2022). See publication: "Reductions in spice lead levels in the Republic of Georgia: 2020-2022."
- 2021-2022 **legal framework and ULAB value chain assessments,** resulting in a paper, *"Policy Brief on ULAB management in Georgia."*
- **Training Workshops.** Pure Earth and UNICEF held a virtual workshop "Reduction of Exposure of Children to Lead in Spices in Georgia " for 18 public and private sector stakeholders (Sept 2021) and a technical training in spice assessment methodology for 15 regional and national officials and inspectors from the National Food Agency. (Nov 2021).
- **Regional Lead Conference.** June 16-17, 2022, Pure Earth hosted a workshop in Batumi, Georgia with participants, including Georgia's NCDC and TEGETA MOTORS, from 9 countries to share knowledge, expertise, and recs on lead pollution. Attendees visited the TEGETA facility, the largest auto/auto part dealer and processor of ULABs in the Caucuses, and shared key takeaways from interventions in Georgia, Mongolia, Kazakhstan, Kyrgyzstan, Tajikistan, Ukraine, Russia, Azerbaijan, Armenia, and the U.S.

GHANA

- In July 2022, Pure Earth Ghana, in collaboration with the ILA conducted a 4-day Benchmarking Assessment Tool (BAT) training. BAT is used to assess environmental, health, and safety performance of lead-based production and recycling facilities. Participating organizations included **5 organizations:** UNICEF, the Mountain Research Institute, Ghana Health Service, and two battery manufacturers, Success Africa, and Recyclers Ghana. **20 individuals trained.**
- Following completion of the Bremang DSA, Pure Earth developed a site cleanup risk mitigation plan. The EPA reviewed and approved the plan and issued a permit for Pure Earth to do the clean-up, pending funding.
- In May 2023, Pure Earth Ghana, the Ghana Health Service, and Ashaiman District Assembly members **educated 200 community members** in Ashaiman, Greater Accra Region on findings of the Ashaiman Fitter Line PSA, the HBA exercise, and the effects of lead poisoning. Environmental health inspectors from the assembly addressed questions about environmental issues and by-law enforcement.
- In June 2023, Pure Earth Ghana and Okere district assembly members, including environmental health inspectors, **educated 150 community members** in Adukrom, Eastern Region on the PSA findings. The assembly pledged collaboration with Pure Earth to address environmental health concerns, and the community appealed for a clean-up of the contaminated site.
- In Q4 2023, with funding from Gravita, Ltd. Pure Earth will conduct a DSA and develop a risk mitigation plan for the Old Gravita site. Gravita will then fund and clean up the site per the plan. Pure Earth will conduct a post-remediation assessment in 2024.

INDIA

- **1 site remediated** (Vellore)
- **0.1 hectares remediated** *(Vellore)*
- **homes remediated:** *(Vellore, but # of homes not recorded)*
- **~250 exposed people benefiting from site remediation**

Stanford Northern India Spice Study 2020-2023

- Spice supply chain and consumer products study in Northern India and South Asia: 20 cities of 4 states - 9 cities in Bihar and 11 in total from neighboring states of Uttar Pradesh and Jharkhand. Pure Earth supports **data collection / technical assistance only.**

Rangapuram, Vellore, Tamil Nadu, Trafigura Foundation

- October 2020 - September 2022 (Covid-19 delays)
- **Main source of exposure: a lead smelting unit and yard, were successfully remediated.** The unit permanently ceased operations and was dismantled, contaminated waste removed, the soil scraped and covered with clean soil, the school entrance paved, and a drainage system with settling tank constructed to reduce polluted run-off during rains.
- Number of **people exposed: ~250** (~55 HHs (~200 people) + daycare students (~50))

Intervention: With assistance from the owner, remediated the former ULAB smelter yard, nearby school and homes that were contaminated by the smelter. Measured children's BLLs. Conducted lead education events and activities for around 100 residents in Rangapuram.

Results:

- # homes remediated: *data not recorded*
- Hectares: 0.1 hectares
- Average soil lead level, school, pre: 4064 ppm

- Average soil lead level, school, post: 1807 ppm
- **% reduction in soil lead level, school: 55%**
- Average soil lead level, residential area, pre: 545 ppm
- Average Soil lead level, residential area, post: 168 ppm
- **% reduction in soil lead level, residential area: 70%**
- **Polluter used own resources to complete clean-up** beyond original scope, completing a wall and extending geo-textile coverage around school to further limit exposure.
- **Communities understand lead exposure sources, impacts, and avoidance/mitigation tactics.**
- As high BLL levels were found in children in both Exposed and Control sites, **we know there are underlying contributing sources, such as metallic cookware.**

Tauw project (2022-ongoing), Vellore, Tamil Nadu, Field Research

- February 2022 - December 2023
- **Partners:** Vellore Institute of Technology (VIT), LumetalliX
- **Purpose:** Assess performance and feasibility of using **low-cost methods for lead detection** in soil and select consumer products via field trials. Compare the results of the alternative methods against the portable XRF analyzer (a highly effective but expensive instrument). Depending on the performance of the alternative method, develop a user-friendly protocol for wider use of the methods as a means of accessible lead detection for communities
- **Project activities:** Assessed 8 new TSIP sites; collected lead contamination data via portable XRF analyzer and selected alternative methods from a total of 15 sites. Refined sampling protocol with feedback from VIT. Compared performance of alternative methods against XRF.
- **Results/Findings:** Two alternative methods were selected for field trials - sodium rhodizonate and the newly developed Lumetallix reagent. When developing lead poisoning prevention programs with community involvement, a combination of these assessed techniques, and the XRF or conventional laboratory analyses—would enhance the effectiveness of available resources. Both sodium rhodizonate and Lumetallix could be used by community members to pre-screen an area. The Lumetallix test would enable the identification of lead sources as it allows for numerous indicative tests to be conducted in a short time, while the sodium rhodizonate test can provide fewer tests but with a more definitive indication of soil lead levels above a threshold of concern. Based on the pre-screening, relevant authorities could then conduct more targeted and resource-efficient follow-up investigations.
- **Outputs:** 8 new contaminated sites entered into TSIP, final report, and video on findings.

INDONESIA

- February 7-8, 2023, Pure Earth Indonesia, with the Ministry of Environment and Forestry **trained 24 government officials** and others on identification of hazardous waste-contaminated land in Bogor. The training was repeated March 7-8 for **32 participants** in Tegal.
- In March 2023, at the dissemination event of the "Action Plan for Reducing Childhood Lead Poisoning in Tegal Regency 2023-2027," the **Environmental Office announced the approval of IDR 600 million (USD 38k) to remediate the Pesarean contaminated site.** Site assessment results served as a f**oundation for the GOI's preparation of an** Environmental Remediation Plan for Pesarean.
- In November 2023, Pure Earth Indonesia, the Department of Community Medicine, Study Program of Occupational Medicine, and Study Program of Family Medicine and Primary Services returned to BLL study areas to **give participants their results and provide counseling**, as needed, and to distribute educational materials. **50 physicians from FKUI, and 51 village nurses, and community health workers participated.**
- On October 9, 2023, **Pure Earth and the Ministry of Environment and Forestry (MOEF), Indonesia, initiated establishment of the Lead Working Group** which will serve as a forum for cross-sectoral

discussion on lead issues and impacts, building coordination to develop, implement, monitor and evaluate strategies, and to mobilize funding. Members will include the MOEF, MOH, Ministry of Energy and Mineral Resources, Ministry of Trade, Ministry of Industry, FDA, Ministry of Cooperative and Small and Medium Enterprises, universities, and NGOs.

MEXICO

Circle of Women Program

Since 2019, the **Circle of Women program** has provided training through a *training-of-trainers* model and support to 10 potter communities in the states of Puebla, Morelos, and Guerrero, supporting **potters to transition to lead-free pottery production.** The program comprises 3 phases: potter circles (improved techniques), participatory community-based research (kiln design improvements and development of local variations of lead-free glazes), and financial education. To date, we have trained *(trainees may overlap):*

- Phase I: 172 potters, who have in turn trained ~519 potters
- Phase II: 126, who have in turn trained ~359 potters
- Phase III: 64 potters, who have in turn trained ~209 potters
- 21 improved kilns serving ~420 potters have been constructed.

Center for Specialized Resources for Potters (CREA)

In 2023, Pure Earth Mexico and partners created the Centro de Recursos Especializados para Alfareros (CREA) for potters seeking to become lead-free. This virtual resource center provides videos, guides, and other useful resources on the process of making lead-free pottery such as glazes, kilns, and financial literacy. The website is continuously updated with new videos and resources.

***Comunidades de Conocimiento* Program**

Universities and other institutions play an important role in research and dissemination of results, and **replication of Pure Earth's model of helping potters transition to lead-free methods.** Through the *Comunidades de Conocimiento* program, the following partners are helping us expand to 4 additional states: Tlaxcala, Tabasco, the state of Mexico, and Oaxaca.

- **Mexican Institute of Social Security:** 4 communities in Tlaxcala (La Españita, La Trinidad Tenexyecac, Tzompantepec, San Pablo del Monte). Trained 11 trainers, who trained 180 potters.
- **Universidad Iberoamericana:** 1 community in Puebla (San Jerónimo Ocotitlán). Trained 13 trainers, who trained 13 potters.
- **Institute for the Promotion of Tabasco Crafts:** 5 communities in Tabasco (Nacajuca, Jonuta, Macuspana, Comacalco, Jalpa de Méndez).
- **Dignicraft**: 1 community, State of Mexico (Basalto). Starting in Nov. 2023 training ~40 potters.
- **Innovando la Tradición:** 5 communities in Oaxaca (Santa María Atzompa, San Bartolo Coyotepec, San Marco Tlapazola, Santo Domingo Tomaltepec, Ixtlán de Juárez) and 1 community in Chiapas (Amatenango). Will initiate in both states in 2024.

Research and Awareness-Raising Partnerships

- **Monterrey Institute of Technology:** faculty and students helping create export plan for lead-free pottery, reengineer production of lead-free glazes, and reengineer design and construction of kilns.
- **Universidad Iberoamericana:** with professors from the industrial design department, creates content on pottery innovation for CREA; designed user guides for the improved kilns.
- **Fundación Comunidad, Morelos:** developed a business case for lead-free pottery as a protected designation of origin. Hosted events & seminars attended by ~744 potters in 2022–2023.

***Barrio con Barro* Initiative**
Launched on July 21, 2021 with 25+ chefs and 40+ people representing restaurants of the Roma neighborhood in Mexico City, the *Barrio con Barro* promotes lead-free pottery use in hotels, restaurants, and shops to decrease lead exposure and increase demand for lead-free pottery. To date, 95 businesses have switched from conventional to lead-free pottery. This includes 2 major restaurant chains, El Pendulo (5 stores) and El Fogoncito (25 stores), that went lead-free in 2023.

THE PHILIPPINES

- With the Food and Nutrition Research Institute (FNRI), **piloted the monitoring and surveillance of blood lead levels of children and pregnant women in 25 of 37 areas covered by the Expanded National Nutrition Survey (ENNS).**
- **Shared BLL survey results with 308 local government units** comprising the 25 FNRI ENNS areas across Luzon, Visayas and Mindanao.
- **Facilitated health assessments and consultations for 269 BLL survey participants** who took advantage of the free services offered by Pure Earth and the University of the Philippines National Poison Management and Control Center.

Outcome 5: Pure Earth's organizational capacity increased

Bangladesh	Registered July 17, 2023. Total of 8 staff engaged in Lead Program activities as of Q4 2023
Georgia	Georgia team formed in 2020. A total of 5 staff (all consultants) engaged in Lead Program activities as of Q4 2023.
Ghana	Registered as Blacksmith Initiative in March 2023. A total of 2 staff and 2 volunteers engaged in Lead Program activities in Q4 2023.
India	Registered as Bharat Pure Earth Foundation October 6, 2011. 7 total staff engaged in Global Lead Program activities as of Q4 2023
Indonesia	Registered March 22, 2022 as Yayasan Pure Earth Indonesia. A total of 10 staff (including a PT, a freelancer and a voluntary advisor) engaged in Lead Program activities as of Q4 2023
Mexico	Pure Earth Mexico was registered prior to 2020. A total of 11 staff are engaged in Lead Program activities as of Q4 2023.
Philippines	Office established in 2008. Total of 6 staff engaged in Lead Program activities as of Q4 2023.
Global	In 2023, hired Director of Policy and Advocacy and Director of Monitoring, Evaluation, Learning, and Reporting. As of Q3 2023, 9 global offices, 77 employees and consultants.