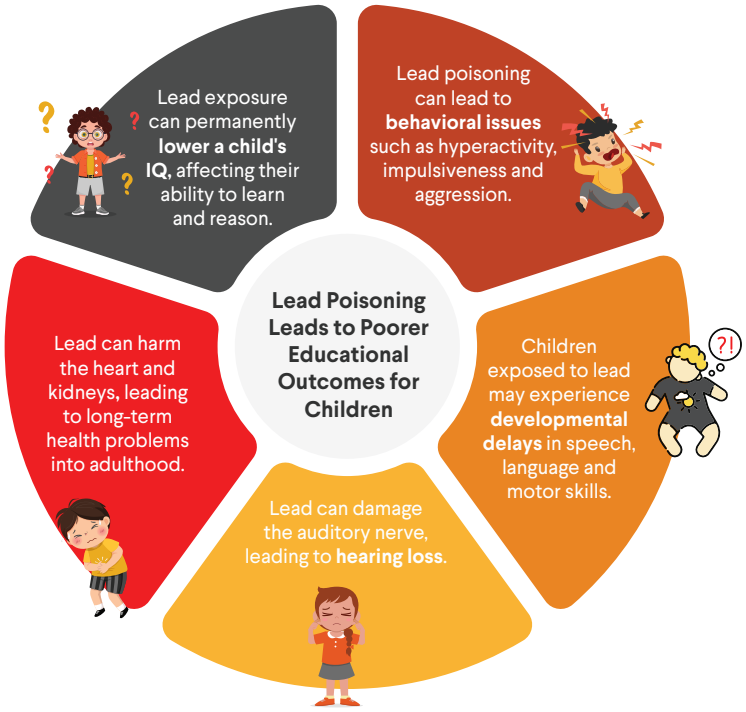
A Call to Action:
Lead Poisoning and Early Childhood Development

Lead (Pb) is a highly poisonous heavy metal that is particularly harmful to young children. Lead exposure affects one in every three children globally, with the majority residing in low- and middle-income countries. Learn more about the devastating impacts of lead on children's health, and what we can do about it.

Impacts of Lead Poisoning

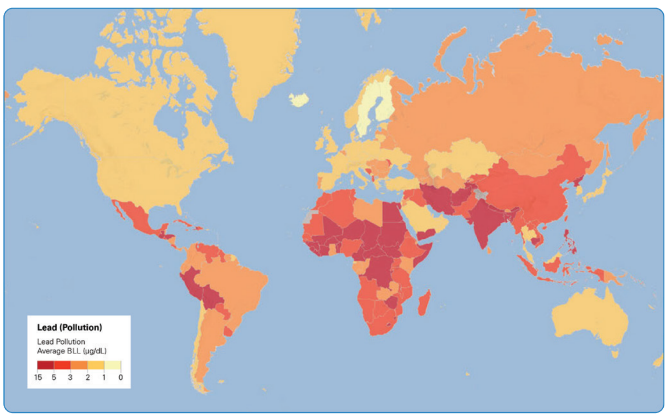


Infographic source: Vital Strategies and ARNEC

Despite clear evidence of harm, lead is still widely used due to its desirable chemical and physical properties. The sources of lead exposure include, but are not limited to, contaminated soil, and consumer products such as paint, metallic cookware, ceramics, cosmetics, toys, spices and food. Lead can also be released from industrial activities like used lead acid battery (ULAB) recycling, coal-fired power plants, artisanal gold mining, and aviation/motor sports (that still use leaded gasoline). In low- and middle-income countries, informal or backyard battery breaking, lead smelting, e-waste recycling, and junkshop operations also result in lead exposure.

It is estimated that one-third or over 800 million children around the world have unsafe blood lead levels.[1] The map below illustrates average blood lead levels among children by country. The darker the color, the greater the level of exposure.

Children's Average Blood Lead Levels by Country (ug/dL)



Source: IHME 2019. Lead exposure and health data is also visualized at www.lead.pollution.org

1. Rees, N., Fuller, R., UNICEF, & Pure Earth (Organization). (2020). The toxic truth: children's exposure to lead pollution undermines a generation of future potential (2nd edition). UNICEF: Pure Earth. https://www.unicef.org/reports/toxic-truth-childrens-exposure-to-lead-pollution-2020

Children under 5 are at increased risk of suffering lifelong damage to their health and development from lead poisoning.

The use of lead comes at a huge cost to young children. According to WHO, there is no safe level of lead in blood. Even at low levels, lead affects the development of a child's brain and nervous system. Low levels of lead exposure can occur without overt signs or symptoms apparent to parents or doctors. At high levels, symptoms include abdominal pain, vomiting, constipation, coma and even death. Older children and adults, as well, suffer severe consequences from prolonged exposure to lead in food, water and the air they breathe, including increased risk of cardiovascular diseases and kidney damage in later life. While the toll of lead poisoning is devastating, it is entirely preventable.

Young Children Are at Increased Risk

Children are particularly vulnerable to lead poisoning compared to adults for several reasons:

Young children are more prone to accidentally ingest lead due to their object-to-mouth behavior.
Image source: Shutterstock

1. Higher Absorption:

Infants and young children absorb about four to five times more of the lead that enters their bodies than adults do.[2]

2. Higher Intake:

Children breathe, drink and eat more per unit of body weight than adults. Consequently, their relative intake of lead from contaminated air, food or water is also higher.[3]

3. Higher Risk of Ingestion:

Children, especially young children, are prone to engage in hand-to-mouth and object-to-mouth behavior, which could result in the accidental ingestion of lead. Children also play outdoors and are closer to the ground, especially young children who are learning to crawl and walk, and therefore have a higher risk of ingesting lead-contaminated soil or dust. Children who engage in pica, the compulsive, habitual consumption of non-food items (e.g., paint chips), are at particularly high risk.

4. Lasting Neurological Damage:

Children's brains are under fast development, especially in the first 1,000 days. Therefore, lasting neurological damage is more likely to occur in children than adults with similar levels of lead exposure.[4]

5. Longer Span for Lead Accumulation:

Compared to adults, children have a longer lifespan to accumulate lead in their systems. Because lead mimics calcium in the body, it is stored in bones where it may leach back into the blood over a lifetime, especially during pregnancy and old age.

2. World Health Organization. " Childhood Lead Poisoning." (2010). https://www.who.int/ceh/publications/childhoodpoisoning/en/

3. US Department of Health and Human Services. "ATSDR Case Studies in Environmental Medicine: Lead Toxicity". (Environmental Health and Medicine Education, 2000). https://www.atsdr.cdc.gov/csem/csem.asp?csem=34&po=7

4. World Health Organization. "Exposure to Lead: A Major Public Health Concern". https://www.who.int/ipcs/features/lead.pdf

Lifelong Impacts on Young Children

The impacts of lead exposure on young children's health and development has serious implications.

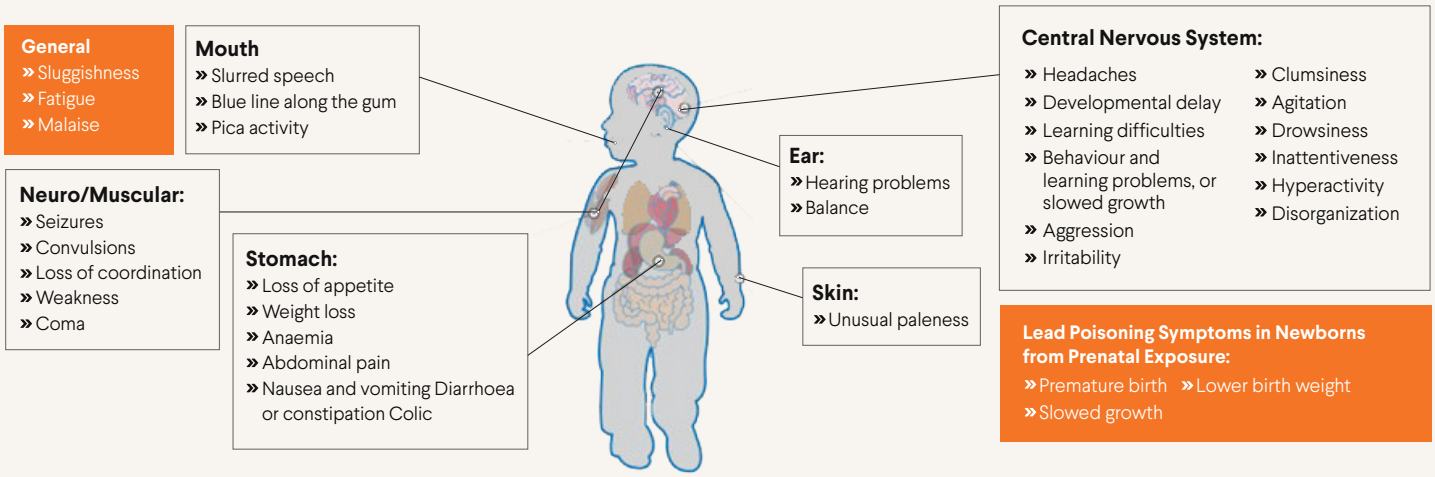
Lead and Learning Gaps

Children under the age of 5 years are at the greatest risk of suffering lifelong neurological, cognitive and physical damage and even death from lead poisoning. Exposure to lead may cause a reduction in IQ scores, shortened attention spans, learning difficulties, poor school performance, and potentially anti-social behavior later in life. It may also result in slow growth as well as speech and hearing problems. When looking at the learning gap between what children in upper-income and lower-income countries achieve academically, research finds that 20% can be attributed to lead.[5]

Lead and Malnutrition

Malnourished children are more susceptible to lead, as they absorb more lead if other nutrients are deficient, especially calcium or iron.

Lead Poisoning Symptoms in Children



Infographic Source: UNICEF and Pure Earth. "The toxic truth: Children's exposure to lead pollution undermines a generation of future potential." (2020)

5. https://www.cgdev.org/blog/can-lead-poisoning-explain-low-test-scores-poor-countries

Lead and Lost Potential

A reduction in a child's IQ is correlated with decreases in lifetime earning potential. In a 2023 study by the World Bank, it was found that globally, children aged 5 and under lost 765 million IQ points due to lead exposure in 2019, with 95% of the loss occurring in low- and middle-income countries. These IQ losses may result in future income loss and are estimated to cost US$1.4 trillion worldwide.[6]

Lead in Pregnancy

Exposure to lead before and during pregnancy can also be extremely harmful. Lead stored in an expectant mother's bones from her earliest exposures can be released during pregnancy when the growing baby creates enormous demands on the mother's calcium stores. This increases blood lead levels and poses risks to both the mother and unborn child. It has been shown to cause bleeding, miscarriage, still birth[7], premature birth and low birth weight, as well as minor malformations.[8] Lead in the mother's blood can pass through the placenta into the baby and into their developing organs, and can affect the baby's growth as well as their future ability to hear, see and learn.[9] After birth, a child may be exposed to lead through breast milk.[10]

The World Bank estimates that children under 5 have lost 765 million IQ points to lead poisoning - a loss valued at US$1.4 trillion. Image Source: Vital Strategies

6. Published online September [12], [2023] https://doi.org/[10.1016]/ S[2542_5196(23)00166_3]

7. Centers for Disease Control and Prevention. "Lead FAQs." https://www.cdc.gov/nceh/lead/faqs/lead-faqs.htm (Accessed June [23]rd, [2020])

8. World Health Organization. "Exposure to Lead: A Major Public Health Concern." ([2010]).https://www.who.int/ipcs/features/lead.pdf

9. Centers for Disease Control and Prevention. "Lead FAQs." https://www.cdc.gov/nceh/lead/faqs/lead-faqs.htm (Accessed June [23]rd, [2020])

10. https://www.unicef.org/bhutan/media/[4141]/file/BLS_Factsheet_Final%[20([002])].pdf.pdf

Why Has Lead Poisoning Been So Pervasive?

Knowledge of lead and its negative health impacts has been around for decades, yet public and clinician awareness of lead poisoning is low, and lead continues to be used and to seep into our systems. We explore why this is so.

1. Lead Exposure Can Happen Invisibly

Lead poisoning can happen slowly and silently. The symptoms of lead exposure differ from child to child, and most have no outward signs. At higher exposure levels, symptoms may include fatigue, vomiting and abdominal pain that can easily be confused with other ailments. Lead exposure is also cumulative and builds over time, so the onset of symptoms can happen very gradually.

Therefore, asking about a household's potential exposure to lead from work, environment, paint and household products can help identify their risk. A blood lead test is the best way to confirm exposure for those at highest risk. However, this is not a common practice incorporated into routine children's health care in low- and middle-income countries in Asia due to the limited awareness among health care professionals and the shortage of testing capacity.

2. Lead poisoning has been overlooked by many governments and societies

Many countries have not invested in programs to understand if lead exposure is prevalent, and if so where the sources of lead may be. Some may see lead as an issue in the past as leaded gasoline is now phased out worldwide. Some may see lead as a localized issue affecting communities near a pollution source (e.g., lead smelters) without being aware of sources that affect the broader population such as lead in paint, spices or drinking water. Countries that regularly monitor lead exposure among children are mostly located in North America and Western Europe. In Asia, only Philippines and Bhutan[10] have recently initiated the effort to monitor lead in children. Other countries that had previously conducted blood lead studies but no longer actively do so are South Korea, China, Japan, Thailand and Singapore. Data is still missing in most countries about the severity of childhood lead poisoning and the major sources; there is consequently very little action to regulate lead in those places.

3. Demand for lead is increasing

Most global lead consumption is for the manufacture of lead-acid batteries for motor vehicles. Between 2000 and 2018, the number of new vehicles sold in low- and middle-income countries more than tripled.[11] Our increasing reliance on motor vehicles is fueling the demand for lead. Invented over 160 years ago, lead-acid batteries are still the most widely used form of stored energy as they are both reliable and relatively affordable. There are currently no readily available alternatives for lead-acid batteries, particularly for vehicles used in low- and middle-income countries.

11. https://www.oica.net/category/vehicles-in-use/

Lead-acid batteries are generally safe. The problem only starts when the battery starts to lose its ability to store energy, typically after several years. This is when lead in the battery can be extracted and sold—a process known as used lead acid battery (ULAB) recycling. This process needs to be done carefully to prevent exposure to workers and contamination of the environment. In low- and middle-income countries, this process is often taken up by the informal sector (sometimes in a person's backyard) by people who may not know about or practice sufficient occupational and environmental safeguards.

Used lead-acid batteries at a workshop. Image source: Shutterstock

This results in the creation of hazardous waste sites where the soil, air, water and general environment are contaminated with lead. People, especially children, who work in and live near recycling sites are at greatest risk of lead exposure from the dust and fumes generated by these operations.

Key Sources of Lead Exposure

In addition to used lead acid battery recycling sites, lead can be found in various sources inside and outside the home. The figure below gives a snapshot of what these items may be, and this section describes the key sources and examples from the Asia-Pacific region.

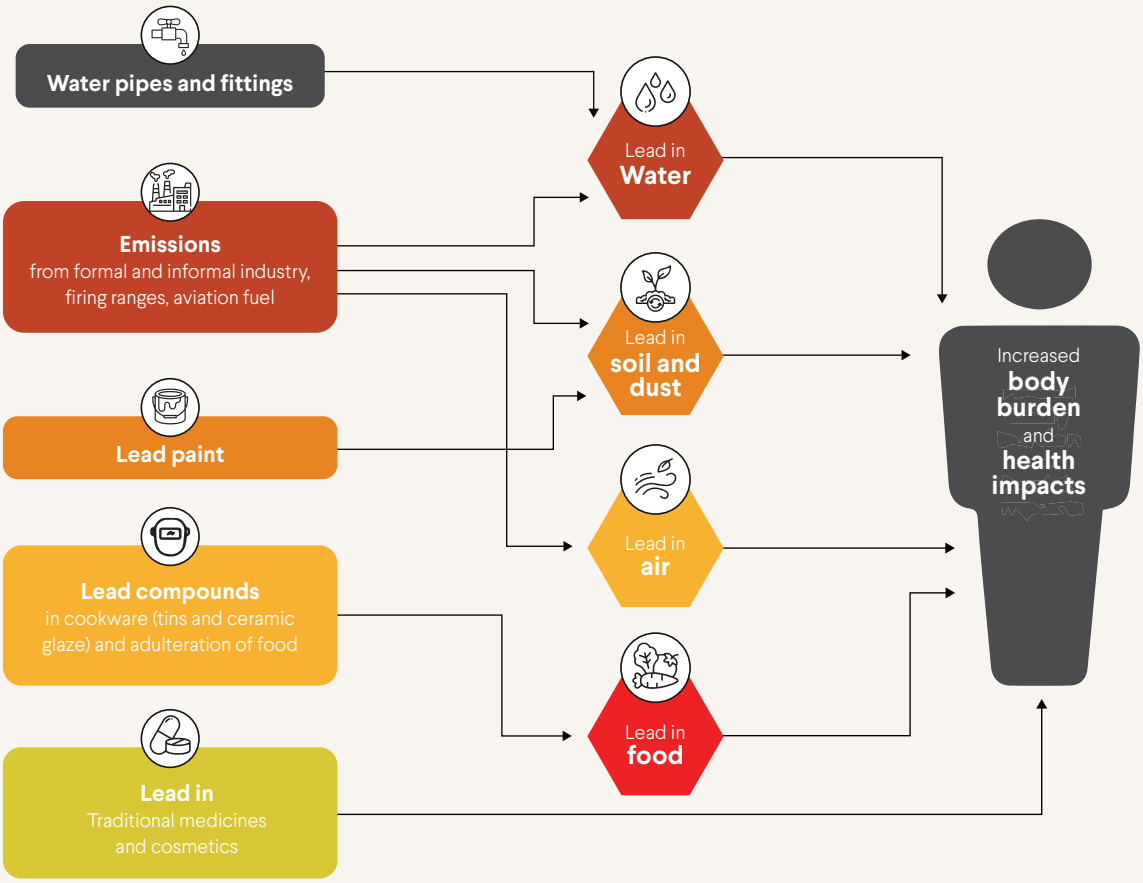


Image Source: Adapted from the WHO guidelines on the clinical management of exposure to lead

Lead in Paint

Lead is added to paint to accelerate drying, increase durability, maintain a fresh appearance, and resist moisture that causes corrosion. It is especially dangerous to children because it tastes sweet, and when lead paint peels and cracks over time, it creates flakes and dust which children can ingest. Toys painted with lead-based paints can be another source of exposure, as young children tend to mouth and chew on their colorful toys. [12]

A 2021 study in Indonesia found that nearly 70% of commercially available paints in Indonesia contain levels of lead higher than the regulatory safe limit of 600 parts per million (ppm). The same study also sampled 32 public playgrounds in Jakarta and found that they contained lead paint.

Study: https://www.nexus3foundation.org/2024/06/10/study-shows-high-health-risks-to-indonesian-lead-paint-workers/

Paints flakes off a metal surface. Image source: Alamy

The highest lead levels are typically found in brightly colored enamel paints of the following colors: **yellow, orange, green and red.** Around 52% of countries in the world do not have confirmed legal controls on lead paint, concentrated in low- and middle-income countries. Even in countries where lead is now regulated, enforcement is often lacking for local small-scale paint manufacturers and older structures may still contain lead from legacy usage. Please see the table below for the list of countries in the Asia-Pacific that have restrictions on lead in paint and those that don't.

List of countries in the Asia-Pacific region that regulate and don't regulate lead paint (as of Jan. 16, 2024). Source: WHO[13]

Asia-Pacific countries that regulate lead paint		
» Australia	» Nepal	» Sri Lanka
» Bangladesh	» New Zealand	» Thailand
» China	» Pakistan	» Vietnam
» India	» Philippines	
» Lao PDR	» South Korea	

Asia-Pacific countries that don't regulate lead paint		
» Afghanistan	» Malaysia	» Soloman Islands
» Bhutan	» Maldives	» Taiwan
» Cambodia	» Mongolia	» Timor-Leste
» Fiji	» New Caledonia	» Tuvalu
» Japan	» Palau	» Vanuatu
» Myanmar	» Singapore	

*This table does not include the following 10 countries, for which data is not available: Brunei, Cook Islands, Federate States of Micronesia, Indonesia, Kiribati, Marshall Islands, Niue, North Korea, Papua New Guinea, Tonga.

12. Stanley Schaffer. " Lead Poisoning: Is Your Child At Risk?" (University of Rochester Medical Center, 2018). https://www.urmc.rochester.edu/patients-families/healthmatters/january-2018/lead-poising-is-your-child-at-risk.aspx#:~:text=Lead%20paint%20has%20a%20sweet,that%20may%20contain%20lead%20paint.

13. https://www.who.int/data/gho/data/themes/topics/indicator-groups/legally-binding-controls-on-lead-paint

Lead in Food

Lead can also enter the food system. This happens when plants or animals are grown in lead-contaminated areas, but it can also occur because lead is purposely added to enhance the color or weight of the food, typically spices. In 2017, a U.S. study of nearly 500 brands of infant formula and baby food found that over 30% had detectable levels of lead.[14] In the Asia-Pacific region, there have not been sufficient studies to understand how much lead may be in our food systems. Any studies would need to be conducted at the country level, because food contamination is a highly localized phenomenon.

A Bangladeshi Success Story

In Bangladesh, lead contamination of turmeric poses a significant health risk. In 2019, Stanford researchers found lead-based adulteration in seven of the nine turmeric-producing districts, with some concentrations exceeding the national limit by up to 500 times.[15] Their evidence suggested that manufacturers had added lead chromate to enhance the yellow color that consumers see as a sign of quality turmeric. They had done this without knowing the health harms of lead. Following the study, there was swift government action to enforce penalties and procure new tools to rapidly assess for lead, as well as public engagement and media attention that resulted in the successful elimination of lead in spices. The percentage of spices detected with lead sold in the market decreased from 47% to 0% after two years.[16]

Turmeric, a spice commonly found in South-Asian markets, has been found to contain lead. Producers add lead chromate – a bright yellow powder – to the turmeric to give it a more vibrant color. Image source: Vital Strategies

14. https://www.usatoday.com/story/news/nation-now/2017/10/25/these-baby-foods-and-formulas-tested-positive-arsenic-lead-and-bpa-new-study/794291001/

15. Forsyth, Jenna E., Syeda Nurunnahar, Sheikh Shariful Islam, Musa Baker, Dalia Yeasmin, M. Saiful Islam, Mahbubur Rahman et al. "Turmeric Means 'Yellow' in Bengali: Lead Chromate Pigments Added to Turmeric Threaten Public Health Across Bangladesh." (Environmental research 179, 2019): 108722. DOI: 10.1016/j.envres.2019.108722

16. https://www.npr.org/sections/goats-and-soda/2024/09/23/nx-s1-5011028/detectives-mystery-lead-poisoning-new-york-bangladesh

Table: Consumables in the Asia-Pacific Region known to have contained lead

Country	Consumable	Usage
China	Ba-bow-san	An herbal remedy used to treat colic pain or to pacify young children
Thailand and Myanmar	Daw Tway	A digestive aid that has been shown to contain high levels of lead, in addition to arsenic
South Asia	Ghasard	An Indian folk medicine that is a brown powder used as a tonic
South Asia	Turmeric	An orange spice that is used commonly for cooking in Asian cuisines.
Bhutan	Jinlab	A religious pill, normally offered by monks

*This is not an exhaustive list

In 2021, the organization Pure Earth conducted a rapid market assessment across 25 low- and-middle income countries that found that 18% of all products sampled contained lead. The study included seven countries in the Asia-Pacific: Bangladesh, India, Nepal, Pakistan, Indonesia, Philippines and Vietnam. Sampled items that contained lead included paint, spices, several different types of foodware (i.e., metallic, ceramic, plastic), cosmetics, and toys. For more information about the study, please visit: https://www.pureearth.org/global-lead-program/exposure-source-analysis/

A study published in 2012 examined the impact of lead poisoning on children living in hazardous waste sites in seven Asian countries: Bangladesh, India, Indonesia, Kazakhstan, Pakistan, Philippines and Thailand. The analysis revealed that there were at least 169 sites lead-contaminated in these seven countries that are likely to have poisoned hundreds of thousands of young children. For more details on contaminated sites, please visit www.contaminatedsites.org

Study: Caravanos J, Chatham-Stephens K, Ericson B, Landrigan PJ, Fuller R. The burden of disease from pediatric lead exposure at hazardous waste sites in 7 Asian countries. Environ Res. 2013 Jan;120:119-25. doi: 10.1016/j.envres.2012.06.006. Epub 2012 Sep 20. PMID: 22999658.

The Many Colors of Lead

It is not possible to determine by looking at a substance whether it contains lead. This is because the lead could be present in trace amounts, and also because lead compounds can present in many different colors. Some of the common colors of lead compounds and where they are used are listed below.

- **Lead carbonate (white):** historically used as a white pigment in paints but largely phased out due to its toxicity.
- **Lead chromate (yellow):** a yellow pigment used in paints or added to turmeric illegally.
- **Lead tetraoxide (red):** used as a pigment in corrosion-resistant paints due to its red color.
- **Lead sulfide (black):** found to be used in some traditional eyeliners like kohl or surma.

The Link Between Climate Change and Lead Poisoning

Although lead poisoning is not a result of climate change, there are several links. First, lead-acid-batteries are widely used products for electric vehicles and solar and wind energy storage. As these lower carbon emitting technologies become more popular and accepted and lithium-ion batteries remain expensive, the demand for lead and lead-acid batteries will continue to rise, particularly in low- and middle-income countries. This may also increase the local recycling of lead acid batteries which, if done in informal settings, may increase lead pollution in the surrounding communities. Not all lead is recycled, and if demand grows for primary sources, mining operations will release greenhouse gases into the atmosphere, contributing to climate change.

Second, climate change will lead to an increase in extreme weather events, such as storms and floods, which is likely to increase the spread of lead in the environment.[17] [18] Climate change is also making the Earth warmer, with the past decade being the hottest in recorded history. Studies have shown that children's blood lead levels peak in warmer months, likely due to increased lead exposure, higher growth rate, and interactions with Vitamin D.[19] A recent review suggested that a hotter, drier, and more extreme climate may increase the lead exposure and toxicity to humans by mobilizing lead in air, soil, water. [20]

Solar Panels and Wind Turbines. Image source: Shutterstock

17. Shiv Bolan, Lokesh P. Padhye, Tahereh Jasemizad, Muthusamy Govarthanan, N. Karmegam, Hasintha Wijesekara, Dhulmy Amarasiri, Deyi Hou, Pingfan Zhou, Basanta Kumar Biswal, Rajasekhar Balasubramanian, Hailong Wang, Kadambot H.M. Siddique, Jörg Rinklebe, M.B. Kirkham, Nanthi Bolan, Impacts of climate change on the fate of contaminants through extreme weather events, Science of The Total Environment, Volume 909, 2024, 168388, ISSN 0048-9697, https://doi.org/10.1016/j.scitotenv.2023.168388.

18. George P. Cobb, Michael T. Abel, Thomas R. Rainwater, Galen P. Austin, Stephen B. Cox, Ronald J. Kendall, Eric J. Marsland, Todd A. Anderson, Blair D. Leftwich, John C. Zak, and Steven M. Presley. "Metal Distributions in New Orleans Following Hurricanes Katrina and Rita: A Continuation Study." Environmental Science & Technology 40 (2006): 4571–77. https://doi.org/10.1289/ehp.1103774

19. Haley VB, Talbot TO. Seasonality and trend in blood lead levels of New York State children. BMC Pediatr. 2004 Jun 4;4:8. doi: 10.1186/1471-2431-4-8. PMID: 15180903; PMCID: PMC449716.

20. Ronnie Levin, Carolina L. Zilli Vieira, Daniel C. Mordarski, Marieke H. Rosenbaum, Lead seasonality in humans, animals, and the natural environment, Environmental Research, Volume 180, 2020, 108797, ISSN 0013-9351, https://doi.org/10.1016/j.envres.2019.108797.

Spotlight Story

Working on lead poisoning prevention in Bhutan

Deki Pem, a leading researcher on lead poisoning in Bhutan, shares her experience on advancing the cause in Bhutan.

Deki Pem is an Associate Professor of the Nursing and Midwifery Department at Khesar Gyalpo University of Medical Sciences of Bhutan.

Over 15 years ago, she enrolled in a midwifery course in Australia, motivated by the desire to bring back evidence-based research on child-growth and development. Later in life, Deki became a mother of two, and her passion for early childhood development grew even stronger.

As part of her ongoing research, Deki observed that cognitive development in children in Bhutan was lagging. She realized that environmental factors could be influencing this delay. Specifically, she suspected that toxic heavy metals, such as lead and arsenic, might be contributing to this issue. Further research revealed that many children aged 6-22 months were not receiving adequate nutrition, particularly iron and calcium. This deficiency made children more susceptible to absorbing higher levels of lead. To investigate this further, Deki collaborated with a US researcher to conduct a blood lead surveillance study in Bhutan in 2018. The results were alarming: 43% of children had blood lead levels exceeding 5 µg/dL.

A Bhutanese researcher uses an XRF monitor to test for the presence of lead in playground equipment.

Determined to identify the source of this lead exposure, Deki conducted another study in 2022 to examine potential lead-containing items. The study revealed that lead paint was a major source of contamination.

Initially, government stakeholders were not that interested in the issue of lead poisoning. However over time, with the support from colleagues in the MOH, WHO and UNICEF, there became sufficient interest to organise a third more comprehensive study[21] on lead poisoning in 2024, with results made publicly available.

One of the key findings from the third study was the presence of lead in religious items in Bhutan, including Jinlab, a pill everyone takes including young children as part of religious practices. This discovery prompted the Ministry of Health (MOH) and other stakeholders to collaborate on identifying how lead had entered these products and to explore ways to eliminate the use and manufacture of lead-contaminated items.

Deki offers this advice to ECD advocates focusing on lead: "It is crucial to have and share research and data to raise public awareness, especially among parents. I know the study reached some parent groups who were deeply concerned about the findings."

Photos and story contributed by Deki Pem ‹dk_pem@fnph.edu.bt›

21. https://www.unicef.org/bhutan/media/4141/file/BLS_Factsheet_Final%20(002).pdf.pdf

What can we do?

Lead poisoning is entirely preventable, and many countries have managed to dramatically reduce their children's exposure to lead.[22] In this section, we highlight what can be done at three different levels: individual/family, institutional/community and sub-national/national. Please note that the categorization of actions is a guide, and there may be instances where you can do more than what is recommended for your level.

At the individual or family level

- Determine if there are lead-based risks in your home and community, particularly areas where your children spend their time. As a precaution, repair areas where paint is cracking and flaking by removing it using water to avoid increasing dust levels, and repaint the surface with lead-free paint. Even if you live in a country where lead paint is currently banned, older paints can still contain lead. In addition, make sure to dispose of lead acid batteries properly.
- Children who live close to used lead acid battery recycling sites, or whose parents work in lead-related industries, are at high risk. Their caregivers need to take additional stricter precautions, such as removing and washing their work clothes immediately upon reaching home.

Informal backyard smelters like this one in Indonesia, are used to melt and extract lead from used lead acid batteries, releasing toxic lead-contaminated fumes and dust into the atmosphere. Image source: Vital Strategies

- Be aware of which products in your country may contain lead and avoid using them. This may vary by country and context; however, products that frequently contain lead include artisanal ceramics, some spices, traditional remedies and some cosmetics (e.g., kohl, kajal, surma, sindoor). The city of New York has a public database of products it has tested that contain lead.[23]
- Practice good sanitation and hygiene, which can reduce exposure to lead and other toxins and pathogens. Ensure children wash their hands and feet after being outside and keep the household clean and free from dust and soil. Where possible, mop or wet-wipe surfaces rather than dry-sweeping.
- Provide a healthy and balanced diet. Iron, calcium and vitamin C can help decrease the absorption of lead if a child is exposed. Healthier children have been shown to suffer less severe consequences from exposure to environmental toxins.
- Seek out quality early childhood development educational services, as they may mitigate some of the negative cognitive effects associated with exposure. Children with elevated lead levels who are at risk for developmental delays benefit most from interventions that start at an early age. Group, curriculum-driven and play-based learning has been shown to increase IQ in children. Mental health and cognitive behavioral therapy in particular can help children manage conditions such as ADHD, which has been strongly associated with lead exposure in children.

22. USA example of tracking lead reduction policies with reduced blood lead levels: https://www.edf.org/health/interactive-chart-forty-years-sound-policy

Geogia example of identifying and eliminating a key source of lead: https://www.npr.org/sections/goats-and-soda/2024/09/23/nx-s1-5011028/detectives-mystery-lead-poisoning-new-york-bangladesh

23. https://data.cityofnewyork.us/Health/Metal-Content-of-Consumer-Products-Tested-by-the-N/da9u-wz3r/data_previe

How can I tell if an object or surface contains lead?

Most of the time, you will not be able to tell. However, there are consumer test kits that are purchasable for ~$30 on established e-commerce platforms. To give more accurate and precise lead contamination readings, trained professionals use an X-Ray Fluorescence (XRF) monitor that can test for lead in objects and surfaces. A typical XRF monitor costs upwards of US$20,000. In the case study mentioned on page 11 of this factsheet, the research team in Bhutan used an XRF monitor to test various surfaces that children may be exposed to.

Image: Example of a consumer testing kit for lead

At the institutional/community level

- Research and understand the sources and effects of lead in your institution and community. If you suspect that young children may be exposed, advocate for the local government to conduct environmental and product tests to determine if there is lead.
- Learn more about how lead-acid batteries are being disposed of and recycled in your community. Work with partners to develop a safe recycling program for used lead-acid batteries.
- Find out if the paint sold in your community contains lead, and which paint products may be unsafe. Ensure that you only use lead-free paints in your buildings and structures. For painted surfaces that are cracking and flaking, ensure that they are safely repaired using wet-sanding, and replaced with lead-free paint. Do not dry-sand or surface-burn to remove old paint as this releases dust.
- Conduct campaigns to raise awareness about the dangers and sources of lead exposure and protective actions with direct appeals to children, parents, schools, youth associations, community leaders and health care workers. Studies have repeatedly demonstrated that parents of children found to have high blood lead levels had no idea that their families were at risk, whether from nearby backyard recycling operations, lead-glazed pottery, home-based workshops or adulterated spices. Likewise, workers in informal recycling and smelting operations often are unaware of the inherent dangers of lead exposure or measures that they should take to protect themselves and their families. Some sample public education materials can be found here: https://www.pureearth.org/public-education-materials/

At the subnational/national level

- Ensure that your health care system has the capability to screen, provide guidance and initiate treatment to evaluate the risks and levels of exposure. This includes equipping health care workers with knowledge and tools to timely identify and manage children with lead exposure, including children with disabilities. This often requires improving the capacity and accessibility to screen children at risk, establishing national clinical guidelines on managing lead exposure, and training health care professionals to incorporate actions into their daily practices. In 2021, WHO published a guideline for clinical management of lead exposure, which is a useful resource for health care providers in making decisions about the diagnosis and treatment of lead exposure: https://www.who.int/publications/i/item/9789240037045

- Undertake studies to design and implement blood lead level surveillance systems in your city, state or country. These studies will help you to understand if lead poisoning is a problem in your area. There is an enormous need for: improved blood lead testing; monitoring mechanisms; data and analysis; and reporting on children who have been exposed. Similarly, pregnant and nursing mothers should be provided with blood lead level testing, particularly if risk factors are present.

A young girl is getting her finger pricked, so that physicians can extract her blood to test for lead as part of a blood lead surveillance exercise in India. Image Source: Vital Strategies

- If lead exposure is detected, undertake further research to find out the key sources of lead, including whether there are any hazardous sites where lead contamination is especially high. Assessments should be conducted at the household, school and community level.
- Take decisive action to eliminate the sources of lead, through regulation, enforcement, public education, and remediation. Consider the costs of not acting on lead poisoning, versus the benefits of intervention. If necessary, engage external support to help calculate these costs and build up a case for investing in lead interventions.
- Invest in safe recycling systems for used lead acid batteries. This is particularly important as it is projected that lead acid batteries will continue to increase in demand. Ensure used lead-acid battery and e-waste recycling operations have controlled and environmentally sound operations that support local economies and protect workers and local neighborhoods from toxic emissions and dust. Improve collection systems of used lead acid batteries to ensure proper and safe recycling.[1]

Lead Elimination Efforts in the Philippines

Lead-containing paints were phased out in 2020 in compliance to the Philippines' Chemical Control Order for Lead and Lead Compounds enacted in 2013.

In 2023, a market screening found that 24% of aluminum pots, 13% of glazed ceramic food ware, 33% of cosmetics, and 16% of house paints were contaminated with high levels of lead.

Source: Pure Earth Philippines

- Land that is already contaminated with lead must be remediated by professional contractors, making it a safe space once again for children. Cost-effective methods to clean toxic sites include removing contaminated soil and waste, installing barrier cloths and paving or covering areas with clean fill, and planting with grass and vegetation.[24]
- Ensure that national drinking water quality standards include lead parameters. Although lead is rarely naturally present in tap water but instead contaminates water when plumbing materials such as pipes corrode.[25] Lead has also been found in polyvinyl chloride (PVC) pipes in low- and middle-income countries. [26]

24. U.S. Environmental Protection Agency. "Superfund Engineering Issue: Treatment of Lead-Contaminated Soils." (1991) https://www.epa.gov/sites/production/files/2015-06/documents/leadcontam_sites.pdf

25. https://www.epa.gov/ground-water-and-drinking-water/basic-information-about-lead-drinking-water

26. Zhang Y, Lin YP. Leaching of lead from new unplasticized polyvinyl chloride (uPVC) pipes into drinking water. Environ Sci Pollut Res Int. 2015 Jun;22(11):8405–11. doi: 10.1007/s11356-014-3999-9. Epub 2014 Dec 25. PMID: 25539706.

Key Resources:

- Rees, N., Fuller, R., UNICEF, & Pure Earth (Organization). (2020). The toxic truth: children's exposure to lead pollution undermines a generation of future potential (2nd edition). UNICEF: Pure Earth. https://www.unicef.org/reports/toxic-truth-childrens-exposure-to-lead-pollution-2020
- https://www.unicef.org/documents/five-actions-end-childhood-lead-poisoning (2023)
- World Health Organization. " Lead poisoning and health." (2024). https://www.who.int/news-room/fact-sheets/detail/lead-poisoning-and-health

Acknowledgements

Authors: Lynn Tang, Yi Lu (Vital Strategies)

Advisors: Neelima Chopra (ARNEC), Joel Lasam (ARNEC), Syifa Andina (Plan International), Larah Ortega Ibanez (Pure Earth), Joy Sampang (Save the Children), Katelin Wilton (Save the Children), Karma Gayleg (MoE-Bhutan), Dan Kass (Vital Strategies)

Design and Editing: Vital Strategies

This fact sheet on lead poisoning is part of the ECD and climate change toolkit that ARNEC is developing under its advocacy on addressing the impacts of climate change on young children. This advocacy initiative is in partnership with UNICEF EAPRO, Save the Children, UNESCO Bangkok, and Plan International. Development of the fact sheets is with funding support from Bainum Foundation and UNICEF-EAPRO