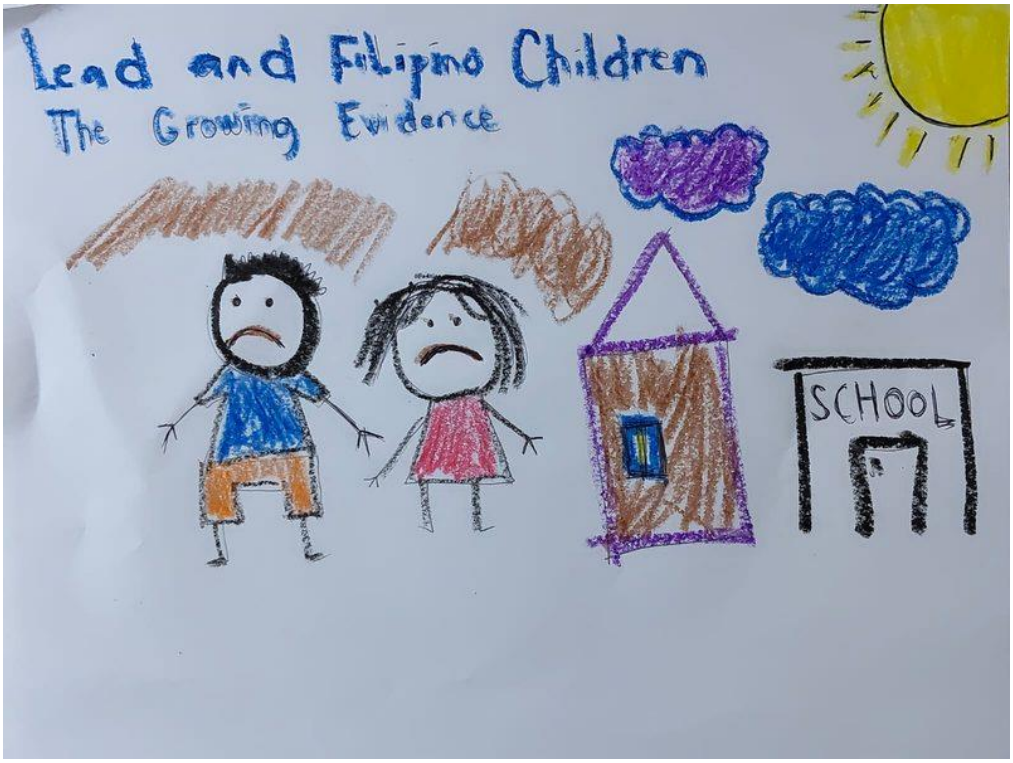
Lead and Filipino Children The Growing Evidence

Part 2 of a two-part series on lead contamination in the Philippines

By Ian Smith BSc BEng MBA, LEAD Group Systems Analyst, using Claude AI (Opus 4.6, 1M context), on research by Philippines-based LEAD Group Executive Assistants Paul Jacobe and Marie Jean Villarosa, edited by Elizabeth O'Brien BSc GradDipHealthEd, Lead Scientist, The LEAD Group Inc. Illustrated by Filipino preschool and schoolchildren's entries in to The LEAD Group's Volcano Art Prize 2026.

Abstract

In Part 1 of this series, we mapped the pathways of lead exposure that reach Filipinos, through water, soil, dust, consumer products, and the food chain. In this second instalment, we examine what that exposure means for the people it reaches, particularly children. Drawing on blood lead studies, health research, and the emerging science linking climate change to lead exposure, this article presents the human cost of the contamination documented in Part 1. It concludes with the growing advocacy movement in the Philippines, from children demanding lead-free schools to cities pioneering protective policies, and the case for sustained action.



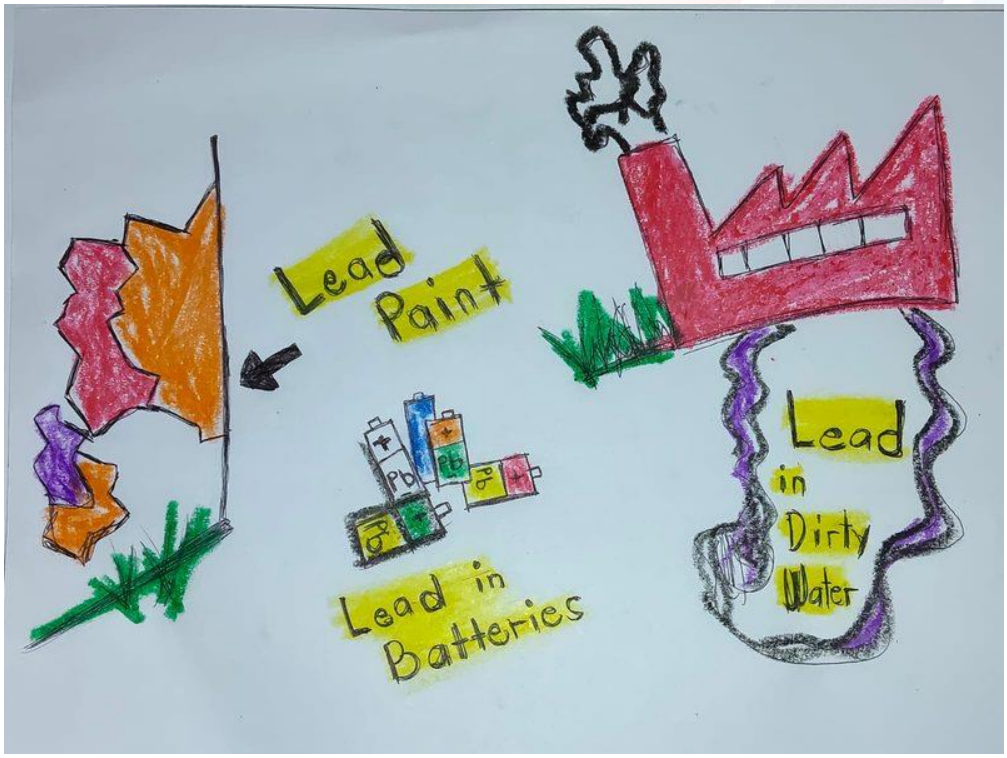
2026 Volcano Art Prize (VAP) Entry
Artist: Khai, Age 8, School in the Philippines
Title: Lead and Filipino Children
Lead-Safety Message: Me and my brother want to know the importance of the growing evidence about how toxic lead is and how to prevent lead poisoning and become lead safe.
Description of Work: Coloured pencil on pen drawing.

https://volcanoartprize.com/portfolio-item/lead-and-filipino-children/ [LID 29413]

Introduction: No Safe Level

The World Health Organization is unequivocal: there is no safe level of lead in blood (WHO 2019).

Even at concentrations too low to produce visible symptoms, lead affects the development of a child's brain and nervous system. The damage is irreversible. It accumulates silently over time, and by the point symptoms become apparent, abdominal pain, fatigue, developmental delay, significant harm has already been done.



2026 Volcano Art Prize (VAP) Entry

Artist: Paula Jacobe, Age: 11, School in the Philippines

Title: No Safe Level
Lead-Safety Message: There's no safe level of lead in the body except zero so adults need to protect us kids from lead in paint, lead acid battery recycling emissions and lead-contaminated water. Prevention starts with awareness.

Description of Work: Coloured pencil drawing.

https://volcanoartprize.com/portfolio-item/no-safe-level/
[LID 29412]

Children are disproportionately vulnerable. Infants and young children absorb four to five times more lead than adults from any given exposure (WHO 2019). They breathe, drink, and eat more per unit of body weight. They crawl on floors, play in soil, and put their hands in their mouths. Their brains are under rapid development, especially in the first 1,000 days of life, making neurological damage more likely and more lasting (ARNEC and Vital Strategies 2025). Malnourished children are at even greater risk, as calcium and iron deficiency increases lead absorption (ARNEC and Vital Strategies 2025).

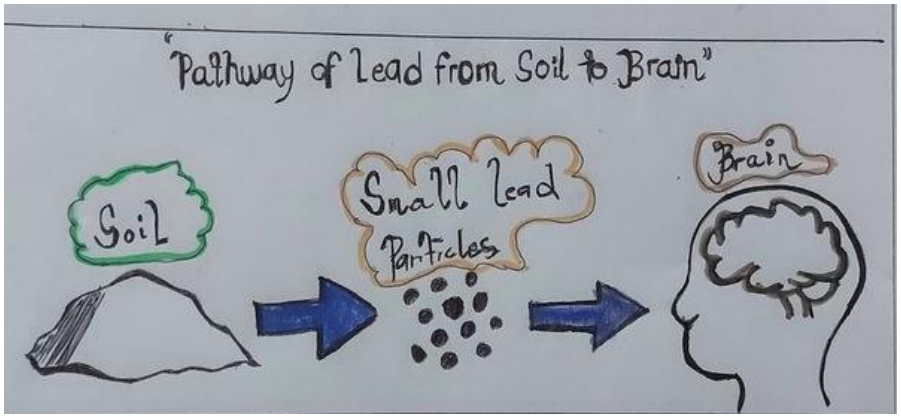
2026 Volcano Art Prize (VAP) Entry

Artist: Hailey, Age 6, School in the Philippines
Title: A Sunflower
Lead-Safety Message: A Sunflower reminds me of clearer Air but the seeds also store lead that the roots have absorbed from lead-contaminated Soil.
Description of Work: Colouring pencils on paper.
https://volcanoartprize.com/portfolio-item/a-sunflower/
[LID 29419]

In Part 1, we documented the pathways of lead exposure in the Philippines. In this article, we follow the lead into the bodies of Filipino children, and into the communities fighting back.

The Health Evidence: What Filipino Studies Reveal

The Philippines has only recently begun to systematically monitor lead levels in its children, but the studies that do exist tell a consistent and concerning story.



2026 Volcano Art Prize (VAP) Entry

Artist: Mark Antonio, Age 12, School in the Philippines
Title: Filipino Lead Studies
Lead-Safety Message: Tiny lead particles in dust and soil are inhaled and ingested then absorbed and affect brain development of children.
Description of Work: Pen and coloured pencil drawing on paper. https://volcanoartprize.com/portfolio-item/filipino-lead-studies/ [LID 29416]

In Caloocan City, part of Metro Manila, Villaluz-Martinez et al. (2012) measured blood lead levels in 86 children aged three to six. No child exceeded the then-current Centers for Disease Control and Prevention (CDC) reference value of 10 µg/dL. However, 51 per cent, 44 of 86 children, had levels exceeding 5 µg/dL, the threshold now recognised by the CDC as indicating environmental lead exposure requiring intervention. More than half of these young children were carrying a measurable lead burden, in a single neighbourhood of a single city. The study identified risk factors including lower parental educational attainment and lack of physician follow-up, suggesting that the most vulnerable families face the highest exposure.

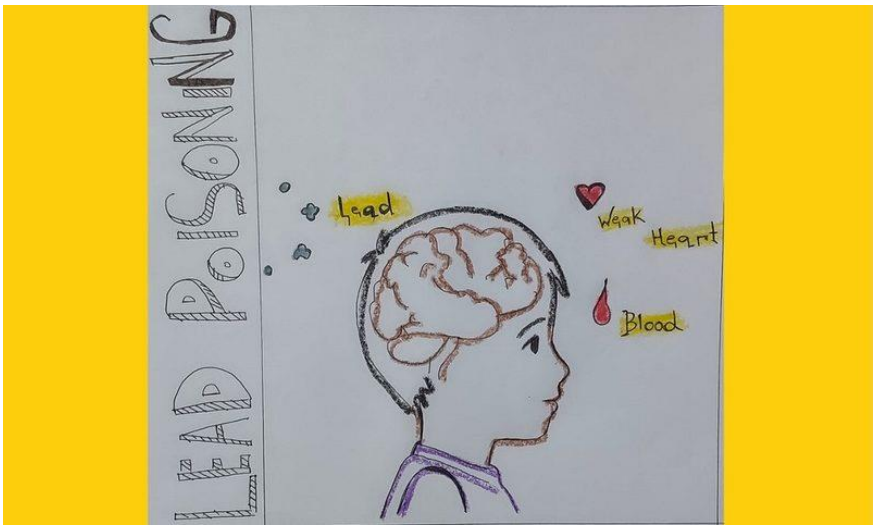
In Bulacan province, Ostrea et al. (2015) took the investigation further. Studying 150 children aged six to seven, they tested hair and deciduous teeth for lead, biomarkers that reflect longer-term exposure than blood tests. The results were striking: 91.3 per cent of children's hair samples tested positive for lead, with a median concentration of 8.9 µg/g. Nearly half of deciduous tooth samples were also positive. As documented in Part 1, the researchers traced the exposure to flood-deposited soils from the polluted river system, establishing a direct link between environmental contamination and children's body burden.

These Philippine findings sit within a global picture that is staggering in scale. The UNICEF and Pure Earth report estimated that one in three children worldwide, approximately 800 million, have blood lead levels at or above 5 µg/dL (Rees et al. 2020). A 2023 World Bank study calculated that children under five have collectively lost 765 million IQ points due to lead exposure, at an estimated cost of US$1.4 trillion in future earnings, with 95 per cent of the loss occurring in low- and middle-income countries (ARNEC and Vital Strategies 2025).

In the Philippines, doctors have publicly raised the alarm. Reports in the Philippine media have highlighted growing concern among paediatricians about rising lead exposure and its consequences for cognitive development, with physicians calling for routine screening and greater public awareness (Inquirer 2013).

How Lead Harms: The Mechanisms of Damage

Understanding why lead is so damaging requires a brief look at what it does inside the body. Moses and Ehireme (2025), in a comprehensive review of lead toxicity in animals, with direct relevance to human physiology, describe the primary mechanism as oxidative stress. Lead generates reactive oxygen species that overwhelm the body's antioxidant defences, damaging cells across multiple organ systems.



2026 Volcano Art Prize (VAP) Entry Artist: Paula Jacobe, Age: 11, School in the Philippines
Title: How Lead Harms
Lead-Safety Message: Lead replaces Iron in the blood causing anemia, reduces IQ making it harder to learn, and increases the risk of early death from stroke and heart attack. Protect Their Future: Keep Kids Safe from Lead Poisoning.
Description of Work: Pen and colouring pencils on paper.

https://volcanoartprize.com/portfolio-item/how-lead-harms/
[LID 29411]

Lead crosses the blood-brain barrier. In the developing brain, this is catastrophic. It disrupts neurotransmitter function, interferes with synaptic connections, and damages the myelin sheath that insulates nerve fibres. The result is a constellation of effects: reduced IQ, shortened attention spans, learning difficulties, behavioural problems including hyperactivity and aggression, and impaired speech and motor development (ARNEC and Vital Strategies 2025). When looking at the learning gap between what children in upper-income and lower-income countries achieve academically, research estimates that 20 per cent of the gap can be attributed to lead exposure (ARNEC and Vital Strategies 2025).

Beyond the brain, lead affects the kidneys, the cardiovascular system, the reproductive system, and the blood itself. It inhibits haemoglobin synthesis, contributing to anaemia. In animals, blood lead levels above 10 µg/dL produce clinical toxicity, with signs appearing within 24 to 48 hours of acute exposure in cattle (Moses and Ehireme 2025). Lead accumulates in bone, where it mimics calcium and can be stored for decades. During pregnancy, when the body mobilises calcium stores for the growing foetus, stored lead is released back into the bloodstream, exposing both mother and unborn child. Lead passes through the placenta and has been linked to miscarriage, premature birth, low birth

weight, and developmental abnormalities (ARNEC and Vital Strategies 2025).

2026 Volcano Art Prize (VAP) Entry

Artist: Alexa, Age 4, Pre-School in the Philippines
Title: My Happy Family
Lead-Safety Message: My family fights for lead-safety in the Philippines.
Description of Work: Crayon drawing on paper.
https://volcanoartprize.com/portfolio-item/my-happy-family/ [LID 29418]

The half-life of lead in blood is approximately 35 days, but in bone it ranges from 20 to 30 years (Moses and Ehireme 2025). This means that a child exposed today carries the consequences for a lifetime. Lead poisoning is not an acute illness that resolves; it is a permanent alteration of developmental potential.

The Climate Multiplier

As if the existing pathways of exposure were not concerning enough, climate change is amplifying lead exposure through several mechanisms.

2026 Volcano Art Prize (VAP) Entry

Artist: Liam Paune, Age 12, School in the Philippines
Title: The Climate Multiplier
Lead-Safety Message: Extreme Weather, Extreme Risks. They all make lead poisoning more likely and worse for the individual. Ask your government to act now for a safer tomorrow.
Description of Work: Crayons on paper.
https://volcanoartprize.com/portfolio-item/the-climate-multiplier/ [LID 29413]

First, rising temperatures increase the mobilisation of lead-containing dust inside homes and schools. Studies have found that children's blood lead levels peak during warmer months, likely due to increased dust exposure combined with higher metabolic rates and more time spent outdoors in contaminated environments (ARNEC and Vital Strategies 2025). In a tropical country like the Philippines, where temperatures are rising and extreme heat events are becoming more frequent, this represents a growing and year-round risk.

Second, extreme weather events, particularly flooding, spread lead contamination across communities. Ostrea et al. (2015) demonstrated this mechanism directly in Bulacan: when rivers overflow, they deposit lead-laden sediment across residential areas, creating new pathways of exposure where none existed before. As climate change intensifies the frequency and severity of flooding across the Philippine archipelago, this mechanism of contamination dispersal will worsen.

Third, the global response to climate change is itself increasing demand for lead. Lead-acid batteries remain the dominant energy storage technology for vehicles and increasingly for solar and wind energy systems. Between 2000 and 2018, the number of vehicles in low- and middle-income countries more than tripled (ARNEC and Vital Strategies 2025). As these economies electrify and adopt renewable energy, the demand for batteries, and the informal, unregulated recycling operations that process spent ones, will continue to grow. Approximately 85 per cent of global lead production goes into batteries, and an estimated half of used lead-acid battery recycling occurs in the informal sector, particularly in Africa and South Asia (Lead Elimination n.d.).

Action and Advocacy: The Philippine Response

Against this backdrop of contamination, health impacts, and climate amplification, a growing movement of Filipino advocates, researchers, and communities is demanding change.

2026 Volcano Art Prize (VAP) Entry

Artist: Clyde Evans, Age 13, School in the Philippines
Title: Philippines Lead Action
Lead-Safety Message: Take action, choose safety, advocate for health. Together, let's eliminate lead hazards from our daily lives.
Description of Work: Pencil, pen and colouring pencils on paper.
https://volcanoartprize.com/portfolio-item/philippines-lead-action/ [LID 29415]

The EcoWaste Coalition has emerged as a formidable watchdog. Their October 2025 testing of imported spray paints, which revealed products with lead levels up to 1,200 times the legal limit for new residential paint sold, many falsely labelled as lead-free, was timed to coincide with International Lead Poisoning Prevention Week, maximising public attention (EcoWaste Coalition 2025). The organisation's persistent testing and public disclosure work puts pressure on regulators and importers alike, demonstrating that civil society can fill enforcement gaps that government agencies have yet to close.

Filipino children themselves are raising their voices. In November 2024, children called publicly for lead-free schools, drawing attention to the contaminated environments documented by researchers like Ona (2010), whose study found lead dust exceeding safe limits in every classroom tested in Tarlac City (Manila Bulletin 2024). The campaign reframes lead safety not as an abstract environmental issue but as a children's rights issue, the right to learn in a safe environment.

At the municipal level, Quezon City and Davao City have been recognised for their efforts to safeguard vulnerable groups from lead exposure (IPEN n.d.). These cities are developing locally-driven approaches to monitoring, enforcement, and public education that could serve as models for the rest of the country. Their initiatives demonstrate that even in the absence of comprehensive national enforcement, determined local governance can make a difference.

The Philippines' Administrative Order 2013-24, which set a 90 ppm limit on lead in new residential paint sold with phase-out periods ending in 2016 and 2019, was itself a significant achievement. The country is one of only 13 in the Asia-Pacific region with confirmed legal controls on lead in paint, compared to 19 that have none, including Japan, Singapore, Malaysia, and Cambodia (ARNEC and Vital Strategies 2025). The regulation exists. The challenge now is enforcement, particularly for imported products, and extending regulatory attention beyond paint to the full spectrum of lead exposure sources.

Conclusion: Building the Case for a Lead-Safe Philippines

The evidence presented across both parts of this series is clear and confronting. Lead reaches Filipino children through every environmental medium, and once it reaches them, it causes irreversible harm to their brains, their organs, and their futures. More than half of young children tested in one Metro Manila neighbourhood showed elevated lead levels. More than nine in ten children in a flood-prone province carried lead in their hair. Imported paints labelled 'lead-free' contain more than a thousand times the legal limit for new residential paint sold. Climate change is making all of it worse.

2026 Volcano Art Prize (VAP) Entry

Artist: Paulo and Ella Mae Castro, Ages 7 and 5, School in the Philippines
Title: Lead Safe Philippines
Lead-Safety Message: Filipino and overseas researchers and NGOs are building the case for a Lead Safe Philippines, for cleaner air, safer spaces, and healthier lives.
Description of Work: Colouring pencils and pen drawing on paper.

https://volcanoartprize.com/portfolio-item/lead-safe-philippines/ [LID 29417]

Monitoring remains woefully inadequate. In Asia, the Philippines is one of only two countries that have even begun to monitor lead in children. The data that exist come not from a national surveillance programme but from the dedication of individual researchers working across the archipelago, often with limited funding and institutional support. The absence of systematic monitoring means that the

true scale of lead exposure in the Philippines is almost certainly larger than what current studies reveal.

Yet there is every reason to believe that the Philippines can lead the way in the Asia-Pacific region. The country already has stronger lead paint regulations than most of its neighbours. Its civil society organisations, particularly the EcoWaste Coalition, are among the most effective lead safety advocates in the developing world. Its researchers are producing exactly the kind of locally-grounded evidence that drives policy change. And its children are speaking up for their own right to a lead-safe environment.

Bangladesh offers a powerful precedent. When Stanford researchers found lead chromate contaminating turmeric in nine producing districts, the government acted swiftly with enforcement, monitoring, and public education. Within two years, the percentage of lead-contaminated spices in the market dropped from 47 per cent to zero (ARNEC and Vital Strategies 2025). The lesson is that when science, advocacy, and political will converge, rapid progress is possible.

The LEAD Group's vision of a lead-safe world by 2041 is not a fantasy. It is a target grounded in the knowledge that lead poisoning is entirely preventable. Every Filipino researcher collecting water samples from the Angat River, swabbing dust from a classroom floor, or testing imported paint in a laboratory is contributing to a body of evidence that makes inaction indefensible and progress inevitable.

The children of the Philippines deserve nothing less.

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2026 Volcano Art Prize (VAP) Entry

Artist: Martin, Age 6, School in the Philippines
Title: The Road of Dreams
Lead-Safety Message: The road to our dreams is built on a sustainable future. Respect Nature.
Description of Work: Pen and colouring pencils on paper.
https://volcanoartprize.com/portfolio-item/the-road-of-dreams/ [LID 29420]

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