Childhood Lead Exposure Prevention: Inventory of Blood Lead Surveillance Capacity Indonesia

Executive Summary

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KEMENTERIAN KESEHATAN REPUBLIK INDONESIA

Vital Strategies

PURE EARTH INDONESIA

Penguatan Sistem Kesehatan untuk Mengurangi Paparan Timbel

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Introduction

Lead (Pb) exposure poses important harm to human health and the environment. In children, even a low level of exposure can affect their brain development and result in reduced intelligence, lower educational attainment, and behavioral changes. In Indonesia, it is estimated that 8 million children have blood lead levels (BLL) above 5 micrograms per deciliter (µg/dL), a level at which intervention is recommended. Unfortunately, no routine monitoring activities have been carried out in Indonesia that provide data to verify this modeled estimate and fully characterize lead exposure in the national population. Obtaining local data to demonstrate the population impact, increasing awareness about lead as an important public health issue among decision-makers, and providing necessary resources will help establish lead exposure monitoring efforts in Indonesia.

Recently, the Director of Environmental Health – Ministry of Health (MOH) has discussed and emphasized the importance of generating high-quality data to help understand lead exposure and health burden among Indonesian children. This will be a critical first step toward effective childhood lead exposure prevention along with source reduction, health system strengthening, and awareness raising. With technical support from Yayasan Pure Earth Indonesia and Vital Strategies, MOH is piloting efforts to establish a blood lead surveillance system in Indonesia. To initiate this effort, we created a capacity inventory report by evaluating and summarizing the capacity of the existing laboratory capacity and health system structure and providing recommendations for capacity building and viable surveillance options through close collaboration with various technical units under MOH.

Information in this report is gathered through literature review, online surveys, and discussion with relevant stakeholders, both offline and online, between October and December of 2023. It is noteworthy that there is no publicly accessible database of all public and private laboratories that conduct clinical or environmental testing of heavy metals. While we have reached many laboratories through meetings and online surveys, the list we provided here may not be complete and is still evolving. For example, capacity with public health laboratories may develop with the MOH's ongoing restructuring plan. More information may also become available in the future as we continue to discuss and develop the surveillance effort with MOH.

Policy Landscape

In the past years, the Indonesian government has made several important efforts to protect children from lead exposure. The Ministry of Environmental and Forestry (MOEF) has identified and remediated lead-contaminated land in various locations within Java Island and increased community awareness through communication campaigns. The Ministry of Health (MOH) has been developing a national guideline for the clinical management of lead exposure among children and pregnant women by adopting the current WHO guidelines. Training curricula and modules have also been developed to enhance the capacity of healthcare professionals in determining risk factors and in making decisions about the diagnosis and treatment of those exposed to lead.

Recommendation: Several stakeholder meetings revealed a strong interest in establishing a childhood hood surveillance system that helps serve the following functions.

- Establish and describe national epidemiology (e.g., geographic distribution) to identify at-risk areas and groups to help prioritize the planning of community-based interventions and adoption of new national guidelines.
- Identify emerging sources of exposure and risk factors to inform policy development and effective screening to remove or reduce lead exposure.
- Increase awareness of lead poisoning among the public through education disseminated through pediatric healthcare providers.

Meanwhile, it has been agreed that reducing lead pollution and exposure requires intersectoral collaborations and actions to regulate lead in industrial processes and consumer products, monitor lead in the environment and population, and strengthen the healthcare system's capacity to identify and manage lead poisoning.

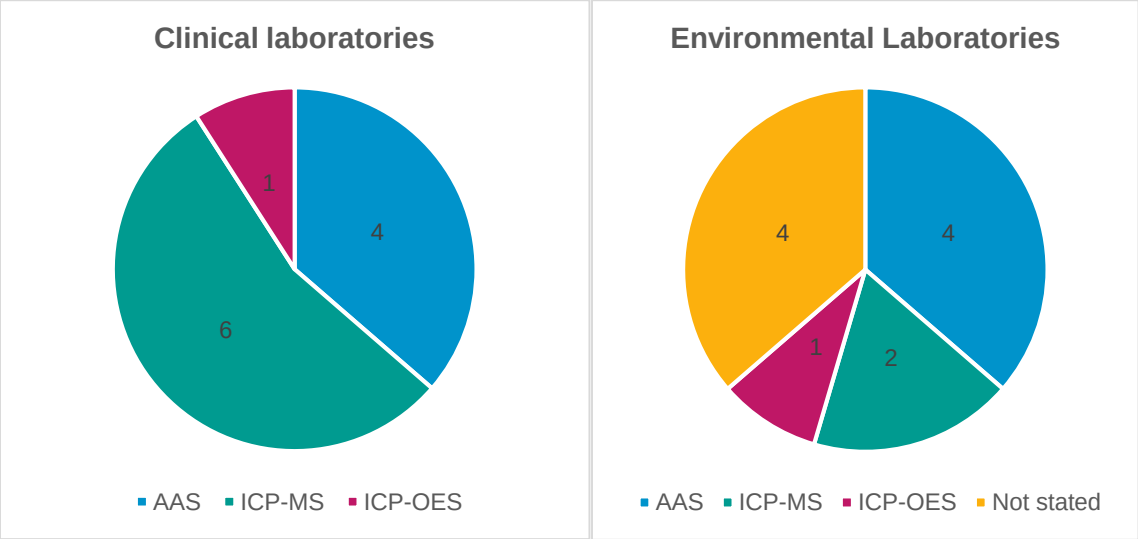
Laboratory Capacity

Eleven laboratories with the capacity to conduct blood lead tests were identified including two national public laboratories, seven local public health laboratories, and two private laboratories, mostly located on Java Island. Many of these laboratories are staffed by part-time technicians who are also responsible for other laboratory analyses in addition to lead testing. The Directorate of Public Health Governance (DPHG) is currently restructuring public health laboratories to enhance testing capacities to better support disease screening and surveillance nationwide. This included the installation of instruments that are

necessary for testing heavy metals in the blood (e.g., atomic absorption spectroscopy or inductively coupled plasma mass spectrometry) at city, provincial, and regional levels. A point-to-care blood lead analyzer (i.e., LeadCare) has been widely used in previous research projects in Indonesia and has been compared to laboratory-based approaches in two studies. However, it may be difficult to use in surveillance due to the lack of registration and formal distributors in Indonesia. This resulted in higher costs for purchasing this analyzer and testing kits in the country. In addition to testing lead in blood, we also identified eleven laboratories that can measure lead in environmental samples including air, water, and soil.

Recommendation: It will be important to work with DPHG and provide training for laboratories with newly installed instruments to establish standard operation procedures and trained technicians and encourage participation in a proficiency program for quality assurance. If point-of-care analyzers are to be used in Indonesia by the government, we suggest initiating discussions with MOH on existing cost and logistic barriers and exploring solutions.

Figure 1. Analytical methods used by clinical laboratories to analyze blood samples and environmental laboratories to analyze environmental samples.



Public Health Surveillance Capacity

Surveillance has been carried out for monitoring heavy metals in the environment such as soil and water but not in the population. However, Indonesia is in a good position with opportunities to initiate blood lead surveillance. Over twenty local studies measured blood lead levels among children, providing regional insights and demonstrating the importance and feasibility of monitoring childhood lead exposure. However, many of these studies are conducted in highly localized locations, communities contaminated by one main pollution source, with small or convenient samples. Gaps in the current research call for efforts to monitor lead exposure among children using a representative sample across larger regions and investigate diverse sources of exposure at home. Several national surveys that regularly collect health information on children were identified as potential opportunities to initiate blood lead surveillance with lower demand in resources.

Recommendation: We recommend initiating surveillance by assessing lead exposure first among vulnerable populations like young children using a large representative sample. The Indonesia Health Survey can be a great candidate for incorporating lead exposure assessment as it samples young children nationwide, assesses health outcomes relevant to lead exposure, and already collects biological samples. There may also be an opportunity to pilot a local passive surveillance system by recommending screening of BLL and lead exposure to children during medical visits and mandating this reporting from doctors and clinical laboratories. This will require strong support and commitment from local leadership, making tests available and affordable, and guiding changes in local medical practices. Areas that are historically impacted and already proposed local action plans to tackle lead poisoning (e.g., Tegal or Bogor regency) may be prioritized to pilot this system. Under the “Strengthening Health Systems to Reduce Lead Exposure” project, Pure Earth Indonesia and Vital Strategies are collaborating with MOH to pilot active blood lead surveillance among children under the age of five in some regions to demonstrate its importance and feasibility.