

Preventing Childhood Lead Exposure: Assessing the Comprehensive Approach Capacity in Peru

Executive Summary

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In July 2020, UNICEF and Pure Earth published an alarming report on childhood lead exposure, highlighting that about 1 in 3 children worldwide, to 800 million, have blood lead levels above 5 micrograms per deciliter ($\mu\text{g}/\text{dL}$), calling for urgent action. In Peru, studies by the National Health Institute, academic researchers and international organizations unveil an alarming situation in several regions, especially in areas where mining activity takes place. Simón Armando Minaya Sánchez (2023) and Astete et al. (2023) found that more than 20% of children in these areas had blood lead levels greater than 10 $\mu\text{g}/\text{dL}$. So far, only the National Center for Epidemiology, Disease Prevention and Control (CDC) has attempted to profile lead exposure in Peruvian children at the national level.

Key stakeholders and policy framework to protect children from lead exposure

The Peruvian regulatory framework includes policies and standards that regulate lead in the environment and in consumer products. These regulations set the grounds for monitoring and managing lead exposure. National policies, led by the Peruvian Ministry of Health (MINSA, for its acronym in Spanish), provide specific provisions to protect children, who are recognized as especially vulnerable to the harmful effects of lead. Collaboration and coordination across different government departments and levels is essential to guarantee a comprehensive framework that facilitates the coordination of programs from different health departments and services in order to assist the exposed population. This framework requires policy actions aimed at preventing and mitigating lead exposure, including remediation of lead contaminated areas and regulation of lead-containing products, such as paints, consumer products and toys.

The National Multisectoral Policy for Children and Adolescents through 2030 stresses the need to adopt a comprehensive and collaborative approach to address lead exposure. Law No. 31189 strengthens prevention, mitigation and health care in communities affected by heavy metal and other chemical contamination. Additionally, technical documents such as Technical Health Standard NTS No. 111-MINSA/DGE V.01 (2014) and Health Directive No. 126-MINSA/DIGIESP-2020 set out specific procedures for surveillance and comprehensive care for individuals exposed to heavy metals.

MINSA has a fundamental role in Peru's comprehensive approach to lead exposure. Several departments are coordinating specific actions and have specific roles to address this problem. The Vice Ministry of Public Health is leading the coordination of policies and strategies, supervising the actions of other departments. The General Directorate of Strategic Interventions in Public Health (DIGIESP, for its initials in Spanish) plans and executes strategic interventions responsible for the integral approach for the exposed population. General Directorate of Environmental Health (DIGESA, for its initials in Spanish) monitors the environmental quality of water, soil, air, food, toys, and office supplies. The National Center for Epidemiology, Disease Prevention and Control (CDC) conducts epidemiological surveillance and risk assessment for lead exposure. The National Institute of Health (INS, for its initials in Spanish) provides scientific and technical support, including toxicity analysis through the National Center for Occupational Safety and Environmental Protection (CENSOPAS, for its initials in Spanish). Regional Health Directorates (DIRESA), established throughout the country, implement regional policies and work in collaboration with epidemiological surveillance units to manage local cases of heavy metal exposure. The role of international organizations, such as Vital Strategies, a strategic partner whose activities have strengthened the skills of health personnel, is also noteworthy. Support has been provided through the successful implementation of active sentinel surveillance in collaboration with CDC in six regions, as well as the donation of equipment such as the LeadCare II and support in the development of technical documents.

Current public health surveillance of childhood lead exposure

Epidemiological surveillance of lead exposure in Peru has been conducted since 2015 through the National Epidemiology Network (RENACE) according to the procedures specified in the Technical Standard NTS No. 111-2014. This network is composed of public, private health facilities and mixed institutions that coordinate activities at national, regional and local levels. When health facilities report an exposed (or suspected; those with confirmed risk factors only) case of heavy metal exposure, the staff responsible for epidemiological surveillance makes home visits to conduct an epidemiological investigation. This investigation seeks to identify environmental, occupational and epidemiological risk factors, focusing especially on vulnerable groups such as children and pregnant women. In 2019, MINSA implemented active sentinel surveillance to assess lead exposure in children under five years of age in six regions of the country. However, the current nationwide

monitoring of lead exposure faces several significant challenges in its implementation. Institutions such as EsSalud, the Armed Forces, the National Police and private clinics have not yet fully adopted the technical regulations, resulting in fragmented surveillance and incomplete results. In addition, surveillance efforts are heavily constrained by limited human and financial resources, incomplete and inconsistent regional coverage, partial information, and lack of local staff capacity. Improved surveillance would allow more thorough assessments of exposure levels and sources, as these are essential to ensure the effectiveness of prevention and control measures. Despite the use of tools for data collection and data entry, challenges continue to exist in the quality of data collection and constraints in analytical capacity due to staff turnover, short staffing, undertraining, and inadequate impact assessments due to lack of adequate resources. New efforts that can provide ongoing training support with dedicated human resources will be highly beneficial. By addressing these needs, children exposed to lead can be identified, reported, and treated in a more timely manner.

Laboratory capacity to conduct blood lead testing

There are eight laboratories that perform blood lead analysis in Peru, one public toxicology laboratory (CENSOPAS-INS) managed by MINSAs, and seven private laboratories, with different capacities due to administrative, technical and geographic factors.

Currently, all biological samples of exposed cases for heavy metals are analyzed by CENSOPAS' Clinical and Chemical Toxicology Laboratory, the only public laboratory equipped to do blood lead analysis, and it is located in Lima. Although CENSOPAS' laboratory is accredited and experienced, its testing capacity is limited due to equipment, shortage of laboratory supplies, shortage of personnel, and logistics issues related to sample transport and storage.

While the portable blood lead test kit (LeadCare II) is not officially mandated by MINSA, it has been used under authorization of the National Institute of Health in sentinel surveillance to detect blood lead levels in children in six regions.

Clinical management of exposure to lead

Based on Health Directive No. 126-MINSA/2020/DIGIESP, comprehensive and quality care must be ensured for individuals, families and communities exposed to heavy metals. MINSA issued the "Clinical Practice Guideline for Managing Patients with Lead Poisoning" in 2007 to guide health professionals at all levels. The clinical guideline was updated in 2017 incorporating risk assessment and other relevant information that supports exposure assessment and clinical practice in resource-limited areas. Currently, the "Practical Guideline for comprehensive care of people with lead exposure and poisoning in Peru," which was developed through a cooperation agreement, is in the process of being approved and published. Exposed individuals (exposed cases) are expected to receive comprehensive care, including medical, nutritional, psychological, dental, developmental, and growth assessments, as well as anemia screening tests and blood lead analysis. Those who exceed the reference value of 10 µg/dL and show clinical symptoms will be considered confirmed cases (poisoned). The results of these evaluations and tests are reported individually during medical consultations at health facilities, and follow-up will continue. Effective implementation requires multi-sector collaboration among the Ministry of Health, the Regional Health Directorates (DIRESA), civil society and non-governmental organizations. However, implementation is not yet consistent across all regions and levels of health care. The evaluation of cross-sectoral interactions and collaborations in addressing lead exposure in Peru reveals that, while there are significant efforts, the lack of consistent coordination with the Ministry of Health represents a constant barrier that limits the effectiveness of many initiatives.

The analysis of human resources for the comprehensive care of the lead-exposed population in Peru highlights important challenges and critical areas. The average density of health personnel is 41.77 per 10,000 inhabitants in Peru, which is below 45, the minimum standard recommended by the World Health Organization (WHO). This density differs considerably across regions and is particularly low in rural areas, affecting the health system's capacity to integrate and implement clinical management for lead exposure. For example, Moquegua has a density of 71.12 while in Ucayali it is 31.49, resulting in

disparities in health care quality and accessibility.

The shortage of specialists, particularly pediatricians, and insufficient training in toxicology, have also limited the ability to provide effective and timely care to exposed children.

Communication and Awareness Raising

Risk communication on lead exposure in Peru has so far been limited, mainly focused on specific interventions in exposed communities. In addition, public access to information on these risks is restricted and limited, regardless of their impact on public health, and also on the social structure of the country. On the other hand, it should be acknowledged that Law No. 32038 has been enacted, which establishes the "National Lead Poisoning Prevention Week" on the last week of October of each year. The objective of this law is to raise public awareness on the issue, following the recommendations of the WHO.

Conclusions and Recommendations

- The regulatory framework in Peru addressing lead exposure is robust and well-structured and provides a solid basis for the protection of public health and the environment. However, effective implementation and coordination across different sectors and levels of government are important to ensure that these regulations and policies are translated into tangible and effective actions aimed at the lead-exposed population.
- MINSA's organization structure is solid and multidimensional for the integral management of the population exposed to lead, seeking effective collaboration among various bodies in order to prevent and mitigate exposure to heavy metals. Each department and unit are responsible for specific roles that together strengthen the health system's capacity to protect vulnerable populations from the harmful effects of lead and other contaminants. Promoting collaboration between programs implemented by MINSA, such as nutritional, maternal, neonatal and mental health programs, is essential to effectively address the challenges of lead exposure.
- Comprehensive care of the lead-exposed population faces significant challenges due to wide disparities regarding the availability of human resources and health services throughout the country.
- The epidemiological surveillance system for lead exposure in Peru is soundly based on regulations and adequate technology tools. However, it faces challenges related

to limited resources and budget, incomplete regional coverage, data quality, analytical capacity, staffing and training. It is crucial to promote the engagement of all health care providers (public and private) in epidemiological surveillance to close the current coverage gaps and strengthen comprehensive monitoring of lead exposure.

- There were eight laboratories with the capacity for blood lead testing, including the public laboratory of CENSOPAS located in Lima. MINSA relies exclusively on CENSOPAS.
- It is essential to promote the establishment of more laboratories in different regions, following CENSOPAS' model, to improve the population's geographical and economic accessibility to blood lead testing; this is essential to strengthening diagnosis capacity and ensuring a broader coverage in lead exposure screening and follow-up.
- Financial support to DIRESAs for the sample collection process and transportation to Lima, along with training of laboratory staff at the regional level to address supply and human resource needs, could significantly improve the coverage of childhood screening in the population.
- Based on the sentinel surveillance conducted by MINSA and Vital Strategies, the donation of LeadCare II kits to the Regional Health Directorates can facilitate continuous screening of high-risk children, ensuring proper selection of those referred for laboratory testing. Continuing this effort will require budget allocations to ensure an adequate supply of test kits. This combined strategy allows for more effective testing and timely interventions.
- To ensure adequate care for lead-exposed children, it is essential to provide access to specialized medical services to the entire population, not just those covered by the public system's Comprehensive Health Insurance (SIS, for its initials in Spanish). More experienced pediatricians and clinical toxicologists are needed, as there are insufficient staff and they are mainly located in urban areas, thus underserving the rural areas of the regions.
- While there are significant strengths in inter-institutional collaboration and the involvement of international organizations and NGOs, the analysis shows that there are still weaknesses related to limited coordination among the Ministry of Health and other sectors, limited public education on the issue, limited academic studies,

and lack of implementation of approved policies. Addressing these issues will improve the effectiveness of lead exposure interventions in Peru. Strengthening communication, training and equitable distribution of human resources is crucial to overcome these challenges and better protect public health. It is encouraging that Peru is rising to the challenge.

ANNEXES

Fig1. Organization Chart of the Ministry of Health for the comprehensive approach to the population exposed to lead

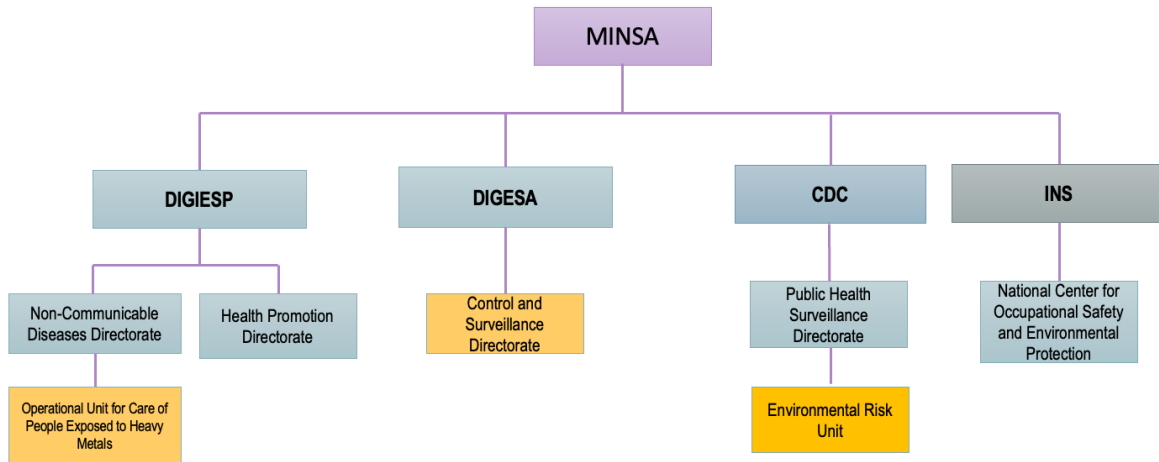


Fig 2. Roles of the Minsa Directorates on managing the population exposed to lead

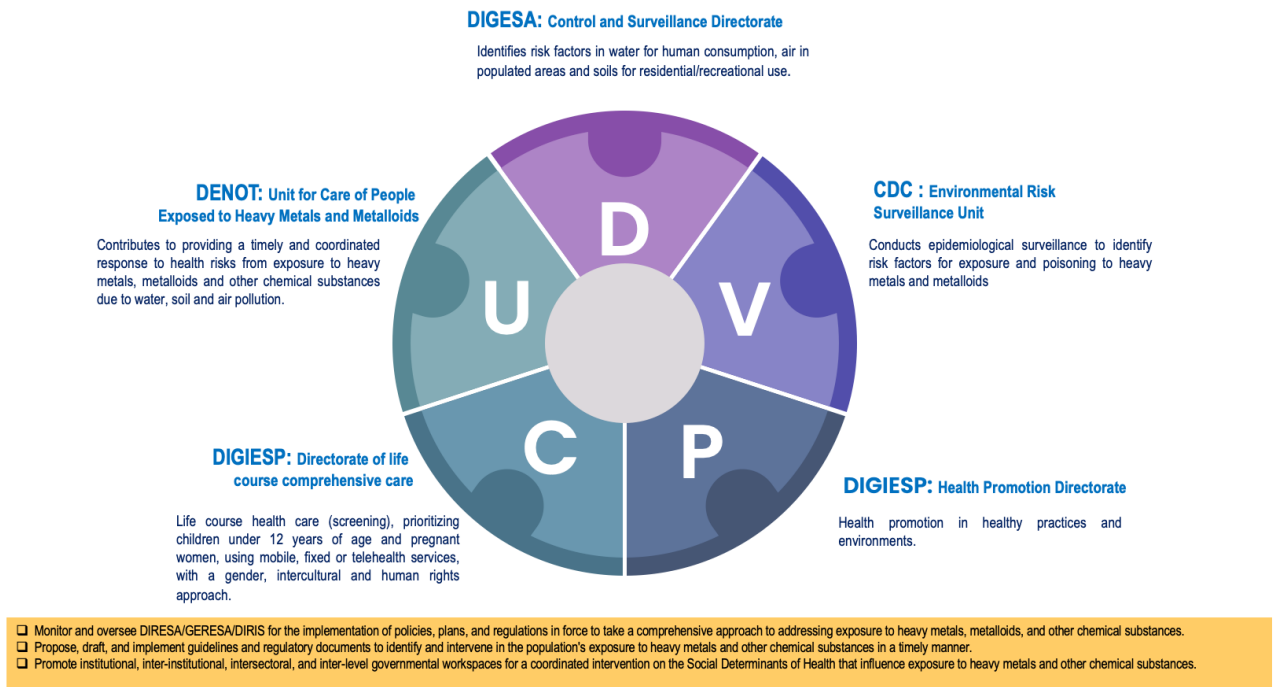


Fig. 3. How cases are established for epidemiological surveillance of lead exposure risk factors

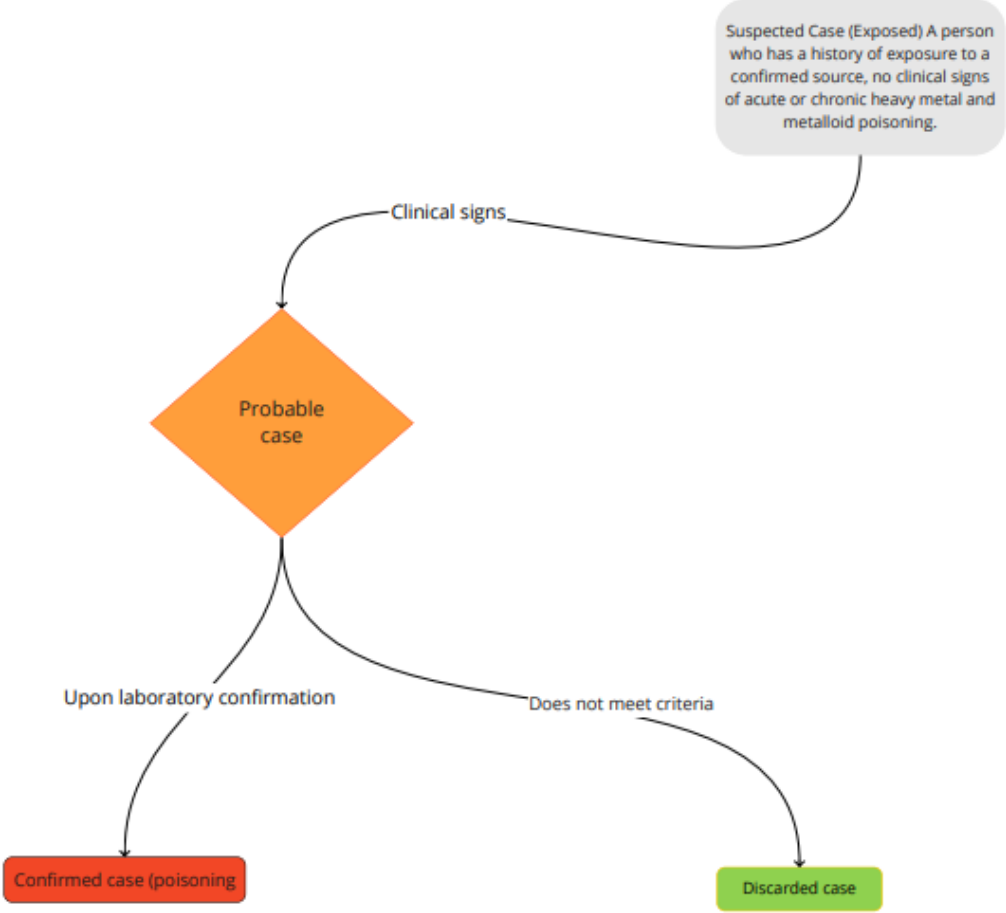


Fig. 4. Public and private laboratories for blood lead testing by method of analysis

Laboratories	Type of institution	Method of analysis
National Center for Occupational Safety and Environmental Protection (CENSOPAS)	Public – INS - MINSA	GFAAS
Multilab	Private	ICP-MS
Synlab	Private	ICP-MS
ROE laboratorio clínico	Private	ICP-MS
Estarbien	Private	ICP-MS
Bioeslab	Private	GFAAS
Clínica Gonzales	Private	ICP-MS
Andina Clinical Laboratory	Private	ICP-MS