

# Confronting the Toxic Threat: Addressing Heavy Metal Poisoning and Pollution in Nigeria

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## Introduction

The rising incidence of heavy metal poisoning-related deaths in Nigeria is an alarming public health issue [1,2]. Heavy metals such as lead (Pb), cadmium (Cd), and mercury (Hg) pose significant health risks due to their toxicity and persistence in the environment [3]. This problem is exacerbated in low- and middle-income countries (LMICs) like Nigeria, where various factors contribute to heavy metal poisoning, including unsafe mining activities, use of leaded gasoline, and contaminated traditional medicines [4,5]. This article highlights the health impacts of heavy metal pollution, with particular focus on lead poisoning, and provides evidence-based feasible and practicable comprehensive strategies to mitigate this issue.

Heavy metal pollution in Nigeria is widespread, with significant contamination reported in various regions [6]. The 2010 lead outbreak in Zamfara State, Northern Nigeria, is a notable example, where over 400 children died and more than 2,000 were left with disabilities due to lead poisoning from illegal gold mining [7-9]. Studies have shown soil lead levels and blood lead levels exceeding 100,000 parts per million (ppm) in certain areas in Nigeria, and 70ug/dL in children under five years of age in affected areas, far surpassing the recommended upper limit of 400 ppm and the recommended BLL of 5 ug/dL respectively [10-12]. The historical use of leaded gasoline and reliance on traditional medicines further contribute to the legacy of heavy metal contamination in Nigeria.

Heavy metal poisoning has serious health consequences, particularly for vulnerable

populations such as children. Although there is no safe blood lead level (BLL), values above 5  $\mu\text{g}/\text{dL}$  are considered indicative of lead poisoning [6]. Elevated BLLs have been associated with a range of adverse health outcomes, including anemia, hypertension, renal injury, cognitive impairment, and behavioral disorders [10]. The lead poisoning outbreak in Zamfara State illustrates the devastating effects of acute heavy metal exposure, with young children bearing the greatest burden of morbidity and mortality. Similarly, an incident in Sokoto State, where individuals were poisoned by contaminated herbal preparations, highlights the ongoing risks posed by heavy metal-contaminated traditional medicines [13].

The drivers of heavy metal pollution in Nigeria are multifaceted and deeply rooted in the country's developmental challenges. Inadequate waste management practices, particularly in urban areas, lead to the release of heavy metals into the environment. Only about 30% of solid waste is properly collected and disposed of [14], with the remainder often ending up in open dumpsites or water bodies leading to the release of heavy metals into the environment [14,15]. Furthermore, the widespread historical use of lead gasoline and the reliance on traditional medicines, which may be poorly prepared and contaminated with heavy metals has left a legacy of lead contamination in Nigeria [16,17].

To address the issue of heavy metal pollution, the Nigerian government must implement stricter regulations on industrial waste management and mining practices [18]. This includes reinforcing the

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use of cleaner and safer mining methods and ensuring the correct disposal of hazardous materials. Providing subsidies or tax incentives for environmentally friendly techniques in the mining sector can also encourage safer practices. National regulations for monitoring and managing the quality traditional medicines are essential to prevent heavy metal contamination [19], as well as public awareness on the safe consumption of traditional medicines.

Healthcare providers need specialized training and resources to recognize and treat heavy metal poisoning [20]. The swift response to the Sokoto incident, marked by the rapid mobilization of health workers, is a promising development [13]. Establishing diagnostic procedures and patient monitoring systems for routine screening of high-risk groups is crucial. The recent launch of the National Genomics Sequencing Consortium by the Nigeria Centre for Disease Control (NCDC) in May 2024 underscores Nigeria's dedication to advancing public health [21]. This centre is pivotal for enhancing preparedness against emerging threats by improving the connectivity between disease control programs and surveillance networks and leveraging the underutilized laboratory capacities bolstered during the pandemic, this new strategy represents a significant step forward. However, while these efforts are commendable, more proactive measures are urgently needed to address not only infectious disease threats, but also the silent epidemic of heavy metal poisoning that continues to devastate the nation, particularly its children. Increasing the availability of rapid point-of-care devices can help detect heavy metal poisoning promptly [22], allowing for immediate medical intervention. In southwestern Nigeria, a study by Ojekunle in Ogun State have detected alarmingly high levels of lead and cadmium in surface water samples collected from mining communities [23]. Community organizations play a vital role in raising awareness and facilitating localized solutions, such as community-led water purification initiatives.

There is a critical need for longitudinal studies to understand the extent and impact of heavy metal exposure in Nigeria. Epidemiological studies should map the prevalence, distribution, and risk factors associated with heavy metal poisoning, identifying vulnerable populations and environmental

determinants. Research on the long-term effects of treatment and the development of affordable diagnostic tools is essential. Exploring innovative remediation techniques, such as phytoremediation, can provide sustainable solutions tailored to the Nigerian context. Interdisciplinary collaboration with policymakers, practitioners, and community organizations is essential to translate research findings into evidence-based, actionable strategies. This comprehensive research agenda can contribute significantly to Nigeria's efforts to address the heavy metal crisis and improve the health and well-being of its citizens.

The increasing incidence of heavy metal poisoning and pollution in Nigeria demands immediate and comprehensive actions. Implementing stricter regulations on industrial waste management, mining practices, and traditional medicines is vital. Efforts to raise awareness, improve healthcare provider training, make available testing devices, and conduct extensive research is crucial for developing targeted interventions. By adopting these multifaceted strategies, Nigeria can effectively combat this public health crisis and safeguard the well-being of its citizens.

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No dataset was generated during and/or analyzed during the current study.

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