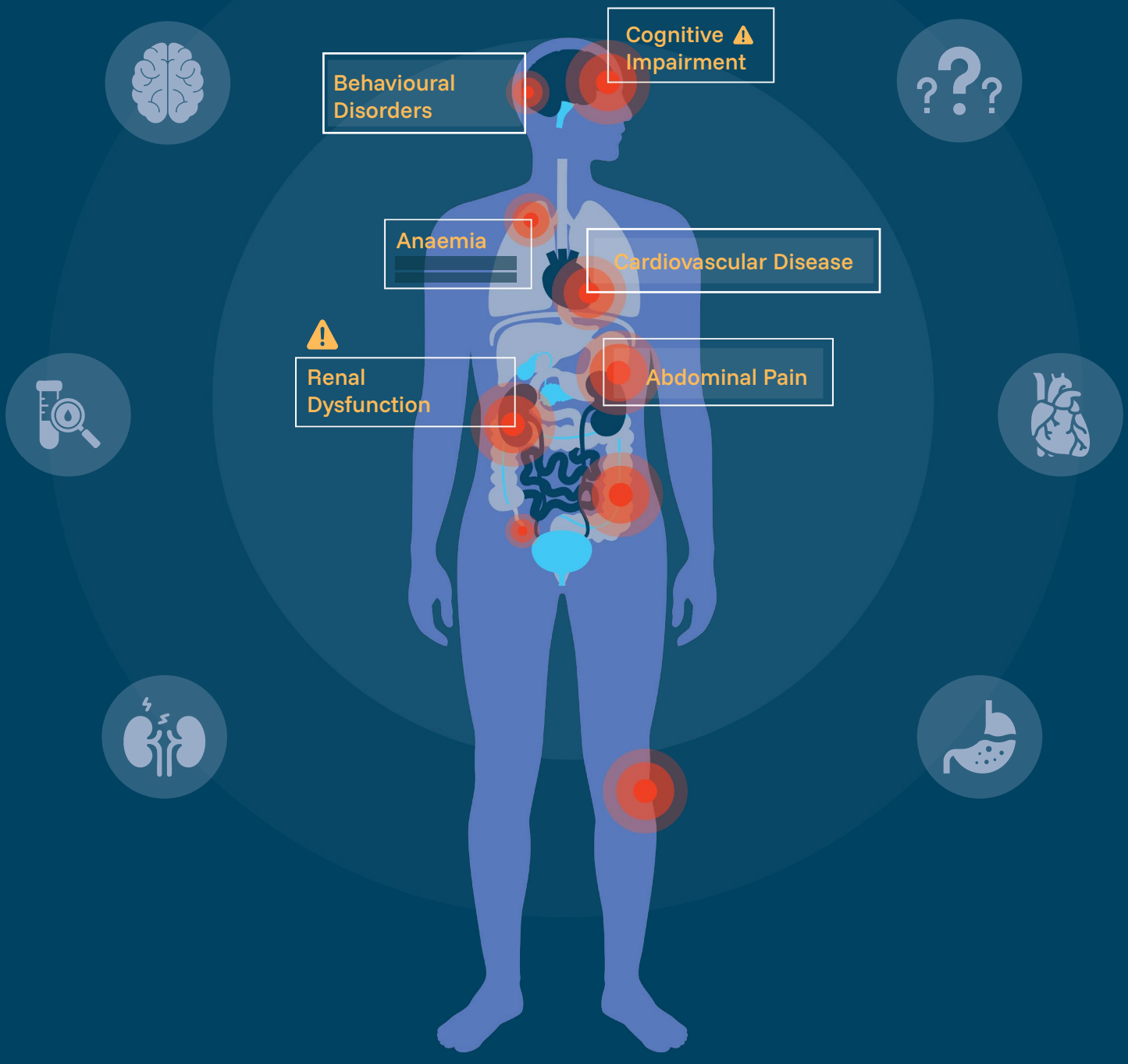
Evidence Brief

Addressing Lead Toxicity in Uttar Pradesh



Addressing Lead Toxicity in Uttar Pradesh 2026

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EXECUTIVE SUMMARY

Lead is a naturally occurring toxic metal found in the Earth's crust. Its widespread use has caused extensive environmental contamination, human exposure and significant public health problems globally.[1] Lead toxicity occurs when a person is exposed to lead through contaminated air, water, soil, food, paint, or occupational sources, and the metal remains in the blood and tissues, causing health problems.[2]

Lead toxicity is a preventable yet widespread public health challenge. There is no known safe level of lead exposure.[3] Even low blood lead levels are associated with impaired cognitive development, behavioural disorders, anaemia, kidney damage, and long-term cardiovascular disease.[4]

Uttar Pradesh bears a disproportionately high burden of childhood lead exposure in India.

With nearly

24 million children and adolescents

estimated to have elevated blood lead levels,

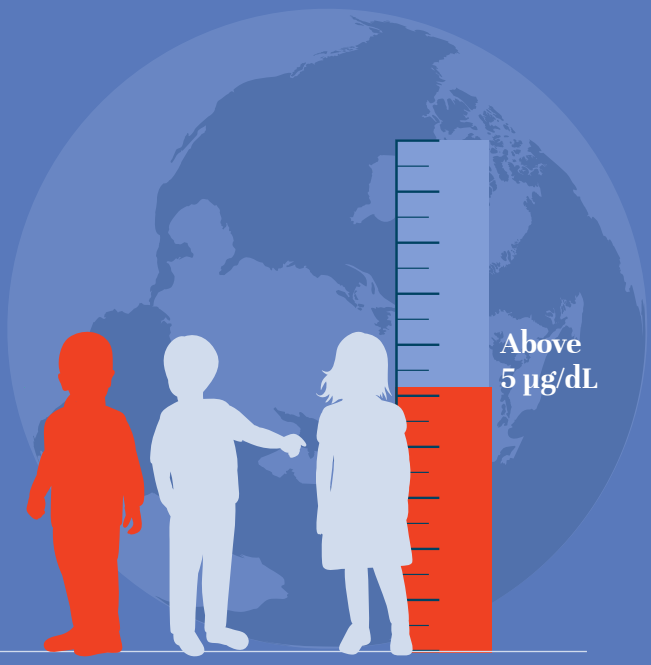
the scale of exposure poses a serious threat to the state's human capital, educational attainment, workforce productivity, and economic growth.[5]

Despite national regulations aimed at reducing environmental lead exposure, gaps in surveillance, enforcement, occupational safeguards, and public awareness continue to allow preventable exposure.

A coordinated, state-led, multi-sectoral response is urgently required.

Why Lead Exposure is a Public Health Priority

The World Health Organization has identified lead as one of the ten chemicals of major public health concern.[3] Blood lead concentrations as low as 3.5 µg/dL are associated with measurable harm in children.[6]



Globally, nearly

1/3 (approximately 800 million) have blood lead levels at or above 5 µg/dL.[7]

Lead exposure contributes to nearly one million deaths annually and over 21 million disability-adjusted life years (DALYs).[8] The economic cost in low- and middle-income countries is estimated at nearly USD 1 trillion annually due to lost productivity and health expenditures.[9]

The India Context

India carries one of the largest burdens of lead exposure globally.

A national meta-analysis reported mean blood lead levels of 6.86 µg/dL in children and 7.52 µg/dL in non-occupational adults. Twenty-three states report average levels above 5 µg/dL. High-population states, including Uttar Pradesh, report averages above 7 µg/dL.[5]

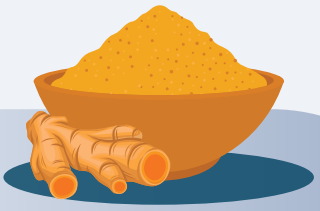
India could prevent over one million deaths and gain up to 9% of GDP by reducing lead exposure.[10]

The Burden in Uttar Pradesh

Uttar Pradesh is among the top five states in India with a high burden of lead toxicity. Average blood lead level among children: 8.67 µg/dL, significantly above the national mean.[5] Nearly 24 million children and adolescents are estimated to have elevated blood lead levels. Lead exposure undermines school readiness, learning outcomes, and productivity, directly affecting the state's development trajectory.[7]

Major Sources of Exposure

Lead exposure in Uttar Pradesh arises from multiple everyday sources that collectively increase risk, particularly for children.



01 Food contamination, such as turmeric adulterated with lead chromate, introduces lead directly into the diet.

02 Household and decorative paints, especially older or poorly regulated products, generate toxic dust as they deteriorate.

PVC toys, artificial jewellery, certain traditional medicines, and cosmetics may contain lead, creating additional household exposure pathways.

03 Drinking water can become contaminated through ageing leaded plumbing.

04 Occupational and environmental sources are also significant, especially in informal lead-acid battery recycling, informal small-scale manufacturing units, and emerging e-waste dismantling activities, where unsafe handling releases lead into soil and air.

05 Improperly glazed ceramic cookware may further leach lead into food.

Together, these diverse and often unregulated sources make exposure cumulative, widespread, and difficult to detect without systematic monitoring.

Key Gaps in Uttar Pradesh

Despite the growing evidence of lead exposure in Uttar Pradesh, systemic gaps continue to limit an effective public health response.

Surveillance Gap

At present, the state does not have a dedicated lead surveillance system. There is no structured mechanism to routinely collect, analyse, and map blood lead levels across districts.

As a result, the true geographic spread, high-risk clusters, and vulnerable populations remain inadequately identified.[5] Without surveillance, policy responses remain reactive rather than preventive.

Reporting Gap

Compounding this challenge is the absence of a uniform reporting framework for elevated blood lead levels. Laboratories, hospitals, and occupational health services do not follow a standardized protocol for reporting cases.

This lack of mandatory notification prevents early detection of outbreaks, delays public health action, and weakens accountability across sectors.

Clinical Gap

Clinical infrastructure for diagnosis and management is also limited. Access to reliable blood lead testing facilities is uneven, particularly in rural and peri-urban areas. Healthcare providers may not be adequately trained to recognise early symptoms of lead exposure, which are often non-specific.

Treatment pathways, including referral systems for moderate and severe cases, are not clearly defined or widely accessible.[7]

Regulatory Gaps

In occupational settings, there are no clearly defined thresholds at which workers with elevated blood lead concentrations must be temporarily removed from exposure. This gap leaves workers in high-risk industries vulnerable to ongoing exposure even after elevated levels are detected, increasing the likelihood of chronic toxicity.

Regulatory enforcement remains particularly weak in the informal sector. Activities such as informal battery recycling and the sale of unpackaged food products in local markets often operate outside effective monitoring systems. These sectors can become concentrated sources of environmental contamination, affecting entire communities.[7]

Occupational Gaps

Furthermore, regulatory clarity around e-waste recycling and associated exposure risks remains limited, particularly in the informal sector.

Informal dismantling and processing of electronic waste can release lead into soil, air, and water, yet regulatory clarity and oversight remain insufficient.

Public Awareness Gaps

Finally, statutory provisions for public awareness and risk communication are limited. There is no sustained, state-wide strategy to inform communities, parents, teachers, and workers about the risks of lead exposure and practical prevention measures.

Without widespread awareness, preventive behaviours are unlikely to be adopted at scale.

Together, these gaps underscore the need for a coordinated, multi-sectoral, and state-led strategy to systematically prevent, detect, and manage lead toxicity in Uttar Pradesh.

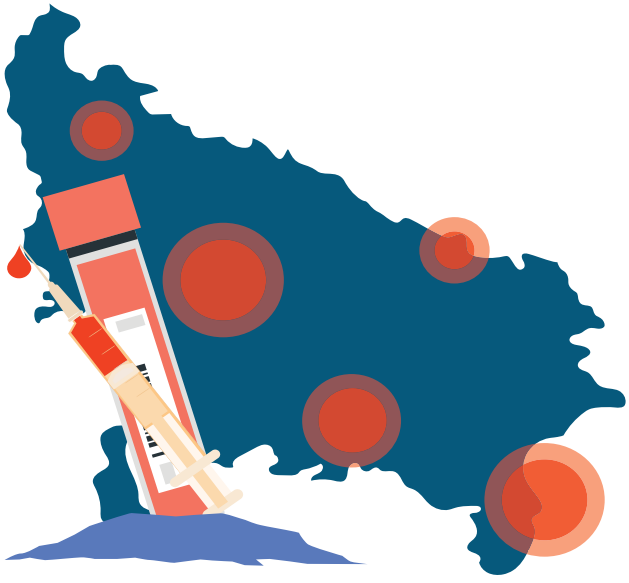
Recommended Way Forward for Uttar Pradesh
Narrative Framework

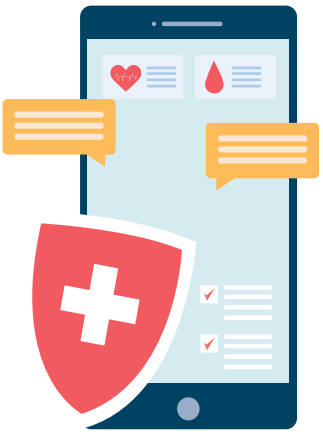
Addressing lead toxicity in Uttar Pradesh requires a coordinated, multi-sectoral approach that moves from fragmented responses to a structured state-wide strategy. The following framework outlines the priority areas for action.

01 Develop a State Action Plan

Uttar Pradesh requires a formal, time-bound State Lead Toxicity Management Plan anchored at the highest level of governance. Establishing a dedicated **State Lead Toxicity Management Task Force** would ensure coordination across departments, including Health, Environment, Labour, Education, Urban Development, Food Safety, and Industry.

A key first step would be to develop a comprehensive Lead Exposure Map of Uttar Pradesh. This would identify geographic hotspots based on blood lead levels, industrial activity, informal recycling clusters, contaminated soil zones, and high-risk communities. Mapping would allow prioritisation of interventions in districts with the greatest burden.





To support evidence-based action, the state should establish a **centralised data-sharing platform** that consolidates laboratory findings, environmental monitoring data, occupational screening results, and food safety inspections. Currently, data exists in silos; integration would allow early detection of clusters and rapid response.

Finally, **a uniform reporting framework for elevated blood lead levels must be instituted**. Standardised thresholds, mandatory notification protocols, and defined response pathways will strengthen accountability and improve surveillance.[5]

02 Strengthen Surveillance and Clinical Infrastructure

Effective prevention depends on early detection. Uttar Pradesh should expand access to reliable blood lead testing by **establishing or upgrading district-level laboratories**. Testing services must be accessible, affordable, and integrated into existing public health systems, particularly in high-risk districts.

Healthcare providers require structured training to recognise early symptoms of lead exposure, which are often subtle and easily overlooked. **Clinical guidelines for screening, diagnosis, management, and referral should be disseminated across primary, secondary, and tertiary care facilities.**

Community health workers can play a critical frontline role. With appropriate training, they can identify children showing developmental delays, behavioural concerns, or other warning signs and refer them for testing. Integrating lead screening into maternal and child health services in high-risk areas would further strengthen early identification.

Strengthening infrastructure is not limited to laboratories; it must include **clear treatment pathways**, **referral systems for severe cases**, and **occupational health linkages for exposed workers.**[5]

03 Strengthen Regulatory Oversight and High-Risk Sector Control

Regulatory enforcement must focus on sectors known to contribute significantly to lead exposure. Informal battery recycling units, smelting operations, and scrap processing facilities require targeted inspections and structured formalisation pathways. Without addressing the informal sector, environmental contamination will persist.[7]

Mandatory soil testing in school playgrounds and child-care settings in identified hotspots can prevent chronic exposure. Where contamination is detected, practical remediation measures—such as soil capping, turfing, or safe resurfacing—should be implemented promptly.

Enforcement of paint regulations, food safety standards, and restrictions on lead-containing products must be strengthened through coordinated inspections and penalties for non-compliance. Additionally, as e-waste recycling expands, Uttar Pradesh should develop state-level guidelines for safe handling, dismantling, and disposal practices aligned with national frameworks.

Clear occupational safety standards are equally critical. Defining blood lead concentration thresholds for temporary removal from exposure and mandatory periodic monitoring will protect workers from long-term harm.

04 Expand Public Awareness and Risk Communication

Public awareness is central to prevention. A sustained state-wide communication strategy should be developed to inform parents, teachers, workers, and local leaders about the dangers of lead exposure and simple preventive measures. Culturally appropriate educational materials should be disseminated through schools, Anganwadi centres, primary health facilities, and community networks. **Awareness campaigns can utilise mass media, social media, and local governance platforms to amplify reach.**

Risk communication should move beyond general messaging to practical guidance—**safe cleaning practices, safe water use, identification of certified products, and avoidance of high-risk materials.** Empowering communities with actionable information will significantly reduce household-level exposure.

Integrating lead-safe practices into school curricula can create long-term behavioural change. When children, parents, and educators understand the risks, community vigilance increases, creating a preventive ecosystem.

Drive industry-wide awareness by presenting the clinical and economic risks of lead exposure alongside practical technical guidance for transitioning to safer alternatives. Integrating the periodic biological monitoring with specialized worker training to bridge the gap between regulatory compliance and workplace safety.

05 Conclusion

The way forward for Uttar Pradesh lies in shifting from fragmented regulatory compliance to a comprehensive prevention and surveillance model. By institutionalising coordinated governance, strengthening health infrastructure, enforcing high-risk sector regulations, and empowering communities with knowledge, the state can substantially reduce lead exposure.

Such action will not only protect children's cognitive development and worker health but will also safeguard the long-term economic and social progress of Uttar Pradesh.

Proposed Strategic Role of UP TSU - IHAT in Strengthening Lead Toxicity Prevention and Control in Uttar Pradesh

About UP TSU

Uttar Pradesh Technical Support Unit (UP TSU), IHAT, operates as an embedded technical support partner to the Government of Uttar Pradesh (GoUP). The organization works in close partnership with the government to provide comprehensive techno-managerial support aimed at strengthening health services at the community, facility, and systems levels. By leveraging the Technical Support Unit model—IHAT provides intensive assistance that spans from strategic planning to implementation at scale. This approach is designed to foster the development of sustainable and scalable programs that meet the needs of every community across the state.

Proposed Strategic Role of IHAT - UP TSU in Lead Toxicity Prevention

IHAT, upon request from GoUP, has established a State Program Management Unit (SPMU) to provide technical leadership and coordination to address the Lead Toxicity challenge in Uttar Pradesh. The core functions of the unit:

Strategic Analysis and Planning

Support data-driven program planning by overseeing comprehensive research to identify lead exposure sources and establishing a robust monitoring and evaluation framework for adaptive programming and long-term policy reform.

Capacity Building

Development of standardized training and treatment protocols to equip healthcare professionals and community workers with the clinical tools to effectively diagnose and manage lead poisoning.

Advocacy

Providing evidence-based recommendations for regulatory enforcement and mobilizing communities through culturally relevant awareness campaigns.

Implementation Support and sustainability

Facilitate multi-sectoral collaboration among stakeholders to ensure a unified and effective state-led response to lead toxicity.

END NOTES

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