



From Exposure to Equity: Reforming U.S. Policy on Lead and Childhood Educational Success

Saasthra Bojja

I. EXECUTIVE SUMMARY

Lead exposure has been a long standing issue, especially within the United States. With industrialization impacting the environment in myriad ways, and the remnants of the widespread use of lead before the 1980s, lead levels have become not just impacted the environment, but public health as a whole (Hernberg). Specifically, lead exposure due to a lack of proper testing and remediation continue to impact the United States population.

This brief will cover lead exposure in relation to socio-economic standing and equality as it specifically relates to education (Marshall et al.). Further, this brief will also cover policy changes that can be utilized to ameliorate the impacts of lead levels and the inherent inequalities posed due to them, specifically within childhood exposure and education.

II. OVERVIEW

Lead is a neurotoxic heavy metal which impacts the human body, especially children (who are susceptible to far lower quantities of lead in the environment, with studies stating “any detectable lead level is abnormal” (Bellinger)) through the “neurological, skeletal, reproductive, hematopoietic, renal, and cardiovascular systems”(Collin et al.). Despite the scientific backing of lead’s lasting impacts on public health, blood lead level testing and the replacement of

infrastructure for lead-affected locations has lagged behind, particularly in places with a higher rate of poverty, specifically in areas where households are earning below 130% of the Federal Poverty Level (Tong et al.). This ‘lag-time’ between the recognition of lead as a neurotoxin and its complete eradication throughout the United States has caused the direct correlation found between income level, risk of lead exposure, and thus, cognitive ability test scores (Marshall et al.). Regions with higher average incomes have been quicker to receive blood lead level testing at both the possible source and human level, ensuring that human blood lead levels are lower or zero as lead contamination is often found sooner than in regions with lower average incomes. Following the detection of elevated blood lead levels, locations with far more resources are highly likely to receive remediation funds and care following any related human lead exposure (Hauptman et al.).

Relevance

Cognitive development as it relates to educational success is a particularly important topic, specifically in historically underserved communities. Educational wellbeing is a key determinant in individual and overall long-term success-- on average, individuals with college degrees earn 117% more than those without (Center for American Progress), and early childhood educational success can directly

indicate future college attendance and degree attainment on the individual level (National Institutes of Health).

Successful education for all children can ensure economic wellbeing, prosperity, and innovation for all Americans; when more children are able to successfully complete their education and move forward to a four-year degree or alternative but equal educational path, employment and opportunity will grow due to the increase of skilled workforce members (American Psychology Association). Thus, the issue of lead exposure, particularly for children, in relation to academic success and socioeconomic standing is one of not just those impacted, but all individuals in the United States.

III. HISTORY

Lead in history

Lead has been seen throughout all eras of history; used by the Romans, then during the middle ages, and then during the modern era as a fuel additive (before it was definitively found to be toxic), moving forward in history as society advanced due to its numerous uses and convenience (Environmental Protection Agency). However, lead's history as a neurotoxicant has been equally documented, yet often minimized.

In the modern era, lead has been used in a variety of ways throughout infrastructure, as a paint and lead additive, playing a crucial role in the initial success of the automobile industry.

However, the extreme health risks posed by lead became abundantly clear by the 1970s in the United States; despite efforts to minimize the health risks posed by lead, it was almost entirely phased out in gasoline as well as in most other

new sources by the 1980s and 1990s. It is important to consider that lead was almost entirely phased out by the 1930s in most European countries.

Lead has long been known to have severe physical health effects, as well as extreme mental health effects through developmental and behavioural impacts, particularly in children, where any level detected is cause for concern.

Current Standing of the Issue

Lead has been widely addressed by legislation and regulatory action at the federal and state level; most states have taken steps to address lead-affected locations, including pre-1979 housing, through remediation funds and strict lead level regulations, as well as efforts towards wider availability of lead testing that have been made. However, source testing has had its limitations: specifically, relating to socioeconomic standing. For those who are traditionally underserved, testing availability is largely disproportionate and difficult.

While many affluent regions are not lead-affected currently, regions that are lead-affected are typically those with lower average incomes, and often do not have the resources or ability to advocate for testing and effective remediation, causing extreme instances and patterns of exposure in children.

Through this cycle of inequity and exposure, patterns have been found regarding educational success and cognitive well-being.

Thus, legislation focused around housing remediation funding has been put in place, but lacking in the criteria needed to qualify for remediation testing and their general use and availability due to a lack of testing (National Association of State Boards of Education).

Current Stances

While lead exposure is largely supported as an issue scientifically, the degree of bipartisan support for remediation efforts has varied. Most successful federal legislative efforts such as the Lead-Based Poisoning Prevention Act and the amendments to the Safe Drinking Water Act, showcasing how the severe health impacts of lead exposure may have to the general public, has led to bi-partisan regulatory efforts. Despite this, though, such as the age of the issue causes some to hesitate in taking action, with some considering it a ‘solved’ issue (The Lead Group).

Thus, inaction on lead coupled with a lack of lead-safety advocacy and education has caused many communities to be routinely exposed to lead with no path forward.

Furthermore, the additional funding needed for thorough lead testing and remediation in housing also poses a potential issue, as the costs associated with lead remediation and abatement at both the local and governmental level can be deterrents.

However, bills specifically related to more staunch lead safety regulations are in consideration at the state level in regions where lead exposure has been found in recent history.

IV. POLICY PROBLEM

A. Stakeholders

There are a multitude of stakeholders in the issue of lead exposure as it relates to educational success and socio-economic standing.

For one, the youth of the United States of America are the primary stakeholders in this issue, being the most vulnerable to the side effects of lead exposure.

Other stakeholders are the families of lead-exposed children, as well as the supporting organizations and services they may require after. Given that the number of lead exposure cases directly impacts the amount of educational and healthcare support required specifically for this cause, preventative action would benefit all stakeholders.

B. Risks of Indifference

The risks of indifference in relation to lead poisoning lie in the immense possible public health effects.

Lead as a neurotoxin has been heavily regulated throughout the United States, leading to possible indifference to due to possible consideration of the issue as ‘resolved’; such a mindset creates dangerous impacts for the educational success and health for America’s children as children are found to be the most susceptible to lead exposure, which can lead to decreased overall literacy rates, increased crime rates, and further health costs for families.

Allowing lead exposure to remain an issue allows for possible backsteps in education and public health; costs aren’t just incurred by these systems, though. Even the criminal justice system is impacted by lead exposure, specifically when lead exposure leads to long-term, wide-spread behavioural shifts that go largely unnoticed.

C. Nonpartisan Reasoning

Lead exposure has resounding impacts in three pre-eminent fronts. Each of these impacts has resounding fiscal and societal impacts even when only certain individuals suffer from the exposure itself.

- 1) Lead exposure can lead to decreased educational success, and therefore decreased literacy and college attendance rates. Given the impacts of lead exposure on cognitive development, reading ability and processing speed of lead-exposed individuals, particularly at a young age, can decline. Thus, overall educational success and wellbeing may decline, leading an individual to be less likely to attend or complete a four-year degree. This may limit the individual's opportunity and economic health later in life. Additionally, as the labor market increasingly has shifted towards favoring college-educated individuals, people exposed to lead at a young age may struggle when seeking employment and opportunity later in life.
- 2) A direct result of lead exposure can be called varying levels of exposure, with more extreme exposure being at a quantity exceeding 3.5 micrograms per deciliter of blood-- which has tangible health impacts on not only cognitive function, but the immune system, respiratory system, and the body as a whole. These impacts not only place a significant burden on the impacted individual, but their caretakers, as well as their larger community as exposed individuals may require supportive financial assistance to ensure their health. By investing in preventative practices, there would be significant decrease in the need for funding towards lead-exposed individuals as such instances would be avoided.
- 3) Finally, as lead has been remediated or abated in housing and lead service lines have been replaced in water utilities in select regions of the country but not all, lead exposure has become an increasingly disproportionate phenomena-- under-resourced communities are often

the most impacted by lead exposure as the infrastructure surrounding them has often not been fully remediated for lead. Thus, by not taking further preventative action against lead exposure, particularly in such communities, the risk for furthering cycles of poverty is increased. When children in under-represented communities are affected by lead, there is an increased financial burden posed on their community, and their educational success is placed under threat, leading to a ripple effect in these individual's lives, in the way of college attendance and future opportunity.

V. TRIED POLICY

Regulations that address lead exposure issues have a long and evolving history in the United States, both with full federal action and various state and local measures. Early voluntary controls to limit lead began as far back as the 1920s, with more strict, mandatory legislation that emerged in the 1970s as growing scientific knowledge of lead's harm became available (Environmental Protection Agency). These policies have grown and developed over time, but gaps in access to testing, depth of remediation, and continued benefit to impacted communities remain(Tong et al.).

One federal success has been the enforcement and continuing evolution of the Safe Drinking Water Act (SDWA), specifically through the Environmental Protection Agency's (EPA) Lead and Copper Rule (LCR). In 2024, the EPA finished the Lead and Copper Rule Improvements (LCRI), adopting a nationwide mandate to replace most lead service lines in ten years—a measure facilitated by \$15 billion in federal infrastructure funds. These new rules also demand more rigorous and more regular water testing in schools and homes, reduced action levels that trigger remediation, and enhanced

communication requirements so families receive prompt notification when they find high levels of lead (Environmental Protection Agency).

At the state level, strong programs have demonstrated the impact of concentrated resources and regulation. For example, New Jersey's Lead Remediation and Abatement Program (LRAP) invests \$180 million in state and federal funds to provide free lead inspections, certified remediation, and direct cash assistance to low- and moderate-income households who reside in pre-1978 housing—prioritizing those with young children and having robust eligibility screening and follow-up (State of New Jersey). Other states such as Maryland, Massachusetts, and Rhode Island have also introduced universal or near-universal screening of kids for blood lead levels and mandatory requirements of abatement in older apartments (Tong et al.).

State-directed innovation also involves partnerships, like New York's regional Lead Resource Centers, which collaborate with health providers to boost blood lead tests and refer families to remediation (New York State Department of Health). Pennsylvania, focusing on the importance of continued monitoring, mandates public notice and retesting in schools and daycares, with requirements lasting until problems are fully remediated (Commonwealth of Pennsylvania Department of Health).

However, even with these advances, chronic implementation problems undermine policy achievements. National guidelines set important baselines, but local application—funding appropriation, enforcement, and timely remediation—varies widely.

On the basis of CDC surveillance, close to 1% of U.S. children under the age of 6 continued to have blood lead levels at or above the reference value as recently as 2022, with as much as four

times these rates in lower income neighborhoods. Accounts indicate that grant-funded programs are likely to fail to reach the most heavily affected families or expire before remediation is possible, and in a few states, mandatory programs run without effective follow-up to actually close exposure gaps (Tong et al.).

Further, policies aimed solely at voluntary testing or disclosure likewise fail to reach the entire at-risk population—particularly in jurisdictions with compromised advocacy or health care. Publication and transparency regulations, enforced currently through CDC, EPA, and multiple state departments, have assisted in serving to bring attention to where inequalities still exist, but without meaningful, enforceable mandates coupled with adequate funding, thousands of children are still lost in the system (CDC).

Overall, while substantial policy gains have been made in the United States, subsequent regulatory gains highlight the necessity that attempted policies surpass minimum standards and voluntary action, integrating data in real time, equitable resource allocation, and sustained political will in a bid to break the prolonged linkage of socioeconomic inequality and lead exposure (Tong et al.).

VI. POLICY OPTIONS

Given the regulation of lead in water, occupational settings, and other infrastructural contexts such as paint and plumbing, as well as the recurring instances of lead exposure in underserved communities, the lack of support and overarching legislation is clear. While specific regulatory agencies such as the EPA and OSHA take responsibility and enforce remediation efforts upon instances of dangerously high lead levels,

lead left behind in the most innocuous places are often overlooked in detection, and post-detection, remediation resources and support for those exposed, furthering the cycle of decreased educational success in under-resourced communities exposed to lead.

To combat not only this oversight of a lack of largely over-arching legislation as well as remediation efforts being disproportionately available, there are a few possible solutions.

1) Optional In-School Lead Testing

An option to help combat unfair testing availability and practices would be to offer optional in-school lead testing, free of charge during routine yearly checkups, from ages K-12 (National Association of State Boards of Education).

Given routine checkups in school are often governed by state law, a federal recommendation stating states should put in place in-school lead testing in tandem with their other routine yearly testing could be a possible option.

In terms of funding concerns, the mandate could put aside a grant-based fund for states to demonstrate funding needed to adhere to this mandate.

This solution allows for all children to receive lead testing, meaning no level of lead will go undetected. Additionally, statutes regarding detected lead levels would ensure there would be remediation protocols put in place in order to ensure under-served communities are fairly tested

and provided resources following the detection of lead levels¹². While this solution ensures that many who wish to be tested are able, it does unintentionally exclude home-schooled or alternatively schooled children-- an alternative optional testing could be offered at schools with available capacity for children not attending a traditional school governed by the state.

2) Remediation Support Fund

Another possible solution could be a grant-based fund providing resources for those found to be lead-exposed or poisoned. Such a fund would allow for all exposed to be privy to resources which would ameliorate the symptoms caused by their exposure, therefore alleviating the correlation between socio-economically under-privileged groups, increased lead exposure, and therefore decreased educational success.

This fund could operate through state-level committees in charge of sanctioning funds from the federal level to distribute and oversee to those affected on the state level, ensuring the efficacy of the funds' use as well as less burden placed on the federal government-- additionally, a state level committee would be able to provide better oversight with unique state-level legislative and enforcement knowledge.

VII. CONCLUSIONS

Through this brief, I explored the correlation between lead exposure and

socio-economic standing, considering the impacts of educational success, the local community, and overall economic and societal health of the United States of America.

Though lead has been a long standing issue, a lack of overarching legislation specifically aiming to help ensure lead awareness, detection, and remediation is more equitable and no longer disproportionate has led to unforeseen gaps in American public and environmental health (Tong et al.).

Through the proposed solutions, there may be a path forward to more equitable lead awareness, and remediation, allowing for reduced symptoms and more resources for those exposed, leading to a healthier tomorrow for all Americans.

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