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Research Article

Lead paint hazards in Nigeria: Public health and environmental impacts

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Abstract: Lead-based paints remain a major public health and environmental hazard in Nigeria, driven by weak regulation, informal manufacturing, and low risk awareness. This review synthesizes evidence on lead concentrations in decorative paints, associated human toxicity, environmental contamination, and policy responses nationwide. Multiple investigations show that a large proportion of Nigerian household paints exceed the 90 ppm global safety limit, with some samples reaching tens of thousands of ppm, especially bright-colored enamel products and older building stock. Children are disproportionately affected, exhibiting irreversible neurodevelopmental deficits, cognitive impairment, and behavioral problems, alongside anemia, hypertension, renal dysfunction, and other systemic effects. Deteriorating paint contributes to persistent contamination of soil, indoor dust, air, and water, creating long-term community hotspots documented in Jos, Lagos, Ibadan, and several southern cities. Case studies, including the Zamfara crisis and multi-city flake, toy, and soil surveys, reveal how legacy paint, artisanal activities, and poor housing interact to drive chronic exposure. Although recent NESREA regulations have adopted a 90 ppm limit aligned with global standards, enforcement weaknesses, limited biomonitoring, and inadequate public education persist. The review calls for strict nationwide enforcement, routine blood lead surveillance, targeted remediation, and an accelerated phase-out of lead paints to reduce health and economic burdens.

Keywords: lead paint, Nigeria, toxicity, human health, environmental pollution

1. Introduction

Lead paint remains a pervasive environmental and public health hazard worldwide, but its impact in low- and middle-income countries (LMICs) such as Nigeria is particularly severe due to gaps in regulatory enforcement, widespread availability of lead-containing products, and limited public awareness. Lead (Pb), a heavy metal with no known physiological benefit, is extensively used in paints because of its pigmenting properties and durability. However, its potent toxicity affects nearly every organ system, especially in children, where even low-level exposures can cause irreversible neurological damage.

Historically, many high-income countries banned or strictly regulated lead in residential paints decades ago. For example, the United States established limits on lead content in paint as early as 1978, significantly reducing lead exposure from this source in subsequent generations (Centers for Disease Control and Prevention [CDC], 2007). Unfortunately, such regulations have been slower to adapt in many LMICs, including Nigeria, where lead-based paints remain widely manufactured, imported, and used in residential, commercial, and public infrastructure.

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This disparity contributes to disproportionately high exposures and their associated health burdens in affected populations. In Nigeria, lead exposure from paints is compounded by rapid urbanization, expanding housing stock, and a booming informal market where regulatory oversight is often weak or absent. Many buildings erected in the colonial and post-colonial eras contain lead-painted surfaces that continue to deteriorate. This aging infrastructure, alongside new paints with unsafe lead levels, creates persistent sources of exposure through paint chips, household dust, and environmental contamination. Children living in such environments are particularly vulnerable due to their developmental behaviors including hand-to-mouth activity and higher gastrointestinal absorption rates of lead.

The health consequences of lead toxicity are well-documented but often underrecognized in Nigeria. Lead's neurotoxic effects during early childhood can cause Cognitive Deficits, Reduced Intelligence Quotient (IQ), Attention Deficit Disorders (ADD), and Behavioral Problems, which translate into diminished educational attainment and lifetime economic productivity (Lidsky & Schneider, 2003; American Academy of Pediatrics, 2016). Beyond neurological outcomes, lead exposure is linked to a range of systemic effects including hypertension, renal impairment, reproductive dysfunction, and immune system compromise in adults (Choi & Grandjean, 2008; Lanphear et al., 2005). The chronic nature of lead poisoning means that exposure often leads to lifelong disability and increased healthcare costs impacting families and the healthcare system at large.

Environmental contamination from lead paints extends beyond individual households. Flaking or peeling paint deposits lead particulates onto surrounding soil and dust, creating hotspots of contamination that persist for decades (Mielke & Reagan, 1998). Water sources can become compromised through runoff, while renovation and repainting activities can aerosolize lead particles, increasing inhalational exposures (Turchi et al., 2012). Such environmental pathways contribute to sustained, community-wide risks influencing both human and ecological health.

Nigeria's public health landscape has been repeatedly shaped by lead poisoning crises linked to artisanal mining and industrial pollution, with paint identified as a major source contributing to cumulative lead burdens (Dooyema et al., 2012; Ericson et al., 2016). The tragic lead poisoning outbreak in Zamfara State, which resulted in the death of over 400 children and debilitating conditions for thousands more, helped catalyze national awareness but also revealed complex environmental and social determinants of exposure (Dooyema et al., 2012; Ericson et al., 2016). Similar outbreaks and localized exposure clusters have occurred in several states, highlighting the need for comprehensive mitigation efforts.

Despite increased recognition, effective governmental regulation of lead paints in Nigeria has been slow to materialize. The Standards Organization of Nigeria (SON) introduced voluntary lead content limits in 2016, but compliance remains poor. The National Environmental Standards and Regulations Enforcement Agency (NESREA) has recently enacted binding regulations limiting lead content to 90 ppm, in line with World Health Organization (WHO) recommendations and global model laws (Yellow and Red Lead Paints International Alliance, 2024). Nevertheless, enforcement is hindered by limited laboratory infrastructure, insufficient market surveillance, and the continued prevalence of informal paint manufacturers and importers who operate outside legal oversight.

Consumer awareness of lead paint risks in Nigeria remains low, complicating efforts to reduce exposure through demand-side mechanisms. Many consumers and paint retailers lack knowledge of the hazards associated with lead-containing paints or the existence of safer alternatives (SRADev Nigeria, 2024). Consequently, unsafe paints command a substantial market share, particularly among lower-income populations who are less likely to afford or demand certified lead-free products.

The economic context further complicates intervention opportunities. The estimated annual economic burden of lead exposure in Nigeria exceeds USD 16 billion, accounting for healthcare costs, lost lifetime productivity, reduced school achievement, and associated social services (Attina & Trasande, 2013; Ogunseitan & Smith, 2015). This substantial economic drag underscores the imperative for timely policies that prioritize prevention as a cost-effective public health investment.

The environmental justice implications are profound. Lead paint exposure disproportionately affects marginalized communities, urban slums, and children in impoverished regions where housing conditions are poor and early childhood development services are inadequate (UNEP, 2024). These disparities perpetuate cycles of poverty and inequality, making lead elimination not only a health priority but a social equity challenge. The global momentum for lead paint elimination is steadily increasing. The WHO and the United Nations Environment Programme (UNEP) established the Global Alliance to Eliminate Lead Paint

(GAELP) in 2009, which provides technical and policy guidance to countries including Nigeria for developing legal frameworks and public awareness campaigns (World Health Organization [WHO], 2020). Several African countries, including South Africa and Kenya, have implemented successful regulatory programs leading to measurable reductions in market lead paint content. Nigeria stands at a critical juncture to align with these international efforts.

This review seeks to synthesize the current knowledge on lead paint toxicity and contamination in Nigeria through a rigorous analysis of scientific studies, environmental assessments, and case reports. By integrating epidemiological data, environmental measurements, and regulatory reviews, the review highlights the multifaceted dangers posed by lead paints to human health and the environment. Drawing on illustrative case studies such as the Zamfara disaster, urban exposure surveys, and cross-sectoral policy analysis, the article identifies critical research gaps and targets for intervention. The ultimate goal is to provide a comprehensive evidence base to inform policymakers, public health practitioners, industry stakeholders, and community advocates in crafting effective strategies for lead paint elimination and exposure reduction nationwide.

Despite known dangers, research and policy gaps remain. Most studies focus on lead in paint samples. They do not connect exposure to health outcomes in the population. Researchers have collected limited long-term data on lead exposure's health effects in Nigeria. There are few evaluations of intervention effectiveness. This includes regulatory enforcement and remediation projects. We know very little about how rural and urban areas differ in Nigeria. Also, we lack information on risk variations across different regions. Economic analyses often underestimate the indirect societal costs of exposure.

2. Materials and methods

2.1. Literature search and selection

The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) protocol in figure 1 was followed to ensure transparency and comprehensiveness. Databases searched included PubMed, Google Scholar, regional academic repositories, and authoritative organizational reports.

2.2. Inclusion criteria:

Studies assessing lead content in paints within Nigeria. Research examining health and/or environmental outcomes of lead exposure from paints. Reports from 1991–2024.

2.3. Exclusion criteria:

Non-Nigerian studies.
Occupational-only exposure assessments.
Non-peer-reviewed or anecdotal sources without organizational backing.

2.4. Data extraction

Study characteristics, analytical methods, measured lead concentrations, reported health impacts, environmental findings, and policy details were systematically extracted and charted.

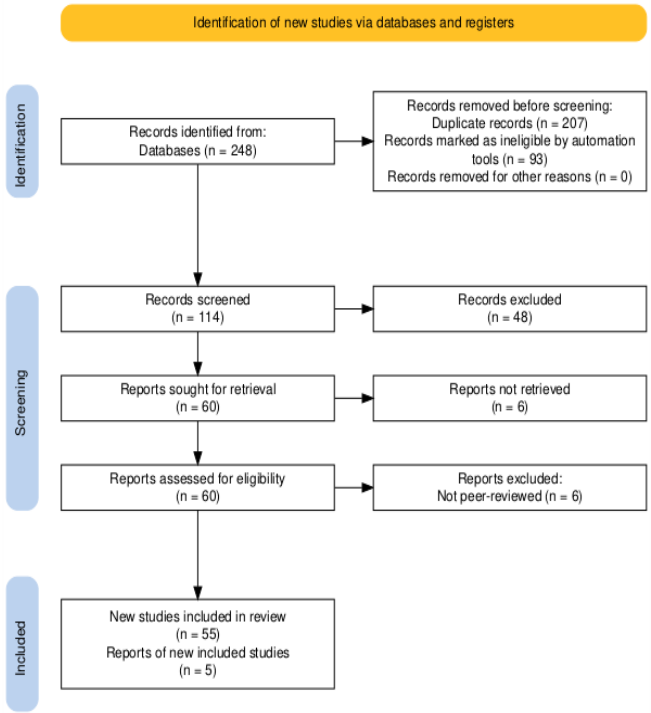

Figure 1: PRISMA Flow Diagram (Haddaway et al., 2022)

3. Results

3.1. Lead paint contamination levels

The extent of lead contamination in paints across Nigeria is, frankly, alarming. Numerous studies across Nigeria have revealed alarmingly high levels of lead in decorative and solvent-based paints. For example,

a multi-city investigation by IPEN reported that approximately 74% of 54 household paint samples exceeded the internationally accepted safety threshold of 90 ppm for lead, with some samples containing levels as high as 160,000 ppm (IPEN, 2017). Similarly, (Ahamefuna et al., (2017) found that 83% of enamel paints available in the Nigerian market contained lead concentrations far surpassing international standards, often reaching tens of thousands of micrograms per gram. Furthermore, Nduka et al. (2016) after assessing 164 buildings across several southern cities, identified pervasive environmental contamination particularly in structures with older paint layers. Collectively, these findings underscore a significant public health concern regarding lead exposure from paint in Nigeria. Recent market reviews show that newer paints manufactured after regulatory changes tend to have lower lead content, but a large fraction of paints on the market still contain hazardous levels due to the ongoing sale of older stock and lack of enforcement (Ahamefuna et al., 2017; IPEN, 2017). Yellow and red colors are especially problematic because of the common use of lead chromate pigments.

3.2. Human health toxicity and burden; case studies

3.2.1 Zamfara State (2010)

The Zamfara State crisis stands as one of the world's most devastating lead poisoning outbreaks. Initially, health authorities attributed widespread pediatric illness and mortality to artisanal gold mining techniques, which released high levels of lead into the local environment. However, subsequent environmental testing and forensic investigations identified multiple sources of lead including the use of deteriorated or improperly removed lead-based paints in homes and schools, compounding the crisis (Dooyema et al., 2012; Ericson et al., 2016).

Key aspects of the Zamfara case include the following: official records indicate that over 400 child fatalities occurred within a two-year period, while thousands more children suffered neurological injuries, including cognitive deficits, seizures, and paralysis. Blood lead levels in affected children frequently surpassed 100 μg/dL a staggering figure, especially considering the intervention threshold at the time was 10 μg/dL. Environmental investigations revealed lead concentrations in soil exceeding 18,000 mg/kg in several villages. Indoor exposures were worsened by contaminated dust and painted surfaces inside homes. Addressing the crisis required coordinated international efforts: large-scale chelation therapy for exposed children, evacuation of severely contaminated residences, and public education campaigns to help communities detect and manage environmental sources, including paint. The long-term health consequences have been significant, with survivors experiencing persistent developmental delays. The crisis also spurred ongoing community advocacy for expanded environmental testing and improved public health infrastructure.

This event was pivotal in prompting much-needed national and international attention to Nigeria's broader lead hazards including paint-based exposures as it demonstrated the interconnectedness of household and environmental lead risks (Dooyema et al., 2012; Ericson et al., 2016).

3.2.2 Jos, Plateau State

In Jos, a household survey provided clear evidence linking deteriorating interior lead-based paint with elevated blood lead levels among children (Wright et al., 2012). The researchers utilized stratified sampling, focusing on communities situated near legacy mining operations and older housing estates.

Key findings from the study include: over 70% of the children tested exhibited blood lead levels exceeding 10 μg/dL, a threshold indicating significant exposure. Multivariate analysis demonstrated that children living in homes with peeling or flaking paint faced double the risk of lead poisoning compared to those in residences with intact paint surfaces. Frequently reported symptoms among affected children encompassed learning difficulties, irritability, abdominal pain, and impaired weight gain. Follow-up interviews revealed a widespread lack of awareness regarding the dangers posed by old paint, as well as an absence of consumer-level regulatory information on paint cans. Public health interventions such as city-sponsored renovation programs and educational leaflet distribution resulted in only limited reductions in risk. Notably, meaningful decreases in exposure were observed only in cases where comprehensive removal of hazardous paint and environmental remediation occurred. Overall, the study underscores the urgent need for targeted public health policies addressing lead exposure from deteriorating paint in aging residential environments.

The Jos case exemplifies the everyday risk lead paint can pose in urban settings where structural deterioration is common, and highlights the value of combining laboratory, epidemiological, and community engagement approaches for effective risk identification (Wright et al., 2012).

3.2.3 Multi-city flake and toy studies

Nduka et al. (2016) conducted a comprehensive sampling of more than 164 buildings across four major southern Nigerian cities . Their research was intentionally broad, encompassing both colonial-era structures and modern buildings to ensure a representative understanding of exposure risks.

Key findings include: paint flakes and dust collected from both newly constructed and older homes frequently exceeded the U.S. EPA's regulatory lead limits, with some readings reaching as high as 7,800 mg/kg. Areas designated for children's play indoors and outdoors were found to contain significant accumulations of lead-contaminated debris, a problem particularly acute in the older urban centers. In a related analysis, Sindiku et al. (2013) identified alarming lead concentrations in domestically available toys, including imported products from Asia. These levels were several orders of magnitude above accepted international safety thresholds, indicating that children who engage in mouthing behaviors and play with these toys face compounded risks of exposure. Community workshops held in response to these findings revealed that parental awareness of lead hazards in toys and building materials was extremely limited. The majority of parents associated vibrant, glossy paint with higher product quality and reported receiving no formal warnings from retailers or healthcare professionals. These observations highlight a critical gap in both public awareness and regulatory oversight regarding lead exposure risks in domestic environments.

This multi-city evidence demonstrates how environmental and consumer product lead risks overlap in complex, real-world settings, and underscores the importance of regulatory and consumer vigilance beyond simply addressing paint formulations

3.2.4 Lagos and Ibadan soil surveys

Apanpa-Qasim et al. (2018) conducted extensive environmental assessments in Lagos and Ibadan, revealing significant lead contamination tied to historical use of lead-based paints. Soil analyses from playgrounds, schoolyards, and residential streets across a spectrum of socioeconomic neighborhoods frequently registered lead concentrations as high as 419 mg/kg, a figure nearly 38 times greater than local background levels. The highest contamination coincided with older, poorly maintained buildings, particularly those constructed during the mid-20th century urban expansion, when lead-rich paints were commonly used. Notably, during the dry season, measurements of atmospheric dust indicated airborne lead concentrations exceeding recommended safety thresholds for chronic exposure, especially in areas undergoing renovation or manual paint removal.

Risk mapping highlighted informal schools and unpaved communal play areas as intervention priorities, given children's heightened vulnerability to both soil and dust ingestion. Stakeholder engagement sessions further exposed a lack of awareness among local officials and a significant absence of practical guidance for property owners regarding lead-safe maintenance practices.

These studies illustrate the "legacy" nature of lead exposure: once introduced to the environment via paint or other sources, lead can pose chronic hazards for generations, even after its use in new products is discontinued (Apanpa-Qasim et al., 2018).

3.2.5 Urban health clinic studies

Kumapayi and Alabi's hospital-based investigations across Lagos and neighboring peri-urban areas provide valuable clinical insight into the ongoing issue of pediatric lead exposure (Ogunseitan & Smith, 2015). Their analysis focused on admissions presenting with unexplained neurological symptoms seizures, developmental delays, and behavioral disturbances seeking to identify underlying environmental factors.

Key findings emerged: a significant proportion of affected children lived in residences with deteriorating interior paint. In some clinical settings, nearly 40% of children with unexplained developmental problems exhibited blood lead levels above 10 µg/dL, underscoring the prevalence of hazardous exposures. These cases predominantly involved families residing in low-income urban environments, where unregulated building materials and do-it-yourself renovations were commonplace. Clinical interventions typically included ongoing blood monitoring, environmental risk assessments via home visits, and referrals to social services for families requiring remediation. Nonetheless, social service agencies frequently lacked the capacity for comprehensive abatement, highlighting the need for broader, community-level preventive efforts. Economically, the burden is striking. Ogunseitan and Smith's (2015) analysis estimated that childhood lead exposure imposes costs exceeding USD 16 billion annually in Nigeria, accounting for lost lifetime productivity, special education requirements, increased healthcare utilization, and various support services.

Altogether, clinic-based evidence clearly demonstrates that lead paint hazards result in substantial, long-term costs to both individual families and the

broader health sector, with available resources for remediation and recovery remaining insufficient.

3.2.6. Ongoing market and awareness gaps

Despite regulatory updates in 2023 and 2024, investigative reporting (see The Guardian Nigeria, 2024; IPEN, 2017) consistently documented the persistent sale of high-lead paints across major Nigerian cities. Market assessments revealed a widespread lack of testing or labeling for lead content among hardware retailers and vendors. Particularly in low-income areas, inexpensive and vividly colored paints still dominated shelves, often without adequate safety assurances. Alarmingly, compliance checks indicated that even products labeled "lead-free" sometimes contained lead concentrations exceeding permissible limits. This discrepancy was largely attributed to weak regulatory enforcement and, at times, deliberate misrepresentation by manufacturers. Public education initiatives, when undertaken, were fragmented and short-lived, lacking any durable framework to monitor consumer knowledge or industry compliance. Additionally, Nigeria's absence of a national reporting mechanism or formal product recall system meant that non-compliant paints could linger in the market for years. Imported paints, too, slipped through regulatory gaps due to porous borders and insufficient scrutiny.

Collectively, these findings illustrate a complex, multi-layered crisis: legacy lead-based paints remain in circulation, contemporary commerce continues to introduce hazardous products, and health system integration remains inadequate. The burden of this ongoing exposure falls disproportionately on vulnerable populations, especially children in low-income communities, perpetuating significant public health risks.

3.3. Environmental impact

3.3.1 Soil and dust

Lead persists for years in household and playground soils, serving as a continuous source of exposure through dust ingestion and hand-to-mouth behavior among children (Apanpa-Qasim et al., 2018; Mielke & Reagan, 1998).

3.3.2 Water and air

Lead-based paints also contribute to contamination of both surface and groundwater through weathering, runoff, and improper disposal of paint residues and wash water, particularly in densely populated urban and peri-urban settlements. During rainfall, lead-containing flakes and dust are washed from building facades into drains, open wells, and streams, where lead can adsorb to sediments and bioaccumulate in aquatic organisms consumed by nearby communities. In parallel, sanding, scraping, and open-air burning of painted materials during renovation or informal recycling release fine lead particles into the atmosphere, which can travel considerable distances, settle on crops and water bodies, and be inhaled or ingested by residents, including children. These combined pathways mean that even households without visibly deteriorating paint can be exposed via contaminated drinking water, irrigated vegetables, and airborne dust, underscoring the need for integrated environmental monitoring that links water quality, air particulate measurements, and paint-use patterns in Nigerian cities (Turchi et al., 2012).

3.3.3 Bioaccumulation

Local livestock and poultry near contaminated sites accumulate lead, suggesting wider food chain risks.

3.4. Regulatory progress and challenges

3.4.1. Progress

Nigeria joined the Global Alliance to Eliminate Lead Paint in 2009, set a voluntary lead paint standard in 2016, and adopted a mandatory 90 ppm standard through NESREA by 2024 (LEEP, 2024).

3.4.2. Challenges

Compliance and enforcement remain problematic due to limited testing infrastructure, low market awareness, and pervasive informal sales channels. Journalistic and NGO-driven market surveys continue to find high-lead paints widely available (The Guardian Nigeria, 2024).

4. Discussion

The review demonstrates that lead paint remains a severe and under controlled exposure source in Nigeria, with many decorative and enamel paints containing lead far above the 90ppm global safety limit, in some cases up to 160,000 ppm, especially in bright-colored products (Ahamefuna et al., 2017; IPEN, 2017). This high contamination level implies continued seeding of lead into soil, household dust, water, and air as painted surfaces weather or are disturbed, sustaining chronic exposure and explaining the persistent burden of neurodevelopmental and systemic toxicity documented

in Nigerian communities and clinics (Mielke & Reagan, 1998; Wright et al., 2012; Ogunseitan & Smith, 2015). Case studies from Zamfara, Jos, Lagos, Ibadan, and multi-city flake and toy surveys show that lead paint interacts with other sources such as artisanal mining and contaminated consumer products, so effective control must address multiple sectors simultaneously. The estimated annual economic burden exceeding USD 16 billion and the disproportionate impact on poor, urban, and marginalized populations indicate that lead paint is both an environmental health threat and a driver of inequality and lost productivity, justifying urgent investment in prevention, remediation, and enforcement (Attina & Trasande, 2013; Ogunseitan & Smith, 2015; UNEP, 2024; WHO, 2024).

The contamination levels reported in Nigerian paints are consistent with previous national and IPEN surveys, which also found a majority of household paints exceeding international standards, confirming that this is a long-standing problem rather than a new phenomenon (IPEN, 2017; Ahamefuna et al., 2017; Saviour, 2022). Compared with global reports from countries that have successfully phased out lead paint, Nigerian market samples still show similar or higher lead concentrations, underscoring a regulatory lag despite recent NESREA adoption of a 90 ppm limit aligned with WHO recommendations (WHO, 2020; LEEP, 2024). The health outcomes described cognitive deficits, reduced IQ, behavioral disorders, hypertension, renal impairment, and reproductive effects mirror classic mechanistic and epidemiological studies on lead toxicity cited in the paper and related reviews of neurotoxicity, confirming that Nigerian exposures generate the same well-established consequences seen internationally (Lidsky & Schneider 2003; Lanphear et al. 2005; Choi & Grandjean, 2008). Environmental findings of persistent contamination in soils and dust around homes, schools, and playgrounds echo prior research by Mielke and Reagan (1998) and Apanpa-Qasim et al. (2018), while the Nigerian evidence extends these insights by linking legacy housing stock, current high-lead paints, and unsafe renovation and waste practices into a single exposure framework (Turchi et al., 2012; Apanpa-Qasim et al., 2018).

Earlier Nigerian and international studies often examined isolated components paint lead content, soil levels, or clinical case series whereas this review integrates contamination data, health outcomes, and regulatory analysis to reveal a national, systemic pattern of risk and to highlight gaps in long-term exposure tracking, regional comparisons, and evaluations of interventions (Dooyema et al., 2012; Wright et al., 2012; IPEN, 2017; Apanpa-Qasim et al., 2018). Prior literature frequently documented contamination or health impacts without fully situating them within policy developments; in contrast, this paper explicitly connects empirical findings to the evolution of SON's voluntary standard and NESREA's binding 90 ppm regulation, showing that nominal alignment with WHO model laws has not yet translated into effective control because of weak enforcement and dominant informal markets (LEEP, 2024; WHO, 2020; SRADev Nigeria, 2024). Compared with global experiences where strong regulation, market surveillance, and public awareness led to measurable declines in paint lead levels and children's blood lead concentrations, the Nigerian synthesis underscores that legal standard alone are insufficient and that sustained surveillance, consumer education, and support for industry reformulation are crucial to achieving similar public health gains (WHO, 2020; LEEP, 2024).

5. Conclusion

Lead paint remains an urgent public health and environmental issue in Nigeria. The scale and chronicity of exposure threaten both current and future generations, with neurodevelopmental, systemic, and economic consequences. Regulatory steps represent promising movement, yet comprehensive and enforced elimination including industry reformulation, expanded surveillance, and societal education are essential.

6. Recommendations

1. Support local paint manufacturers in reformulating products to eliminate lead, providing technical training, incentives, and international collaboration.

2. Strengthen enforcement of existing lead paint regulations: Regulatory agencies should prioritize systematic market surveillance and compliance checks to ensure that all decorative and enamel paints meet the 90 ppm lead limit, with particular attention to bright-colored and low-cost products that studies show frequently exceed this threshold.

3. Scale up monitoring of environmental and biological lead burdens: Routine surveillance of soil, household dust, water, air, and children's blood lead levels should be expanded in high-risk urban and peri-urban communities, especially where legacy housing, informal markets, and previous contamination (e.g., Zamfara, Jos,

Lagos, Ibadan, and southern cities) have been documented.

4. Target remediation in identified contamination hotspots: Environmental clean-up efforts should focus on locations where the review identified persistent contamination such as older residential buildings, playgrounds, schools, and communities with documented high soil and dust lead levels to reduce ongoing exposure among children and other vulnerable groups.

5. Implement sustained, evidence-based public and stakeholder education: Public health campaigns should directly address the low awareness highlighted in the review among consumers, retailers, and local officials, using locally generated evidence on paint lead levels, health effects, and economic costs to encourage demand for certified low-lead products and safer renovation practices.

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