Past, present and future: A review and synthesis of US EPA lead regulations and children's health

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Objectives

1. Describe exposure pathways through which children come into contact with lead.
2. Identify health effects of childhood lead exposure.
3. Discuss temporal trends in US childhood blood lead levels.
4. Describe US lead regulations and potential future federal actions to address childhood lead exposure.

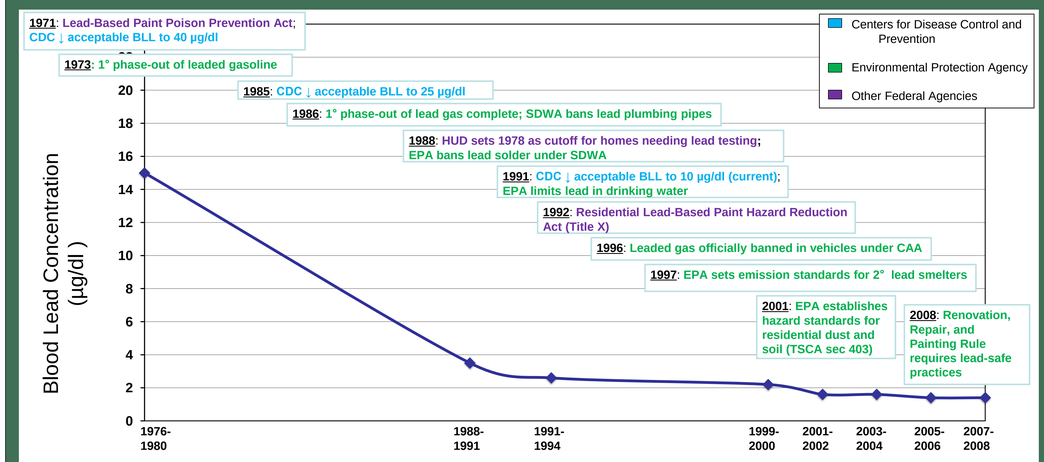
Childhood Lead Exposure

- Children may be exposed to lead through a variety of sources, including: gasoline, paint from old housing, lead solder, consumer goods (i.e. toys, jewelry), plumbing materials, air emissions, imported foods (candy, canned goods), residue from lead bullets, and soil.
- Childhood lead exposure can occur through ingestion (most common), inhalation, trans-placental absorption, and dermal contact.

Childhood Blood Lead Levels In the US

- **Figure 1** shows that median childhood blood lead levels in children 1 – 5 years have decreased from 15 µg/dl to 1.5 µg/dl from 1976 to 2008 in the US.
- Approximately 32% of black children <6 years have lead levels at or above 2.5 µg/dl, compared to 12% of white and 16% Mexican American children (**Figure 2**).
- More children who live below 100% poverty level having blood lead levels at or above 2.5 µg/dl than children at or above 100% poverty level (**Figure 2**).

Figure 1: Median blood lead levels in children 1 – 5 years old (1976 – 2008) and major federal actions from 1971 – 2008.

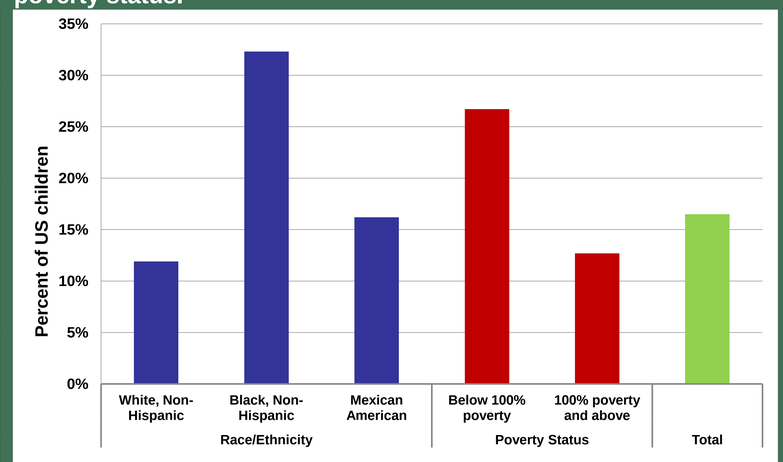


Source: *America's Children and the Environment* ; Data: *National Health and Nutrition Examination Survey (NHANES).*

Toxic Effects of Lead in Children

Blood Lead Level	Child Health Effects
< 5 µg/dl	Transplacental transfer (mother-to-child)
	Cognitive Functioning: ↓ in school performance Behavioral: ADHD, delinquent and antisocial behaviors
<10 µg/dl	Cognitive Functioning: Full-scale IQ deficits Sensory: Decreased auditory acuity Immune: Elevated serum IgE levels Reproductive: delayed puberty Developmental: delayed postnatal growth
<50 µg/dl	Gastrointestinal: Colic Hematopoietic: Anemia Central Nervous System: Encephalopathy
≥ 70 µg/dl	Death

Figure 2: Percentage of US children 1 - 5 years old with a blood lead concentration ≥ 2.5 µg/dl (NHANES; 2005-2008); by race/ethnicity, poverty status.



Source: *America's Children: Key National Indicators of Well Being* (2011). Data: *NHANES.*

Conclusions

- US federal actions have helped reduce anthropogenic sources of lead (**Figure 1**). As a result, childhood blood lead levels have dramatically decreased since the 1970's.
- Despite these trends, both racial/ethnic and socioeconomic disparities exist in current US childhood lead levels.
- Bottom line: childhood lead poisoning is still a concern in the US. Further efforts to reduce lead in the environment are being investigated.

Gaps to Address in Childhood Lead Exposure

- Deteriorating paint, household dust and contaminated soil are the most common exposure sources for children.
- Roughly 25% of American households built before 1978 have lead-based paint hazards.
- Current commercial products containing lead: car wheel weights, aviation gasoline, fishing sinkers, shot, bullets, and imported food and goods.
- Lead is one of the most common contaminants at Superfund sites in the nation.

Environmental Regulations under Development

a. Lead Wheel Weights; Regulatory Investigation
b. Lead; Renovation, Repair, and Painting Program for Public and Commercial Buildings
c. Residential Lead Dust Hazard Standards
d. Nation Primary Drinking Water Regulations for Lead and Copper: Regulatory Revisions
e. Air Toxics Residual Risk and Technology Rules for Primary and Secondary Lead Smelters
f. Review of National Ambient Air Quality Standards for Lead
g. Lead Emissions from Piston-Engine Aircrafts Using Leaded Aviation Gasoline

For more information, visit: http://www.epa.gov/lead/