

# Healthcare: A Clinical Perspective on Lead

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# Objectives

- Describe the impact of lead poisoning in the developing child
- Identify likely sources of lead exposure in the home
- Provide examples of lead poisoning prevention efforts through coalition building

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# Lead Toxicity

- Not reversible.
- No threshold for effects.
- Iron deficiency worsens the effect of lead.
- Primary target: brain.



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# Signs and Symptoms

## Lifelong consequences:

- Speech and language problems.
- Decreased bone and muscle growth.
- Hearing loss.
- Damage to the nervous system and/or kidneys.



Irritability



Behavioral problems



Abdominal pain



Lethargy



Loss of appetite



Headaches



Memory loss



Seizures  
(high lead exposure)

## Effects of lead poisoning:

- Developmental delay.
- Cognitive problems.
- Decreased IQ.
- Attention Deficit Disorder.



These symptoms are rare outside of acute lead poisoning (blood lead level  $>70$  mcg/dL)



These less dramatic symptoms are much more common

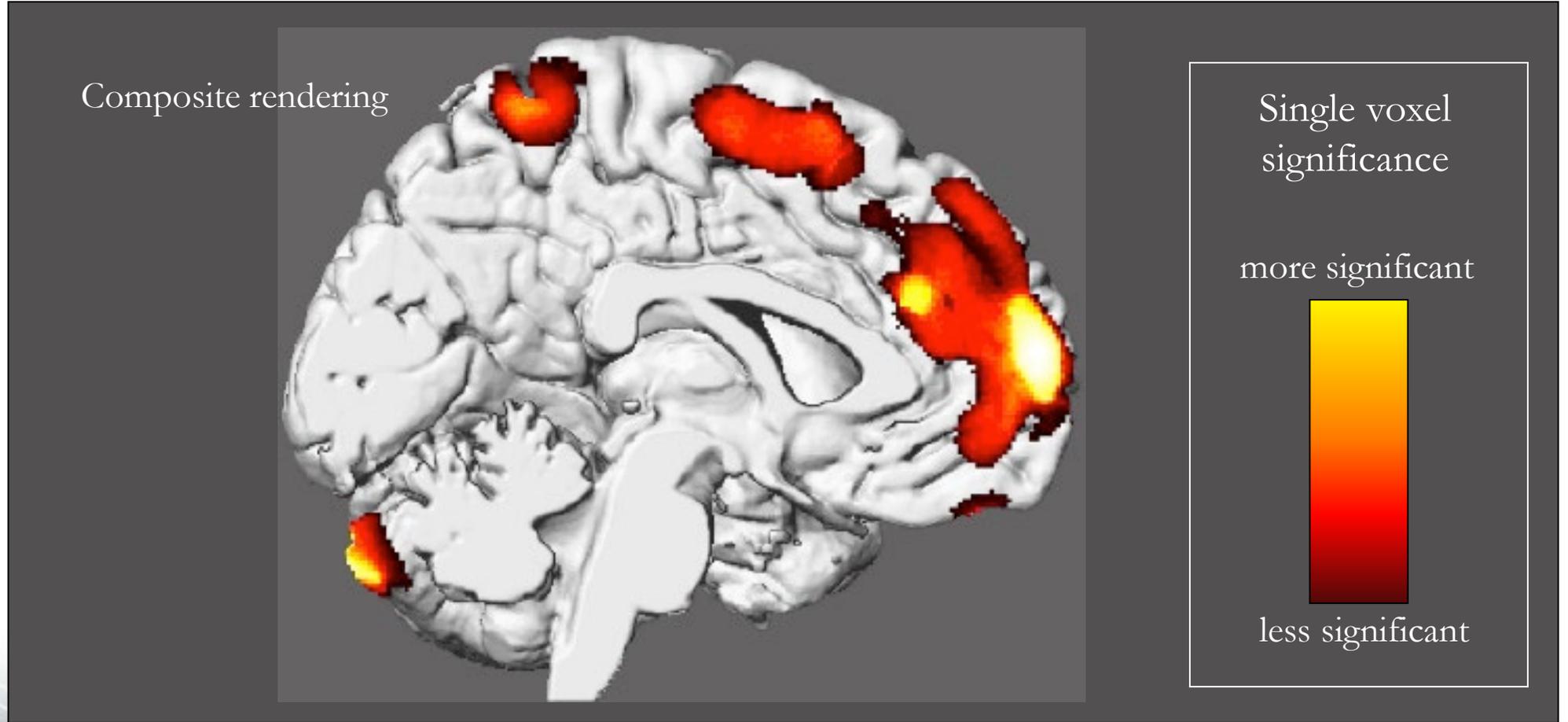
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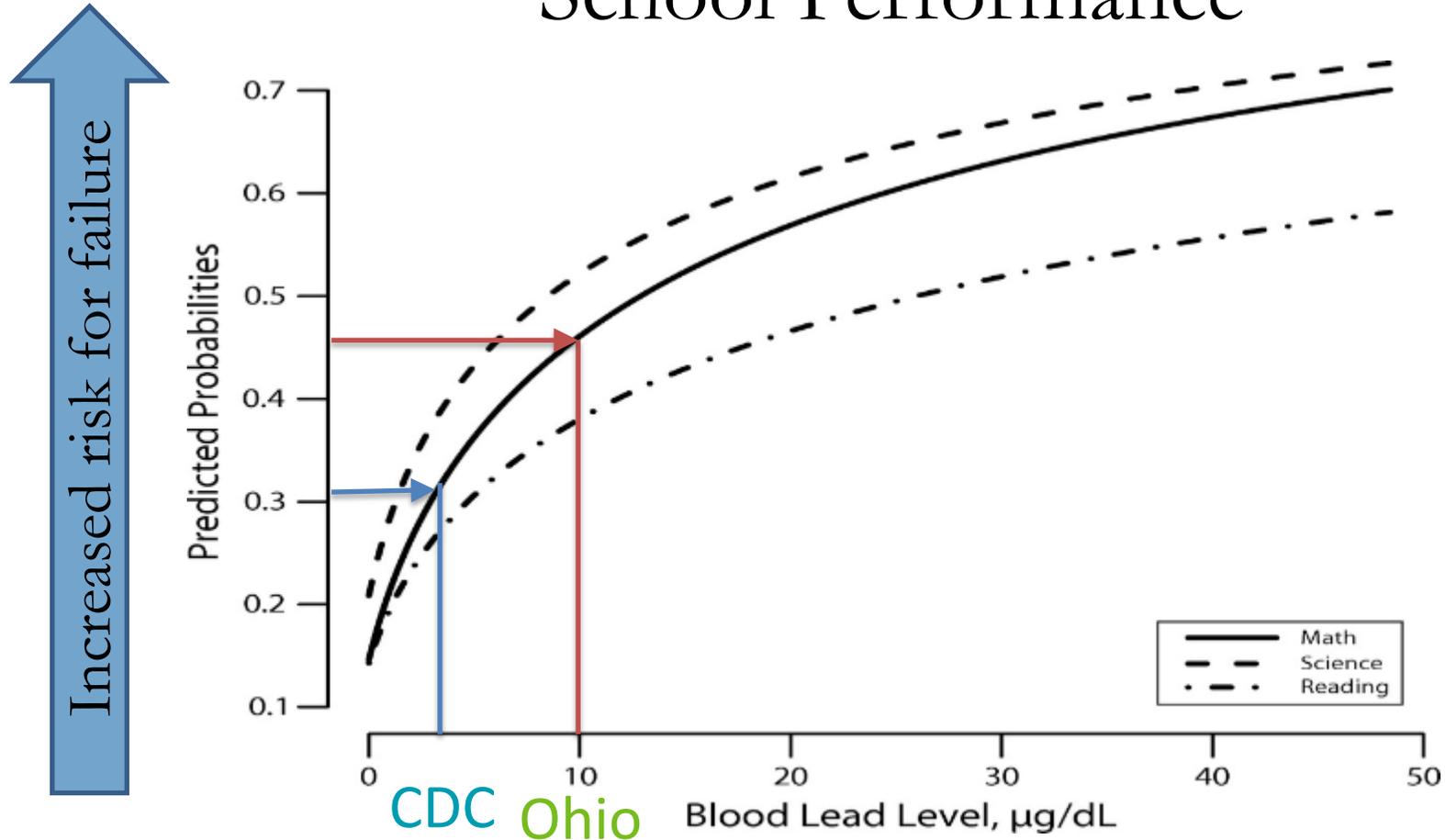
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# Adult Cortical Gray Matter Loss in Relationship to Postnatal Lead Exposure to Six Years



Map of strength of association between blood lead concentration and population-wide loss of gray matter volume. Single-voxel minimum significance threshold is  $p < 0.001$  (uncorrected), found within a cluster of at least 700 voxels (Cecil, et al., PLoS Medicine, 2008).

# School Performance



Predicted probabilities of scoring “less than proficient” on 3 tests of the Michigan Educational Assessment Program as a function of blood lead level:  
Detroit Public Schools, MI, 2008–2010

Zhang, AJPH, 2013

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# 2020 CWRU Study Found...

- As young children they had 27% lower chance of being on track for kindergarten
- As teens they were 25-30% more likely to enter the juvenile justice system
- As adults they were 34% more likely to be incarcerated
- By age 23, they were 40% more likely to require homeless services (and other public aid)

Return On Investment: Ohio would save an estimated \$2.8 billion each year by preventing child lead poisoning.

[https://case.edu/socialwork/povertycenter/sites/default/files/2020-07/Downstream\\_06182020\\_rev07082020.pdf](https://case.edu/socialwork/povertycenter/sites/default/files/2020-07/Downstream_06182020_rev07082020.pdf)

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# Primary Prevention

- Goal: no children exposed to lead
- Why?
  - No "safe level" of lead in the body
  - Effects of lead are not reversible
- How?
  - Know about common sources
  - Learn preventive strategies

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# Common Sources of Lead



Lead-based  
paint dust/  
chips



Occupational  
take-home  
lead



Water



Food/herbs



Soil



Toys



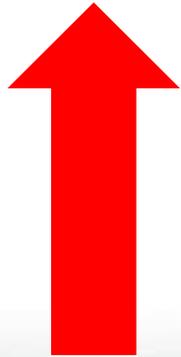
Cosmetics  
and  
ceremonial  
powders\*



Spices\*



Traditional  
medicine\*



80% of children in Ohio  
are exposed this way.

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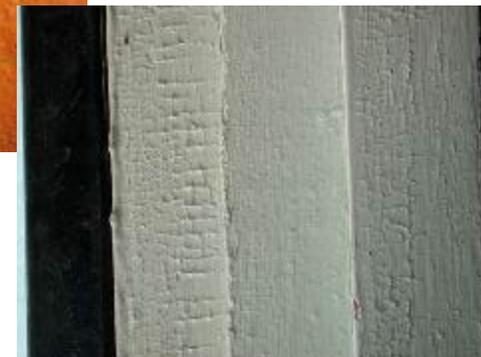
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# Lead Exposure from Housing

- Lead-based paint was used until 1978
- Highest amount of lead is in pre-1950 housing
- Mostly from lead-contaminated dust
- Lead paint was used
  - Doors
  - Windows
  - Trim
  - Porches
  - Any areas expected to be wet or damp



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# Not Just Housing Age, but Condition



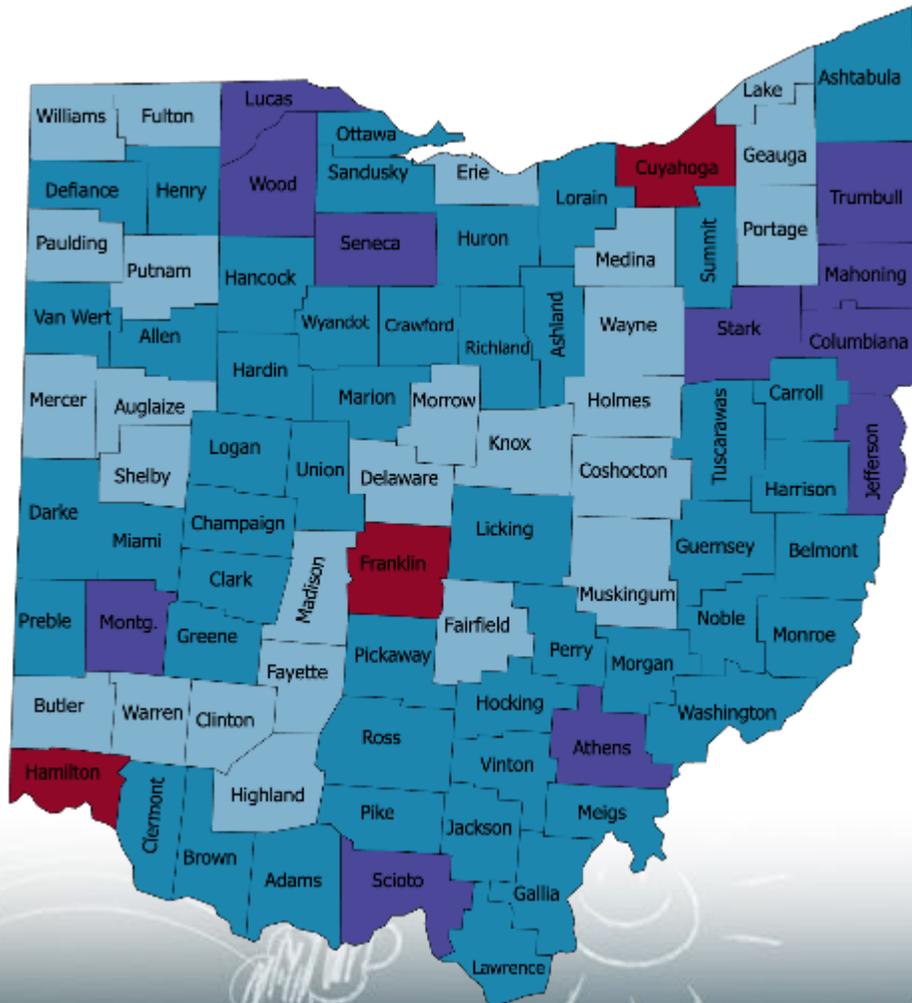
<https://www.nhhfa.org/rental-assistance/landlords-property-owners/lead-and-healthy-homes/>

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# High Risk Zip Codes



## County Level Lead Exposure Risk:

- Light Blue: 1-9 high risk zip codes
- Blue: 10/18 high risk zip codes
- Dark Blue: 19-27 high risk zip codes
- Red: 28+ high risk zip codes

Take home point: Every county has at least 1 high risk zip-code

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# Lead Poisoning Prevention

## Reduce hazards

- Lead-safe housing
- Lead-safe renovating

## Reduce Exposure

- Cleaning
- Hygiene

## Reduce Absorption

- Good diet
- Adequate iron intake

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# General Hygiene

- Hand-to-mouth behaviors put children at high risk
- Wash hands frequently
  - Before eating
  - Before bedtime
- Avoid playing in bare soil in high-risk areas
  - Near older homes (within 10 feet)
  - Near street
  - In neighborhoods with nearby industry



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# Diet and Reducing Lead Absorption

- A well-rounded healthy diet reduces lead absorption.
- Vitamin C aids in iron absorption.



## Foods Rich in Calcium, Iron & Vitamin C

<b>Rich in Iron and Calcium</b>	<b>Non-heme iron:</b> Dried beans, peas, lentils, spinach and broccoli <b>Heme iron:</b> Lean red meats, chicken and fish <b>Calcium:</b> Low-fat milk, cheese and yogurt
<b>Rich in Vitamin C</b>	Citrus, leafy greens, broccoli, bell peppers and sweet potatoes



# Advice for Families: Preventing Lead from Work

- Ideally
  - Change clothes and shoes at work
  - Shower at work
- No facilities at work?
  - Remove contaminated clothes before entering the home
  - Shower
  - Keep clothes separate – wash separately



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# Purpose of Blood Lead Testing

Identify cases for which primary prevention has failed.

Treatment

Environmental  
Intervention

Most interventions are public health interventions.

Goal: Reduce elevated blood lead levels  
as rapidly as possible.

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## Blood lead testing requirements for Ohio children less than 6 years

1. Medicaid eligible
2. Lives in a high risk zip code (see *Ohio High Risk Zip Codes Requiring Blood Lead Testing*)
3. Lives in or regularly visits a home or building built before 1950
4. Lives in or regularly visits a home or building built before 1978 that has deteriorated paint
5. Lives in or regularly visits a home or building built before 1978 that has current or planned renovation/remodeling
6. Has a sibling or playmate that has or did have an elevated blood lead level
7. Frequently encounters an adult who has a lead-related hobby, or occupation
8. Lives near an active lead smelter, battery recycling plant, or other industry known to generate airborne lead dust



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# Medicaid Testing Requirements

- **ALL** 12- and 24-month-old Medicaid enrolled children **must** have a blood lead test (**Ohio State Law**).
- Every child 36 to 72 months of age **must** have a blood lead test, unless previously tested.

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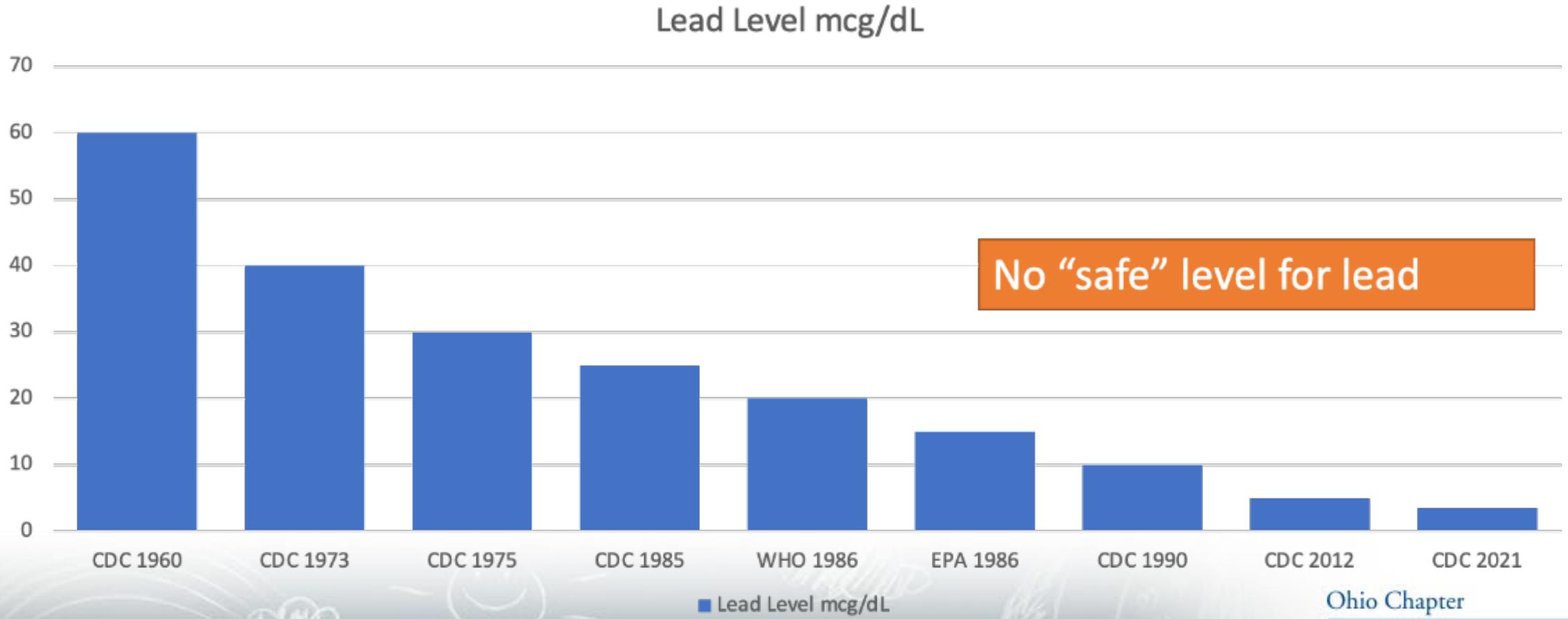
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# What Happens with a Blood Lead Test?



\* Required by State Law

# "Acceptable" Blood Lead Levels



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# What does a **proactive approach** look like?

Primary Prevention

Address the housing stock



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# Lead Safe Cleveland Coalition



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# Lead Safe Home Fund

- Lead Safe Grants
  - Property Owners
  - Childcare Centers
- Lead Safe Resource Center
  - Workforce Development
  - Operational Hub
- Program Administration and Evaluation

LEAD SAFE  
**Loans & Grants**  
APPLICATIONS  
ARE NOW OPEN!

Find out if you're eligible for financial assistance and apply today.

[chnhousingpartners.org/lead](http://chnhousingpartners.org/lead)



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# Ohio Lead Free Kids Coalition

- 3/25/2025 Advocacy Day for omnibus budget bill (HB 96)
- Accepted by the House Finance Committee and passed by the Ohio House on 4/9/2025
  - Lead Abatement: Appropriates \$250,000 in GRF ALI 440527, Lead Abatement, in each fiscal year. Earmarks these funds for local governments for projects that include lead hazard control and housing rehabilitation initiatives that expand the ODH's lead hazard control and prevention efforts.
- Now to Ohio Senate for further deliberation!

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# Other Considerations....



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# Who is At Risk?

- Children under 6 years
- Children who live in housing built before 1978
- Children from low-income households
- Immigrants, refugees, or recently adopted from less developed countries



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# Who is At Risk?

- Children of color
- Living in rental properties
- Experiencing nutritional/food insecurity



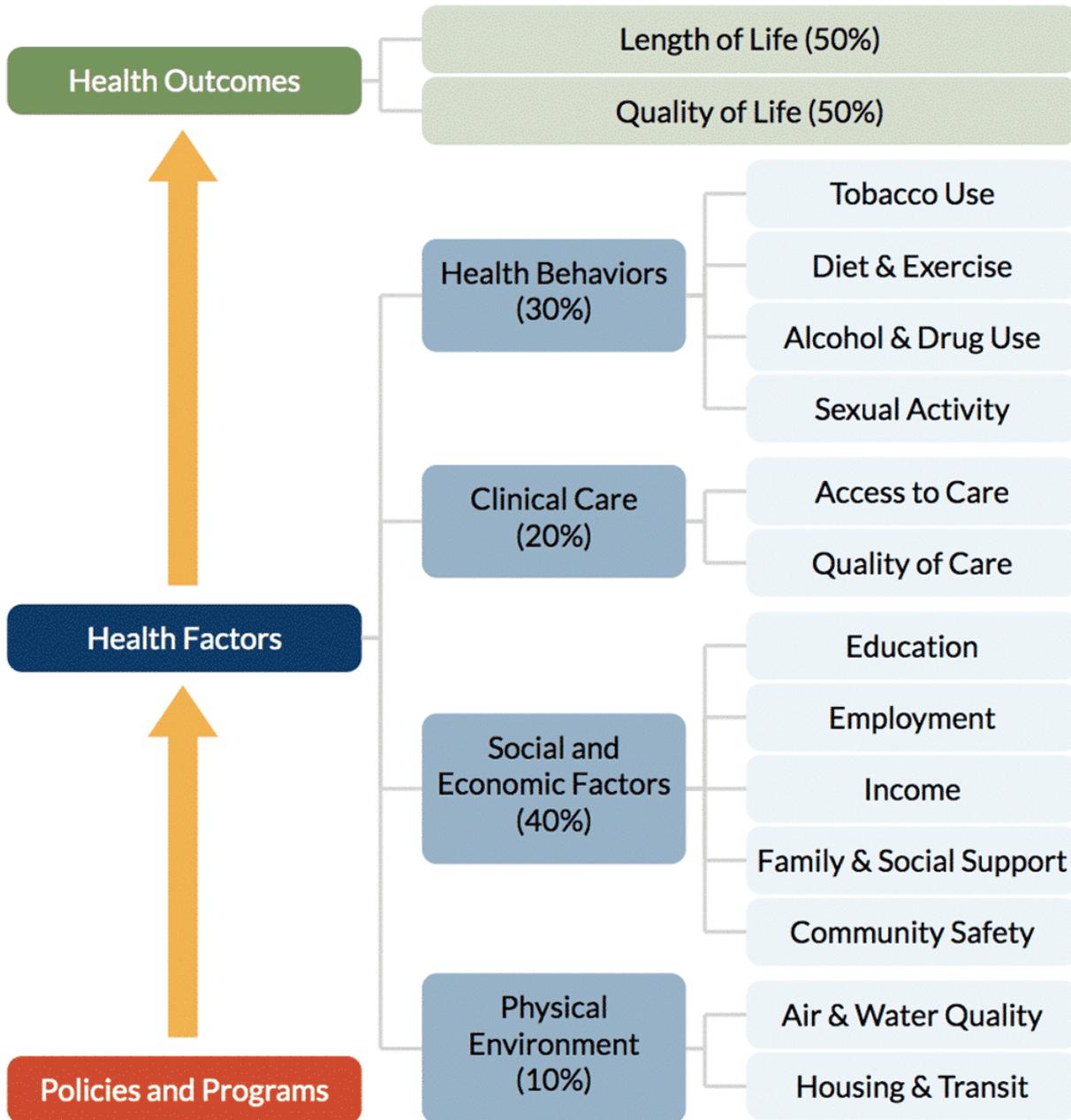
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County Health Rankings model © 2014 UWPHI

**Only 20% of a population's health is determined by the clinical care it receives**

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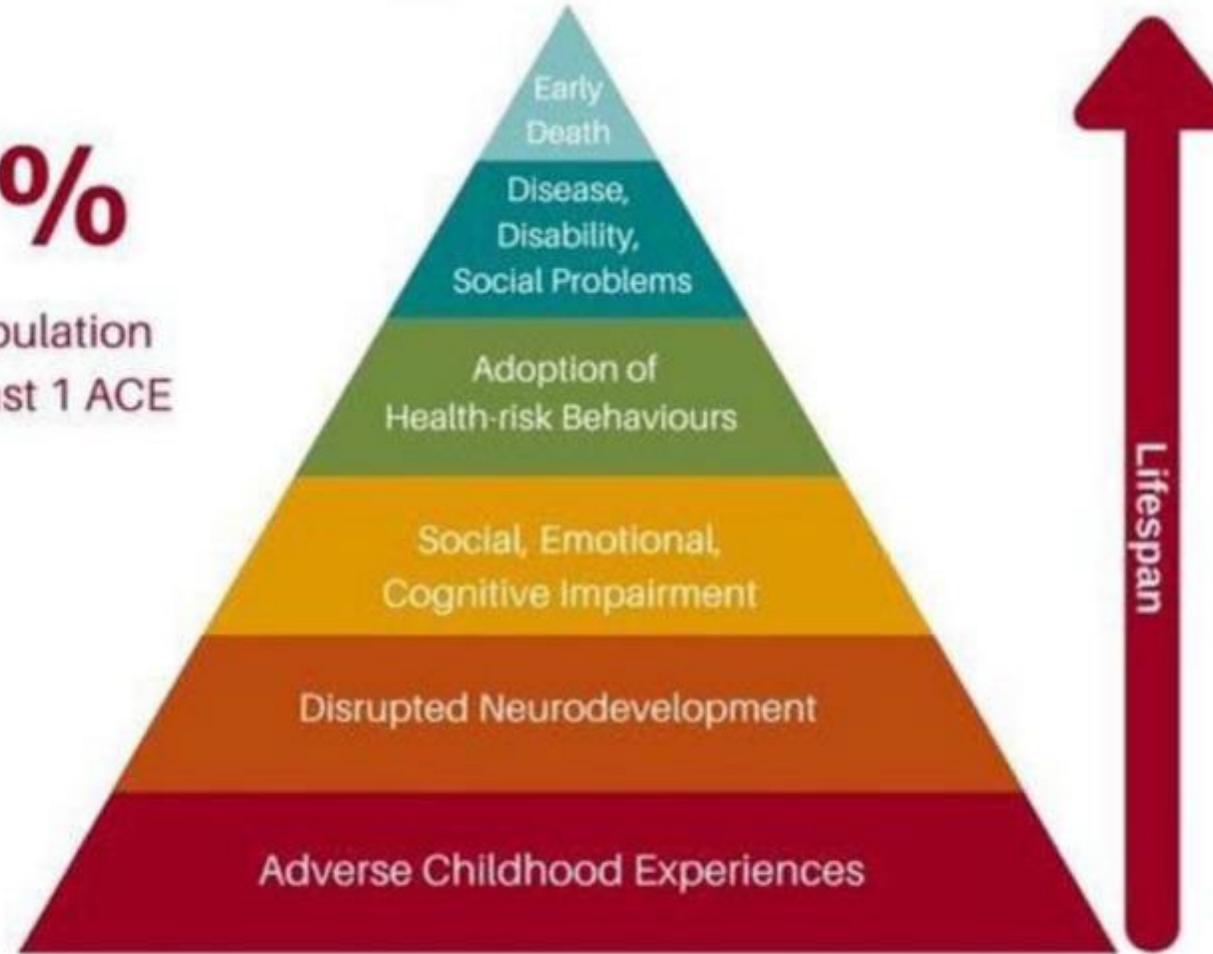


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# Adverse Childhood Events (ACEs)

**67%**

of the population  
have at least 1 ACE



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# Lead poisoning is an ACE



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# Immigrant Population

- 14.3% of the US residents are foreign-born
  - 2.5 million immigrant children in the United States
  - Top 4 countries of origin being Mexico (18%), India (8%), China (5%), and the Philippines (3%).
- In 2024, the US admitted 100,034 refugees
  - The UN High Commissioner for Refugees (UNHCR) estimates that 2.9 million refugees will need resettlement in 2025
- Children in immigrant families (CIF) are defined as children who are either foreign-born or have at least 1 parent who is foreign-born
  - 1/4 children in the United States are CIF

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# Unique Challenges of CIF

- Less likely to have a medical home, to access public benefits
- May not have received adequate screenings/immunizations in their home country
- Many have a parent who faces threat of deportation without notice
- Increased risk of anxiety, depression, poor school performance, sleeping and eating disruptions
- Forced separations may result in loss of family income, resulting in housing and food instability
- May have experienced abuse, exploitation, serious trauma.

[https://www.aap.org/en/patient-care/immigrant-child-health/?srsId=AfmBOoqearsT-K8yEX0uUToe6c1KAhWQyreVqkWINDt2SmJdKzO3\\_iWO](https://www.aap.org/en/patient-care/immigrant-child-health/?srsId=AfmBOoqearsT-K8yEX0uUToe6c1KAhWQyreVqkWINDt2SmJdKzO3_iWO)

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# Higher risk for EBLLs in immigrant/refugee children

- Predictors of EBLL include country of origin, country of last residence, and age
  - India, Afghanistan, Burma, and Nepal
- Refugee children are at continued risk for ongoing lead exposures after arrival in the United States.
  - One analysis of lead exposure among refugee children (n=705) 0–16 years of age in Syracuse, NY, found that 6.3% children had an EBLL at follow-up but had a BLL <5 µg/dL at the initial screening

# How about in Ohio?

- NE Ohio, n=19,753 children < 6 years of age
  - 3.2% had blood lead levels > 5 mcg/dL
  - 6.1% had blood lead levels > 3.5 mcg/dL
- Children of refugee and resettled families (compared to non-RRF)
  - 3.62 [95% CI 1.84-7.13] times as likely to have BLL > 5 mcg/dL prevalence
  - 6.72 [95% CI 2.60-17.40] times as likely to have BLL > 5 mcg/dL during study follow-up

Shakya, S., Ojha, S., White, P.C. et al. Relationship Between Primary Language Spoken at Home and Blood Lead Levels in Children from Northeast Ohio, United States: A Retrospective Cohort Study. *J Immigrant Minority Health* 25, 733–743 (2023). <https://doi.org/10.1007/s10903-022-01432-7>

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# Food Insecurity

- Increased reliance on self-stable foods means...
  - Increased risk for iron deficiency anemia
  - Decreased access to natural sources of vitamin C and calcium
  - Decreased variability of diet may lead to overconsumption of contaminated foods
    - Applesauce
    - Fruit purees
    - Cinnamon

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# Food Insecurity

- Increased reliance on food pantries means...
  - Increased exposure to donated game-hunted meat
    - Ohio food bank system received over 100,000 lbs venison in 2023-2024
- 15% of donated venison in Wisconsin food banks had lead ammunition fragments on xray analysis (US Dept Health, 2008)
  - Minnesota conducts xray screening of all donated meat
  - Iowa provides warning labels
  - Ohio currently has no safety regulations

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“Lead poisoning is a  
public health problem  
with a housing solution”

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