

Lead Poisoning in 2023: Where Are We Now? Where Are We Going?

Stanley J. Schaffer, MD, MS
Director, Western New York Lead Poisoning Resource Center,
Rochester Office
Department of Pediatrics, Golisano Children's Hospital
University of Rochester

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MEDICINE *of* THE HIGHEST ORDER



Uses of Lead

Lead is a naturally occurring element

Lead has been used in hundreds of ways, including:

Pipes/plumbing

Ammunition

Pewter and bronze

Leaded glass/crystal

Building material

Inks and dyes

Sweetener

Cosmetics

Traditional medicines

Paints and glazes

Gasoline anti-knock agent

Radiation shields

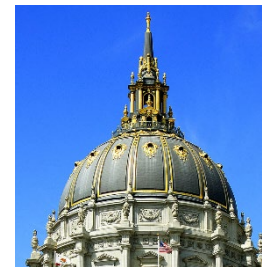
Car batteries

Plastics



Lead has no use in the human body

All forms of lead are TOXIC to people and animals



We've Known About the Harmful Effects of Lead for a Long Time

- Lead is a poison that has no useful role in the human body. It can cause seizures, mental confusion, coma and death if there is significant exposure.

“Lead makes the mind give way.”

-- Dioscorides – 2nd Century B.C.

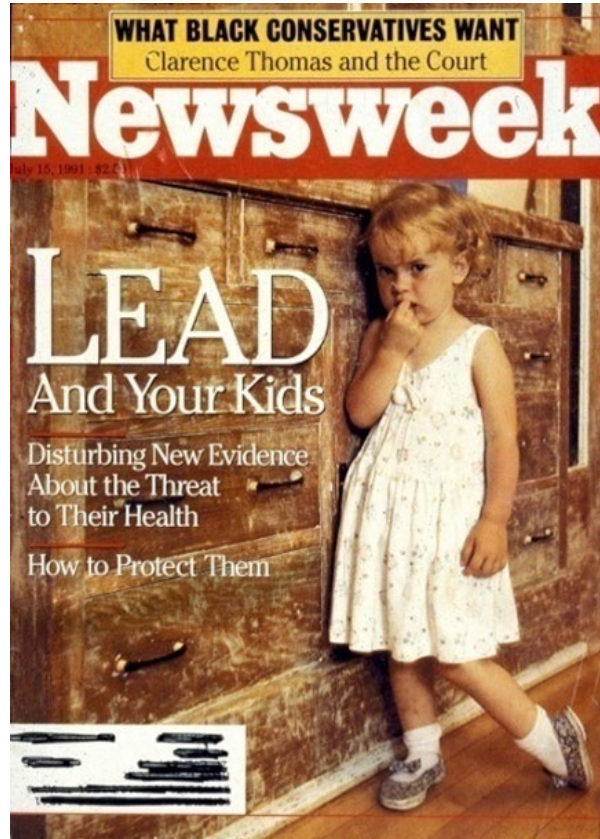
- Exposure in the home environment can be harmful

A Plea for Painted Railings and Painted Walls of Rooms as the Source of Lead Poisoning Amongst Queensland Children

--J. Lockhart Gibson, *Australasian Medical Gazette*, April 20, 1904

- The U.S. was very slow to address the lead problem
Lead paint was outlawed in most European countries in early 1920s after the League of Nations recommended it be banned due to the danger of lead poisoning.
Lead paint only outlawed in the U.S. in 1978

The Problem Is Still With Us



1991

25
Years
→



2016

Who Is Mostly Affected by Lead?

- Lead exposure mostly targets low socioeconomic status inner city minority populations, especially children
 - Their families tend to rent rather than own their own homes
 - Rental properties in low-income areas are often in poor condition
 - The brains of young children are rapidly developing, so lead exposure in the first 3 years of life can be devastating
 - Often these children are iron-deficient or have little calcium in their diets. Since iron and calcium compete with lead for GI absorption, they are likely to absorb more lead in the GI tract
- Lead exposure has affected multiple generations in these populations

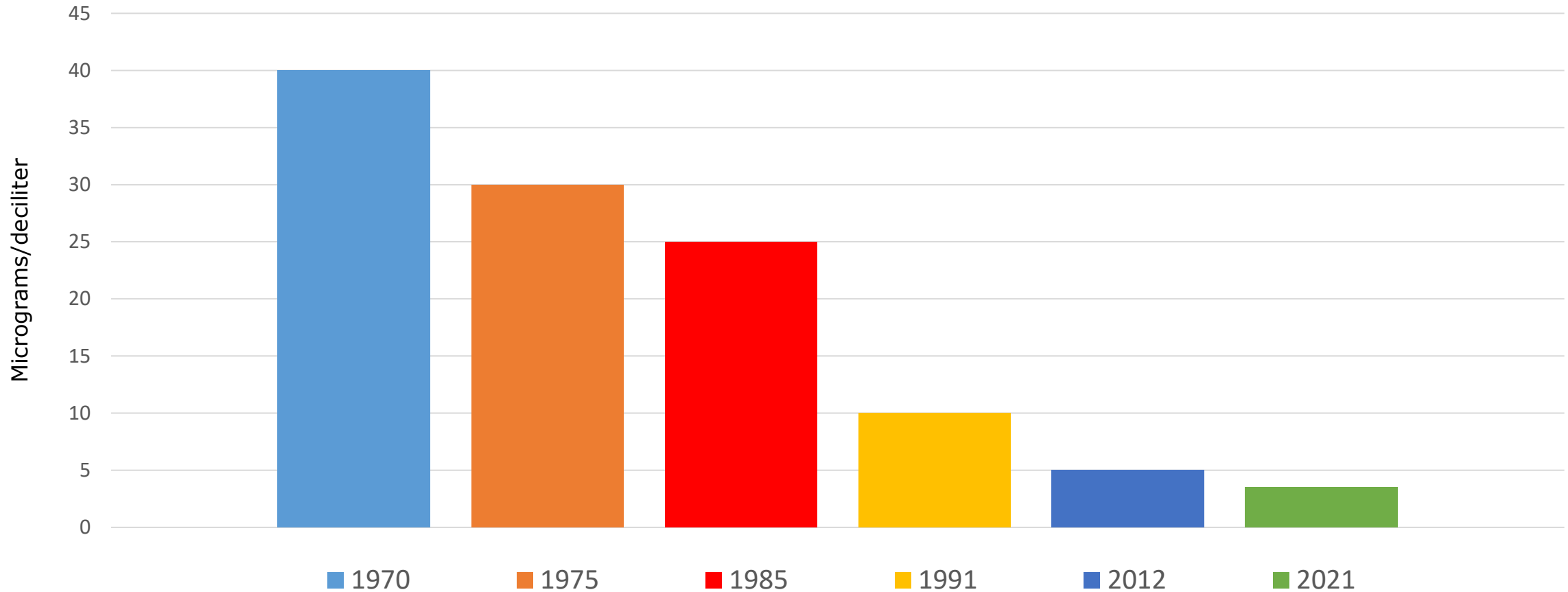
Why Are We Still Talking About Lead in 2023?

We have learned that:

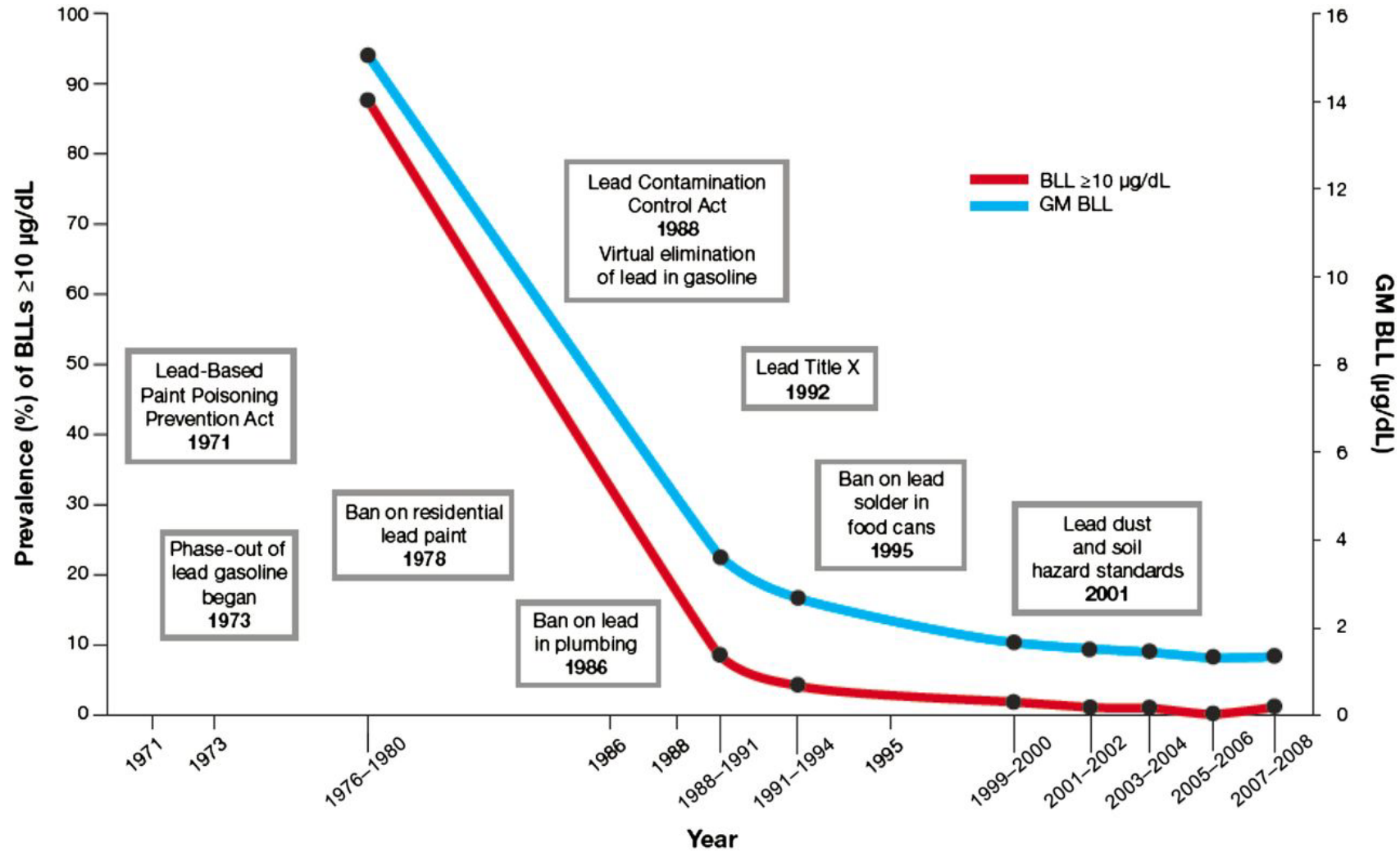
- Many of the effects of lead exposure can occur at low levels of exposure
- Cumulative exposure over time predicts long-term outcomes
- There is no known threshold for adverse effects
- Effects of lead exposure early in life can be severe and permanent
- There is no effective treatment to overcome the adverse effects of lead poisoning. Chelation, performed for BLLs ≥ 45 ug/dL, can reduce the body's lead burden, but it does not reverse the adverse effects of previous exposure.

What Is Considered An Elevated Blood Lead Level?

Cut-Offs Delineating Elevated Blood Lead Levels per CDC



National Progress in Reducing Lead Exposure

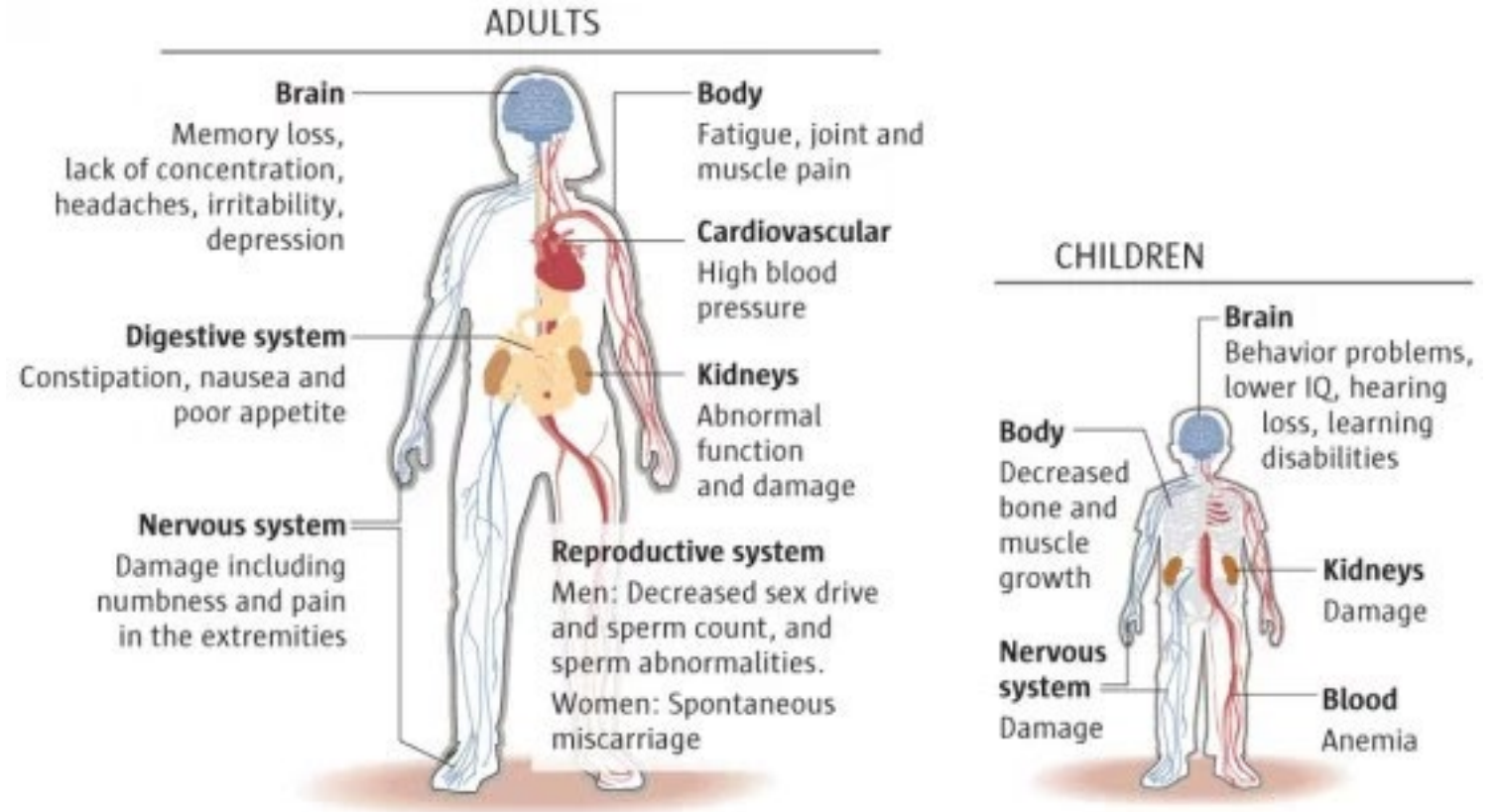


Health Effects of Lead

At very high levels, lead can cause encephalopathy, seizures, coma or death.

Lead can also affect many body systems:

- Renal (hypertension)
- Hematologic
- Endocrine
- Gastrointestinal
- Reproductive
- Cardiovascular
- Skeletal
- Neurologic
- Auditory



The Long-Term Effects of Lead Exposure in Early Childhood on the Brain

Later neurological effects of low levels of lead exposure in childhood include:

- Irreversible loss of IQ
- Auditory processing difficulty
- Attention problems & distractibility (ADHD)
- Poor control of emotions, lack of impulse control
- Aggressive behavior and conduct problems
- Increased likelihood of dropping out
- Delinquency
- Incarceration



For unknown reasons, the effects are generally more pronounced in males.

Lead's Effects on IQ

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812

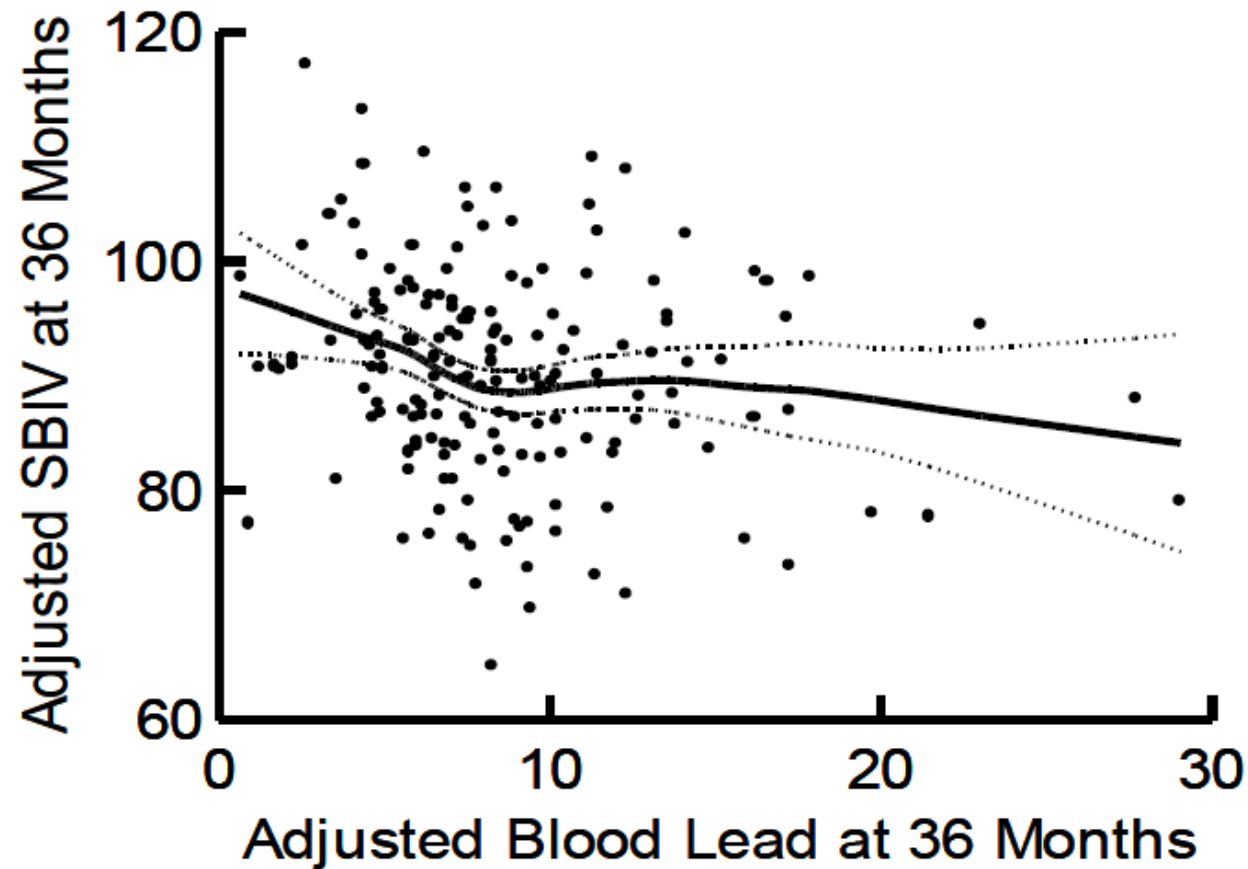
APRIL 17, 2003

VOL. 348 NO. 16

Intellectual Impairment in Children with Blood Lead Concentrations below 10 μg per Deciliter

Richard L. Canfield, Ph.D., Charles R. Henderson, Jr., M.A.,
Deborah A. Cory-Slechta, Ph.D., Christopher Cox, Ph.D., Todd A. Jusko, B.S.,
and Bruce P. Lanphear, M.D., M.P.H.

The Effects of Low Level Lead Exposure on IQ in Young Children



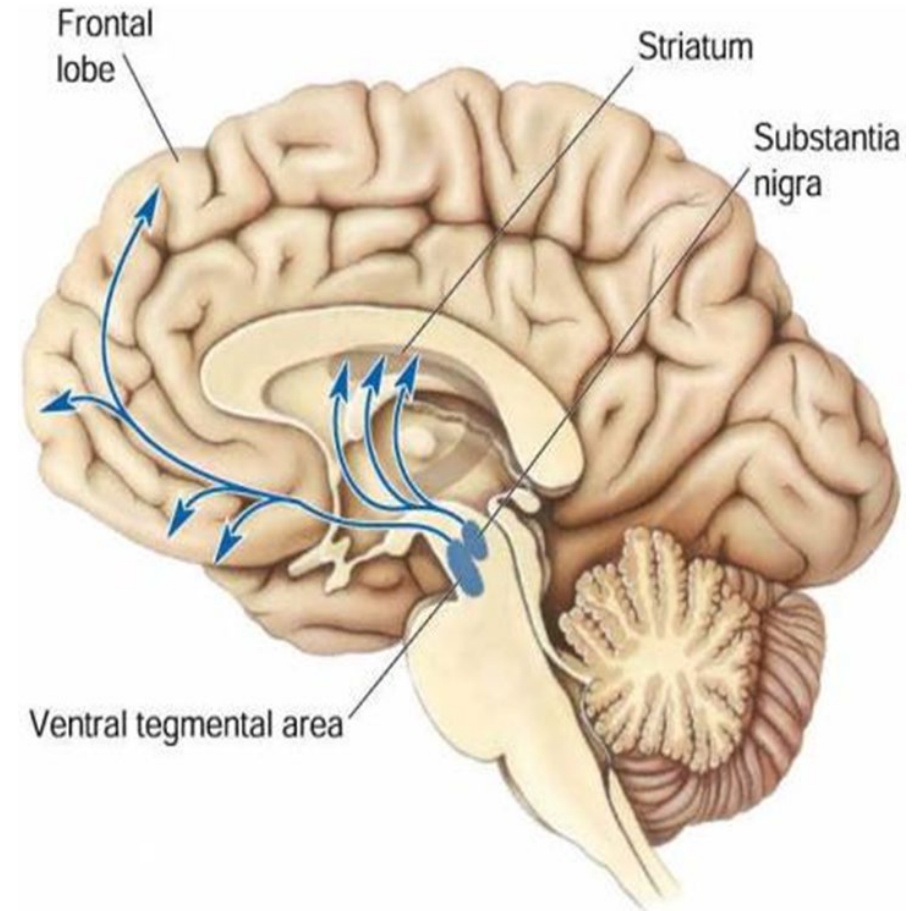
Canfield RL, Henderson CR, Cory-Slechta DA, Cox C, Jusko TA, Lanphear BP. *NEJM*. 2003;348:1517-1526

Neurobiological Mechanisms: the Mesocorticolimbic Dopamine System as a Target of Lead

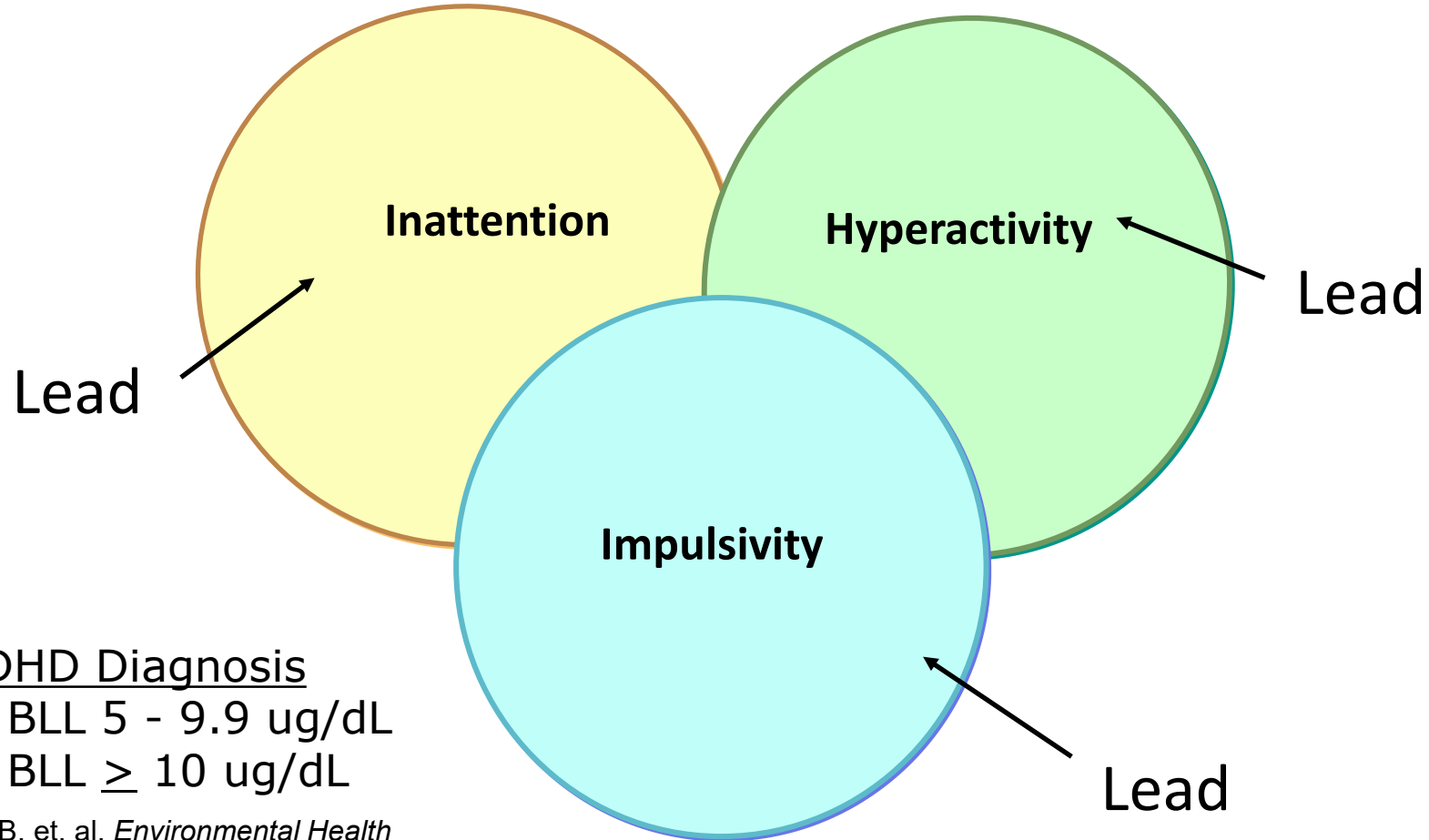
Mesocorticolimbic system:

- ◆ Learning
- ◆ Executive Function
- ◆ Attention
- ◆ Decision-making
- ◆ Reward
- ◆ Addiction
- ◆ Impulse control

Dopamine neurotransmitters in the mesocorticolimbic system are highly sensitive to lead



Lead Exposure and ADHD



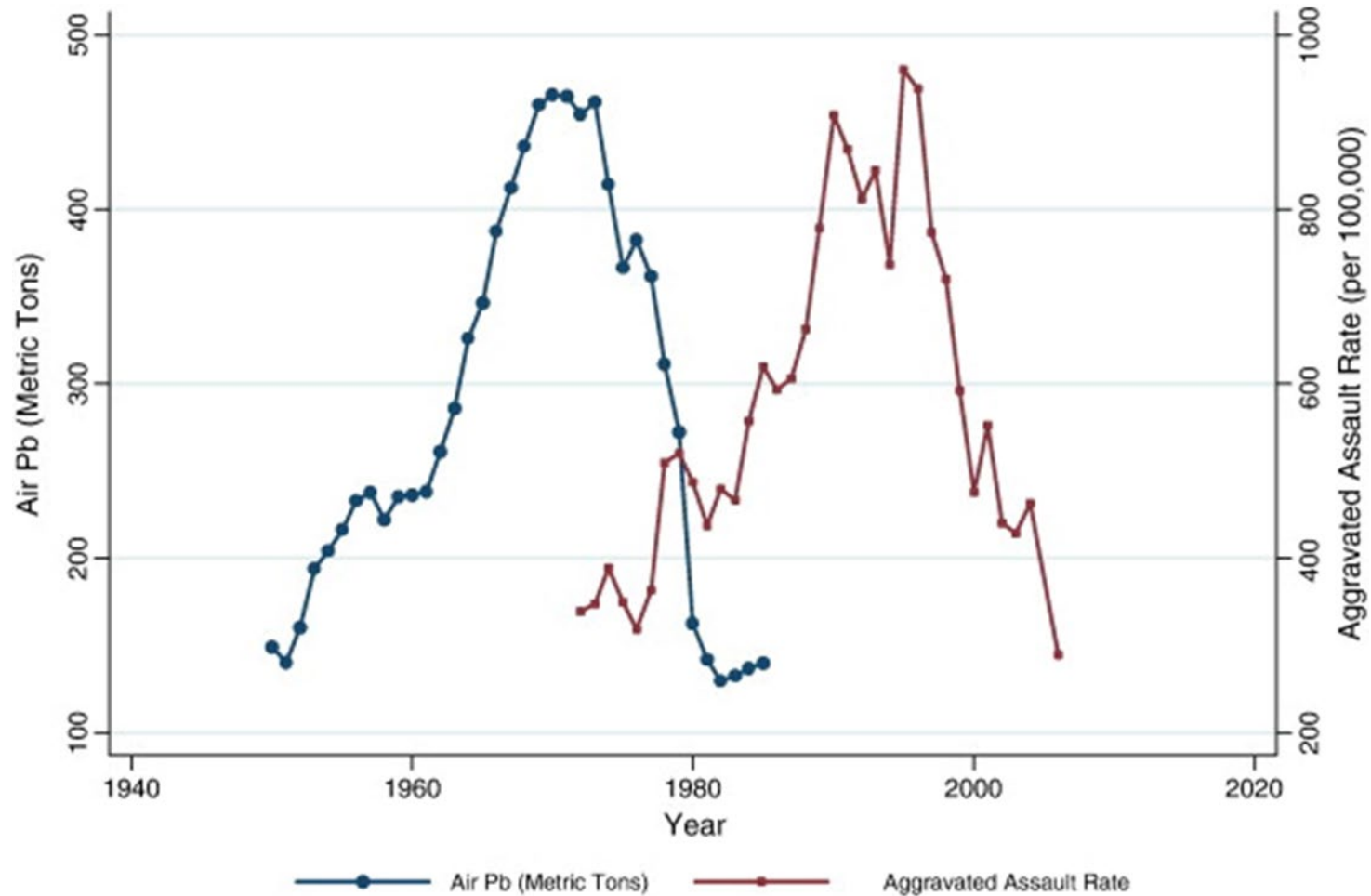
Likelihood of ADHD Diagnosis

5.2x as likely if BLL 5 - 9.9 ug/dL

7.2x as likely if BLL \geq 10 ug/dL

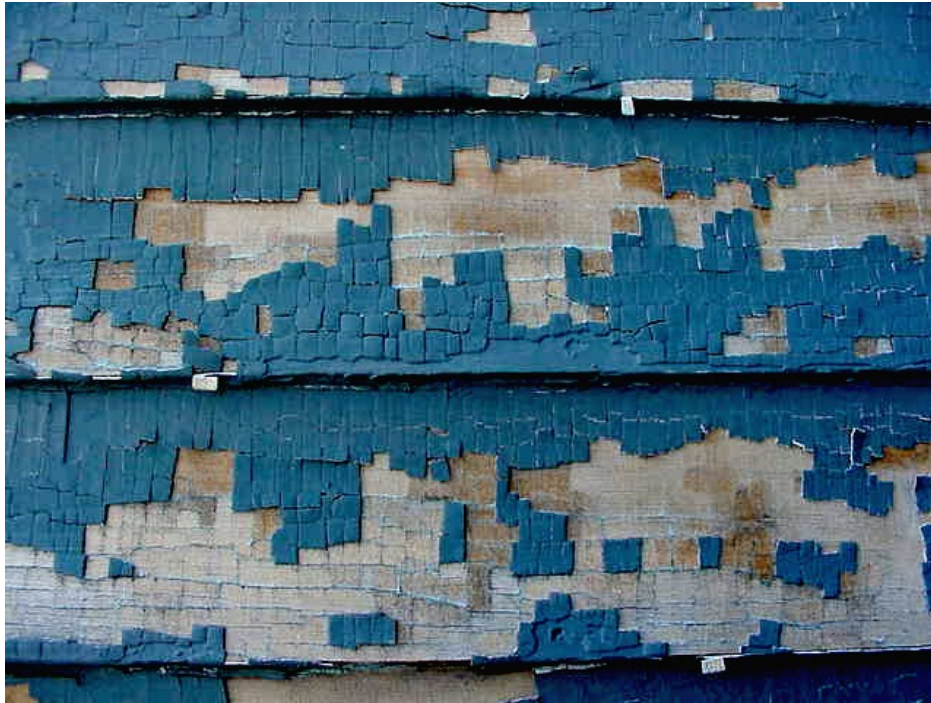
Wang HL, Chen XT, Yang B, et. al. *Environmental Health Perspectives*. 2008; 116:1401-1406.

Air Lead Emissions and Aggravated Assault Rates: A 22 Year Lag



Sources of Lead Exposure Today: Housing

Peeling or Chipping Paint or Lead-Containing Dust



Other Common Sources of Lead Exposure Today

- Lead-containing dust trekked or blown into homes or from friction caused by opening and closing windows
- Contaminated soil
- Water contaminated by degrading lead pipes or lead solder
- Imported foods and cosmetics
- Jewelry containing lead
- Toys containing lead
- Stationary industrial sources and airports

What About Water?

Sources of lead in water:

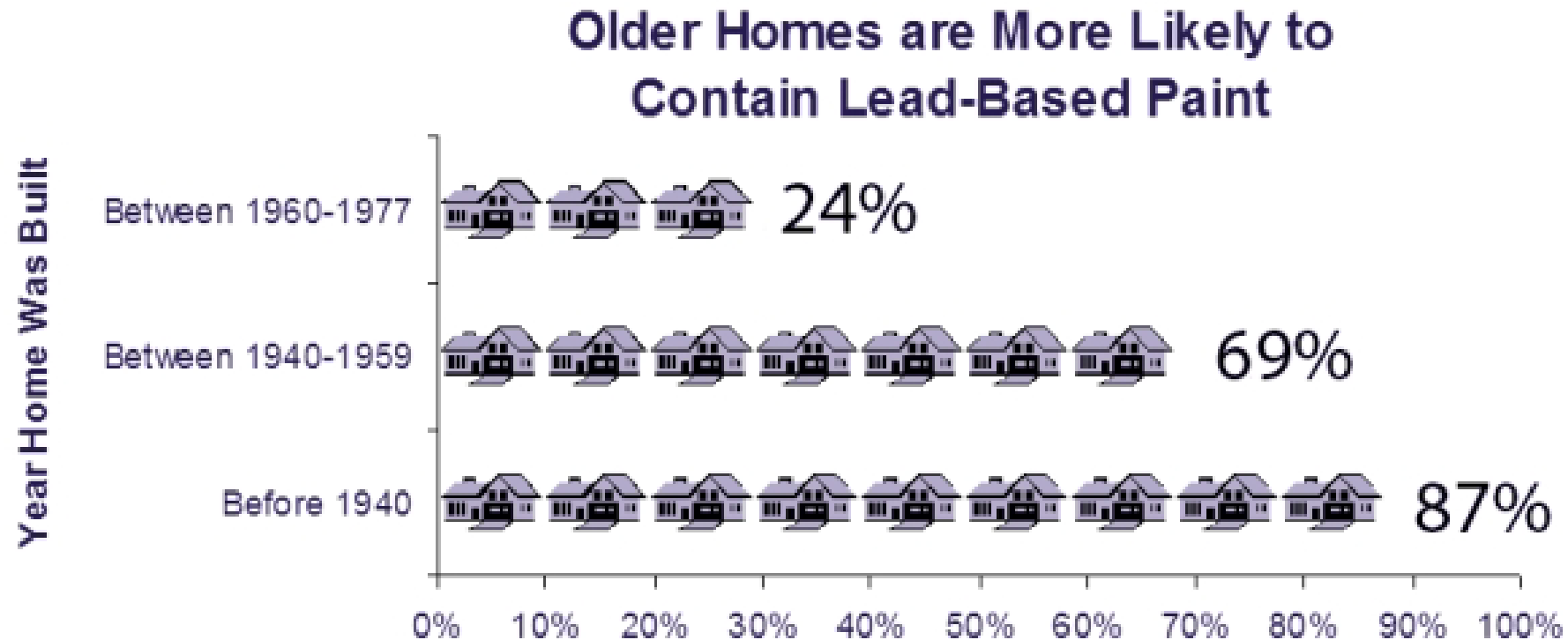
- Dispersal from lead-containing pipes and solder
 - Lead service lines
 - Pipes in homes
- Dispersal from plumbing fixtures in the home

Tips:

- *Run cold water in kitchen faucet for 2 minutes each morning before using the water*
- *Use a water filter certified to filter our lead*



The Older the Home, the Greater the Chance of It Having Surfaces Containing Lead Paint



NYS Housing

New York State has the largest percentage of older housing in the U.S

75% built before 1978
45% rental units



US Census 2018 American Community Survey 5 year estimates
(<https://data.census.gov/>)

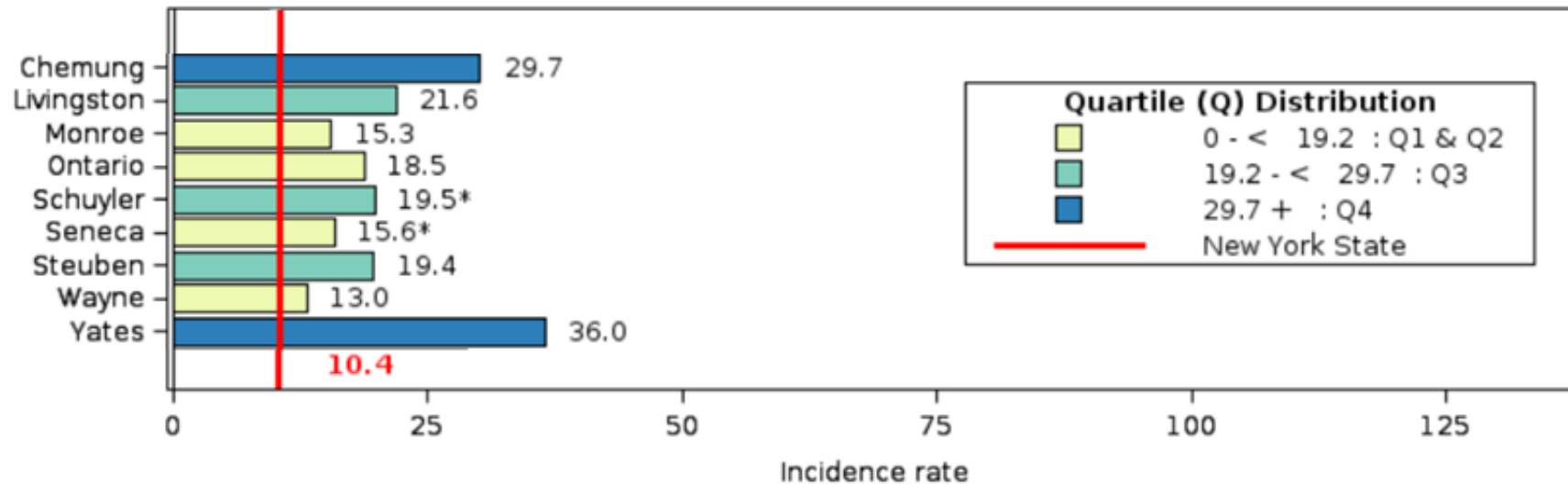
Childhood Blood Lead Testing Rates in NYS and Finger Lakes for Children Born in 2017

| Children born in 2017 | 9-17 Months Old Tested, % | 18-35 Months Olds Tested, % | Tested $\geq 2x$ by 36 Months, % |
|---------------------------|---------------------------|-----------------------------|----------------------------------|
| Finger Lakes (8 Counties) | 60.0 | 66.4 | 46.9 |
| Monroe County | 77.5 | 77.4 | 64.1 |
| New York State | 75.6 | 75.3 | 62.4 |

Source: NYS Community Health Indicator Reports
www.health.ny.gov/statistics/chac/indicators

Elevated Blood Lead Levels in Finger Lakes Region

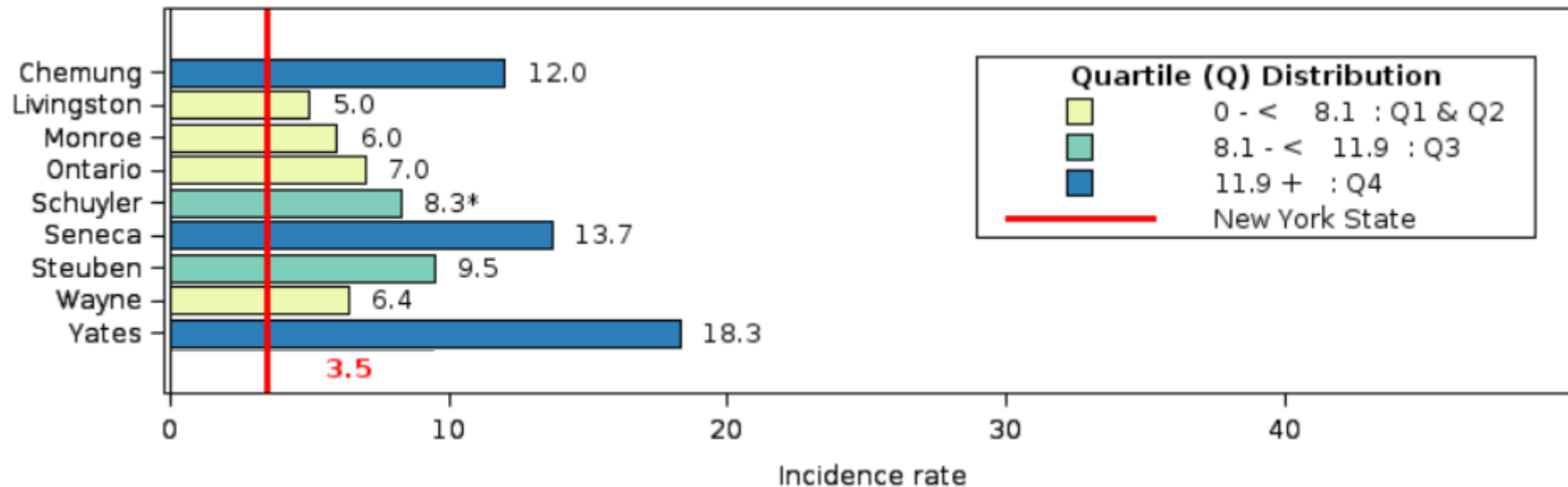
Incidence of confirmed high blood lead level (≥ 5 ug/dL) –
Rate per 1,000 tested children aged <72 months, 2020



*Fewer than 10 events in the numerator, therefore the rate/percentage is unstable
Source: NYS Community Health Indicator Reports www.health.ny.gov/statistics/chac/indicators

Elevated Blood Lead Levels in Finger Lakes Region

Incidence of confirmed high blood lead level (≥ 10 ug/dL) –
Rate per 1,000 tested children aged <72 months, 2018-2020



*Fewer than 10 events in the numerator, therefore the rate/percentage is unstable

Source: NYS Community Health Indicator Reports www.health.ny.gov/statistics/chac/indicators

Role of Public Health

At blood lead levels < 45 $\mu\text{g}/\text{dL}$, there is no treatment is to reduce exposure, so medical providers must collaborate with and rely heavily on public health interventions.

As of October 1, 2019, Local Health Departments in New York are required to provide care coordination and environmental management to children with venous lead levels of 5 $\mu\text{g}/\text{dL}$ and above. Environmental inspections include the child's home and other locations where they spend significant time.

Prevention is Key But is Both Costly and Cost-Effective



Potential Savings of Getting Rid of Lead



Addressing Lead Means Overcoming the Silo Effect



Since lead poisoning is a problem that crosses disciplines affecting health, education, the environment, housing and the criminal justice system, it is not someone else's problem; it's everyone's problem.

Importance of Collaboration

Assemble key players and re-establish a functioning lead coalition:

- City and/or County Government
 - Health Department
 - Housing Department
 - Water Department
 - Code Enforcement
 - City Council members
- Educators
 - School Districts
 - Preschool and Head Start Programs



Importance of Collaboration

Assemble key players:

- Healthcare Providers
 - Physician Organizations and Accountable Care Organizations
 - Hospital Systems and Medical Schools
 - Insurers
- Neighborhood Organizations
- Media
- PR Professionals
- Community Foundations



Key Factors

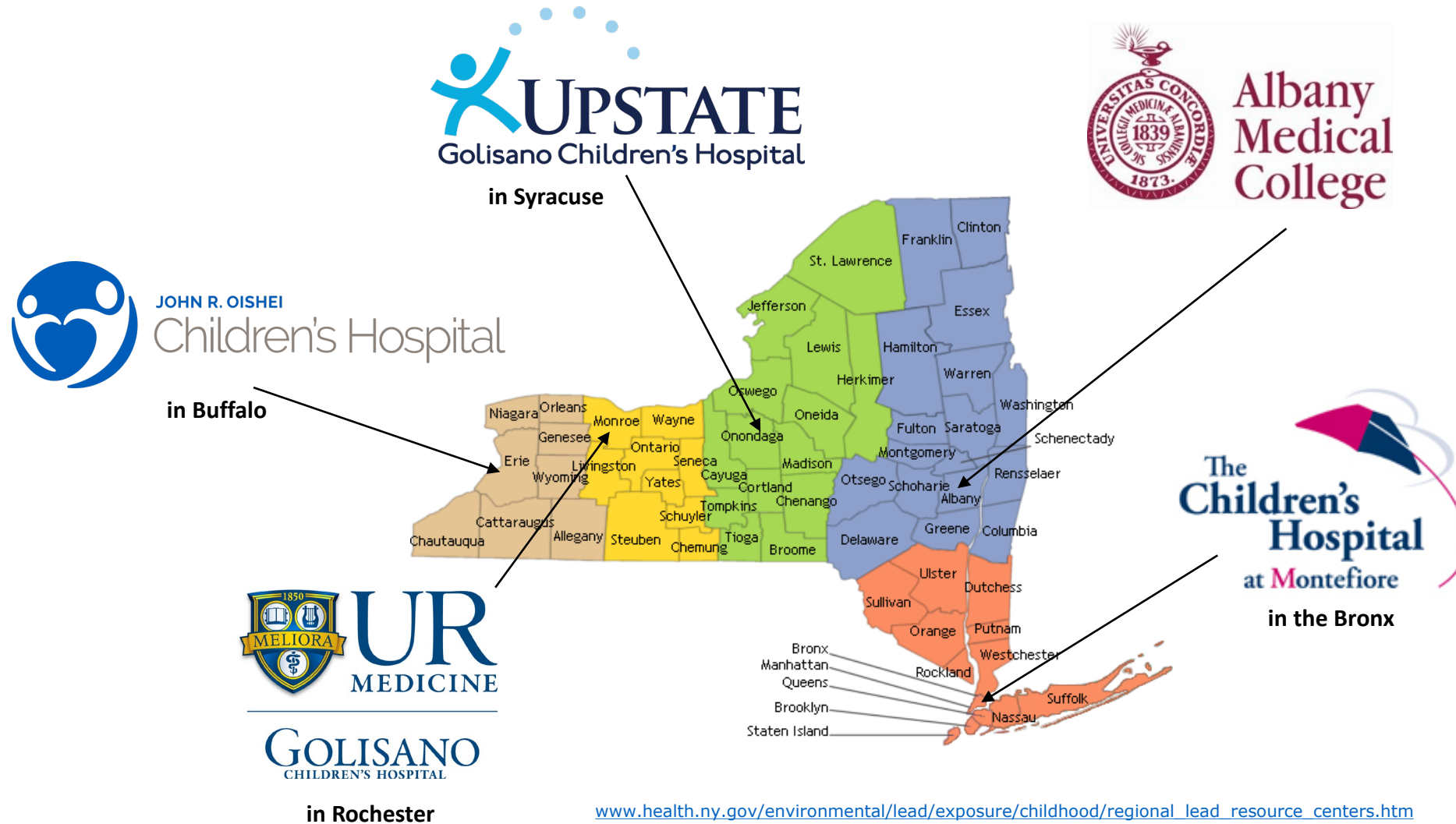
- Emphasize always that the focus is on children and their future
- Importance of having and regularly reviewing data
- Follow the science and insist on best practices
- Build upon each person's area of expertise
- Set realistic goals
- Get folks to commit to working together over the long term
- Develop laws and regulations to ensure safe housing (e.g., requirements for periodic inspections of rental properties)
- Get the story out

Final Thoughts

- Work to sustain progress over time
- Avoid declaring victory too soon



Role of NYS Regional Lead Resource Centers



www.health.ny.gov/environmental/lead/exposure/childhood/regional_lead_resource_centers.htm

Western New York Lead Poisoning Resource Center's Rochester Office

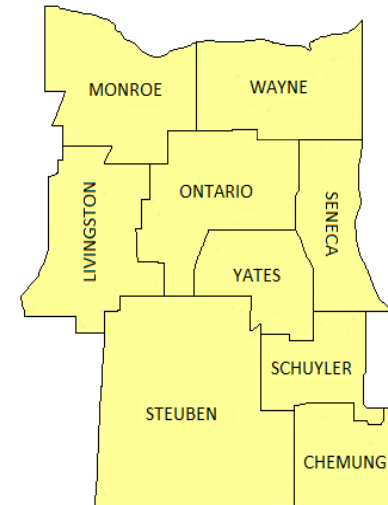
- Serving nine counties in the Finger Lakes region
- Funded by NYSDOH since 1994

Phone: 585-276-3105

Toll Free Number: 877-352-5775

Web: Golisano.urmc.edu/lead-poisoning

We are on Facebook too at facebook.com/roc.leadresourcecenter



Questions?

Our Common Goal

