The Unexpected Consequences of Lead Poisoning on Our Children

February 5, 2020
LeadSafeCNY: How We Got Here

- CNYCF focused for many years on literacy, workforce development and college attainment
- 2015 - Creation of a new local network to focus on healthy homes in Syracuse:
  - GHHI
  - NYS AG Restitution Funding
  - $1m to HHQ to support resident-owned property renovations
- Lead poisoning – children as canaries in the coalmine
- 2018 - CNYCF board committed to new funding initiative to help community move forward
$2m in funding and other support over 4 years

Built environment: windows and doors initiative
- Home Headquarters
- PEACE, Inc.
- Greater Syracuse Land Bank

New affordable housing
- Housing Visions

Sustain the Green & Healthy Homes Initiative local network and key intermediaries
- Home Headquarters – GHHI sponsor

Funding and Strategy

Community/neighborhood engagement and empowerment
- Tomorrows Neighborhoods Today – Grassroots Neighborhood Groups
- WCNY – Public Service Announcements

Workforce development
- Contractors: EPA-certified in lead remediation

Public policy change
- Lead paint ordinance
- Statewide policy network
Lead Poisoning Costs and Consequences
Syracuse, New York

Sandra D. Lane, Ph.D., MPH
Laura J. and L. Douglas Meredith Professor Public Health and Anthropology, Syracuse University
Research Professor, Obstetrics and Gynecology
Upstate Medical University
What is Lead?

- Pb, #82 in the periodic table.
- The safe level for lead in our bodies is ZERO.
- Our bodies treat lead like calcium and iron.
Lead Levels and Risk Over Time

<table>
<thead>
<tr>
<th>Year</th>
<th>Levels (mcg/dl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before 1970</td>
<td>60mcg/dl</td>
</tr>
<tr>
<td>1970</td>
<td>30mcg/dl</td>
</tr>
<tr>
<td>1985</td>
<td>25mcg/dl</td>
</tr>
<tr>
<td>1991</td>
<td>10mcg/dl</td>
</tr>
<tr>
<td>2002</td>
<td>5mcg/dl</td>
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</tbody>
</table>
Lead in Egypt

• In my study of blinding eye disease in rural Egypt (1986-8), women used galena (lead sulfide) as an eye makeup and remedy for eye irritation, called “Kohl.”

• Study of children in a daycare ages 1-3 years, Cairo, 1989:
  - Mean lead level 30mcg/dl
  - Range 15-49 mcg/dl

• Illegally operating lead smelting plant on the edge of the city

https://www.npr.org/sections/health-shots/2013/11/22/246706295/eye-make-up-used-to-protect-children-can-poison-them-instead
Major Sources of Lead in Syracuse, New York

• Older houses: Lead paint is present in most houses build prior to 1978.
  • Most of this exposure is older houses that are poorly maintained. Children most often ingest paint dust from windowsills and door frames.

• Can be present in water, via lead solder in pipes.
  • Especially if the potable water is not treated with anti-corrosives.

• Is in soil around houses.
  • From prior industry and from sanding of external paint.

• Leaded gasoline: phased out in US 1986

(photos: Syracuse.com)
Clifford F. Lord posts a price for leaded gasoline at his station in Everett, Massachusetts in 1955.

[Link to article: theatlantic.com/health/archive/2016/02/an-american-history-of-lead-poisoning/462576]
Lead in Syracuse Children

Figure 52. Percentage of tested children with blood lead levels of ≥5μg/dL, Onondaga County and Syracuse, 2012-2018

Source: OCHD Division of Community Health, Lead Poisoning Prevention Program. Data are preliminary.
HOW MUCH LEAD IS DANGEROUS?

Even low levels of lead exposure can damage the nervous system, and high levels of exposure can lead to coma or death. The Centers for Disease Control and Prevention say there is no safe blood lead level in children. Paint containing lead can deteriorate or chip, leaving traces of lead dust at dangerous levels.

2X TOO MUCH

- Think about a sugar packet
- Picture it filled with lead dust instead
- Spread that little packet equally through 100 10x10 rooms
- That amount of lead dust in each room would still be two times higher than the federal hazard level.

https://www.binghamtonenv.com/article.cfm?ArticleNumber=70
How Much Does Lead Poisoning Cost Syracuse?
(data from 2008)

3. **School Drop Out**: Lead poisoning in young children robs their learning potential. These effects are not reversible and will continue to affect them to adulthood. Among children with elevated blood lead, (10mcg/dl or greater) every 1 mcg/dl of blood lead decreases their school attendance by 0.131 years. **In the SCSD, this would result in an estimated 86 students per year dropping out in the 9th grade.** George Fowler High School, in ZIP code 13204, had the lowest graduation rate (37.6%) of all city high schools (New York State Education Department 2005).

4. **Special Education**: Lead poisoning increases the need for special education. An estimated 20 percent of children with blood lead levels >25 mcg/dl will need special education services for three years each. **Per year, the extra cost for special education caused by lead poisoning is estimated to be $70,000.** In Bellevue Middle School Academy, in ZIP code 13204, one-third (30%) of students require special education services.

5. **Juvenile Justice**: Using findings by Herbert Needleman, MD, an Ohio county estimated that 11 percent of all their juvenile delinquent cases are due to childhood lead poisoning (Stefanak, Diorio, and Frisch 2005). **Per year, in Onondaga County, an estimated $323,758 of local dollars spent on juvenile justice is attributable to childhood lead poisoning.**

6. **Repeat teen pregnancies**: An estimated 38 percent of repeat teen pregnancies in Syracuse are attributable to lead poisoning; **the estimated Medicaid bill for those repeat teen pregnancies is $106,129 per year** (Lane et al. 2008).
Children’s Cognitive Development

SCSD 2018

• 3rd grade reading proficiency=20%

• Graduation rate=65%
  • Of students (n=1413) who have reached 12th grade
  • This represents 44% of the 9th grade cohort of 2013

• 21% of the 3rd grade have “disabilities”

Source: SCSD 2018 report card
Lead Exposure

For every 10 µg/dL increase in BLL, children's IQ was found to be lower by four to seven points.


African American children are overrepresented in special education, in part due to their higher lead exposure.

Minority students in special and gifted education, Committee on Minority Representation in Special Education M. Suzanne Donovan and Christopher T. Cross, Editors, National Academies Press.
Lead and the Brain

• Neurotoxicity from lead poisoning affects not only cognitive capacity but the ability to plan, learn from prior experience, and control impulsive behavior, and creates impairments that are collectively termed deficits in “executive function”

• Observational studies with exposed children have found associations between lead exposure and what has been variously termed impulsive behavior, delinquency, and aggressive/anti-social behavior
Lead-associated Behavioral and Emotional Problems in Children

![Graph showing percentage of behavioral issues in children with different levels of lead in their dentine]

Class | Dentine lead (ppm)
--- | ---
1 | < 5.1
2 | 5.1–8.1
3 | 8.2–11.8
4 | 11.9–17.1
5 | 17.2–27.0
6 | > 27.0


Source: https://www.urmc.rochester.edu/MediaLibraries/URMCMedia/childrens-hospital/lead%20center/documents
From the Cincinnati Lead Study (1979-2014)
John Paul Wright, Ph.D
n=250 children living in an impoverished area of the city
ELA Scores
Elevated Blood Lead Levels among Tested Children, by Census Tract

Syracuse, NY, 2017


Data notes: Includes unconfirmed fingersticks. Location data represent address provided at time of testing. Census Tracts with fewer than 10 children tested were suppressed. 2017 data are provisional.
Table 2

Logistic regression results (odds ratios and 95% confidence intervals) for models using repeat pre

<table>
<thead>
<tr>
<th>Predictor variables</th>
<th>Model 1:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Repeat pregnancy</td>
</tr>
<tr>
<td></td>
<td>(n = 462)</td>
</tr>
<tr>
<td>Childhood lead level (20+ μg/dl vs. 0–19 μg/dl)</td>
<td>1.59 (1.04, 2.43)</td>
</tr>
<tr>
<td>Mother’s race/ethnicity (African-American vs. white)</td>
<td>1.46 (1.25, 1.71)</td>
</tr>
<tr>
<td>Mother’s age, years (18–19 vs. 15–17)</td>
<td>1.45 (.95, 2.21)</td>
</tr>
<tr>
<td>Medicaid (Medicaid vs. private insurance)</td>
<td>1.70 (1.06, 2.73)</td>
</tr>
</tbody>
</table>

Data in parentheses are 95% confidence intervals.
Health Disparities Due to Lead

Some of the damaging effects of lead exposure

The Centers for Disease Control and Prevention states no level of lead is safe in adults and children. Often symptoms of lead exposure may not appear, but damage can still occur. Although rare, lead poisoning can cause a coma, seizure or death.

**Children**
- **Brain**
  - Behavior problems, lower IQ, hearing loss, learning disabilities
- **Body**
  - Decreased bone and muscle growth
- **Nervous system**
  - Damage
- **Kidneys**
  - Damage
- **Blood**
  - Anemia

**Adults**
- **Brain**
  - Memory loss, lack of concentration, headaches, irritability, depression
- **Body**
  - Fatigue, joint and muscle pain
- **Cardiovascular**
  - High blood pressure
- **Kidneys**
  - Abnormal function and damage
- **Reproductive system**
  - Men: Decreased sex drive and sperm count, sperm abnormalities
  - Women: Spontaneous miscarriage

© 2014 MCT
Source: Public Health—Seattle and King County; Centers for Disease Control and Prevention; National Institutes of Health; Graphic: Mark Nowlin, The Seattle Times

www.seattletimes.com/gunranges
Prevention of Lead Exposure: The Pediatric Perspective

Travis Hobart, MD, MPH
Medical Director

CNY Lead Poisoning Resource Center
CNY Children’s Environmental Health Center
Objectives

- Identify sources of lead exposure in the environment
- Describe acute and chronic effects of lead exposure
- Describe primary and secondary prevention of lead exposure
- Describe the long term benefits of preventing exposure
Children’s Environmental Health

- Why do we worry about children and their environment?
- Increased susceptibility
  - Physical
  - Biological
  - Social

Lead can be found throughout a child’s environment.

https://www.cdc.gov/nceh/lead/
Why are kids so vulnerable to lead exposure?

- Hand to mouth behavior
- Higher absorption from gut than adults
- Higher levels in brain tissue than adults
- Developing brain is particularly sensitive to the effects

Systems affected

- Neurologic
- GI Hematologic
- Renal
- Endocrine
- GI

Exposure to lead can seriously harm a child’s health.

- Damage to the brain and nervous system
- Slowed growth and development
- Learning and behavior problems
- Hearing and speech problems

This can cause:
- Lower IQ
- Decreased ability to pay attention
- Underperformance at school

https://www.cdc.gov/nceh/lead/
Toxicokinetics

Lead Half-life:
- Blood: 28 to 36 days
- Soft tissues: 40 days
- Bone: >25 years

Pathophysiology in Pregnancy

Figure 3-1. Major Lead Exposure Pathways from Mother to Infant

- Mother
  - Environmental Lead Sources (PAST EXPOSURE)
  - TRABECULAR BONE
  - CORTICULAR BONE
  - Environmental Lead Sources (PAST EXPOSURE)

- WHOLE BLOOD
  - RED BLOOD CELL
  - PLASMA
  - Environmental Lead Sources (CURRENT EXPOSURE)

- INFANT BLOOD
  - UMBILICAL CORD
  - INFANT MILK
  - INFANT BLOOD

- Bone
- Environmental Lead Sources

DIET
The Impact

535,000
U. S. children ages 1 to 5 years have blood lead levels high enough to damage their health.

24 million
homes in the U.S. contain deteriorated lead-based paint and elevated levels of lead-contaminated house dust.

4 million of these are home to young children.

It can cost
$5,600
in medical and special education costs for each seriously lead-poisoned child.

https://www.cdc.gov/nceh/lead/
Progress Has Been Made Over Time

- Lead Contamination Control Act 1988
- Virtual elimination of lead in gasoline
- Lead-Based Paint Poisoning Prevention Act 1971
- Ban on residential lead paint 1978
- Phase-out of lead gasoline began 1973
- Ban on lead solder in food cans 1995
- Lead Title X 1992
- Ban on lead in plumbing 1986
- Lead dust and soil hazard standards 2001
Definition of “Elevated” Has Changed Over Time

https://www.atsdr.cdc.gov/csem/csem.asp?csem=34&po=8
Challenges in New York State

Source: CNY Vitals
NYS Lead Testing and Assessment

- Test all children for lead poisoning at age 1 and **again** at age 2.

- Assess all children age 6 months to 6 years at each well child check for risk of lead exposure using the Risk Assessment Questionnaire. Test children found to be at high risk.

- Educate all families on lead poisoning prevention.
### Percent of NY Children Screened

#### By 17 mos

<table>
<thead>
<tr>
<th>Region 8 Central NY</th>
<th>Count</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cayuga</td>
<td>410</td>
<td>803</td>
<td>51.1</td>
</tr>
<tr>
<td>Cortland</td>
<td>329</td>
<td>461</td>
<td>71.4</td>
</tr>
<tr>
<td>Madison</td>
<td>411</td>
<td>710</td>
<td>57.9</td>
</tr>
<tr>
<td>Oneida</td>
<td>1,749</td>
<td>2,614</td>
<td>66.9</td>
</tr>
<tr>
<td>Onondaga</td>
<td>3,134</td>
<td>5,317</td>
<td>58.9</td>
</tr>
<tr>
<td>Oswego</td>
<td>668</td>
<td>1,335</td>
<td>50.0</td>
</tr>
<tr>
<td><strong>Region Total</strong></td>
<td><strong>6,701</strong></td>
<td><strong>11,240</strong></td>
<td><strong>59.6</strong></td>
</tr>
</tbody>
</table>

#### By 35 mos

<table>
<thead>
<tr>
<th>Region 8 Central NY</th>
<th>Count</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cayuga</td>
<td>490</td>
<td>803</td>
<td>61.0</td>
</tr>
<tr>
<td>Cortland</td>
<td>361</td>
<td>461</td>
<td>78.3</td>
</tr>
<tr>
<td>Madison</td>
<td>432</td>
<td>710</td>
<td>60.8</td>
</tr>
<tr>
<td>Oneida</td>
<td>1,962</td>
<td>2,614</td>
<td>75.1</td>
</tr>
<tr>
<td>Onondaga</td>
<td>4,509</td>
<td>5,317</td>
<td>84.8</td>
</tr>
<tr>
<td>Oswego</td>
<td>821</td>
<td>1,335</td>
<td>61.5</td>
</tr>
<tr>
<td><strong>Region Total</strong></td>
<td><strong>8,575</strong></td>
<td><strong>11,240</strong></td>
<td><strong>76.3</strong></td>
</tr>
</tbody>
</table>
Mining foreman R. Thornburg shows a small cage with a canary used for testing carbon monoxide gas in 1928. (George McCaa, U.S. Bureau of Mines)
Primary Prevention

- There is no “safe” blood lead level
- Children living in poverty and children of color disproportionately affected
- Education on lead poisoning prevention and available community resources
- Abatement is the most effective strategy
Report From Pew Trusts in 2017

<table>
<thead>
<tr>
<th>Intervention for kids born in 2018</th>
<th>Costs</th>
<th>Future Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Removing lead paint from homes of low income children built before 1960</td>
<td>$2.5 Bil</td>
<td>$3.5 Bil</td>
</tr>
<tr>
<td>Ensuring lead safe renovation</td>
<td>$1.4 Bil</td>
<td>$4.5 Bil</td>
</tr>
<tr>
<td>Removing lead pipes from homes</td>
<td>$2 Bil</td>
<td>$2.7 Bil</td>
</tr>
</tbody>
</table>
Conclusion

- Children are uniquely vulnerable to environmental exposure
- Lead is a potent neurotoxin with irreversible long-term effects
- The most effective strategy is primary prevention
- Investment in healthy housing makes a big difference
What’s to Come: A New Lead Ordinance

Frank Ridzi, PhD, MPA
Lead Exposure is a Recurring Challenge to Societies- Not Just Syracuse


https://earthjustice.org/blog/2016-october/the-toxic-legacy-of-lead
Lead Exposure in the Spotlight

• Not just a local problem - Statewide
• In 2016, New York State led the nation in the number of children with elevated blood lead levels at 17,745.
  • New York City accounting for 5,610
• Nearly 80 percent of New York homes were built before 1978
• In Syracuse, 95 percent of all housing units were built before 1980
A ‘WICKED’ SOCIAL PROGRAM THAT REQUIRES VIGILENCE

- Requires a multi-disciplinary approach
  - Such problems are intertwined with other social issues such as poverty
- Wicked problems are never completely solved
- Syracuse and Onondaga County have taken steps to be truly vigilant about lead poisoning and as a result, one that never again will be surprised by lead exposure.

How Prototyping Helps to Solve Wicked Problems

https://link.springer.com/chapter/10.1007/978-3-319-01303-9_8
A STEADY MARCH FORWARD

Why we are supportive of a Lead Ordinance
A STEADY MARCH FORWARD: THE CRITICAL NEXT STEP TO ADDRESS LEAD POISONING IN SYRACUSE

**JULY 2018**
Interior inspections of 1 & 2 family rental units by City

**2020 (INCREASE)**
New Lead Ordinance would make lead hazards a class B housing code violation

**MAY 2018**
Bureau of Administrative Adjudication created by City

**AUGUST 2018**
NYS allows unpaid housing violations to be added to property tax bills

**2019**
New resident & landlord resources

**JUNE & SEPT 2019**
County & District Attorney crackdown on lead violations

**MAY 2019**
County withholds rental assistance from landlords with lead violations

**2012**
Greater Syracuse Land Bank created
Apartments inspected by the Division of Code Enforcement in the city’s Department of Neighborhood and Business Development.

Historically, inspections for one and two unit rental properties were only exterior and visual. Landlords could simply renew their membership on the city’s rental registry with a postcard, vouch for the safety of their dwelling in writing, and pay an annual fee.

This procedure changed in July 2018 with the addition of required internal inspections (A) in order for a location to be placed on the rental registry. It also mandated inspections every three years. It did not, however, make the presence of lead a violation.
• State and local policymakers worked together to create what would be later known as the city’s Bureau of Administrative Adjudication (C).
• In the past, uncorrected housing code violations were practically unenforceable except through housing court, a long and labor intensive process.
• Bureau of Administrative Adjudication changed this such that these fines would now be taken care of by an expedited city administrative process rather than in court.
New New York State legislation signed by the governor has signaled that in the future it will likely be possible for unpaid code violations affirmed by the Bureau of Administrative Adjudication to be added to a landlord’s property tax bill (D).
Unpaid tax bills themselves might be considered weak in terms of enforcement if it had not been for the creation of a land bank several years earlier (E).

This entity has the staffing and capacity to accept the properties that have been seized by the city for unpaid taxes, renovate them and resell them onto the market in strategic ways that complement neighborhood and business development planning.
To add further pressure to landlords, the Onondaga County Executive issued an order in May of 2019 (F) to have the county’s Department of Social Services withhold rent subsidies (such as housing payments) to landlords whose properties have open lead violations.

This expanded from withholding rents for uncorrected lead violations on a unit to cover all units in a property.
in the fall of 2019 the District Attorney’s office began publicly cracking down on egregious landlords with open or uncorrected lead-related violations
$9 million in New Federal resources

Lead Safe CNY’s commitment of $2 million investment going toward a variety of approaches to address the issue:

- New housing construction
- Existing home renovations
- Community outreach and training
- Workforce Development
The final component of this gear train, anticipated in early 2020, would be the introduction of a new city ordinance (B) that would fill a problematic gap by making the presence of lead hazards a violation of city housing code.

Such an ordinance would augment the recently-added interior housing inspections with mandatory dust wipes to check for lead contaminated dust.

Lead dust is a key risk. Children crawl through lead dust and paint chips. When they put their hands in their mouths, they ingest the lead dust, causing lead poisoning.
We are monitoring the hardest hit neighborhoods…
...and tracking progress in targeted neighborhoods
But to see progress on a community-wide level we need systems change.
Further Information:

Lead Ordinance: Public Comment Period
Email: KTowsley@syrgov.net
Website: http://www.syrgov.net
Forum: February 12, 5:30 pm, Common Council Chambers, City Hall

Volunteer
Tomorrow’s Neighborhoods Today: http://www.tomorrowsneighborhoodstoday.org/
HHQ: https://www.homehq.org/

Donate/Share Stories
http://www.leadsafecny.org