

# Preventing Lead Poisoning In Children

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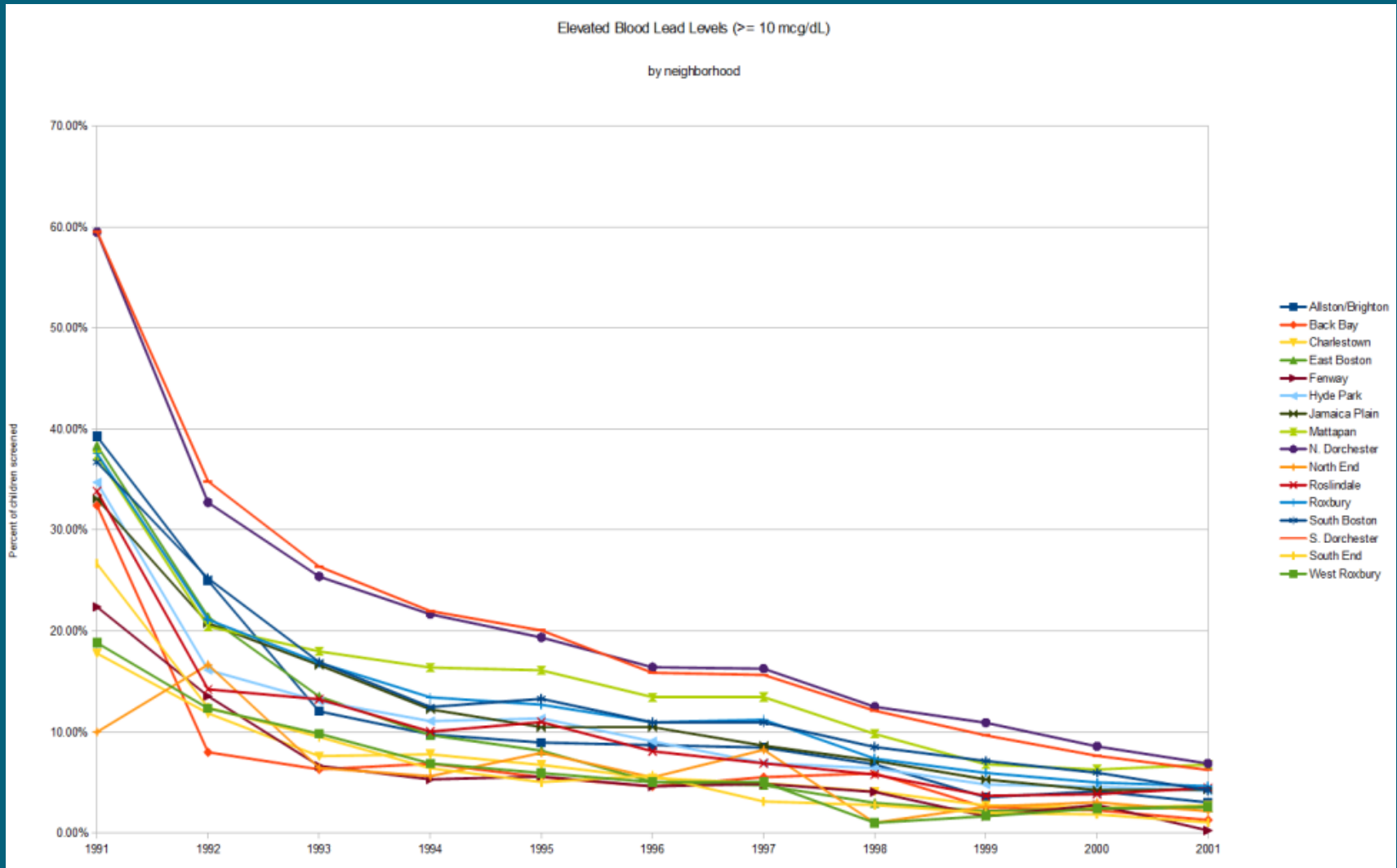
# Objectives of this discussion

- To develop (here) a program to prevent lead poisoning of all Massachusetts' children
- To effectively identify and treat all poisoned children living in or entering the State. (why in this order? Prevention is more powerful)
- Educate all parents, landlords, realtors, regulators and legislators about causes and effects of lead poisoning and how to avoid them
- Design and agree on an integrated, statewide campaign to:
  - Eliminate all lead throughout all housing stock (paint, dust, water, soil)
  - Minimize lead exposure in our children's other environments = back yards, shelters, schools, churches
  - Replace all pipes that contain lead or lead solder and test water routinely
  - Teach the risks and consequences of childhood lead poisoning at different ages, from different environments, and with different blood levels, at prenatal & early childhood visits, in schools and parenting classes, at home visits by public health & educational programs who perform home visits
  - Screen all children per national guidelines
  - Manage infants and children with short and long term lead exposures
  - Legally mandate remediation of all significant lead hazards

# Conflicts of Interest

- None.
- I'm considered an anathema by everyone having related financial interests (except perhaps deleading contractors)

# We're Doing Better But Don't Be Fooled



# Why Then do we need to force so many people to spend so much money to delead?

- If we don't, our children will continue for generations to suffer:
- (at best) low-level lead poisoning with loss of IQ points, challenges to their language acquisition, attention, and visual-spatial skills,
- And (at worst), higher chances of school failure, arrests, incarceration, lower-paying jobs, serious social and financial challenges in life

# We Have Just Begun



# A LITTLE HISTORY

- We have known about the toxicity of lead and its sweetness for millenia
- Rome may have fallen because Romans made their wine tasty by adding lead
- Composer Beethoven, painter Goya, President Andrew Jackson may have died of lead poisoning
- Europe banned lead in house paint 100 years ago
- USA refused to until 1978 because it bowed to manufacturing and financial interests

# Last 40 years

- When I was in medical school in the late 60s, the only patients we diagnosed with lead poisoning were seizing or dying
- Epidemiological and statistical studies started showing that most people in this country were poisoned because of exposure to paint and car exhaust
- Levels of concern started at  $>45$ , dropped to  $>0$
- We started screening, and discovered strong associations of “low” lead levels with attention deficits, language delays, behavior disorders and mental health problems, incidence of crime



# TYPICAL CASES WE'VE SEEN IN THE LAST MONTH

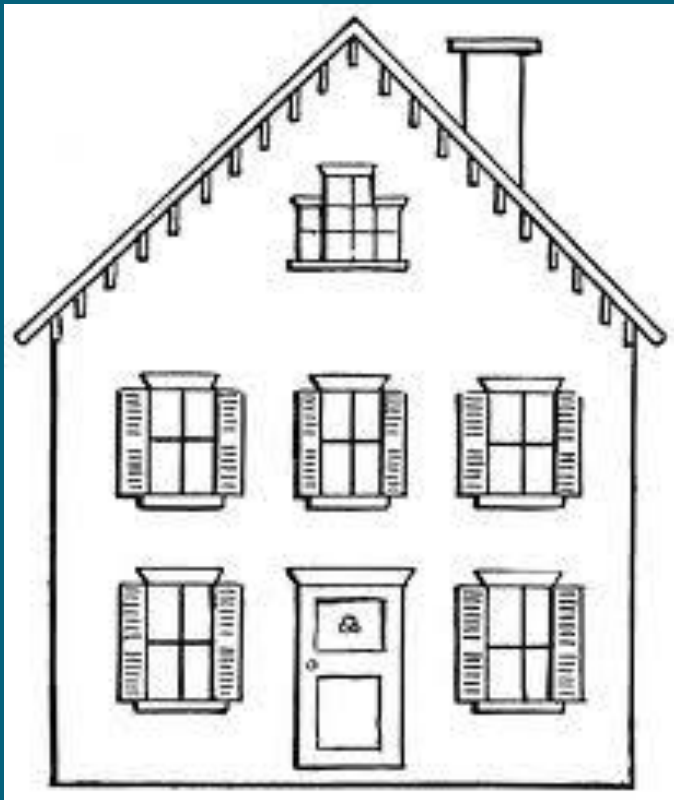
- 18 month old with a lead level of 20 on her 18 month screen
- 9 yo from Colombia with a level of 62 after being shot there and having shrapnel in his hip
- 13 yo from Cabo Verde with a screening level of 31
- 10 yo who is failing in school and whose parents want to sue a former landlord

# ESSENTIAL QUESTIONS TO BE ANSWERED

- Where? – wherever children live & play – around their
- homes – inside and out
- Other sources: air, water, soil, solder, batteries, pottery, tiles, glazes, food, medicines, cosmetics
- How? – developmentally common behavior
- = crawling, exploring, mouthing, pica, hugging their dad or mom after work
- When and For How Long?
- At what ages? - fetal life, first 3+ years of life, rest of life
- Are the child's behaviors related to lead poisoning?

# Sources: universal objects

Everywhere in our Houses



Gasoline Fumes and Car Paint



# Household objects

**Pretty Pitchers**



**Nice Old Family Cookware**



# Paint, Woodwork and Renovations

**Your Porch, your Sandbox  
Your School, Your Church**

**Your Home  
Renovations**



# Doors, Windows in and out

**High end,  
Short People**



**Gardens, Food & Water**



# Dust, and not just from next door



# From Outside Home in

**Parents bring lead from  
work  
and  
give it away at Home**



**Bullets  
are made of lead**





# From Outside the USA

**Battery recycling  
in Cabo Verde**



**Mining in Africa**



# Essential Community Industries: Roofing Tiles in Mexico



# Where Does Lead Go and How does it Poison Us?

- Lead gets into the body through the mouth, the air and from the mother
- Gets absorbed through the gut or lungs into the blood, gets into blood cells, esp. RBCs
- Passes into fatty tissues – especially the brain
- Gets bound in deep stores in the brain
- The body slowly excretes lead through the urine

# A little Chemistry

- Lead looks like other divalent cations, eg, Calcium, Iron, Zinc and others with two positive charges
- It competes with, interferes with the essential activities of these other essential elements
- For instance, it competes with iron in the synthesis of heme
- It fouls up nerve transmission across synapses

# Multigenerational toxicity

A **young girl** finds lead, likes it (it's sweet and chewy), eats more

- Girl **grows up** (not as bright as she would have been if not poisoned), **gets pregnant**
- Her body “mobilizes” the lead into the blood and passes it to the fetus, **poisoning the next generation**

# What does Lead Poisoning Do to children?

- Biggest increase in effect is from a lead level of nothing (0) to a lead level of something
- There is **NO SAFE LEVEL OF LEAD**
- For every increase in level of 10, children lose approximately 4 IQ points (statistical average)
- Specific problems caused = decreased attention, language acquisition, visual-spatial skills, impulse control
- Resulting in poorer school performance, lower likelihood of graduating HS, crime, job success

# Increasing Toxicity

- At lower levels, **2-40**, we cannot identify the specific contribution of lead poisoning to ADHD, school difficulties, etc.
- Social, educational, emotional, genetic, and nutritional factors are all contributing
- By levels of **40-60**, you can get stomach pains, ataxia, dizziness
- At levels of **60 - 200**, you can get somnolence, headaches, seizures, coma, and death

# How do we **manage** children with levels between **0 – 10?**

- >0 but less than 10:
- Discuss issue with parents
- Stress keeping child away from peeling, chipping paint, anywhere, even furniture or old toys
- Urge careful cleaning of house with Spic & Span or other household cleaner, not cooking with old pots
- Feed foods rich in iron (why?)
- Repeat lead and CBC in 3-2 months (or sooner if you suspect increased risk)



# How do we **manage** Children with Levels **10 – 25?**

- **>10 – 25:** Repeat all of the above, ask about other sources, grandmother's place, day care
- Ask about pica, parents' work and good hygiene, recent or nearby renovations, proximity to an auto body shop or heavy work area (close windows on that side)
- Consult Regional Lead Poisoning Prevention Program
- Ask parents to press landlord to inspect and delead the home
- Start child on 2-3 mg/kg of elemental iron a day

# What if the parents don't want to have an inspection?

- ENCOURAGE them to clean with household soap, act on their children's behalf
- LISTEN - are they afraid to lose their housing Because they are not living legally in that unit?
  - Are afraid that their hosts / relatives will be evicted?
  - Are afraid that they will be harassed or evicted?
- EDUCATE – law is on the tenant's side, but not that strongly
- ADVOCATE - Help families get all the help available

# How do we **manage** Children with Levels **25-50?**

- All of the above
- Now the State can intervene, require a home inspection and deleading by certified contractor
- Refer to us, and we will chelate with DMSA (Chemet) – 3 doses a day for 5 days, then 2 doses a day for the next 14 days
- (What is the evidence that chelation helps?)
- Repeat lead level after re-equilibration (10-14 days later) - (iron therapy is suspended during chelation – restart Fe after chelation till level <10)
- Lead level should drop 6-7 ug/dl each chelation

# How do we **manage** Children with Levels > 50?

- Admit for chelation (no more provocation tests)
- Level below 60, CaNa<sub>2</sub>EDTA (iv preferably) x 5 days
- Level above 60, chelate with BAL x 3 days (started a few hours before EDTA) and EDTA for 5 days)
- Level likely to drop 20+ ug/dl
- Will have to re-chelate, probably with oral DMSA if lead level < 50 or 55

# Effects of Chelation

- Lead is chelated from the blood not the other compartments
- Lead is constantly re-equilibrating between stores and blood and urine
- Remember that there may be lead in the GI tract as well – must check and clear the gut
- Remember also that we are usually sending children back to lead contaminated homes and communities
- Lead also causes anemia because it blocks several of the steps in heme synthesis. Iron competes with lead at all the enzymatic steps, so we continue iron Rx and food

# Interventions that made a difference

- Screening children routinely (lots of push back)
- 9 mos (why?), 18 mos, yearly till 6 (where?)
- Must be venous, not capillary sampling
- Getting lead out of household paint (lots of push back)
- That battle is over, but there is still lead in car paint
- Getting lead out of gasoline (lots of push back)
- That battle is also over and made a huge difference
- Educating doctors, parents, homeowners, landlords, legislators (lots of ignorance, financial pressures)
- (This battle will not be over in the foreseeable future)
- Passing legislation to make cleaning up the environment easier (massive pushback still)

# Interventions that need to be continuously Reinforced

- Routine discussions *before birth*:
- Do you know if your house has lead?
- If the landlord claims he/she doesn't know, any house built before 1978 has lead in it.
- Very careful renovations – who should do this?
- When must that conversation occur ?
- Who should insist that this be done carefully? The paint companies?
- Who is allowed to renovate? And what are the requirements? Is “Moderate Risk” deleading safe ??
- Official renovations / deleading – with tremendous care when pregnant, children or moms are in house

# When should we be empowered to inspect?

- Whenever renting a housing unit
- Whenever selling a housing unit
- Whenever any child has a lead level above 2, 5, 10, 15 ??
- ?? Even if the likely source is outside the country (the child who died 10 yrs ago after immigrating to the US but was poisoned here)
- Whenever we see an older house with peeling paint



# When should renters and sellers be **required** to delead?

- At every rental or sale - Why should this not be like Title 5?
- In which ways is lead contamination different than an inadequate sewer system?
- If a house is found to have lead, the landlord should have to delead it before renting it to anyone - or only if the next renter has children under 6?
- Can any landlord exclude renters with children?
- If there were realtors who only rent delead homes, should they be given tax or other advantages?

# Should there be a new **tougher law**?

- To reflect the “new” science
- To enable action (inspections and deleading) on all cases of children 0-6 years old with lead levels > 5
- Elimination of loop-holes relating to “official residence”: if a child lives there, legally or not, the unit must be delead
- All actions must be uncoupled from immigration / INS – (the issue is the housing unit not the child or family)
- To prevent owners from discriminating
- To prevent owners from lying about “not knowing”
- To reflect the real financial duties of renters and sellers
- To increase the housing stock available to families with children

# What **Additional Resources** do we need?

- Sufficient **staffing** (inspectors, community health workers, social workers, access to lawyers) to manage each case closely
- More, readily accessible **funds**, or hefty tax breaks for landlords to delead (permanently)
- **Coordination** of oversight with other healthy homes / in-home educational services
- Funding for **Early Intervention** evaluations, and services for any that need it

# EP = Erythrocyte Protoporphyrin

- One of the substrates in heme synthesis
- EP rises when lead blocks the enzymatic step that converts EP to the next compound
- Used to be used as screening tool when lead level of 45 was the level of concern
- Now EP is used to reflect the duration of poisoning – changes more slowly than blood PB – example:

# What do I Train Doctors to Do?

- Educate every parent, every landlord, every realtor that lead is still a problem & know risks, signs and symptoms
- Screen, routinely, at 9 mos, 18 mos, and yearly till 6 years of age if child remains with elevated levels or at risk
- Screen immigrants up to 10 years of age who come from rural areas and/or developing countries where gas is still leaded, children and adults work and play around lead
- Insist that any housing unit a parent rents or buys be delead
- Advocate that all other places children are (day cares, schools, shelters, churches) be delead (some funds available, but we cannot require this to happen <25 ug/dl
- If we are not insistent, this problem will not be solved

# What Can Parents Do?

- Have the knowledge and courage to care, to insist on knowing if there is lead in their homes, insist on getting the lead out
- Learn how to protect their children and themselves
- Enrich their children's environments
- Establish strong, effective discipline
- Access the best schools
- Instill a strong desire in their children to learn

# What does BLPPP do?

- I run the Boston clinic to meet, educate and treat patients and families
- We get all elevated lead levels run by the State Lab
- We are referred many children from their PCPs
- Boston PHC staff, who work with me, go to homes, know most of the addresses in Boston
- Evaluate homes, arrange inspections if legally allowed, perform “lead hazard reductions”, educate families about lead poisoning, etc..
- No longer funded directly

# What should You Do?

- Help us get the lead out of every home, shelter, day care, school
- Work as a team
- If you're not allowed to advocate, find articulate people who can and teach them
- As a citizen, urge legislators to provide more money and tighter laws



