Case: Lead-Based Paint

Use of lead in house paint banned in 1978
Exposure to Lead Paint: Adults

- Adults exposed to lead can suffer from:
  - Nervous system effects
  - Cardiovascular effects, in increased blood pressure and incidence of hypertension
  - Decreased kidney function
  - Reproductive problems (in both men and women)

Source: https://www.epa.gov/lead/learn-about-lead#effects (2017)
Exposure to Lead Paint: Pregnancy

• Lead in a pregnant woman’s body can result in serious effects on the pregnancy and her developing fetus, including:
  – Reduced growth of the fetus
  – Premature birth

Source: https://www.epa.gov/lead/learn-about-lead#effects (2017)
Exposure to Lead Paint: Children

• Main target for lead toxicity is the nervous system. Even very low levels of lead in the blood of children can result in:
  – Behavior and learning problems
  – Lower IQ and Hyperactivity
  – Slowed growth
  – Hearing Problems
  – Anemia

Source: https://www.epa.gov/lead/learn-about-lead#effects (2017)
# Exposure to Lead Paint: Children

<table>
<thead>
<tr>
<th>Classification</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>&lt;10 mg/dL</td>
</tr>
<tr>
<td>Moderately elevated</td>
<td>10-19 mg/dL</td>
</tr>
<tr>
<td>Highly elevated</td>
<td>20-44 mg/dL</td>
</tr>
<tr>
<td>Urgently elevated</td>
<td>&gt; 45 mg/dL; chelation</td>
</tr>
</tbody>
</table>

As of 2012, no safe level, reported at or above 5 mg/dL, children and environments to be monitored.

Source: CDC (2013)
Lead Exposure in Baltimore City 1993

- 95% of housing stock in low income neighborhoods filled with lead paint
- Rate of lead poisoning among children in Baltimore 10-15 times the national average and in some neighborhoods 20-30 times higher.

Source: Pollack (2002)
Lead Exposure in Baltimore City 1993

- 33.9% of children tested had lead levels above 10 mg/dL (Statewide 25%)
  - In certain low income neighborhoods up to 60% of children had elevated blood levels
  - 20% of children had extremely high levels (40 times the national average)

Source: Pollack (2002)
Lead Exposure in Baltimore City 1993

• Kennedy Krieger Institute (KKI) at forefront of treating children exposed to lead.

• In cooperation with Congress, EPA and other relevant Federal agencies KKI designed Repair and Maintenance Study
  – Funded by EPA Office of Pollution Prevention and Toxics and HUD Office of Lead Hazard Control
Repair and Maintenance Study (1993)

• What is the short term (6 months) and long term (24 months) efficacy of lead abatement methods previously proven to be effective in reducing children’s exposure to residential paint and dust?
  – Funded by the EPA
  – Conducted by Johns Hopkins researchers in collaboration with Kennedy Krieger Institute
Repair and Maintenance Study (1993)

- **Repair and Maintenance Properties**
  - Category 1 ($1650)
  - Category 2 ($3500)
  - Category 3 ($6500)

- **City Lead Abated Houses**
  - Previously abated by City of Baltimore (Control 1)
  - Properties built after 1978 (Control 2)

Based on pilot work, expected reductions in lead dust: 89.3.6%, 91.1% and 96.6%
Repair and Maintenance Study (1993)

- Repair and Maintenance Properties
  - Common measures
    - Removal of loose and peeling paint
    - Sealing floors with sealant
    - Aluminum caps on window wells
    - Professional cleaning
  - More extensive
    - Removal and replacement of windows

Source: Pollack (2002)
Repair and Maintenance Study (1993)

• Repair and Maintenance Properties
  – Eligible families: Those living in designated properties or seeking to rent properties with children under 4 years of age.

Source: Pollack (2002)
Repair and Maintenance Study (1993)

• Procedures
  – Enrollment
  – Interviews
  – Blood Testing
    • Follow-up in response to elevated levels

• Families received
  – Small payments, tokens of appreciation
  – Lead-safety education
  – Cleaning supplies
Repair and Maintenance Study (1993)

RESEARCH QUESTION: What is the short term (6 months) and long term (24 months) efficacy of lead abatement methods previously proven to be effective in reducing children’s exposure to residential paint and dust?

• QUESTION 1: Does the research question posed, have social/scientific value?
  – Yes
  – No
Repair and Maintenance Study (1993)

• Why yes?
• Why no?
Repair and Maintenance Study (1993)

- **CASES**
  - Levels of Abatement
    - Category 1 - $
    - Category 2 - $$
    - Category 3 - $$$

- **CONTROLS**
  - Presumed Lead Free
  - Previously Abated
    - Control 1
    - Control 2

- **QUESTION 2:** Will the study as designed answer the research question?
  - Yes
  - No
Repair and Maintenance Study (1993)

• Why yes?
• Why no?
Repair and Maintenance Study (1993)

SAMPLE: Current residents of rental properties and potential renters approached to participate

Levels of Abatement
- Category 1 - $
- Category 2 - $$
- Category 3 - $$$

Presumed Lead Free Previously Abated
- Control 1
- Control 2

• **QUESTION 3:** Were the families being recruited to enroll in the study likely to benefit from the findings?
  - Yes
  - No
Repair and Maintenance Study (1993)

- Why yes?
- Why no?
QUESTION 4: Could family decisions to enroll in the project be adequately informed and free from controlling influence?

– Yes
– No
Repair and Maintenance Study (1993)

- Why yes?
- Why no?
Repair and Maintenance Study (1993)

- QUESTION 5: Could the promise of “trinkets, food [coupons], money” be a controlling influence on family decisions?
  - Yes
  - No

Repair and Maintenance Study (1993)

• Why yes?
• Why no?
Repair and Maintenance Study (1993)

• Findings
  – Lead abatement measures reduced lead dust
  – Blood levels of most children stayed constant or went down, in a few cases they rose
  – Statistically significant reduction in blood lead levels for those who had levels of above and below 15 mg/dL
Repair and Maintenance Study (1993)

• Legacy
  – How to balance protection of subjects with advancing knowledge
  – Measures incorporated into state/local laws and HUD lead safety regulations
  – HUD funded replication in 13 other cities
MARYLAND DEPARTMENT OF THE ENVIRONMENT
CHILDHOOD BLOOD LEAD SURVEILLANCE
STATEWIDE 1993-2014

CALENDAR YEAR
(Number of Children with BLL>=10mcg/dl)
(Number of Children Tested)