De-leading Rhode Island:
Assessing the Health Benefits of Lead Hazard Remediation

Thesis Defense Presentation
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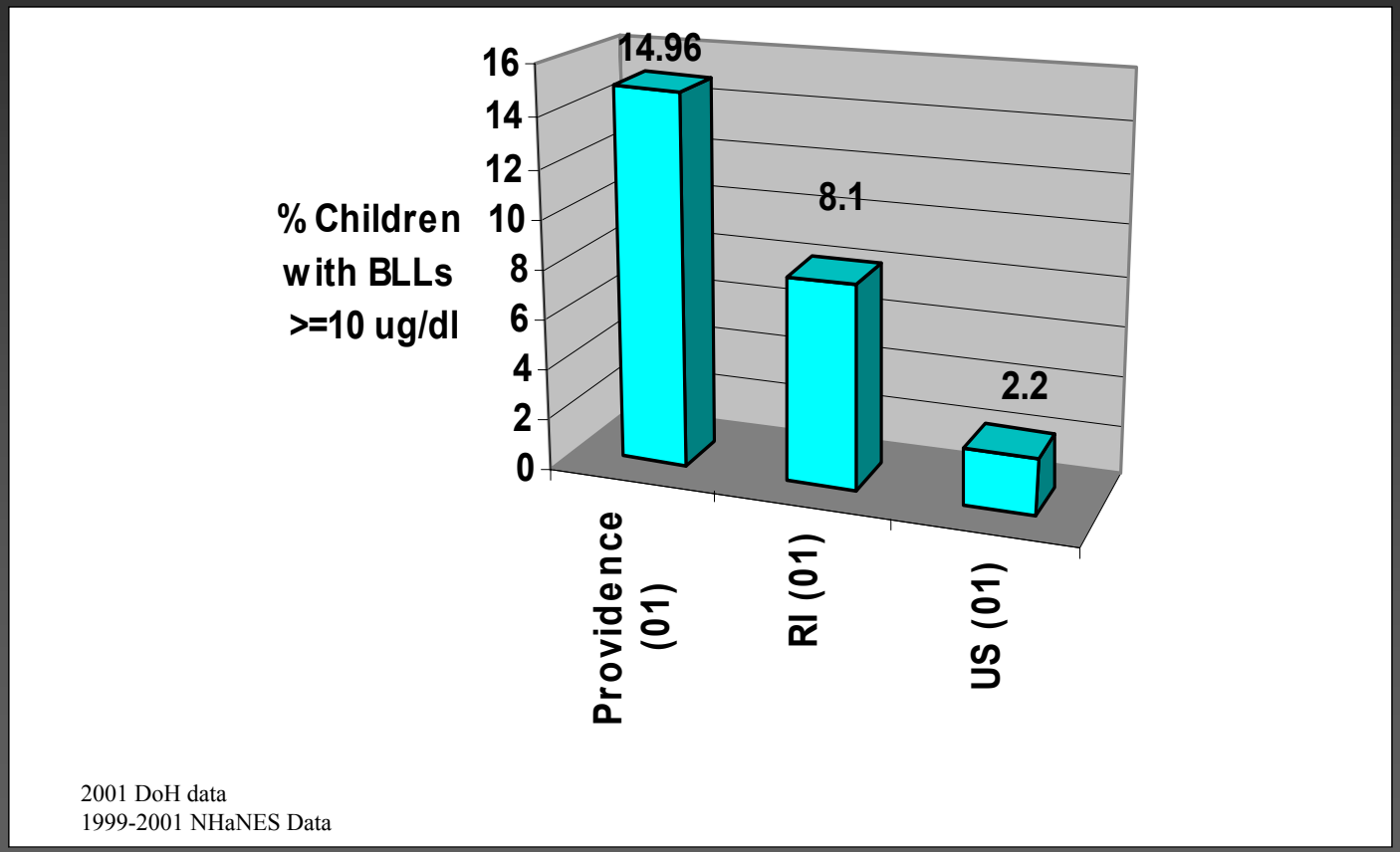
The Lead Poisoning Epicenter:
Rhode Island



2001 DoH data
1999-2001 NHaNES Data

Is Lead Hazard Remediation the Answer?

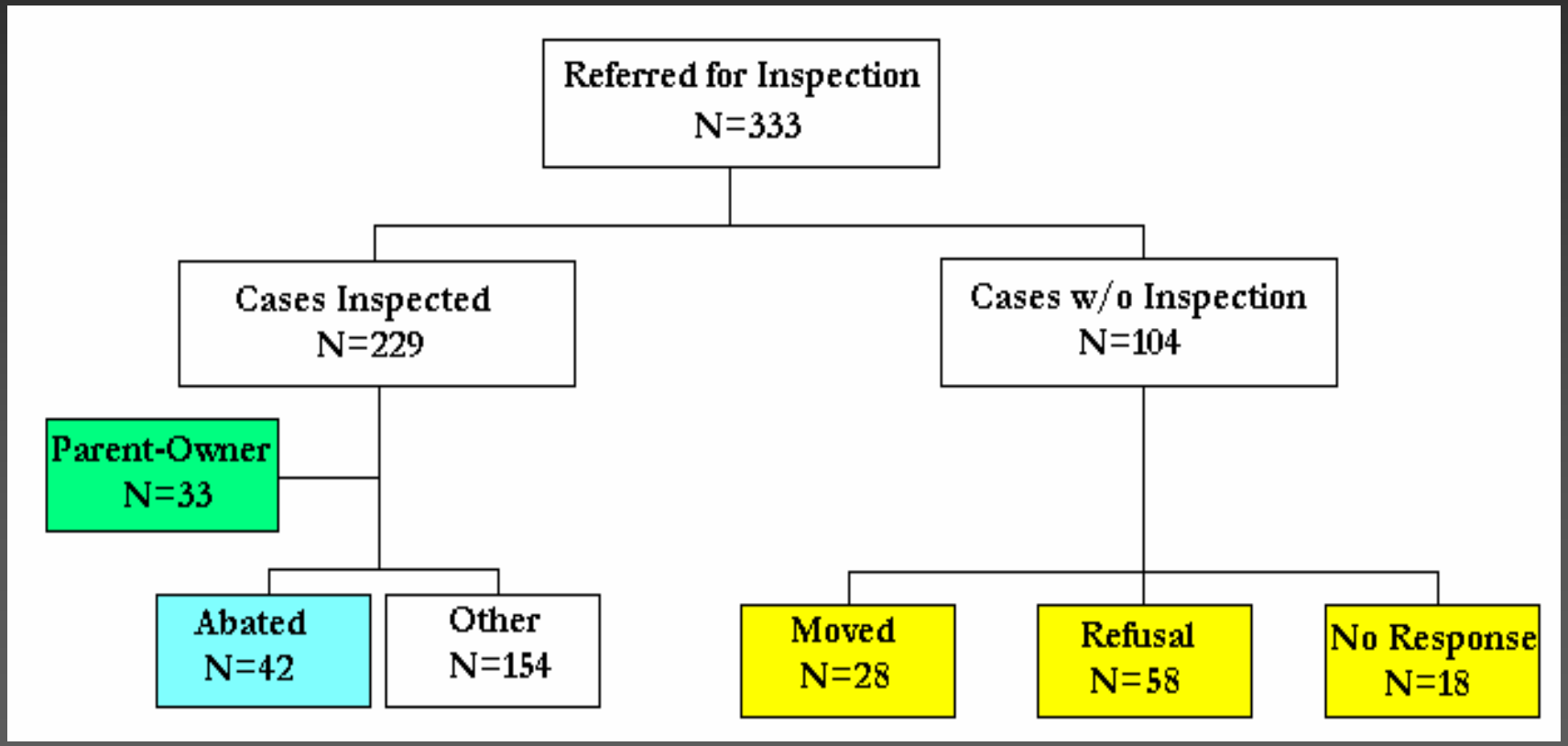
BENEFIT

- **St. Louis Study: Staes et. al. (1994)**
  - Sig. diff. amongst BLLs of case and control groups 10-14 months after open (BLLs ≥34 μg/dL)
- **Meta-analysis: Niemuth et. al. (2001)**
  - 9% decline in BLLs due to 'natural' factors
  - 16% decline in BLLs due to intervention

NO BENEFIT

- **Toronto Study: Langlois, et. al. (1996)**
  - could not attribute benefit to remediation.
- **RI DoH Case Mgmt. Study: MacRoy, et. al. (2002)**
  - No sig. diff. amongst case and control groups

Cases Referred for Environmental Lead Inspection
Rhode Island - 2001



Approaches to Determine Efficacy of Lead Hazard Remediation

1.) BLLs of children in the cases and controls at various periods after cases were opened

2.) BLLs of children who moved from and remained in remediated homes

3.) BLLs of all children residing at the addresses of the cases and controls three years before and after cases were opened

4.) Evidence of Housing Discrimination in the HA and REF groups

Approach 1 – Results

	0-60 days	61-120 days	121-365 days	366-730 Days	>730 days
HA	**22.2** (21.3-22.2) N=379	**20.8** (19.9-19.4) N=303	**18.6** (17.8-19.4) N=488	**15.5** (14.8-16.3) N=408	**12.6** (11.9-13.4) N=280
REF	**20** (18.5-21.4) N=127	**18.6** (17.1-20.1) N=113	**15.9** (14.9-17) N=167	**13.6** (12.2-14.9) N=100	**10.9** (9.4-12.4) N=64
PO	**20.8** (19-22.5) N=102	**18.5** (16.5-20.6) N=87	**16.9** (15.7-18.2) N=124	**14.4** (13-15.8) N=85	**12.2** (10.3-14) N=48

Mean BLLs (ug/dL) of the cases and control groups during various periods after cases were closed by the DoH.

Approach 1 – Results

- BLLs of cases generally do not statistically differ from the controls during the periods after they were opened.

- Where differences do exist, the direction of the differences are unexpected
  - (BLLs controls < BLLs cases).

Approach 1 – Results (cont.)

	0-60 days	61-120 days	121-365 days	366-730 days	>730 days
HA v. REF	.012	.016	<.001	.012	.052
HA v. PO	.135	.036	.027	.153	.644
REF V. PO	.519	.957	.266	.399	.283

- T-tests ($p < .05$) Comparing the Mean BLLs of Poisoned Children in the Case and Control Groups at Various Periods After the Opening of Cases

The Direction of the Differences are Unexpected

-- Controls are Sig. Lower than the Cases

Approach 2 – Results

	0-60 days	61-120 days	121-365 days	365-730 days	>730 days
Stayed	**21** (19.5-22.5) N=177	**18.7** (17.4-20) N=124	**17.7** (16.5-18.9) N=221	**14** (13.1-14.9) N=168	**11.4** (10.4-12.4) N=103
Moved	**23.3** (22.1-24.5) N=209	**22.1** (20.8-23.4) N=190	**19.4** (18.4-20.4) N=288	**16.7** (15.7-17.7) N=262	**13** (12-14) N=206

Mean BLLs of Children who Stayed in and Moved From Remediated Homes during various periods

Approach 2 – Results (cont.)

- BLLs of children who move from remediated homes are significantly different (higher) than those who stay
  - However, they are also significantly different before cases are closed.
    - Therefore, mobility is not causing the difference and something is inherently different from these groups.

	0-60 days	61-120 days	121-365 days	366-730 days	>730 days
Moved v. Stayed	.009	<.001	.03	<.001	.02

Approach 3

	Before Intervention	After Intervention	Diff in mean BLLS	Critical Value
HA	**16.8** (15.9-17.7) N=301	**14.4** (13.5-15.2) N=290	**2.4**	**<.001**
REF	**16.7** (15.6-18.1) N=157	**12.8** (11.5-14.1) N=137	**3.9**	**<.001**
PO	**18.1** (16.2-20.1) N=74	**13.2** (11.9-15.2) N=77	**4.9**	**<.001**

Mean BLLs of Cases and Controls Before and After Intervention

Approach 3 – Results (cont.)

- Results are similar to Approach 1:
  - BLLs of children residing at the addresses of the case and control groups before and after intervention generally do not statistically differ.
    - In the case where there is a sig. difference, the direction is unexpected
      - Cases are Sig. higher than the controls

	BLLs Before Intervention	BLLs After Intervention
HA v. REF	.958	.041
HA v. PO	.217	.168
REF v. PO	.267	.609

Approach 3 – Results (cont.)

- RI's lead hazard remediation program does not benefit poisoned children
- The Results are also suggestive that it does not benefit non-poisoned children

Approach 4 – Results

- Potential evidence that some property-owners deny families with young children rental housing
  - The tails of the distributions indicate differences of –13, -11, and -10 children at addresses.
  - 9% of HA addresses and 22.1% of REF addresses have children at them before remediation and refusal (as detected by the presence of lead tests) before intervention, but no tests afterwards.

Limitations

- **Different Groups:**
  - Inherent differences amongst the groups (I.e., SES, riskier homes, worse nutrition)
- **Behavioral Changes:**
  - Control groups may remediate hazards or alter behaviors
  - Case group may not take appropriate risk reduction measures
- **Uncertainty in locating Evidence of Housing Discrimination**
  - 'Aging out'
  - Intervention increases price of homes, families with children unable to afford home

Conclusions

- Lack of significant differences amongst cases and controls indicates that RI's lead hazard remediation does not benefit poisoned children
  - Where significant differences exist, the directions are unexpected:
    - Cases are Significantly Higher than the Controls

Conclusions (cont.)

- Findings do not support anecdotal evidence that mobility adversely affects children's BLLs

- Findings support anecdotal evidence that property-owners potentially discriminate amongst families with and without children.

Recommendations

- RI must shift from remediating lead hazards to preventing lead poisonings from occurring in the first place via a comprehensive primary prevention strategy
  - Including the complete removal of lead from homes (lead-free)

- Implicit or explicit, the message that remediation benefits children must be corrected.
  - This can provide an incentive to ‘crack-down’ on the worst homes

Recommendations (cont.)

- Caution those given the responsibility by Izzo Bill to refer tenants to lead-safe and remediated homes.
  - Instead they should refer solely to lead-free or low-risk homes
- Record types of intervention to delineate amongst effects of different types of remediation (i.e., encapsulation, window replacement)
- Investigate property-owners suspected of engaging in housing discrimination