Innovative Landscape Scale Lead Remediation: Lessons from Katrina and Rita

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Special needs of Children?

- Children are the current inhabitants of a developmental stage through which all humans must pass
- Extreme vulnerability to Pb; learning, violence, and costly chronic diseases
- The protection of children is essential for sustainability of the human species
- They are our future
- Chemical issues of the engineered environme

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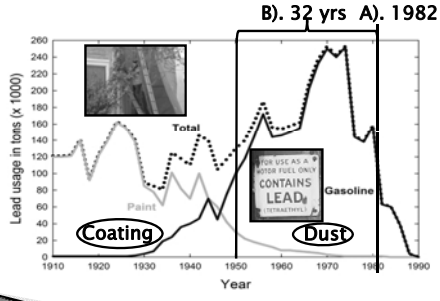
U.S. Industrial Pb: mines to urban products (12 million metric tons)



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Quantities of Pb exhausted by vehicles in New Orleans

A).1982: Annual Traffic ~3,930,000,000 Miles ~97 mt

B).1950-1982: ~7,300 mt of Pb exhaust from gasoline

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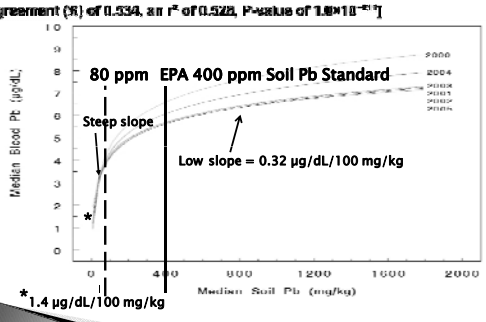
Pre-Hurricanes Katrina/Rita

- The metropolitan high density soil survey conducted pre-Katrina and Rita
- Pre-Katrina and Rita, matched the soil lead data with blood lead data from the Louisiana childhood lead poisoning prevention program
- New Orleans research indicates a significant association between children and Pb accumulated in the soil

Children Require Clean Soil (Pb in 281 census tracts)

Overall model: BLL=2.038+0.172*(SL)$^{0.5}$

[Agreement (R) of 0.534, an r^2 of 0.528, P-value of 1.8×10^{-21}]



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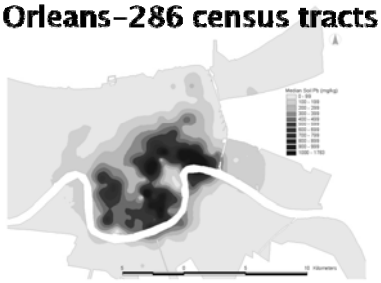
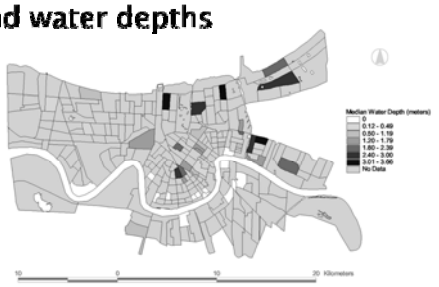
Pre-Hurricanes Katrina/Rita Soil Pb map (n=5,467) of metropolitan New Orleans-286 census tracts



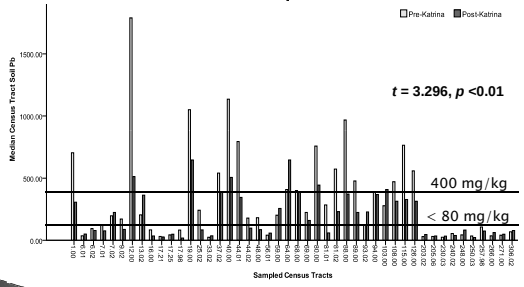
Post-Hurricanes Katrina/Rita

- Quasi-Experiment set up by the Hurricanes
- In 2006 from April 4 through June 5 my Xavier team scrambled to collect soil samples from a selection of 46 census tracts
- Attention was paid to:
  - inner-city, suburban location within the city
  - the Katrina/Rita median water depths of census tracts
- After the environmental health program was terminated at Xavier University my laboratory was moved to Tulane University

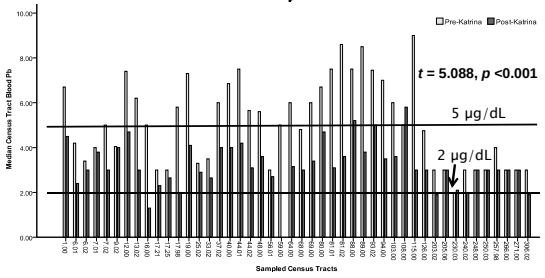
Post-Katrina/Rita 46 census tracts and water depths



Soil Pb comparison pre and post Hurricanes Katrina/Rita



Children's BL pre and post Hurricanes Katrina/Rita



Results of the Quasi-Experiment pre & post Hurricanes Katrina/Rita

- Paired t-test results show that SL decreased from 329 to 203mg/kg post-flood ($t = -3.296$, $p < 0.01$)
- When SL decreased at least 1%, median children's BL declined 1.6 µg/dL
- Declines in median BL are largest in census tracts with ≥50% decreases in SL
- BL decreases range from -1.2 to -1.7 µg/dL, depending on the observed decline in census tract SL and whether children were born post-Hurricanes Katrina and Rita.

The quasi-experiment supports large scale soil mitigation

- The Mississippi River delivers an average of around 300 U.S. tons of soil per minute
- The sediments are clean with a median Pb content of ~ 5 mg/kg
- Pilot projects have tested the feasibility of emplacing clean soil on contaminated soil

Conclusion: Greening the Soil Pb map of metropolitan NOLA

HUD Recover New Orleans Project

Greater New Orleans Foundation-Environmental Fund: Lead-Safe Play Areas at Childcare Centers

Play soil Pb ~750 ppm: Within hours the play soil Pb was<5 ppm
Cost ~ $100/child

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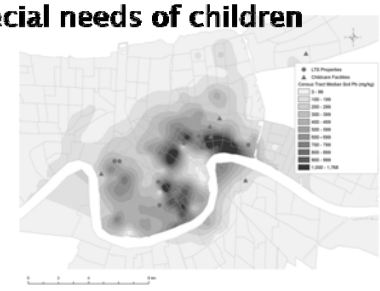
Greening the Soil Pb map by design, engineering, and rebuilding to meet special needs of children



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