

Metal Toxicity in New Orleans: Soil Pb, Blood Pb and Student Achievement by 4th Graders

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Introduction and Purpose

Rigorous attention to metal toxicology is critical for the global development of healthy and sustainable urban environments. Lead (Pb) is a well known neurotoxin that was extensively used in high volume consumer products during the 20th Century. It was dispersed worldwide and accumulated in large quantities within built environments. This study evaluates a spatially matched database for New Orleans consisting of soil Pb, children's (age ≤ 6 yrs) blood Pb and school grade point average (4th grade) from the Louisiana education assessment program (LEAP 21).

Figure 1. Map of the quartiles of median soil Pb by census tract.

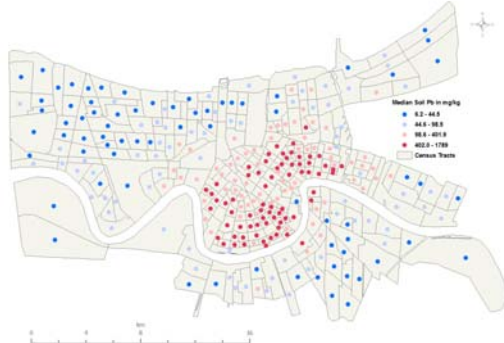
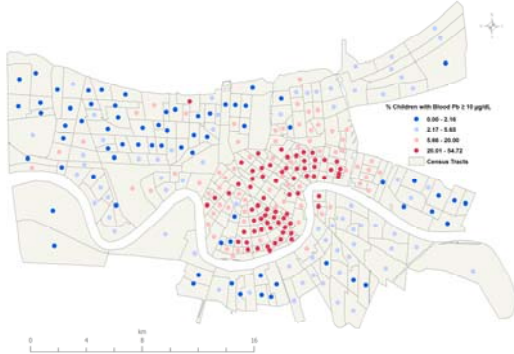


Figure 2. Map of the quartiles of blood Pb ≥ 10 μ g/dL by census tract.



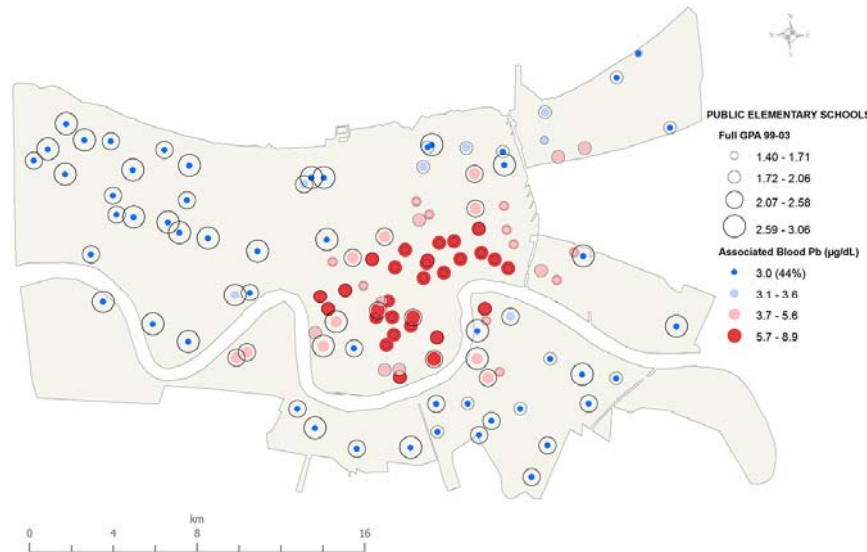
Methods

All data for soil Pb, blood Pb and school GPA scores were from year 2000-2005 and reflect pre-Hurricane Katrina conditions in New Orleans.

Results

Figures 1 and 2 illustrate the strong association between soil Pb and blood Pb ($r^2 = 0.85$, $P < 0.0001$). The significant association between in 4th grade school GPA for combined achievement of LEAP 21 tests and blood Pb by census tract is illustrated by Figure 3. The regression coefficients range from $b = -0.075$ to $b = -0.082$ between median BPb and GPA in English, Science, Mathematics, and Social Studies. The results show that an increase in median BPb of 1 μ g/dL in a community reduces school GPA by about one-tenth of a point.

Figure 3. Map of the quartiles of full school GPA and associated census tract blood lead.



Discussion and Conclusions

Pre-Katrina, poor people of color predominantly lived in the most Pb contaminated neighborhoods of New Orleans. For schools at the margins in a high-stakes testing system, the expected GPA loss observed in this study can push teachers and administrators into job loss and costly school closures. The social burden of Pb is especially large in the inner city where children in some communities have a 50 percent plus prevalence of exposure \geq the CDC 10 μ g/dL guideline for Pb in blood, and within the same communities, school failure rates exceed 50% in all subjects of the LEAP 21 test. An estimated \$US 76 million per year represents the costs of pre-Katrina Pb poisoning in New Orleans. This estimate understates a host of costs related to the inequities of Pb poisoning because it excludes the social stresses from excessive violence and the extraordinary price of the justice and prison system. During the recovery from the federal levee failure, New Orleans has an opportunity to reduce the toxicity of the environment for the benefit of children's health that would promote education and the inhabitability of the entire community.

Selected References

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