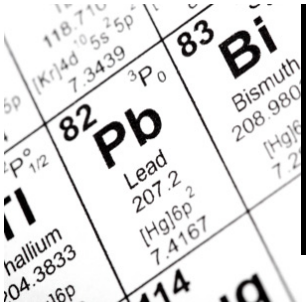
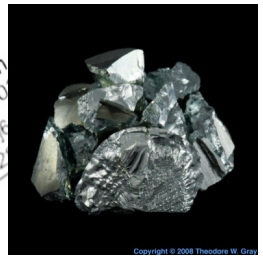
Lead Contamination in Drinking Water and Associated Housing Characteristics in the Mississippi Delta

Kristie Willett, Stephanie Otts, John Green, Lynn Woo, Alex Fratesi, Rachel Haggard, Cathy Janasie, Cammi Thornton, Josephine Rhymes

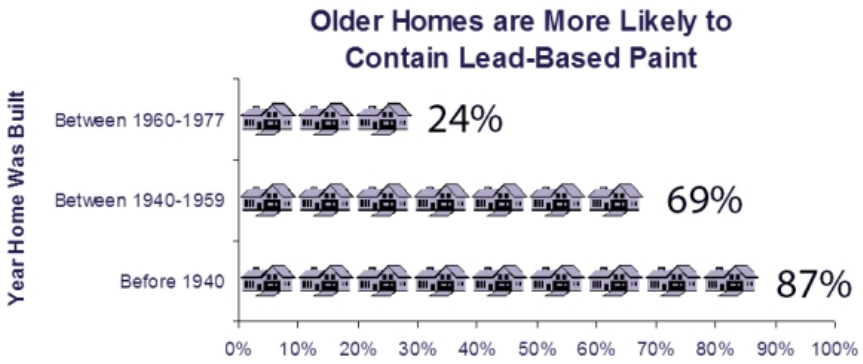


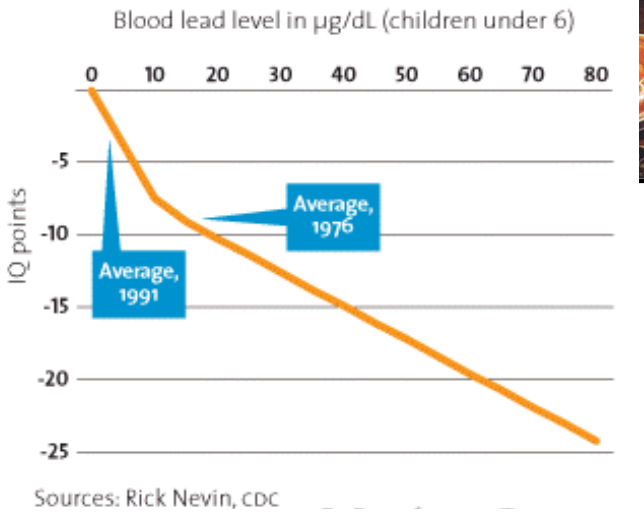


Lead (Pb)

One of oldest most studied toxicants, ubiquitous

Sources: smelters, coal burning, leaded gas, pipes esp. if pH less than 6.4, pottery glazes, paint

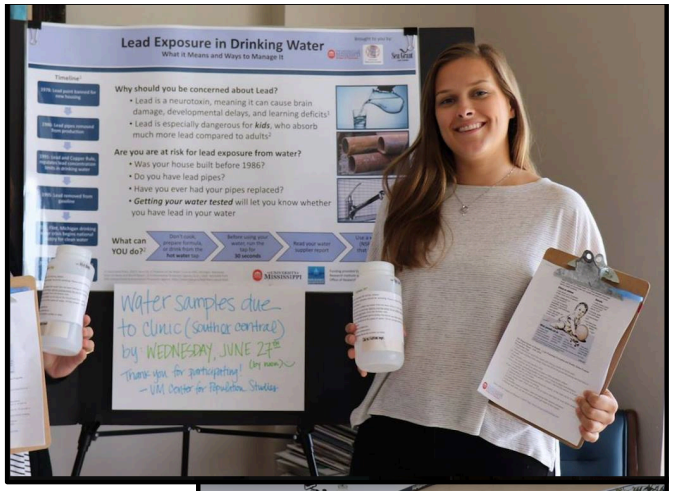




http://www.epa.gov/lead/

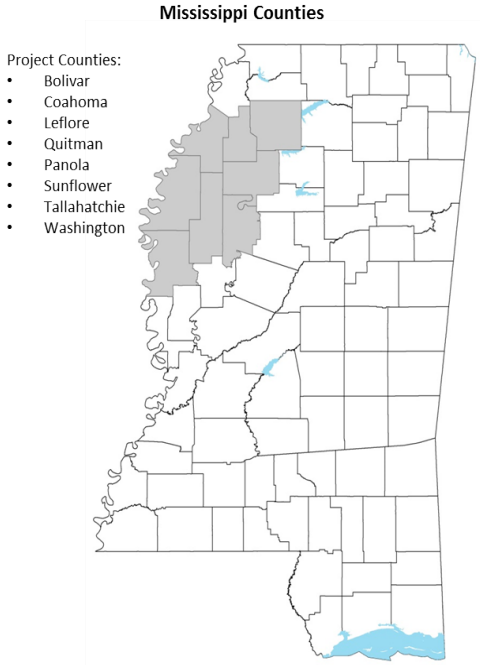
Project Background

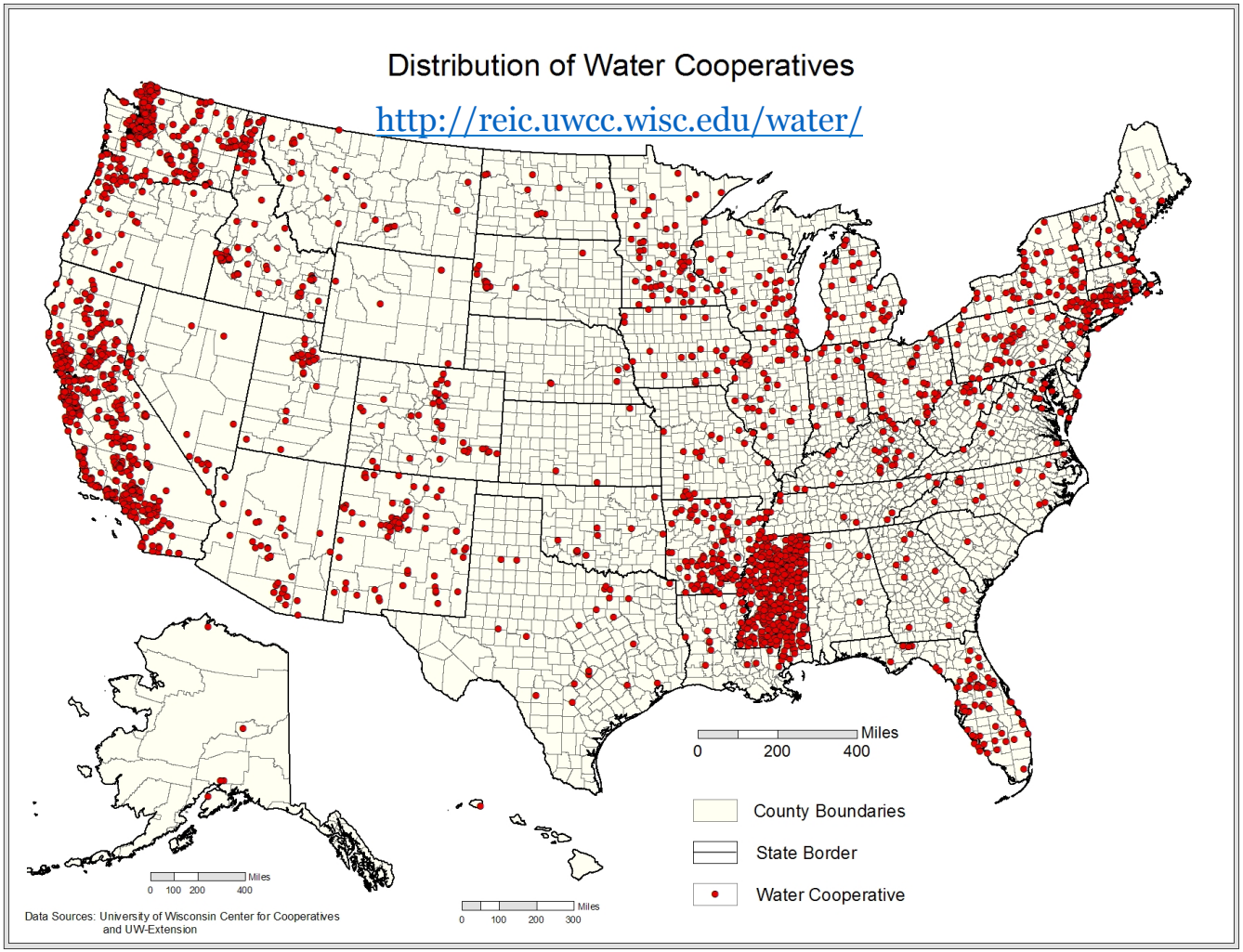
- UM Lead in Drinking Water Team formed in 2016. Co-led by John Green (sociology), Stephanie Otts (law), and Kristie Willett (toxicology).
- ORSP Investment Grant in 2016 to work with community partners in Mississippi Delta to raise awareness of the issue and collect/analyze residential water samples.
- MWRRI grant in 2017 to assess effectiveness of various community engagement strategies.
- Approached by Foundation for the Mid-South in 2018 to expand work to Jackson to support efforts of Jackson Water Coalition funded in 2018 by UM Community Wellbeing Constellation.



Research Questions

- Can multi-disciplinary, multi-method, and community-based approaches to research provide more data to test for potential lead exposure?
- Can these data be used to inform better monitoring, outreach, and policy reform?
- Based on LCR violations, our work has focused on counties in and contiguous to the Mississippi Delta.




Distribution of Water Cooperatives
http://reic.uwcc.wisc.edu/water/
Miles
0 200 400
County Boundaries
State Border
Water Cooperative
Miles
0 100 200 400
Miles
0 100 200 300
Data Sources: University of Wisconsin Center for Cooperatives and UW-Extension

Community Partners

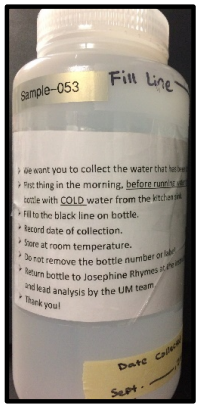
- New Pathways to Health Initiative, Tri-County Workforce Alliance
- James C. Kennedy Wellness Center
- Right! From the Start Program staff and church partners
- Mississippi State University Extension
- Harvard Law School Mississippi Delta Project/Delta Directions Consortium
- Aaron E. Henry Community Health Center and Delta Health Center

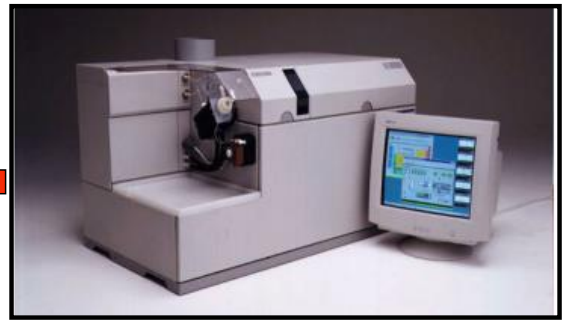
S. Snell
Right! from the Start Initiative

J. Rhymes

J. Barrett

Community Engagement & Water Testing Process





If water lead concentration is >5 ppb, a filter is provided to resident. All participants receive their results and lead info sheet.

Findings

- 307 households have participated in the project in some way
  - ✓ 214 households responded to the survey and returned water samples
  - ✓ Data represents 16 counties and 50 census tracts with the majority from Humphreys (n=42) and Coahoma (n=39), then Panola (n=26), Sunflower (n=20), Washington (n=20), Bolivar (n=19), and Quitman (n=17) counties
  - ✓ Percent bottle return from 8 different engagement approaches ranged from 49-100% with an average of 70%.
  - ✓ Participants with lead concentrations exceeding 5 ppb (n=10) received certified NSF/ANSI Standard 53 filter.

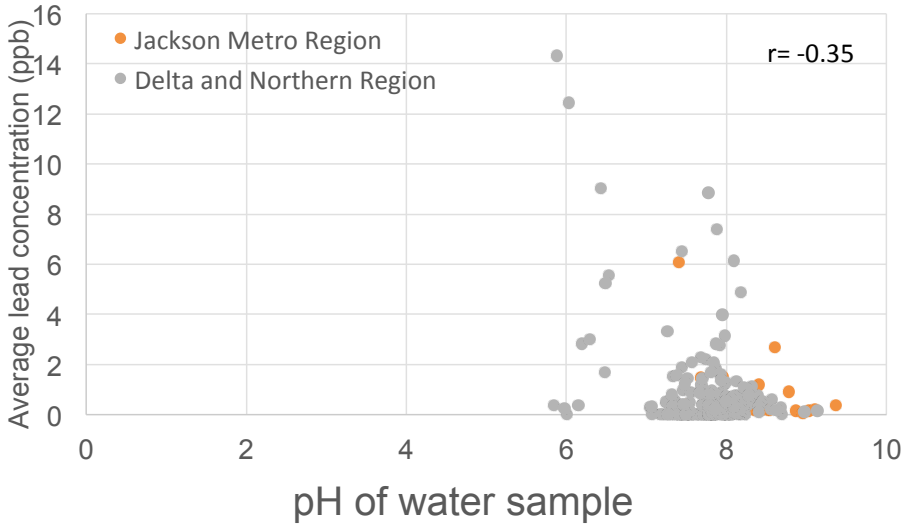
Lead and drinking water household characteristics

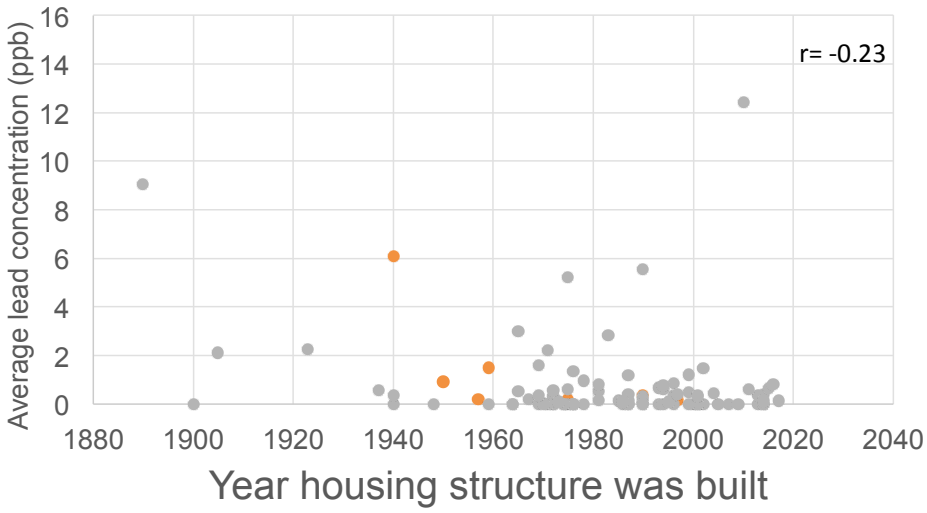
(Households returning both questionnaires and water samples, Total n=214)

Characteristics		Delta MS	
		f	%
Housing tenure	Renters	61	30
	Owners	134	65
	Other arrangement	12	5
Housing type	House	162	78
	Mobile home	22	10
	Apartment/town house	25	12
Know when built (yes)		113/206	54
Built 1985 or earlier (yes)		54/113	48
Pipes ever replaced	Yes	34	17
	Unsure	78	38
	No	90	45
Source of water	Public system	180	89
	Well	23	11
Use filter for drinking water (yes)		64/213	30

Drinking water pH and lead concentration results (ppb)		
Characteristics	**pH (n=213)**	**Lead (ppb) (n=214)**
Mean	**7.74**	**0.84**
Median	**7.82**	**0.30**
Standard deviation	**0.52**	**1.86**
Minimum - Maximum	**5.84 – 9.13**	**nd – 14.32**
Pearson's correlation between pH and lead concentration	**-0.35**	

Lead Concentration vs. Water pH or Year Housing Structure Was Built





Conclusions

- Research revealed that some communities in Mississippi are experiencing elevated concentrations of lead in their drinking water.
- Neither water pH nor age of housing consistently predicted higher lead concentrations.
- In a well-owner community event, 6 of the 20 samples had lead concentrations above the FDA's 5 ppb limit. The average pH of the well samples was 6.97.
- http://nsglc.olemiss.edu/projects/lead-contamination/index.html

Ongoing Work

- Continue to inform and empower Mississippi residents/parents to make behavioral choices in their own homes and communities through residential and school drinking water testing events.
- Enhance community engagement in high risk exposure populations (e.g. Jackson MS, well owners, and new mothers).
- Assess programmatic features, such as implementation and outreach differences across the rural-urban continuum, to make scalable recommendations for the state and nation.

Lead exposure

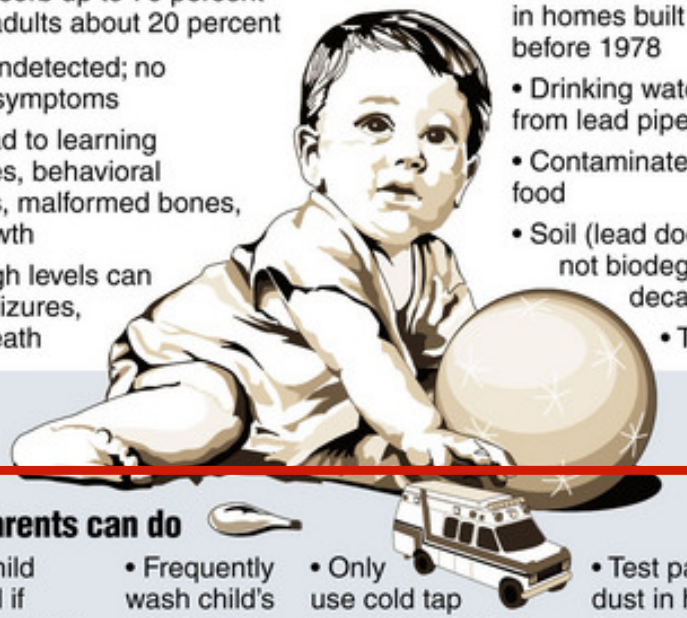
About 310,000 U.S. children ages 1 to 5 have elevated blood lead levels, which can accumulate over months and years and cause serious health problems.

Effects on children

- Kids absorb up to 70 percent of lead, adults about 20 percent
- Often undetected; no obvious symptoms
- Can lead to learning disabilities, behavioral problems, malformed bones, slow growth
- Very high levels can cause seizures, coma, death

Sources

- Lead-based paint, contaminated dust in homes built before 1978
- Drinking water from lead pipes
- Contaminated food
- Soil (lead does not biodegrade, decay)
- Toys*



What parents can do

- Have child screened if there is concern of lead exposure
- Frequently wash child's hands, toys, pacifiers
- Only use cold tap water for drinking, cooking
- Test paint, dust in home if it was built before 1978

*Old toys with lead paint a known risk, but new toys from China now have come under scrutiny

Source: U.S. Centers for Disease Control and Prevention, U.S. Department of Health and Human Services

THE UNIVERSITY of MISSISSIPPI

kwillett@olemiss.edu

For water: Filters certified by NSF International