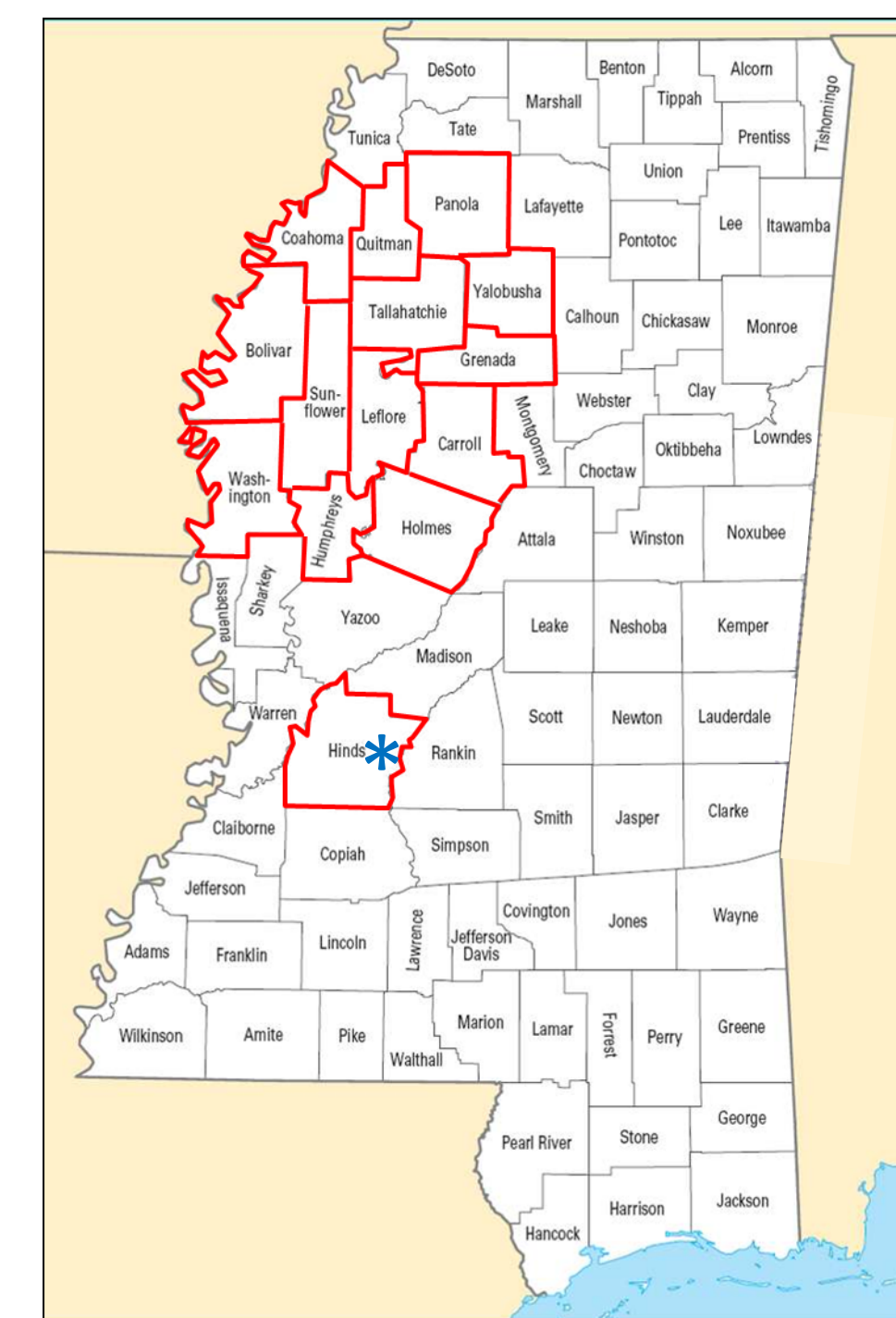


Strategies to Analyze Risk of Lead Contamination in Drinking Water in Mississippi: Contributions from Community-Based Research

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Background

- Lead exposure can have severe neurodevelopmental impacts especially in infants and children.
- Much of the monitoring, research, and policy focuses on exposure through lead paint.
 - ✓ Yet, contaminated drinking water may account for 10-20% of all cases of lead poisoning.
- Mississippi ranks 18th worst for lead poisoning even when less than 20% of our youth are tested for elevated blood lead (EBLL; ≥ 5 $\mu\text{g/dL}$).
- Residential water supplied by public water systems (PWS) is tested based on population served. In MS, PWS are very decentralized thus few homes are tested for lead. Residential wells and schools are not required to test.
- Our focus communities represent both urban and rural Mississippi and are areas plagued by old infrastructure, economic instability at the municipal level due to poverty, and isolated and disenfranchised populations.
- The EPA Lead and Copper Rule (LCR) specifies if the 90th percentile sample is >15 ppb, municipalities must act. FDA's limit for lead in water is 5 ppb.
- Since January 2016, Jackson, MS has been in violation of the LCR and is now considered a serious violator.



Top: Tri-County Workforce Alliance meeting in September 2016. **Bottom:** Community meeting with partners from Rosemount Baptist Church, Working Together Jackson, Jackson Public Schools, and Pearl Riverkeepers in September 2018.

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 and the City of Jackson (counties outlined in red above, Jackson *).

Community partners (to date)

- James C. Kennedy Wellness Center
- New Pathways to Health Initiative, Tri-County Workforce Alliance
- 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
- Green and Healthy Homes, Jackson, MS
- Mississippi Urban League, Jackson, MS



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

Findings

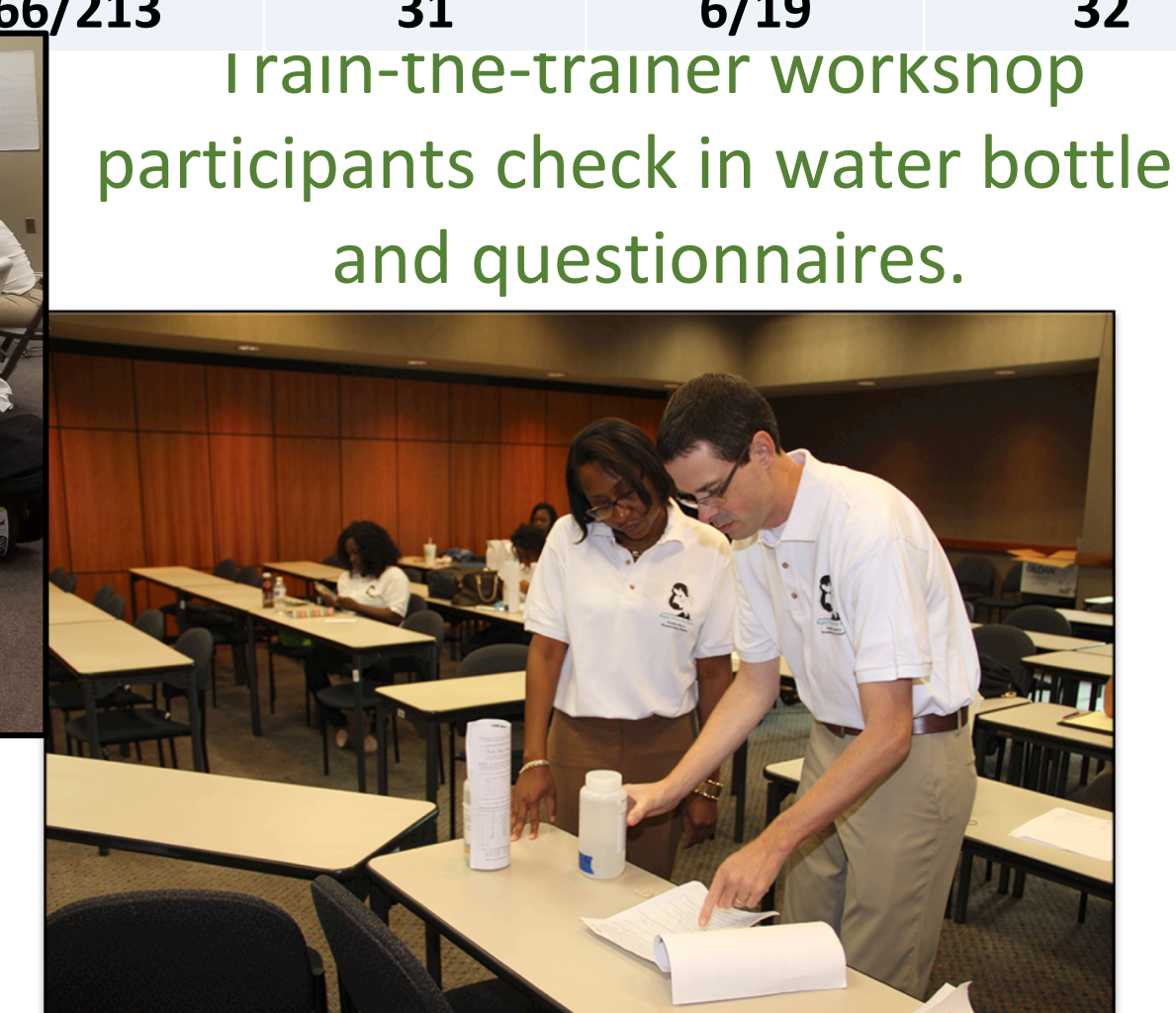
- 307 households have participated in the project in some way
 - ✓ 232 households responded to the survey and returned water samples
 - ✓ Data represents 16 counties and 63 census tracts with the majority from Humphreys (n=42) and Coahoma (n=39), then Panola (n=26), Sunflower (n=20), Washington (n=20), Bolivar (n=19), Quitman (n=17), and Hinds (n=16) 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=11) received certified NSF/ANSI Standard 53 filter.

Received certified NSF/ANSI standard 62 water.

Characteristics		Location of community engagement sampling events			
		Delta MS (n=213)		Jackson Metro MS (n=19)	
		f	%	f	%
Housing tenure	Renters	61	30	5	26
	Owners	134	65	14	74
	Other arrangement	12	5	0	0
	Total	207		19	
Housing type	House	162	78	16	89
	Mobile home	22	10	0	0
	Apartment/town house	25	12	2	11
	Total	209		18	
Know when built (yes)		112/206	54	12/19	63
Built 1985 or earlier (yes)		54/113	48	9/12	75
Pipes ever replaced	Yes	34	17	5	26
	Unsure	78	38	8	42
	No	90	45	6	32
	Total	202		17	
Source of water	Public system	180	89	16	94
	Well	23	11	1	6
	Total	203		17	
Use filter for drinking water (yes)		64/213	30	4/19	21
Use filter for ice (yes)		66/213	31	6/19	32



At the MS Urban League Baby Café, new mothers learn about the risks of making formula with lead contaminated water and receive bottles for testing their



Train-the-trainer workshop participants check in water bottles and questionnaires.

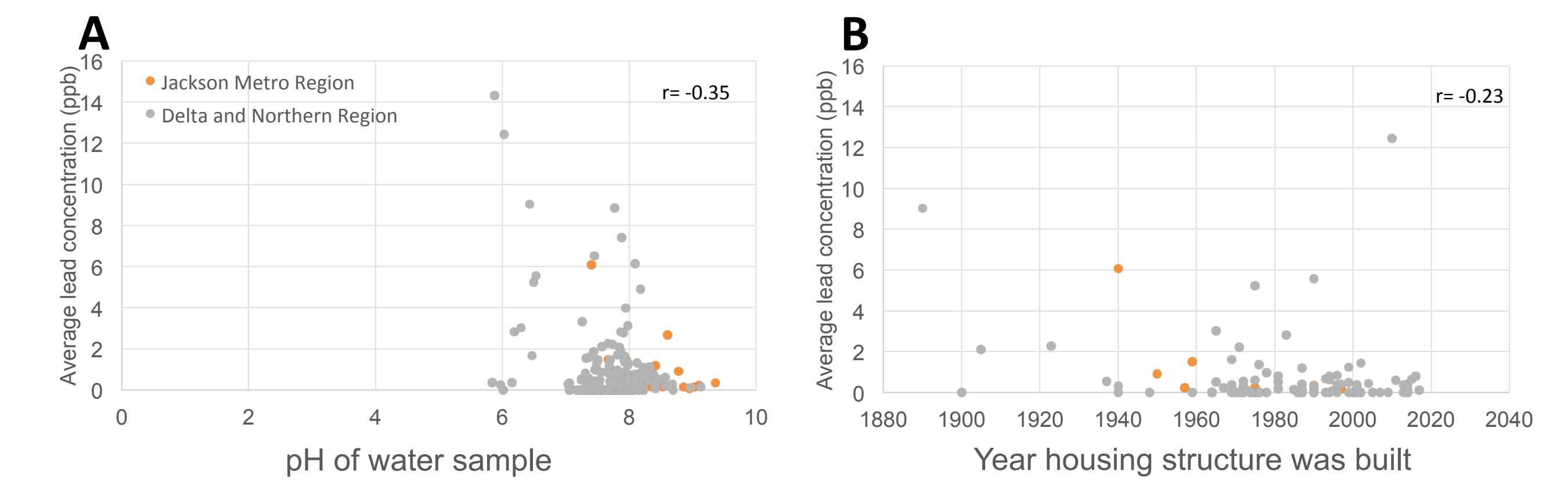


Figure 1. Lead concentration vs. water pH (A) and year housing structure was built (B). n=233 samples for pH and n=98 for year built.

Table 2. Drinking water pH and lead concentration results (ppb)

Characteristics	Location of community engagement sampling events			
	Delta MS		Jackson Metro MS	
	pH (n=213)	Lead (ppb) (n=214)	pH (n=19)	Lead (ppb) (n=19)
Mean	7.74	0.84	8.39	0.88
Median	7.82	0.30	8.43	0.29
Standard deviation	0.52	1.86	0.56	1.43
Minimum - Maximum	5.84 – 9.13	nd – 14.32	7.40 – 9.36	0.06 – 6.08
Pearson’s correlation between pH and lead concentration	-0.35		-0.47	
	-0.33			

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.

Future 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).
- Understand barriers to youth blood lead level (BLL) given that Mississippi ranks 18th worst among states for lead poisoning.
- Assess programmatic features, such as implementation and outreach differences across the rural-urban continuum, to make scalable recommendations for the state and nation.