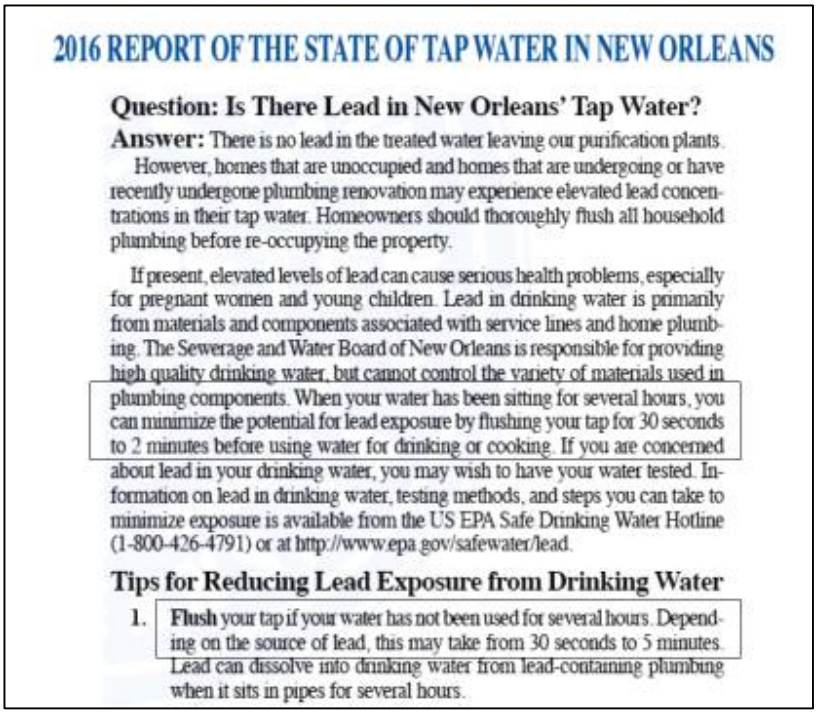
Supplementary Materials: Effectiveness of Prevailing Flush Guidelines to Prevent Water Lead Exposure in a Compliant City with Lead Service Lines

Information about New Orleans Sewerage and Water Board water treatment system:
The New Orleans Sewerage and Water Board (S&WB) operates two water treatment plants- one on the East Bank and the other on the West Bank of New Orleans (NOLA). This study focused on homes served only by the S&WB's East Bank or Carrolton plant. The Carrolton plant provides an average of 135 million gallons of water per day to an estimated population of 286,603 [83]. The plant uses a conventional treatment system to purify water from the Mississippi River. Ferric sulfate and polyelectrolyte is used for coagulation followed by flocculation and sedimentation. Chlorine, in the form of sodium hypochlorite, is used as the primary disinfectant and chloramines are used as the secondary disinfectant. Lime is used for corrosion control pH adjustment and sodium hexametaphosphate is added as a sequestrant. The final step are fluoridations followed by filtration through rapid gravity filters (sand and anthracite) [48].



2016 REPORT OF THE STATE OF TAP WATER IN NEW ORLEANS

Question: Is There Lead in New Orleans' Tap Water?

Answer: There is no lead in the treated water leaving our purification plants. However, homes that are unoccupied and homes that are undergoing or have recently undergone plumbing renovation may experience elevated lead concentrations in their tap water. Homeowners should thoroughly flush all household plumbing before re-occupying the property.

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. The Sewerage and Water Board of New Orleans is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your drinking water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the US EPA Safe Drinking Water Hotline (1-800-426-4791) or at http://www.epa.gov/safewater/lead.

Tips for Reducing Lead Exposure from Drinking Water

1. **Flush** your tap if your water has not been used for several hours. Depending on the source of lead, this may take from 30 seconds to 5 minutes. Lead can dissolve into drinking water from lead-containing plumbing when it sits in pipes for several hours.

Figure S1. "Tips for reducing lead exposure from drinking water" (Source: NOLA S&WB's 2016 Consumer Confidence Report [83])

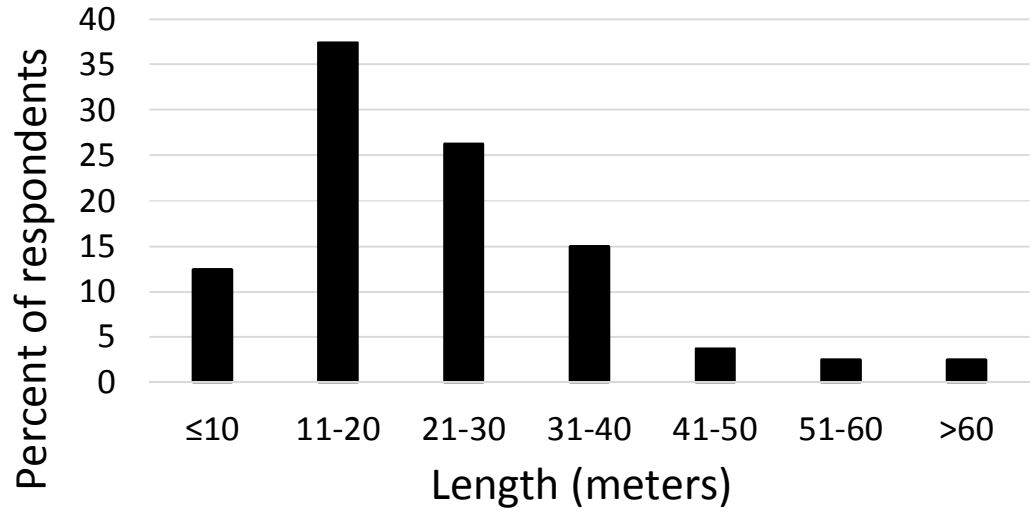


Figure S2. Percent of survey respondents by reported length of premise plumbing + service line measurements (meters)(n=80)

Table S1. New Orleans 2015 water quality data for finished water (after purification)

Parameter	n	Min	Avg	Median	Max
Temperature (◦C)	588	9.5	22.4	23.4	33.4
Nephelometric turbidity (NTU)	588	0.07	0.12	0.13	0.79
pH	588	8.16	8.82	8.85	9.16
Free chlorine residual (ppm as Cl_2)	588	0.1	0.2	0.2	0.5
Polyphosphate (ppm)	240	0.10	0.33	0.32	0.59
Total alkalinity (ppm as $CaCO_3$)	588	82	126	127	172
Total chlorine (ppm)	588	0.7	3.0	3.2	4.2
Calcium (ppm)	588	36	55	51	66

Source: NOLA S&WB. Samples collected 1-1-2015 through 12-31-2015 from 11 points of entry to the distribution system.

Table S2. Participant and household characteristics of respondents and mean FD WLLs[5]

Characteristics	n=375 N(%)	FD WLL (ppb) Mean±SD	P-value[2]	P-value[3]	OR (95% CI)[4]
Number of occupants in household					
1	25 (7.7)	3.9±3.4			
2-3	176 (54.2)	2.4±2.4	**0.011**	**0.01**	**0.27 (0.10, 0.73)**
≥4	124 (38.1)	1.8±1.9	**<0.001**	**0.004**	**0.22 (0.08, 0.61)**
Income					
<50K	78 (26.4)	2.7±3.3			
51-74K	61 (20.7)	2.0±1.6	0.094	0.792	1.08 (0.59, 1.98)
≥75K	156 (52.9)	2.2±2.3	0.194	0.535	0.86 (0.53, 1.39)
Race					
Caucasian	257 (75.0)	2.3±2.2			
African-American or others	86 (25.1)	2.2±3.2	0.492	**0.013**	**0.59 (0.39, 0.89)**
Education					
High School and under	32 (10.0)	2.5±3.2			
College	114 (35.4)	2.0±1.9	0.472	0.677	0.86 (0.43, 1.73)
Graduate	176 (54.7)	2.6±2.7	0.687	0.974	1.01 (0.52, 1.98)
Number of Children <6 years old					
0	188 (60.1)	2.3±2.4			
1	85 (27.2)	2.4± 2.7	0.688	0.843	0.96 (0.61, 1.50)
≥2	40 (12.8)	2.0±1.8	0.358	0.268	0.72 (0.40, 1.29)
Street sidewalk work					
No	167 (56.6)	2.2±2.3			
Yes	128 (43.4)	2.3±2.5	0.566	0.814	0.95 (0.64, 1.43)
Era build					
Post-1950	66 (17.6)	1.9±2.6			
Pre-1950	248 (66.0)	2.4±2.3	0.156	**<0.001**	**3.00 (1.88, 4.79)**
Unknown	62 (16.5)	2.4±3.0	0.263	**0.079**	**1.69 (0.94-3.05)**
Home type					
Single family	247 (71.2)	2.5±2.7			
Multiple family/Apt complex	100 (28.8)	1.9±2.0	0.076	0.1516	0.74 (0.50, 1.12)
Ownership					
Own	276 (82.1)	2.4±2.6			
Rent	60 (17.9)	1.9±2.2	0.084	**0.024**	**0.58 (0.36, 0.93)**
Water Usage					
Monthly total (100 gallons)	45.9±28.1	(n=41)	-	-	-
Average daily (100 gallons)	1.8±2.4	(n=38)	-	-	-

Notes: "-" sample size is too small (n<50) for solid modeling [1]Non-respondents were not included in the percentage and denominators; [2]Association with numeric water lead level in FD samples using mixed model adjusted for flush times. [3]Association with detectable (≥1ppb) vs. non-detectable lead level using mixed model adjusted for flush times. [4]Odds ratio (95% confidence interval)

LEAD EXPOSURE ASSESSMENT FOR DRINKING WATER STUDY

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SURVEY FOR HOMES

Study participant_____ Date of home visit_____

Neighborhood_____ Home visitor_____

Contact Information

1. Address:_____
2. Contact Phone:_____ Contact email:_____
3. Prefer to be contacted by: ☐ Phone ☐ Email

Water Tested

4. Tap to be tested: ☐ Kitchen ☐ Water-fountain ☐ Other: _____
5. Floor of tap to be tested: ☐ 1st ☐ 2nd ☐3rd ☐ Other: _____

Home Information

6. Do you own the home or rent? ☐ Own ☐ Rent
7. Type of building: ☐ Single family ☐ Double ☐ 4-Plex ☐ Larger Apartment/Condo
8. How old is the building/home? Year/Decade: _____ *OR* ☐ Pre1950 ☐ Post1950 ☐ Unknown
9. What year did you move into the home? _____
10. If no one currently lives in the home, how long has it been uninhabited? _____
11. Any new plumbing inside the home? ☐ Yes ☐ No ☐ Unknown
12. If known, when was the most recent plumbing repairs made (note location): _____

    _____
13. Do you know if any of these materials are in your plumbing? (check all that apply):
    ☐ Lead ☐ Plastic ☐ Galvanized metal ☐ Cast iron ☐ Copper ☐ Brass
    ☐ Other: _____
    ☐ Not sure about all plumbing materials in the home
    ☐ Do not know about any of the plumbing materials in the home
14. Do you have lead water service lines from the home to the street? ☐ Yes ☐ No ☐ Unknown
    a. If you don't know but want to find out you can go through the steps here to find out: http://apps.npr.org/find-lead-pipes-in-your-home/#intro

       Or scan the QR code with your smart phone or tablet.

b. Indicate if you went through this process to find out: □ Yes, I followed these steps □ No

15. Any partial or full replacement of water lines outside home? A full replacement is replacement of pipes from the home to the water main in the street. A partial replacement is just replacement of pipes from the meter to the main or from the meter to the home. □ None □ Partial □ Full □ Unknown

16. Any work on street or sidewalk in the last 6 months *within your block*? □ Yes □ No

17. Number of occupants in your building:_____

18. Number of occupants under the age of 6 years in your home:_____
    a. Are the children home-bound? □ Yes □ No □ Part-time
    b. Any there any other home-bound inhabitants? □ Yes □ No □ Part-time

Environmental Lead Levels

19. Ever tested the home for lead before? □ Yes □ No
    a. If yes, did you have lead anywhere? □ Yes □ No
    b. Where was the lead found?_____
    c. Did you remediate or remove the lead source? □ Yes □ No □ Unknown

Water Use

20. Source of drinking water?
    □ Bottled water □ Filtration system □ Tap water (unfiltered) □ Pitcher filter
    □ Other: _____

21. Do you ever use unfiltered water for cooking? □ Yes □ No

22. Do you ever use unfiltered water for drinking? □ Yes □ No

23. Do you ever use unfiltered *HOT* water for either drinking or cooking? □ Yes □ No

24. Do you flush your tap water before using? □ Yes □ No
    a. If yes, for how long?_____

25. Does the tip of your kitchen faucet have a filter on it (aerator filter)? □ Yes □ No

26. If so, do you ever clean the filter at the end of your faucet? □ Yes □ No
    a. If yes how often? □ 1/week □ 1/month □ Other: _____

27. If you have infants, have you used unfiltered tap water for milk formula? □ Yes □ No

28. Average number of cups of *unfiltered* home tap water you drink per day:_____

29. If you have water filtration system, what kind?_____

30. Do you see any signs of corrosion in your plumbing, such as frequent leaks, rust-colored water or stained dishes or laundry? □ Yes □ No

31. Does your water have a bad (metallic) taste? □ Yes □ No

32. What is your reported water usage on your Sewerage and Water Board Bill for your last water bill? See "THIS BILL" at top of your last S&WB statement:
    a. Reading Date: _____
    b. Water Usage (100 gal): _____
    c. Age Usage/Day (100 gal): _____

Socio-demographic Information

We collect this information to make sure we are reaching low-income, minority populations who may be in need of outreach. This information will help us characterize our study population and redirect efforts if needed.

33. Race: ☐ Caucasian ☐ African-American ☐ Latin ☐ Asian ☐ Other_____
34. Home Net Income: ☐ ≤$25k ☐ $26-50k ☐ $51-75k ☐ $76-100k ☐ >100k
35. Highest degree earned: ☐ Grade school ☐ High school ☐ College ☐ Graduate

Knowledge and Concerns

36. Have you ever been told about health hazards of lead, lead sources and ways to reduce exposures to lead by your doctor or other public health official? ☐ Yes ☐ No
    a. If yes, who was the source of this info? _____
37. Any lead-related issues or concerns? _____

    _____

    _____

Lead Poisoning

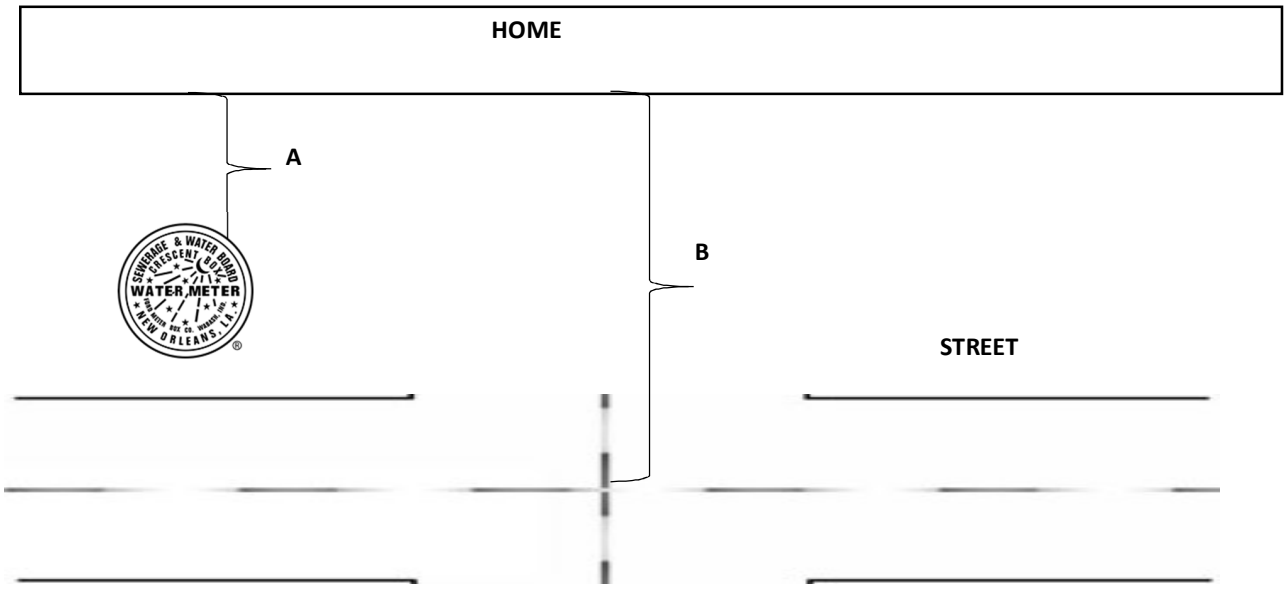
38. Have you ever had your child tested for lead? ☐ Yes ☐ No (jump to question 39)
    a. If so was his/her lead elevated (>5 ug/dL)? ☐ Yes ☐ No
    b. What was the age of the child and year of test?_____
    c. If you know the source of exposure, what was it? _____
    d. Did you remove or remediate the source of exposure? ☐ Yes ☐ No
    e. If you tested the child's blood lead level again after you removed the source of exposure how did his/her blood lead level change? ☐ Went up ☐ Went down ☐ Stayed same

Home Measurements (feet) (if have time)

If you have time, please see the diagram on the following sheet and get measurements for your home's plumbing. This information may assist us in estimating optimal flush times for reducing people's exposure to lead.

39. Distance from shut-off valve or water meter to front of home (A):_____
40. Distance from water main in middle of street to front of home (B):_____
41. Distance of internal plumbing from front of home to tap to be tested:_____

(Measured along the wall from the front where pipe enters home to the tap)



42. Finally, how did you find out about the study?
☐ LSUHSC letter ☐ Media ☐ Word of mouth

Other: _____

Use this space for any additional comments or concerns.

Thank you for participating in this study.
We will contact you shortly as soon as the water test results are received,
and give you guidance on next steps if needed.