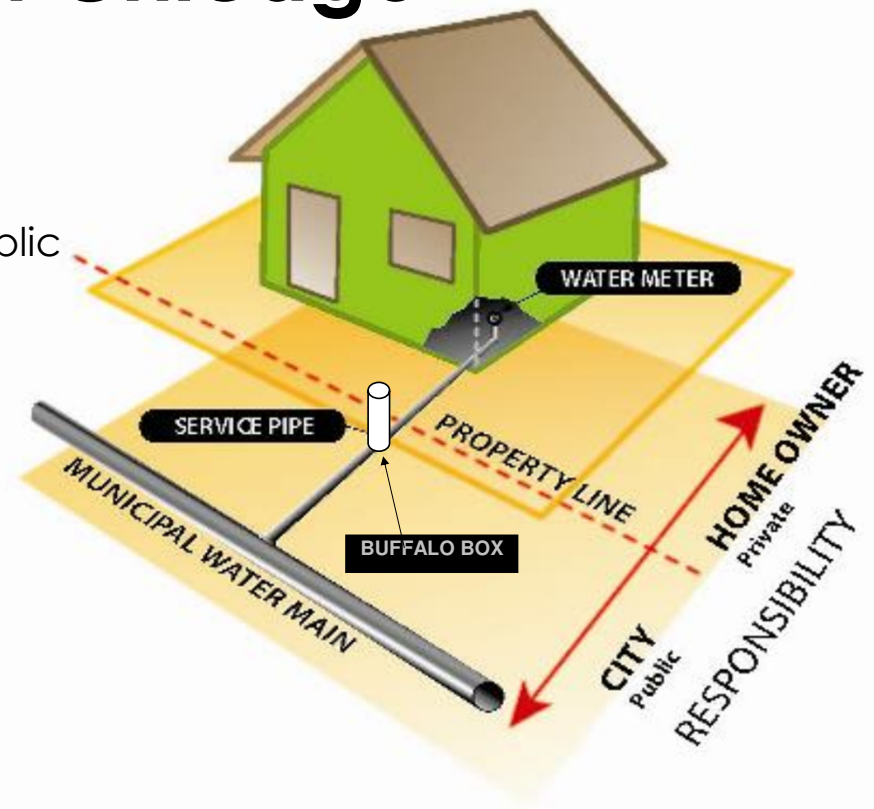


Individual Household Income Variation Within a Service Area: Chicago as a case study

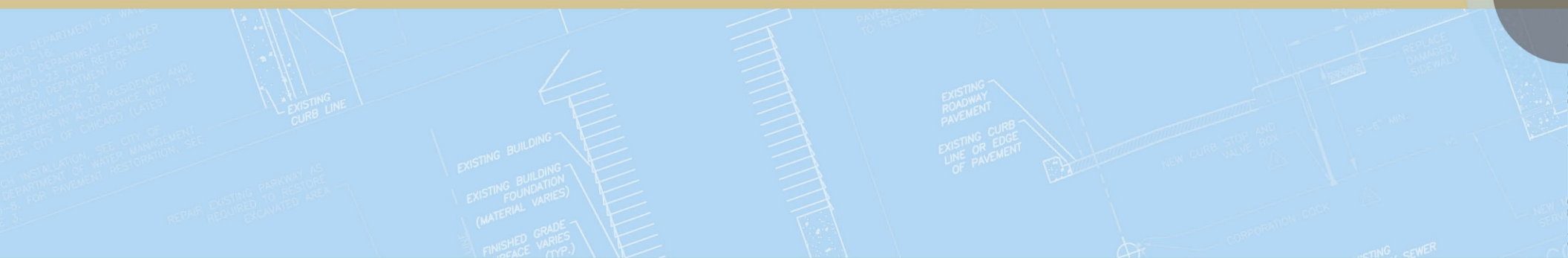
Andrea R. Holthouse Cheng, Ph.D., P.E., Commissioner
City of Chicago Department of Water Management

★ Lead Service Lines in Chicago

- 494,000 water accounts
 - 387,000 estimated Lead Service Lines
 - Private side LSL inventory began in 2009 & public side began in 2016
- Lead Services Lines (LSL) in Chicago
 - ~78% of single family & 2-flats
 - Pre-1988 & ≤ 2 " diameter
- Currently below EPA lead action limit
 - 90% of samples must be below 15 ppb
 - Chicago 90th-percentile is 9.1 ppb
- In Chicago, LSLs are in every residential neighborhood regardless of household income



Lead Sampling Background





Lead Sampling Programs

- Lead and Copper Rule (LCR) Sampling Program
 - Up until 6/2022 → reduced Monitoring (50 Homes every 3 years)
 - 10 full lead sampling profiles – Quarterly
 - Currently in the middle of re-sampling (switch from triennial to annual)
- 311 Program
 - Voluntary Consumer Program
- Chicago Department of Public Health (CDPH)
 - Part of Lead Exposure Investigation
 - No correlation found between lead levels in water and blood lead levels in Chicago
- Lead Research Studies
 - Before and After Water Main/Meter (largest study of its kind in the U.S.)
 - Ultrasonic Meter Study
 - Optimized Corrosion Control Pipe Loop



Lead Testing Programs: 311 Program

Free 311 lead testing kits & visits

- Chicago has offered free lead in-home testing at least 1986
- Began offering lead kits as opposed to in-home testing in 2016 due to spike in requests
- 3 bottles for samples at 0, 2, and 5 minutes of flushing
- Created apps in GIS to efficiently handle scheduling & tracking



- 2015
 - 50 requests
- April 2016 – July 2022
 - 103,909 lead test requests
 - 92,802 mailed, rest as visits
 - Peak of 400 kits/week
 - 33,756 kits returned
 - 34.8% return rate
 - 29,366 kits analyzed
 - 2,250 kits had any of the 3 bottles > 15ppb (7.66%)



Follow-Up Investigation: Overview

- Approximately 10% of Single Family Homes Require Follow-up
 - 2,100 Performed Since 2016
- Developed Over Time With 311 Lead Testing Program
 - Not Regulatory Driven
- Response to Homes with Elevated Lead
 - Maintain Consumer Confidence
 - Contact Provides Resident with Confidence the Utility is Working to their Benefit
- Offered if any sample shows elevated lead ($\geq 15 \mu\text{g/L}$) or shows lead levels increasing by 5 min flush
 - 2,100 Performed Since 2016, 20-25 Per Week Currently
 - ~7% Of all Kits, 10% of Single-Family Homes



Follow-Up Investigation: Profile Sampling

- Appointments typically last 30 minutes
- Sanitary Engineer performs detailed sampling profile of the plumbing system
 - Includes ten 1L samples collected sequentially
 - Samples at 3 and 5 minutes (7, 10, and 15 minutes if needed)
 - Analyzed for Total Lead
 - Minimum 6 hours of stagnation
 - Check temperature, chlorine residual and turbidity
 - Additional flush sample collected for metals analysis
- Ask resident questions about water usage
 - Previous home vacancies, extended periods of low water usage or unoccupancy, recent plumbing work
 - For metered homes water usage history is also pulled





Water Filter Program

- Water pitcher filters NSF-53 certified (no substitutions) to reduce lead and 6 filter cartridges are distributed
 - to any resident in a home that has elevated levels of lead
 - as part of water meter installation
 - as part of water main or sewer main replacement projects
 - given expected LCR revisions, in the future as part of repairs, etc.
- Filters can be requested by calling 312-742-2406 or at www.chicagowaterquality.org/filters
- Residents notified of eligibility via
 - mailed letters from DWM,
 - postcards,
 - emails (when available), or
 - Alderman notification.
- Over 61,000 filter sets distributed since Dec 2018

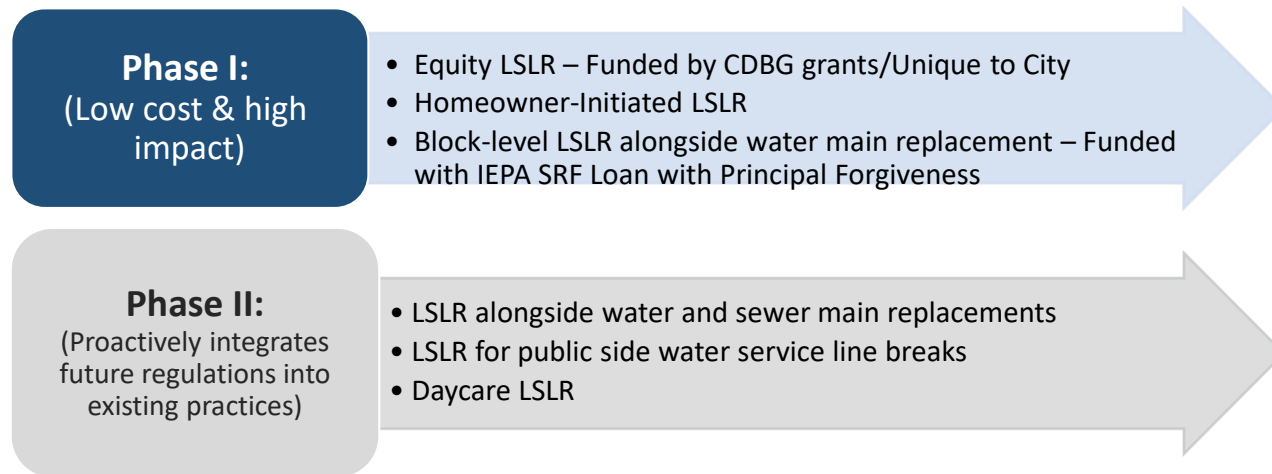
Lead Service Line Replacement





LSLR Summary

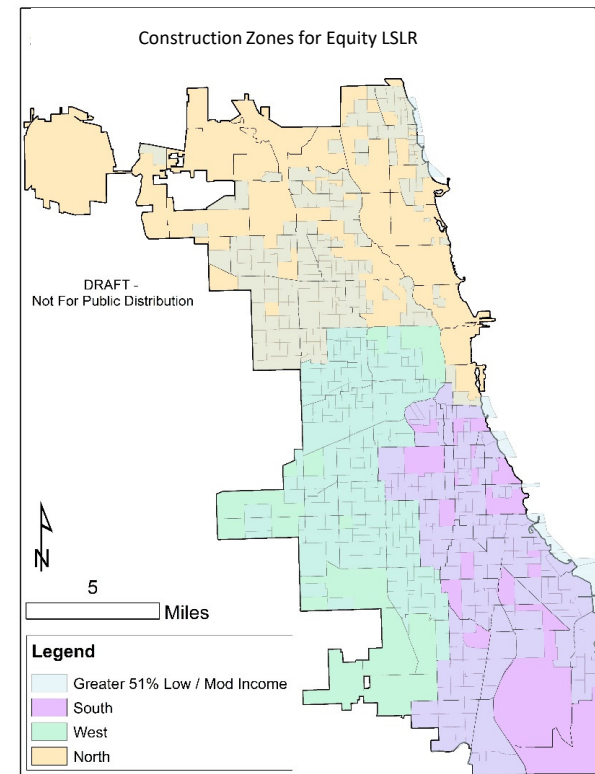
- Developing a plan for replacing all ~387,000 lead service lines
- Exploring methods to fund the program and reduce the financial burden on City residents



Chicago drinking water is currently in compliance with State and Federal Lead Regulations.

Phase I – Equity LSLR

- Unique to Chicago
- Summary: Free full LSLR for low-income
 - Prioritizes homeowners with tested lead >15 ppb or children in home
 - Focused on low-income neighborhoods
- City Cost: \$20,000-\$26,000 per full LSLR
- Funding: CDBG grant
 - \$15M CDBG for 2021 & 2022
- Estimated Annual Replacements: 600

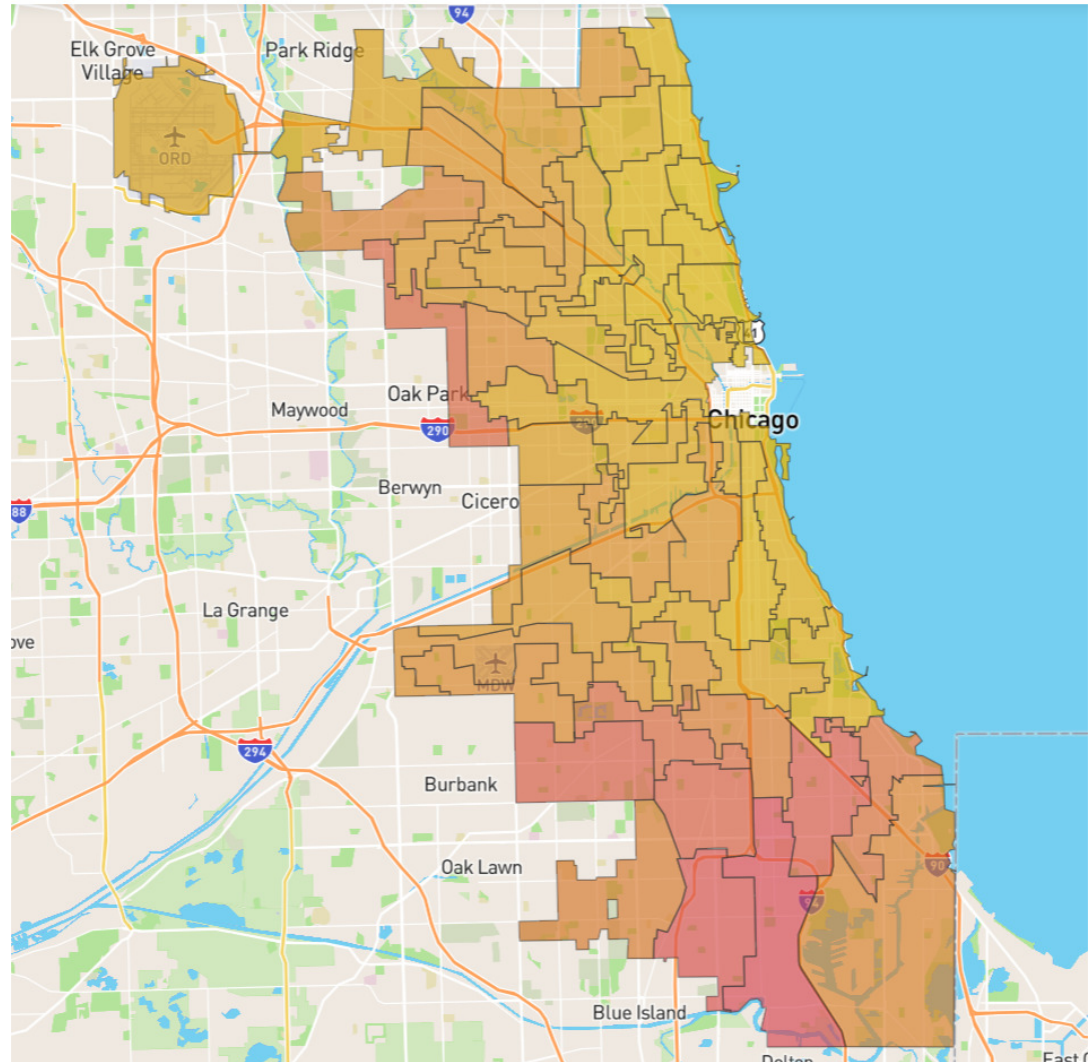


Replacements capped by region and prioritized by neighborhood income

ELSLR data

- 2,490 applications
 - Applications that provided income mapped here
 - Most applications came in since May 2022
 - Many have not finished providing income paperwork
- Income limit is \$83k (80% AMI)

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Attributes

- Those with LSLs tend to be more paper driven, more likely to take advantage of UBR, and more likely to be a senior
- All coincides with LSLs being mostly located in SFHs

Attributes	Visually confirmed as lead service lines (139-148k)	All service lines (495-500k)
% as Single Family Home	67%	53%
% that have ever been in Utility Billing Relief	5.6%	4.3%
% Currently in Utility Billing Relief	4.1%	3.2%
% Taking senior exception	34%	20%
% Receiving paperless bills	22%	27%
Avg. Median Income	\$ 60,976	\$ 62,107
Avg. Age of building (yrs +/- st. dev)	81.8 (59.2 - 104)	87.9 (56.0 - 120)

*Median Income from census data, building age from assessor data

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Income Variation

- LSLs found mostly in SFH & 2-flats
- Highest income areas are downtown, where very few SFH's exist
- High variability in census-based median income, with lead lines or without

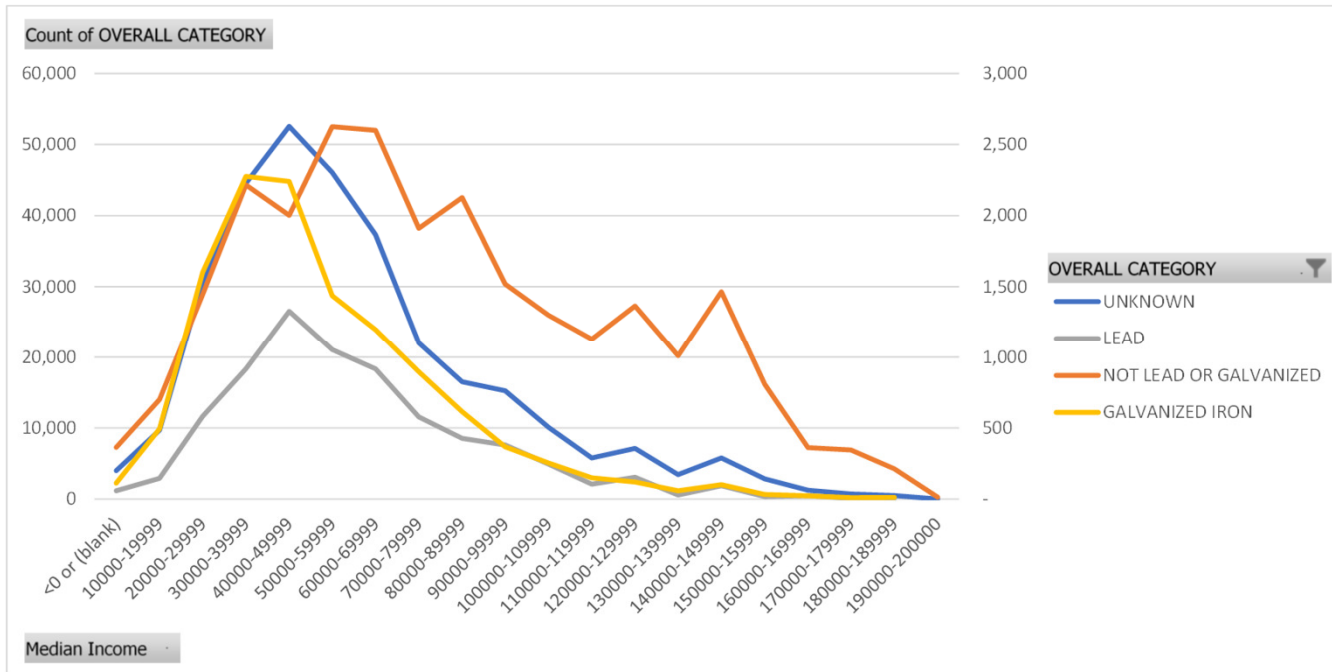
Row Labels	Average of Median Income	StdDev of Median Income	Min of Median Income	Max of Median Income	Count
GALVANIZED IRON	\$ 53,542	\$ 27,168	\$ 11,146	\$ 188,697	12,001
LEAD	\$ 60,976	\$ 28,451	\$ 11,146	\$ 188,697	141,415
NOT LEAD OR GALVANIZED	\$ 82,139	\$ 41,295	\$ 11,146	\$ 194,167	25,530
UNKNOWN	\$ 61,315	\$ 31,717	\$ 11,146	\$ 194,167	316,273
Grand Total	\$ 62,107	\$ 31,666	\$ 11,146	\$ 194,167	495,870

*Conservative inventory estimate – assumes any small residential services not visually seen are unknowns

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Income Variation

- Data slightly skewed - higher income when confirmed “not lead”, because of conservative estimate of copper
- Only consider confirmed copper if it’s a high rise or other large building, so that is mostly downtown



*Conservative inventory estimate – assumes any small residential services not visually seen are unknowns

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Questions?

