

Lead in Homes with Domestic Wells in Three Illinois Counties



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Lead and Health (CDC)



- ▶ Lead affects both adults and children and at high levels can severely damage the brain and kidneys
- ▶ Children more vulnerable than adults
- ▶ No safe blood lead levels have been identified for children
- ▶ In 2012 CDC lowered children's blood lead level of concern from 10 micrograms per deciliter to 5
- ▶ Despite the elimination of leaded gasoline and paint, there is still abundant lead in the environment

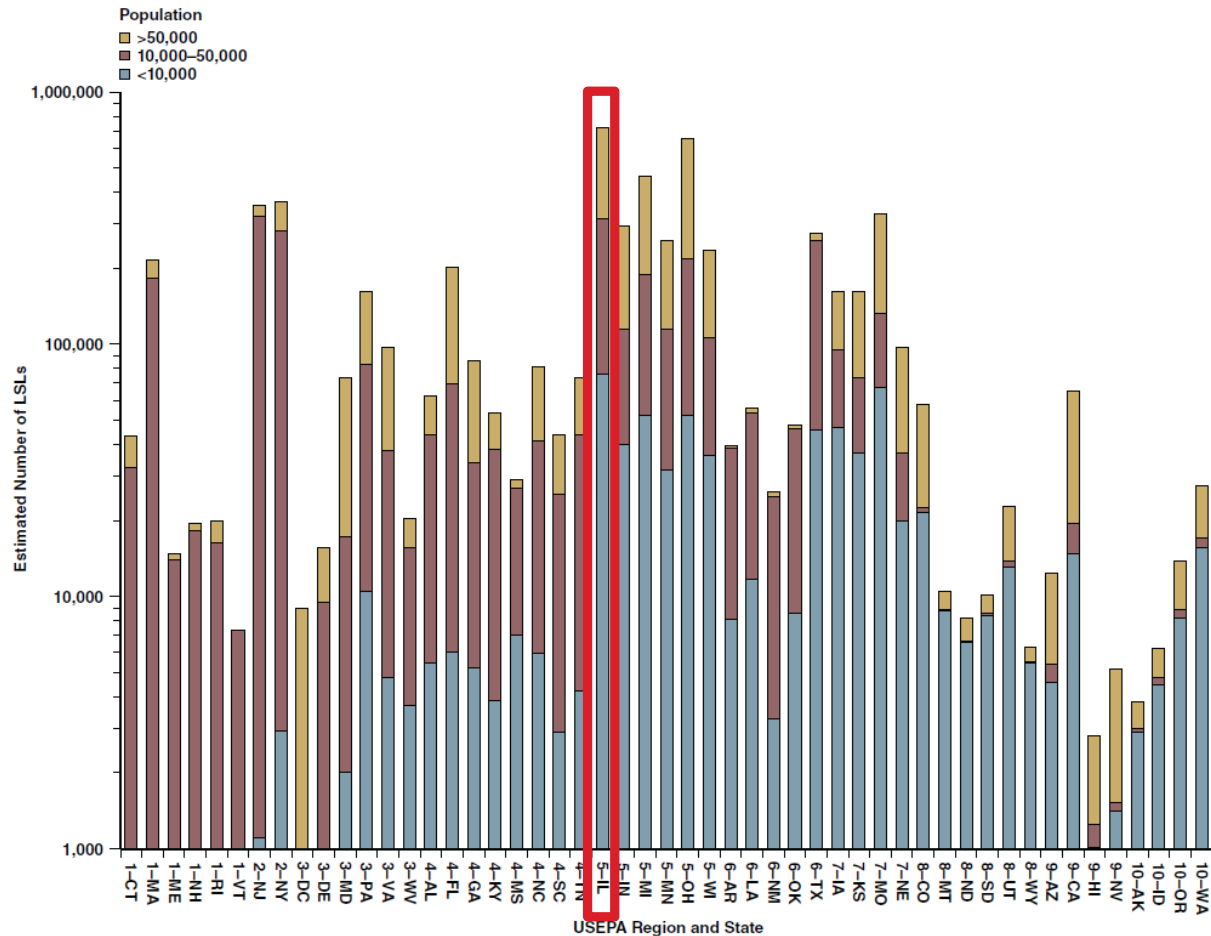
USEPA Lead and Copper Rule

- ▶ For public water supply systems
- ▶ Systems monitor drinking water at customer taps
 - Number tested a function of system size
- ▶ If Pb > 15 ppb in more than 10% of customer taps sampled, system must undertake additional actions to control corrosion
- ▶ Private wells are not regulated for water quality: the owner/user is responsible for making sure water is safe to drink and the system is maintained

How Many Lead Service Lines are There in Illinois?

- ▶ A lot
- ▶ 80% of Chicago's properties have a lead service line

FIGURE 5 Total number of LSLs estimated per population size range for each state^a



LSL—lead service line, USEPA—US Environmental Protection Agency

^aUS estimated number of LSLs from 2011 and 2013 surveys

It is important to caution that the analysis in this document was performed by grouped region. In order to convert to state occurrence, the same k and N values were assumed for each state in the grouped region. The state information is presented only to provide relative information on state variability.

What are the Sources of Lead into Well Water?

- ▶ Lead pipes are typically worst contributor; banned in 1986
- ▶ Lead solder used to join copper pipes (50% lead, 50% tin until 1986)
- ▶ Brass components such as faucets, coolers, and valves
 - Could be 8% Pb until 2012
 - Pipe and plumbing fittings and fixtures installed in potable water-supply systems after January 2014 must contain no more than 0.25% lead
 - Especially an issue during the first few months of use

What are the Sources of Lead into Well Water? (continued)

- ▶ Lead "packers" above the well screen may have been used in wells that were drilled over 20 years ago



What are the Sources of Lead into Well Water? (continued)

- ▶ Lead "packers" above the well screen may have been used in wells that were drilled over 20 years ago
- ▶ Some submersible pumps manufactured before 1995 may contain leaded-brass components
- ▶ Galvanized metal (zinc & lead coating)
 - Has a minimum lead requirement
 - Forms iron scale that can sorb lead (particulates)
 - Well casing, drop pipe for pump, premise plumbing, fittings
- ▶ In rare instances, lead can be a natural contaminant



How does the Lead get into the Water?

- ▶ Corrosive water can leach lead from surfaces
 - The longer the contact the more that is leached
- ▶ Particulates can flake off of scale, films, joints, fittings
 - Corrosion can cause particulates to be released directly
 - Dissolved lead may sorb to scale, then be removed by moving water during flushing
 - Particles moving through system can pick up lead
- ▶ Physical disturbances

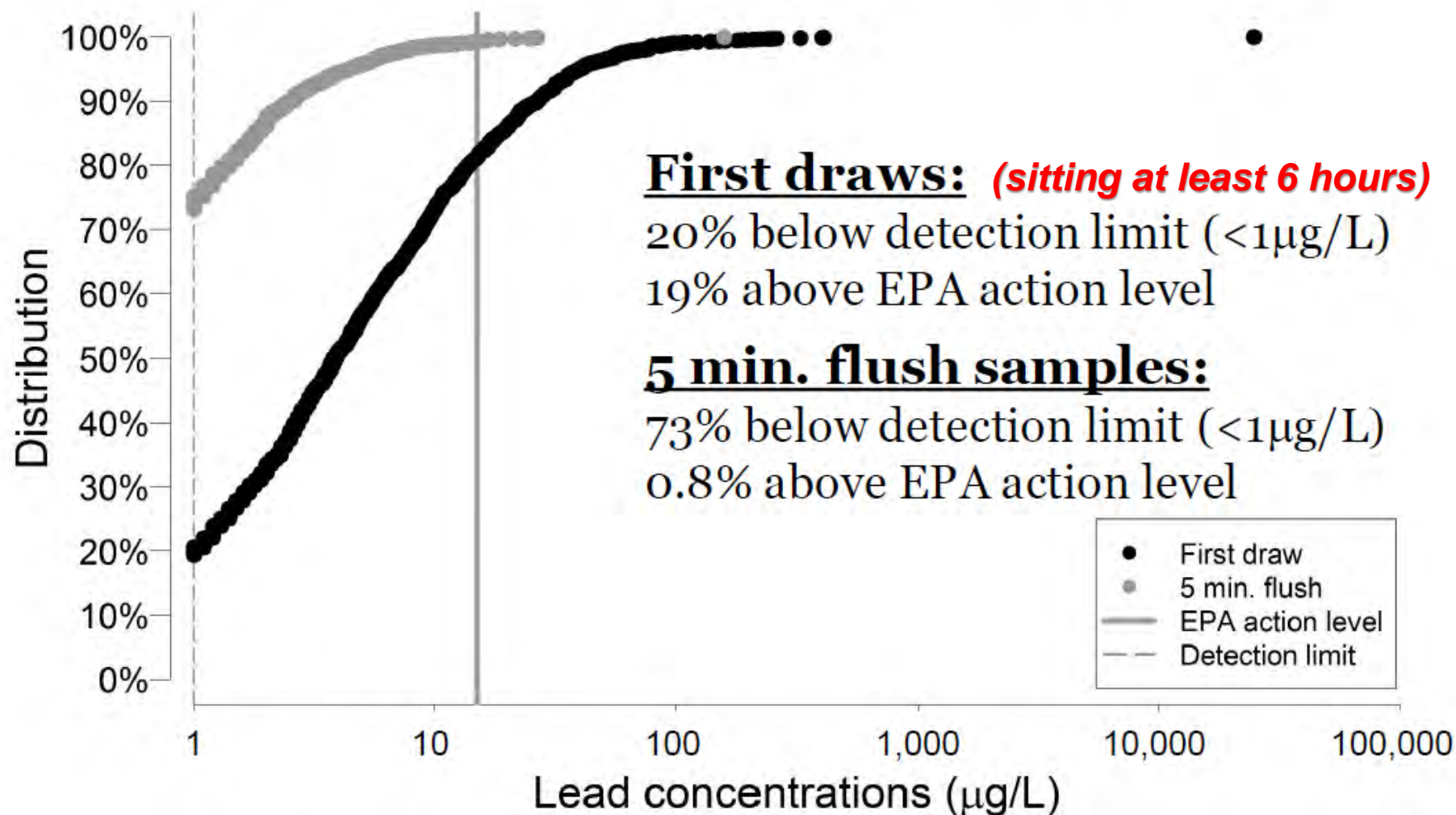


Lots of Water Quality Factors Can Affect Release of Lead

- ▶ pH and Alkalinity
 - ▶ Chloride and Sulfate
 - ▶ Hardness (Calcium and Magnesium)
 - ▶ Dissolved Oxygen
 - ▶ Oxidation Reduction Potential
 - ▶ Natural Organic Matter
 - ▶ Iron, Aluminum, Ammonia
 - ▶ Temperature
- Main factors for determining corrosivity*



Waterborne lead concentrations

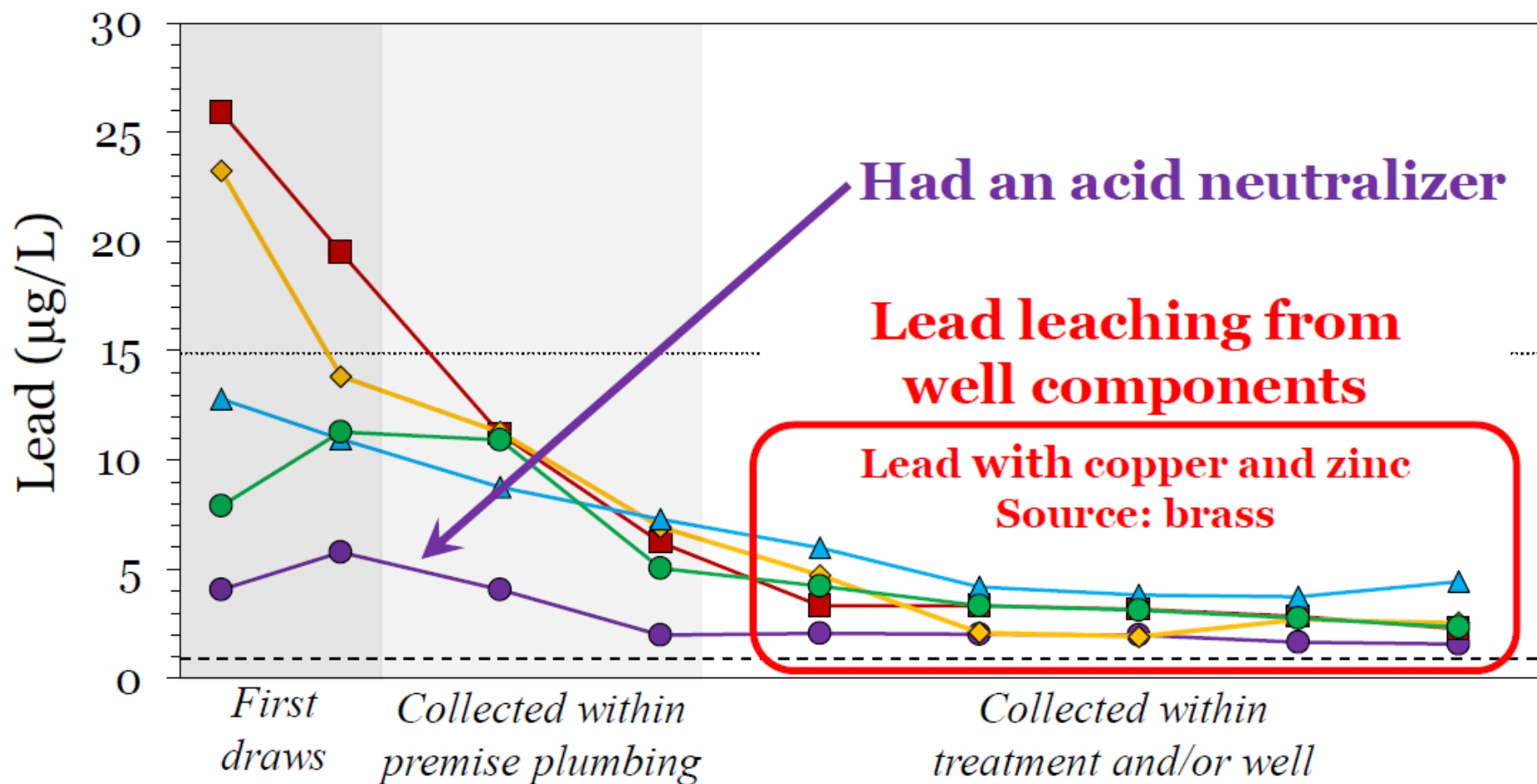


Pieper et al. (2015) *J Water Health* 13(3): 897–908

$n = 2144$

Homes with sustained detectable lead

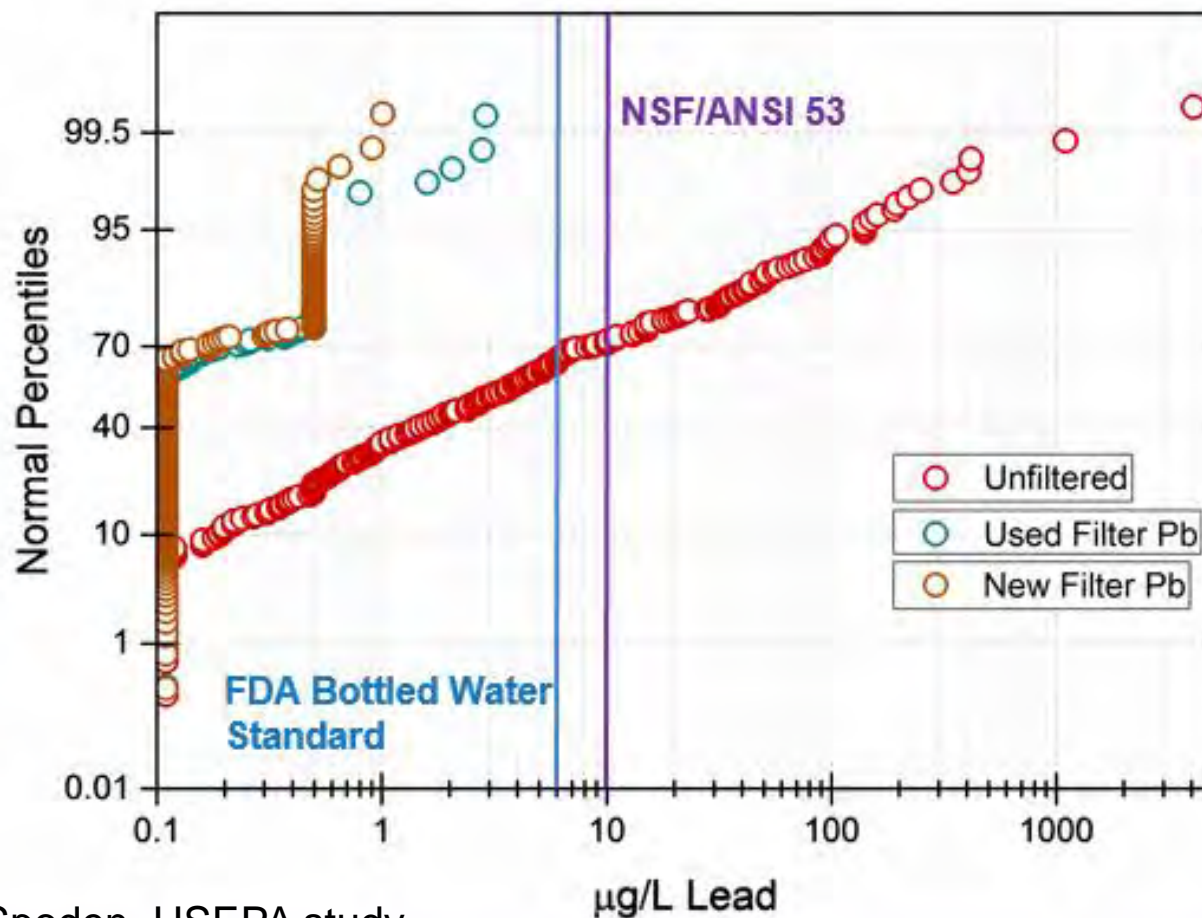
5 systems maintained detectable lead ($>1 \mu\text{g/L}$) despite flushing systems for 45+ minutes





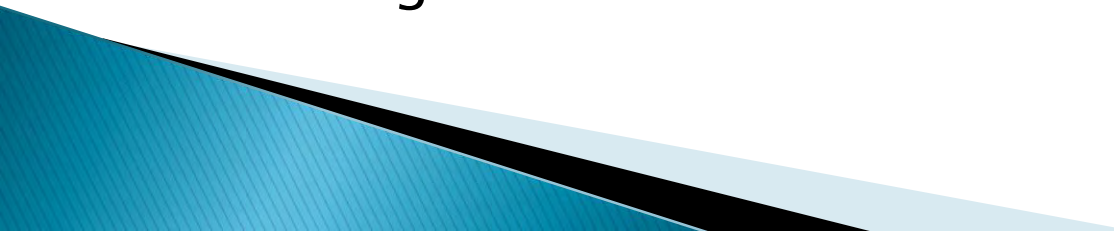
Performance with Pb Removal (Certified)—Kitchen tap

Removing Lead: Point-of-use Devices



Schock and Spoden, USEPA study

Research Aims: Pilot Study

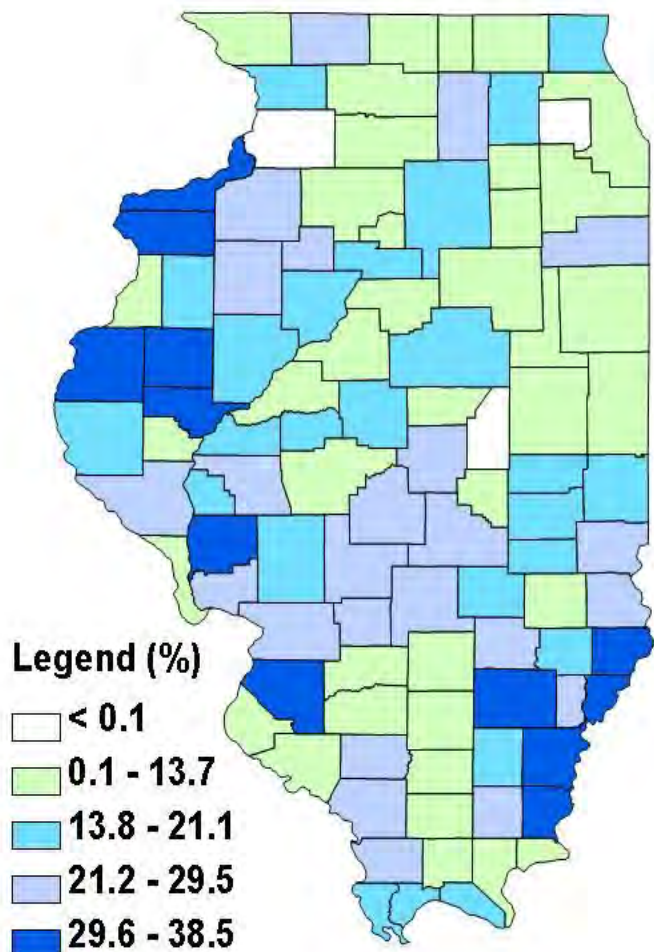
- ▶ Characterize the distribution of Pb and water corrosivity in domestic well water in 3 counties
 - ▶ Develop and evaluate health dept. partnerships, participant recruitment approaches, and home sampling methods in order to inform the design of a scaled-up study
 - ▶ If Pb levels are found to be elevated, explore options for mitigating sources of lead and/or corrosivity with homeowners, health depts., and other government agencies
 - ▶ Findings will indicate whether further study and public health interventions are needed to reduce Pb exposure among users of domestic well water in Illinois
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Methods

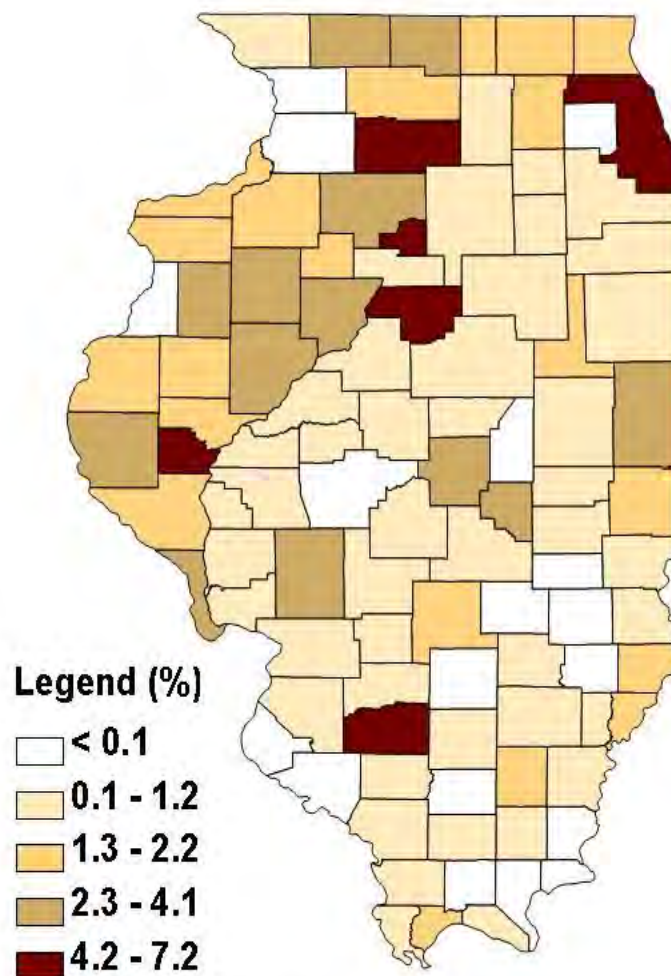
- ▶ Samples from ~75 homes in each of 3 counties
- ▶ Participant enrollment and data collection will be accomplished through partnerships with local health departments of each county
- ▶ Homeowners will collect 3 samples:
 - 1st L (Pb) [first draw]
 - 7th L (Pb)
 - Anions/alkalinity
- ▶ Health Dept. staff will survey homeowners and survey premise plumbing
- ▶ Follow-up: 15 homes with highest Pb levels per county re-sampled for complete chemical analysis



Percent of Children Tested* by County Illinois, 2008



Percent of Children with Elevated Blood Lead Levels* by County Illinois, 2008

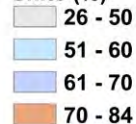


***Percent of children tested:** The number of children less than 72 months of age tested for blood lead divided by the total number of children less than 72 months of age based on 2000 U.S. Census data, multiplied by 100.

***Percent of children with elevated blood lead levels:** The number of children less than 72 months of age with a confirmed elevated blood lead level ≥ 10 $\mu\text{g/dL}$ divided by the number of children less than 72 months of age tested for blood lead, multiplied by 100.

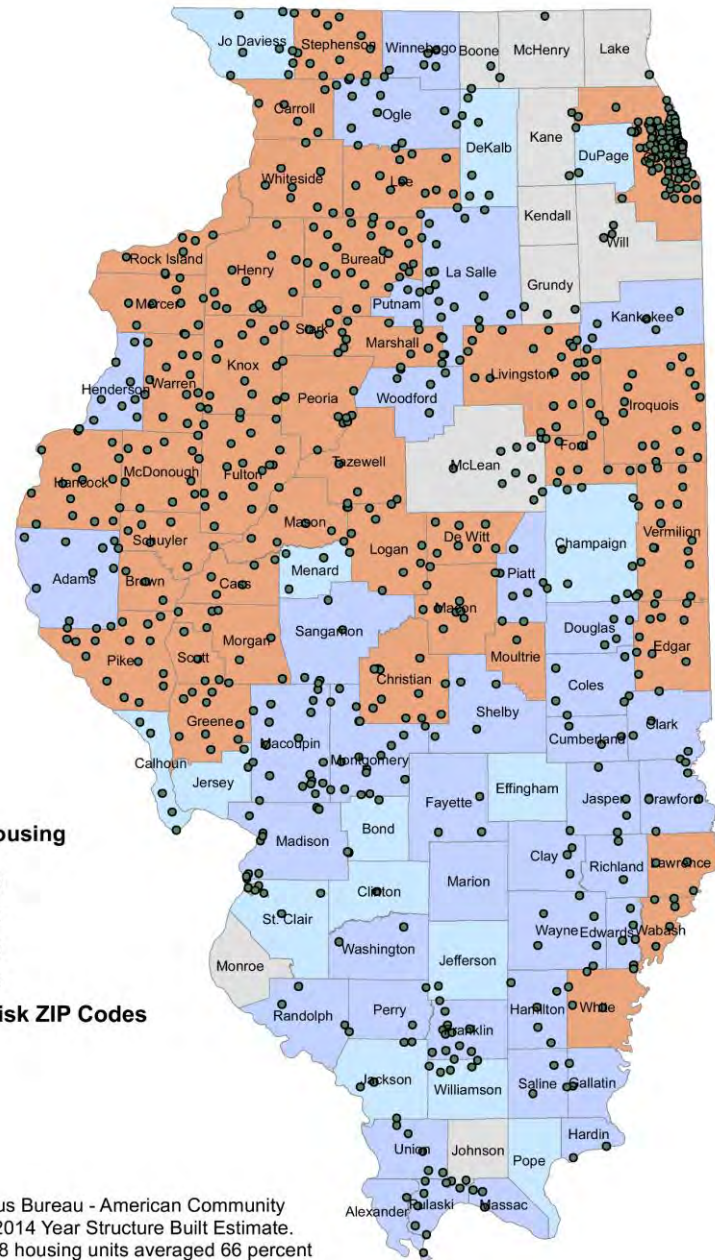
Old Housing and High- Risk Zip Codes in Illinois

Pre-1978 Housing Units (%)



• High-risk ZIP Codes

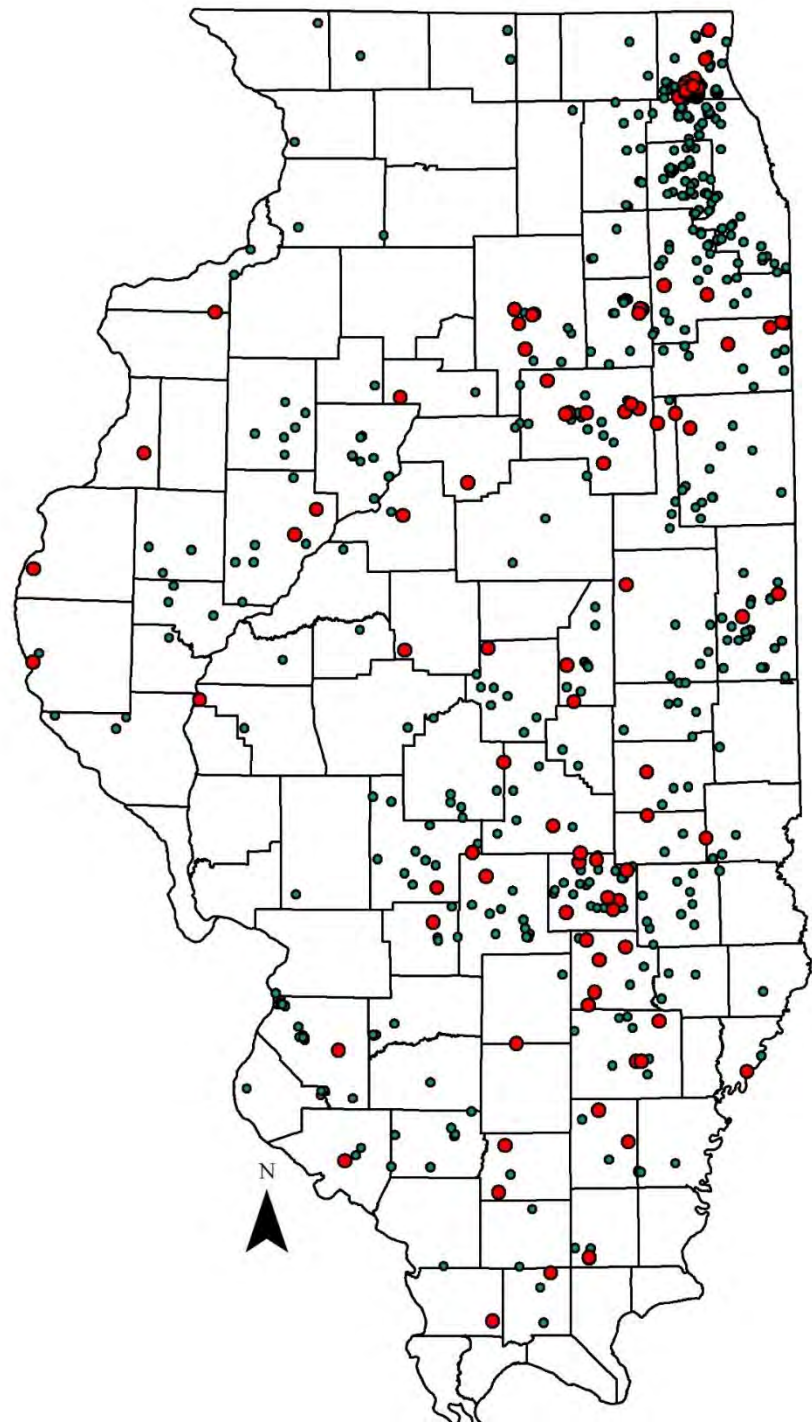
Source: Census Bureau - American Community Survey 2010-2014 Year Structure Built Estimate.
Note: Pre-1978 housing units averaged 66 percent by Illinois county. Created 12/15/2016.



Corrosivity in Domestic Well Water Samples

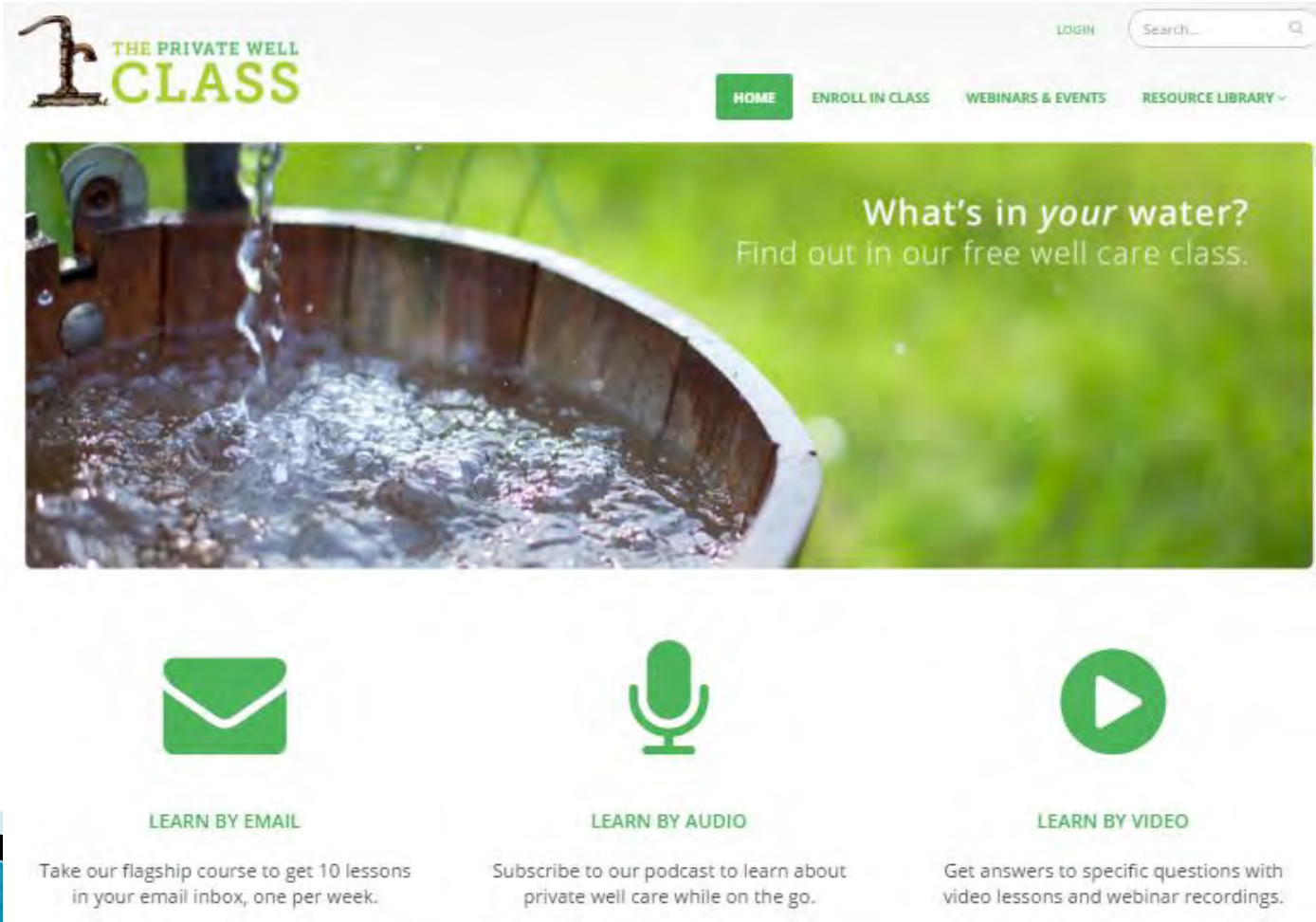
Larson-Skold Index

- Red > 3
- Green > 1



Resources on Lead available at PrivateWellClass.org

► <http://privatewellclass.org/lead>



The screenshot shows the homepage of The Private Well Class. At the top left is the logo, which features a stylized well head and the text "THE PRIVATE WELL CLASS". To the right of the logo is a "LOGIN" link and a search bar. Below the logo is a navigation menu with links for "HOME", "ENROLL IN CLASS", "WEBINARS & EVENTS", and "RESOURCE LIBRARY". The main banner image shows water being poured into a wooden bucket, with the text "What's in your water? Find out in our free well care class." overlaid on the right side. Below the banner are three learning options: "LEARN BY EMAIL" with an envelope icon, "LEARN BY AUDIO" with a microphone icon, and "LEARN BY VIDEO" with a play button icon. Each option has a brief description of the learning method.

THE PRIVATE WELL CLASS

LOGIN Search...

HOME ENROLL IN CLASS WEBINARS & EVENTS RESOURCE LIBRARY

What's in your water?
Find out in our free well care class.

LEARN BY EMAIL
Take our flagship course to get 10 lessons in your email inbox, one per week.

LEARN BY AUDIO
Subscribe to our podcast to learn about private well care while on the go.

LEARN BY VIDEO
Get answers to specific questions with video lessons and webinar recordings.

The Private Well Class

- ▶ A series of 10 lessons sent to participants via email over 10 weeks. Self-paced.
- ▶ Webinars provide specific information supporting the 10 lessons, giving participants a chance to ask questions. All are recorded and available online.
- ▶ A website, www.PrivateWellClass.org, that serves as a resource to private well owners.
- ▶ Additional resources for realtors, labs, EHP's, and podcasts, videos, and partner resources.

