Strong Heart Water Study
Participatory Interventions to Reduce Arsenic Exposure among Private Well Users in American Indian Communities

Christine Marie George
Associate Professor
Global Disease Epidemiology and Control
Department of International Health
Johns Hopkins Bloomberg School of Public Health

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# Strong Heart Water Study Investigators

**Columbia University**  
- Ana Navas-Acien

**Missouri Breaks Industries Research Inc**  
- Marcia O’Leary  
- Lyle Best  
- Joseph Yracheta  
- Marie Gross  
- Tracy Zacher  
- Annabelle Black Bear  
- Francine Richards

**Johns Hopkins Bloomberg School of Public Health**  
- Elizabeth Thomas  
- Martha Powers  
- Joel Gittelsohn  
- Allison Barlow  
- Larry Moulton  
- Kellogg Schwab  
- Ana Rule  
- Camille Morgan  
- Khaled Hasan
## Strong Heart Water Study Investigators

**Indian Health Service**
- CAPT David Harvey
- CAPT Rohlfs
- CAPT Boland
- Commander James Begeman
- Commander Kris Neset

**Tribal Housing Authorities**

**Environmental Consultants**
- Robert Thompson
- Carlyle Ducheneaux
- Reno Red Cloud

**MedStar Health Research Institute**
- Jason Umans
- Barbara Howard
Study Rationale

Map showing arsenic levels in drinking water across the United States. The map indicates areas where arsenic levels exceed the EPA standard of 10 μg/L.

Chronic Elevated Arsenic Exposure Associated with:

- Cardiovascular Disease
- Cancer Mortality of Lung, Prostate, and Pancreas
- Diabetes
- Kidney Disease

References:
Develop and evaluate the effectiveness of participatory interventions to reduce arsenic exposure among private well users in American Indian communities from North Dakota and South Dakota who have participated in the Strong Heart Study
Social Ecological Conceptual Framework for Strong Heart Water Study

- **Tribal Nations**
  - *Environmental Factors*
  - Arsenic mitigation policies for private well users

- **Community**
  - *Environmental Factors*
  - Access to water arsenic testing

- **Family/Household**
  - *Environmental Factors*
  - Access to arsenic mitigation options for private well users

- **Individual**
  - *Environmental Factors*
  - Access to arsenic safe water and to resources on the health implications of arsenic
Obtaining an Arsenic Test for a Private Well

Laboratory Testing
Installing Arsenic Removal Device
Drinking and Cooking with Water from the Filter Faucet
Changing the Arsenic Removal Device Cartridge
Aim 1: Strong Heart Water Study

Develop Sustainable Participatory Arsenic Interventions through Formative Research and Community Engagement

- In-Depth Interviews
- Community Workshops
- Intervention Development
- Pilot of Interventions
Aim 2: Strong Heart Water Study

Evaluate the Effectiveness of an Arsenic Intervention Program in Reducing Arsenic Exposure

- Conduct a randomized controlled trial
- Compare arsenic in urine and markers of cardiovascular disease and respiratory health pre and post intervention
- Evaluate long-term sustainability of intervention (1-3 years post intervention)
Aim 3: Strong Heart Water Study

Disseminate the Study Findings to American Indian Nations and Indian Health Service

• Disseminate the Strong Heart Study arsenic findings
• Inform sustainable arsenic mitigation policies based on the results of the developed intervention program
Formative Research
Formative Research: Liz Thomas

- Doctoral Student
- JHSPH: Department of International Health
- Formative Research for WASH Interventions
Aim 1: Formative Research Questions

1) What are community member and key stakeholder perceptions with respect to drinking and cooking water?
2) What is the level of arsenic awareness and risk mitigation in our partner communities?
3) What are community preferences for an intervention to reduce arsenic exposure in this setting?
4) What are the barriers and facilitators to sustained use of arsenic-safe water?
Exploratory Qualitative Research

34 In-Depth Interviews

- Private Wells Users
- Water Utility or Water Resources Staff
- Tribal Leaders and Educators
- Community Elders
- Indian Health Service Technical Personnel
- Tribal Community Health Workers
- Non-Governmental Organization Staff
Individual Preferences
Aesthetic Qualities of Water

- Taste
- Smell
- Appearance (e.g. color)
- Temperature

Well Water Use

Well Water Non-Use
Individual Preferences
Aesthetic Qualities of Water

Positive aesthetic qualities of drinking water
- Cold Temperature

I like to have ice, or really cold water. And, um, so that's why I mainly don't drink that water [public supply water].
Individual Preferences
Aesthetic Qualities of Water

Negative aesthetic qualities of drinking water

- Taste and Smell of Chlorine

You can taste it…the chlorine is what you can taste. And then you go up country and there’s no chlorine [the water]. And there’s such a big difference, you know, just the taste of it. Even though the city water may be safer, but the taste of it, you know.
Awareness and Understanding of Arsenic

- Range of familiarity with arsenic
- Associations between poor aesthetic qualities and arsenic
- Origins:
  - Naturally occurring
  - Anthropogenic
    - Illegal dumping
    - Pesticides

I haven’t heard [of] any arsenic being around HERE. I know it can exist in drinking water and I know...it’s virtually a poison...I’m assuming it’s naturally occurring, but I don’t know that.
The Relationship between Water and Health

- Important concern among communities
- Concerns voiced for exposure to heavy metals, bacterial infections, and pesticides from drinking water

Tying personal experiences with cancer to water

Tying personal experiences of good health to having good water
…My [spouse] and my [other relative] each had cancer within a year of each other, and I’ve heard people say, “Oh, it’s something in the water,” and, you know, there’s different neighbors that had cancer, and I always just dismiss that as just an expression, but…it really does make you wonder. Could it be something in the water that maybe our health outcomes have a little more to do with the water than we ever knew possible? (Private Well User).”
The Relationship between Water and Health

To me [private well] water’s kind of good! I don’t know how good it is, but we drink it and...nothing happened to us, so it’s good.

(Private Well User)
Water as a priority, and competing priorities

- Water is life
- Competing “day-to-day” priorities

...because of the economic conditions...many times people don’t have time to worry about water...when you don’t have a job and you’re just getting by putting food on your table...just surviving...water quality might be on your mind it’s pretty low on the priority, given the other things.
Community Workshops
Community Workshops

Newspaper
Word of Mouth
Door to Door Distribution
School/Child change agent
Senior Center/Elder change agent
Posters

Flyers
Video
Radio/PSA
Facebook
TV
Mail

Presenter’s Name
Date
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<th>Vote Count</th>
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<td>Communication of water test results</td>
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<tr>
<td>34</td>
<td>Need for education and information</td>
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<tr>
<td>30</td>
<td>Contamination (herbicides/pesticides)</td>
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<td>25</td>
<td>Cost for sustainable filtration</td>
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<td>Cost of testing</td>
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# Preferred Communication Channels

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<td>Mailings</td>
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Intervention Development
Obtaining an Arsenic Test for a Private Well

**Posters**

**Newspaper**

**Mailings**

**Radio**

**Hotline**

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**About the Strong Heart Water Study…**
- Arsenic is naturally occurring but only in some locations in parts of South Dakota.
- Arsenic is tasteless, odorless, and colorless. Without proper testing, there is no way to tell if your well water has arsenic in it.
- The US EPA standard for Arsenic is less than 10 parts per billion.
- Arsenic is unhealthy at elevated levels.
- The only way to know for sure if your well water is safe to drink is to have your well water tested.

*This message only pertains to private wells, not the Minn-Wicomi Water System.*
Water Arsenic Testing Program

- 347 Wells Tested
- 112 Wells Arsenic >10 µg/L
Water Arsenic Testing Program

- 330 Wells Tested
- 101 Wells with Arsenic above EPA Standard of 10 µg/L

Water Arsenic Samples from Household Wells
Community A (N = 330 wells)
Deciding to Install an Arsenic Removal Device

Call to Explain Water Arsenic Result

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<td>mg/L</td>
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<td>Uranium (U)</td>
<td>0.020</td>
<td>mg/L</td>
<td>10</td>
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Mailing

About the Strong Heart Water Study...
- Arsenic is naturally occurring but only in some locations in parts of South Dakota.
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- Arsenic is unhealthy at elevated levels.
- The only way to know for sure if your well water is safe to drink is to have your well water tested.

*This message only pertains to private wells, not the Mini-Wiconi Water System.*

Strong Heart Water Study Partners:
- South Dakota University
- Indian Health Service
- Water Quality Research Institute
- University of Washington
- University of Oklahoma
Installing an Arsenic Removal Device

Image showing the installation of an arsenic removal device under a kitchen sink, with labels for the main faucet and filter faucet.
Drinking and Cooking with Water from the Filter Faucet
Drinking and Cooking with Water from the Filter Faucet

WHY DID YOUR FAMILY CHOOSE TO FILTER YOUR WATER?
Drinking and Cooking with Water from the Filter Faucet
Changing the Arsenic Removal Device Cartridge
Changing the Arsenic Removal Device Cartridge

STEP 2: Take out and open canister
Health Promoter Intervention Contacts

6 Month Intervention Program
1. Installation In-Person Visit
2. 2 Week Phone Call
3. 1 Month In-Person Visit
4. 3 Month Phone Call
5. 5 Month Phone Call
6. 6 Month In-Person Visit
Pilot
Pilot Study Design

Pilot Households
- 9 Month Follow-up Period
- Arsenic Removal Devices
- Study Arm Assignment
  - Intensive Intervention
  - Standard Intervention

Evaluation
- Follow-up In-Depth Interviews
- Water Quality Measurement
“The biggest change [is I] don’t see the residue – seeing that, what we’re eating, drinking, that to me [is a] big plus – [it] makes me feel better about drinking clear water, better water than what we [had].”

“I tell them [the kids] to use [the filter faucet] or the water in the pitcher or cold water in the fridge. The kids don’t ask questions – they kind of like the new little system, something different.”
Pilot Findings: Successes

“I use them all [intervention promotional materials]…I think it covers everything. We use the water bottles inside and outside – take them with us when it’s nice, go cruising, or whatever.”
“It takes a while, but I’d rather wait for the water…just be patient with the water flow, so you know you have safe water. You’re helping feed your families, and your children. Just keep using your filter, sometimes it’s convenient to open the regular faucet…”
Interviewer: “What do you think of the filter faucet?”

Participant: “I’ve never tried it… I’m waiting [for the results].”
Upcoming Activities
Upcoming Activities: June 2018

Randomized Controlled Trial

Tribal Level Intervention
Policy planning and sustainability

Community Level Intervention
Community promoter training program
Water arsenic testing program

Household and Individual Level Interventions

Standard Program
150 Households
300 Participants (2 per home)
• Arsenic removal device
• Written maintenance instructions (1 visit)

Intensive Health Promotion Program
150 Households
300 Participants (2 per home)
• Arsenic removal device
• Health promotion program including maintenance instructions (6 Contacts)

Funded by National Institutes Environmental Health Sciences (R01ES025135)
Evaluate the effectiveness of an arsenic intervention program in reducing arsenic exposure

- Compare arsenic in urine and markers of cardiovascular disease and respiratory health pre and post intervention (installation, 1 month, and 6 month visits)
- Evaluate long-term sustainability of intervention (1-3 years post intervention)
Questions