Dartmouth Toxic Metals
Superfund Research Program

Arsenic in NH Private Wells:
Challenges of Communicating & Translating Risk & Research to Local Communities

Dartmouth Toxic Metals Superfund Research Program
Research Translation & Community Engagement

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http://www.dartmouth.edu/~toxmetal/

Research Translation Core

- **Communicating to Broad Audiences**
- **Partnering with Government Agencies**
- **Communicating with NIEHS & Other SRPs**
- **Technology Transfer**

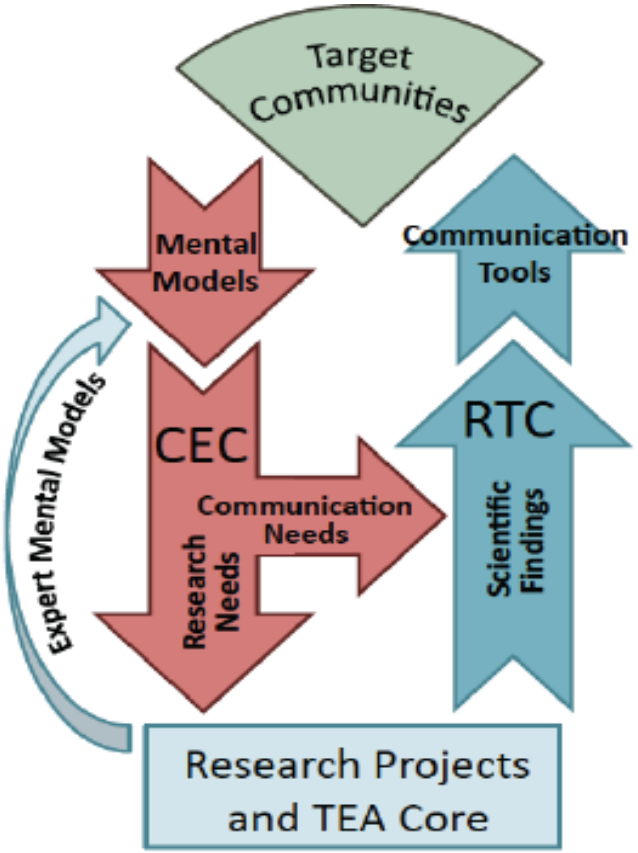


Figure 1. Knowledge flow relationship between CEC, RTC and target communities.

What I will cover…

1. Setting the stage
2. Overview of CDC funded NH DES grant
3. What can we learn from this experience?
4. Where do we go from here?

1. Setting the stage…

Arsenic in water from public bedrock wells in New England – data from New England states

New Hampshire:
"The Arsenic State"

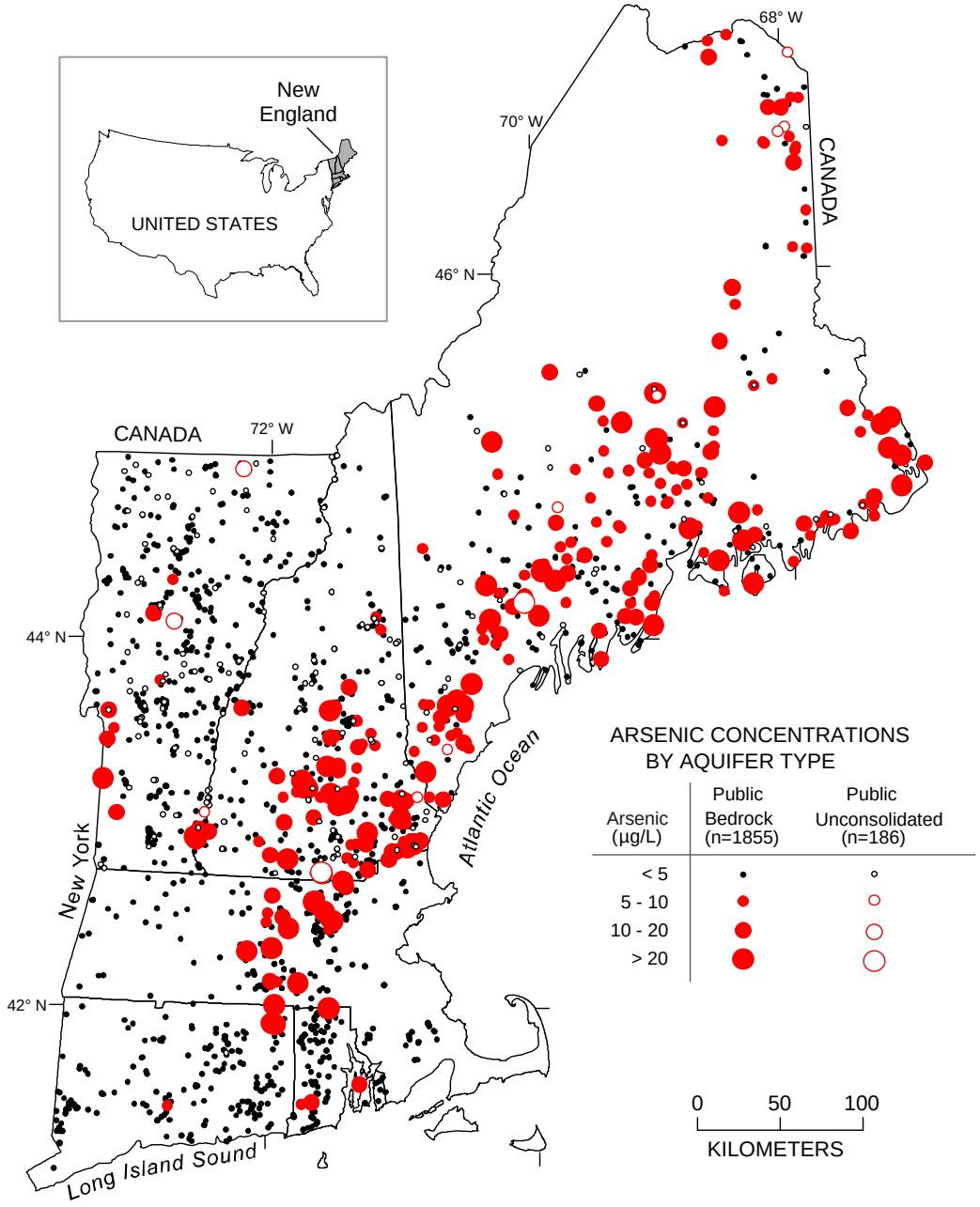
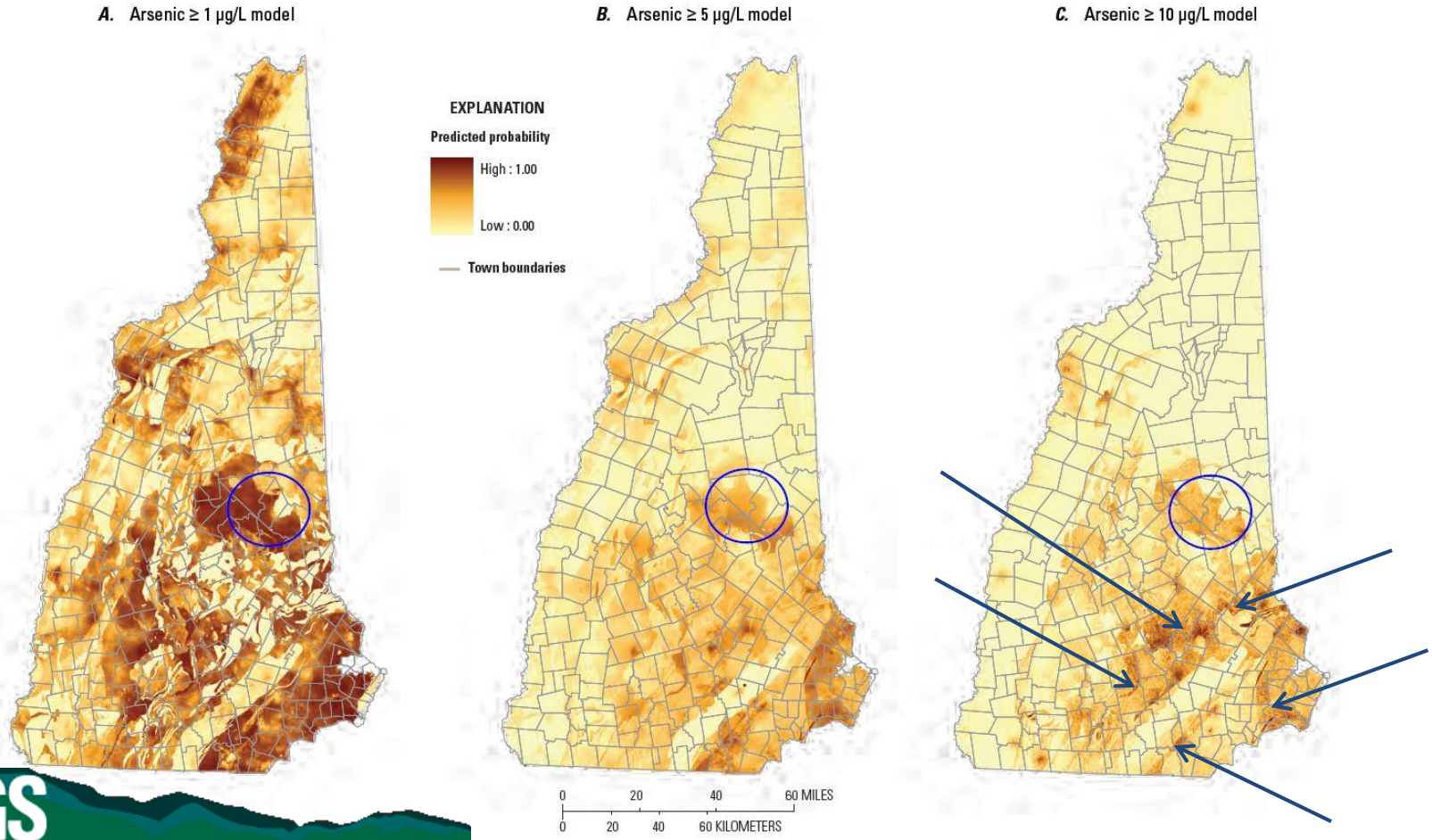


FIGURE 1. Arsenic concentrations in source waters to public-supply wells in New England.

Model-predicted probabilities of arsenic concentrations in groundwater from bedrock aquifers at 1, 5 and 10 PPB.



Arsenic in drinking water: Possible health effects

- Studies link exposure to arsenic in drinking water to a wide variety of adverse health effects:
  - Cancers (bladder, skin, kidney, liver, prostate and lung)
  - Vascular and cardiovascular disease
  - Reproductive and developmental effects
  - Cognitive and neurological effects
  - Diabetes and other metabolic disorders
  - Neuropathy

Hughes et al. (2011). "Arsenic Exposure and Toxicology: A Historical Perspective" *Toxicological Sci* 123(2): 305–332.

WHAT IS RISK?

Simply stated**, "risk"** is the **likelihood** that a **harmful consequence will occur** as a result of **exposure to a hazard**. An important thing to note in this definition is that **for risk to occur** there **must be both** a *source* of risk (**the hazard**) and **an *exposure* to the hazard**. Even if you are exposed, it is possible that concentrations may be so low that they would not be expected to pose a health concern.

Examples:

- MtBE: Manmade; result of industry

- Arsenic: Naturally occurring, result of natural processes

Risk Perception:

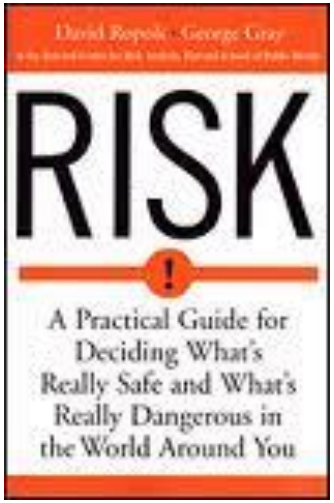
Fischoff:
Risks familiar, voluntary, natural, under control **Vs.**
exotic, unfamiliar, involuntary, out of control

Risk Communication: (Lundgren, McMakin, 2009)

Care Communication—danger and management determined by research—protecting

Consensus Communication—working together to determine how to manage risk

Crisis Communication—extreme, sudden danger



David Ropeik:
Risk: A Practical Guide for Deciding What's Really Safe and What's Really Dangerous in the World Around You

Arsenic Risk Characteristics

- No perceptual cues or reminders of presence of risk – colorless, odorless, tasteless
- Risk is generally natural; no villain to assign responsibility or blame
- Experience with risk is generally benign
- Deaths due to the risk are not dramatic
- Exposure to the risk is voluntary
- Effect of the risk is far removed from initial exposure
- Risk is not the same for everyone but varies in complex ways
- Probability of the risk relatively low

A Risk related message should…

Be Clear.

It Must Present:

1) **The Problem.**

2) **Information about the problem.**

3) **Action.**

2. Overview of NH DES Grant…

Arsenic in Private Well Water in New Hampshire

- **Year One Activities**
  - Community Focus Groups
  - Statewide Survey
  - Intervention Selection and Design
- **Year Two Activities**
  - Town Selection Process
  - Intervention Implementation Planning
  - Communication Materials Development

Focus Groups:

Barrington, Goffstown, Londonderry, New London, NH

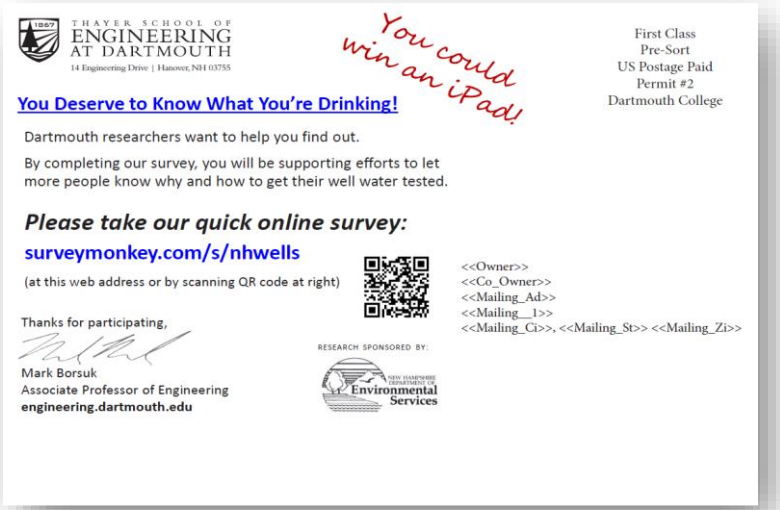
Selected because all have:

(i) a relatively high number of private wells;
(ii) regions with high arsenic levels according to USGS data;
(iii) a relatively high percentage of children among their population relative to other NH towns.

Arsenic in Private Well Water in NH

Statewide Survey

- Goals
  - Estimating rates of well water testing and treatment for As
  - ID factors determining rate of water testing results and treatment
  - Evaluating NH DES flyer in encouraging water testing
  - ID subpopulations less likely to test and treat their water
  - Determine types and maintenance of water systems being used


THAYER SCHOOL OF ENGINEERING AT DARTMOUTH
14 Engineering Drive | Hanover, NH 03755

You could win an iPad!

First Class
Pre-Sort
US Postage Paid
Permit #2
Dartmouth College

You Deserve to Know What You're Drinking!

Dartmouth researchers want to help you find out.

By completing our survey, you will be supporting efforts to let more people know why and how to get their well water tested.

Please take our quick online survey:

surveymonkey.com/s/nhwells

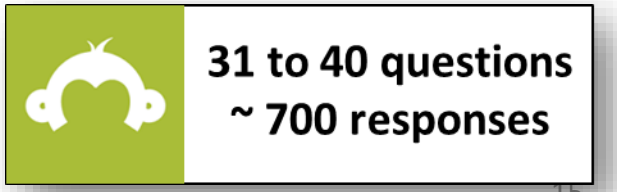
(at this web address or by scanning QR code at right)

<<Owner>>
<<Co_Owner>>
<<Mailing_Ad>>
<<Mailing__1>>
<<Mailing_Ci>>, <<Mailing_St>> <<Mailing_Zi>>

Thanks for participating,

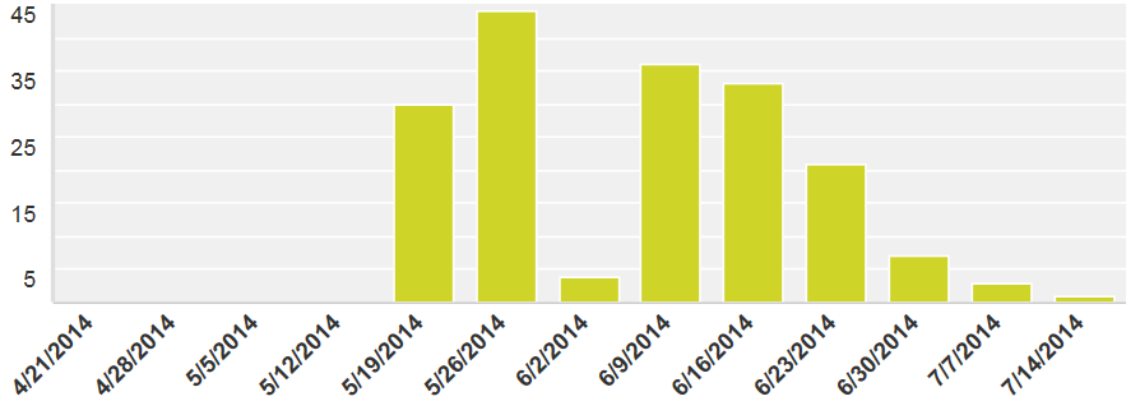
Mark Borsuk
Associate Professor of Engineering
engineering.dartmouth.edu

RESEARCH SPONSORED BY:
Environmental Services

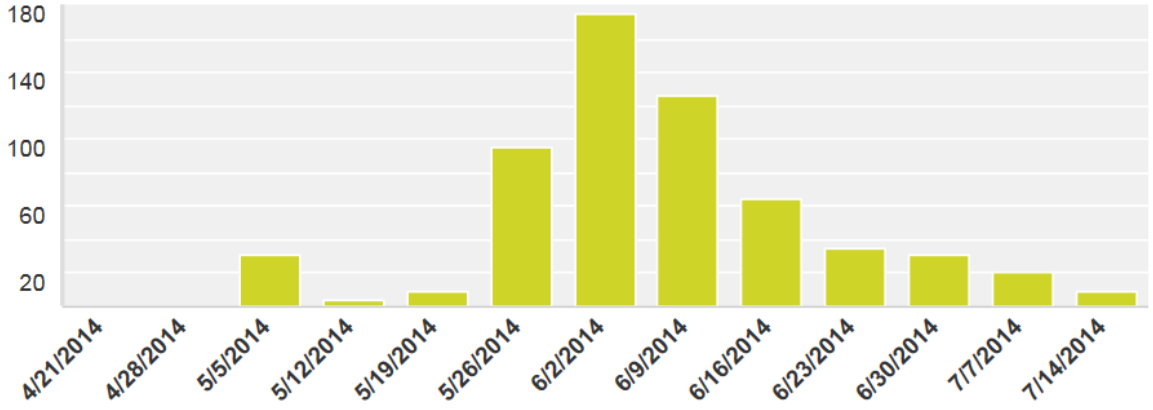


Timing of Survey Responses:

5800 from a list of 50,000 with wells drilled since 1984—3%



Media promotion and town outlets- 550 responses



Exposure and Health Effects:

- estimate based on information available at the time of the 2001 NRC report likely underestimates health effects in NH
- consistent with the expectation that the current DRAFT IRIS guidelines are likely to lead to a further increase in the estimated cancer risk rate[21]
- conclude that our lifetime estimates for NH of 737 potentially avoidable cancers (640 lung and bladder cancers and 97 skin cancers), is likely a lower bound on a very uncertain estimate of the full health impacts of exposure to arsenic in well water in New Hampshire (Figure 10)

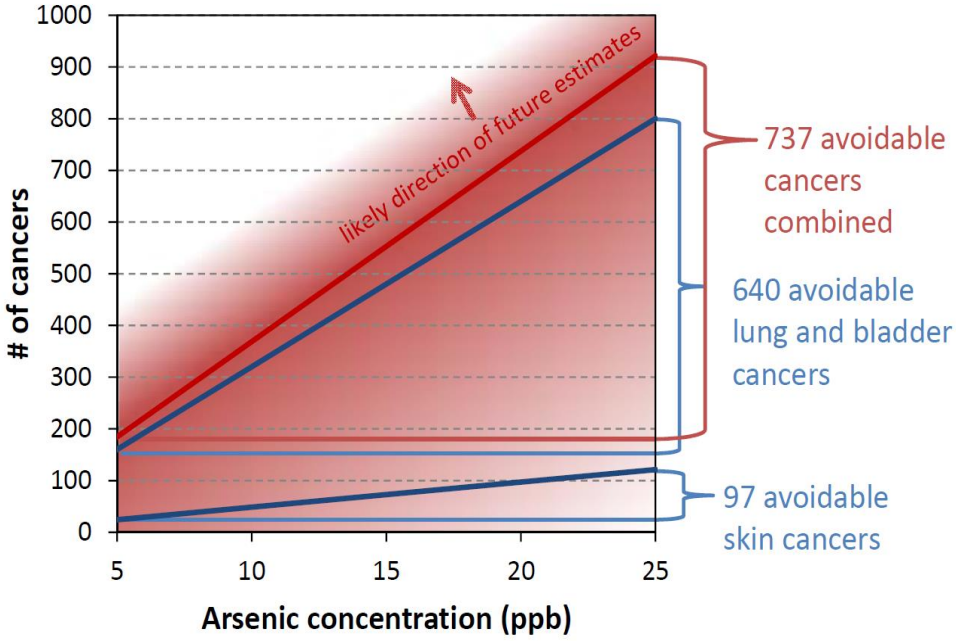


Figure 10. Illustration of the relation average well water arsenic concentration and the estimated number of potentially avoidable cancers in NH.

Implement the three best local interventions:

- ***town communications***, ***testing events***, and ***intercept events***
- in six highly motivated towns

Experimental Design

INTERVENTION	Town					
	1	2	3	4	5	6
A	X		X	X		X
B	X	X		X	X	
C		X	X		X	X

Town Selection Process

- Pre-readiness screening
- Key Informant Community Readiness Interviews

  Turn water GREEN!
- Town Selection

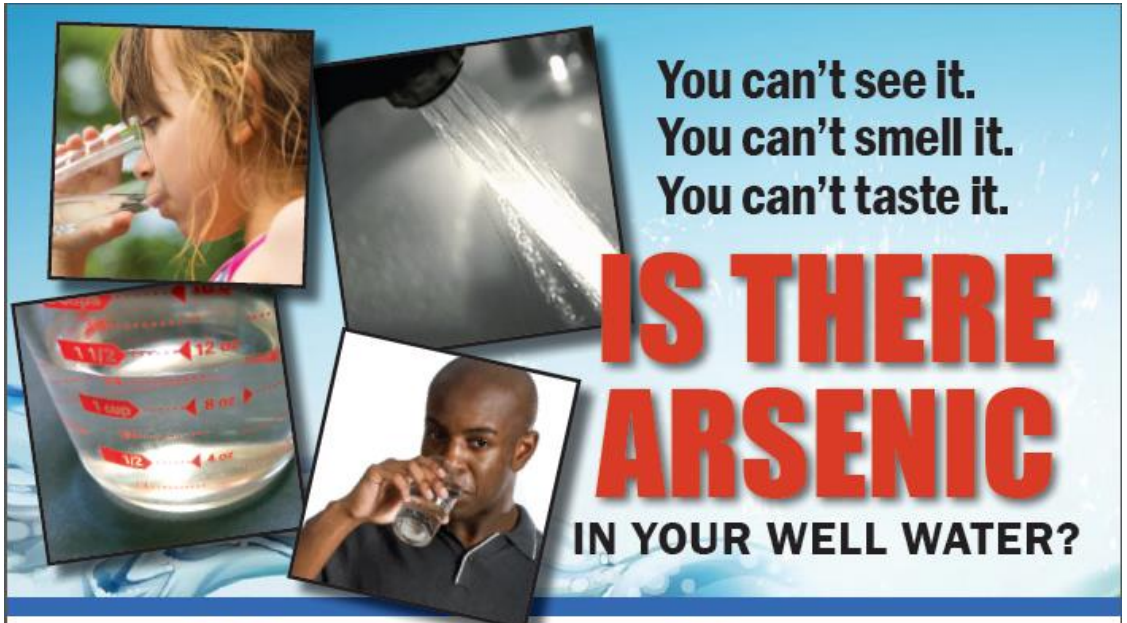
Town	Town Communication	Intercept Event	Testing Event
Bow	X		X
Windham		X	X
Pelham	X	X	
Londonderry		X	X
Barrington	X		X
Epsom	X	X	

Intervention Implementation Planning

- Working with all 6 towns to select locations and communication methods

Community Health Institute/John Snow

- Outreach material design (focus groups, key informant interviews, PAT)
- Evaluation and Intervention Planning and Operations



You can't see it.
You can't smell it.
You can't taste it.

IS THERE ARSENIC IN YOUR WELL WATER?

1 in 5
homeowners' wells in New Hampshire contain unsafe levels of arsenic

15 dollars
is all it costs to test your well water for arsenic

10 minutes
is all it takes to collect a water sample

3-5 years
is the recommended frequency for testing

ARSENIC IS COMMON IN WELL WATER.

- **Arsenic is present in New Hampshire well water** because of the state's granite and other types of rock.
- Arsenic in well water can cause **serious health issues over time**, such as heart problems and bladder, skin, and lung cancer.
- **Children are especially vulnerable** to the effects of arsenic in water.
- Everyone's wells need testing, so **do not rely on the results of your neighbor's test.** Arsenic levels vary from house to house.
- **Common treatment methods, such as boiling, pitcher filters, or a water softener, do not remove arsenic.**
- There are **many resources available** to help! We suggest you start at: http://www.dartmouth.edu/~toxmetal/arsenic

TESTING YOUR WATER IS EASY.

- The **first step to keeping your family safe** is to test your well water for arsenic and other contaminants.
- The cost to test your water ranges from about **$15 for just arsenic to $85 for a standard package** of tests of the most common contaminants.
- **Sample collection bottles are easily available** from state or private labs. Bottles **can be mailed to you** and samples **can be mailed back**. Directions will be included in your kit.
- If testing shows that you have unsafe levels of arsenic, there are **reliable options** to address it.
- For a list of certified labs, visit: http://www2.des.nh.gov/CertifiedLabs

TEST YOUR WATER TODAY, AND THEN AGAIN EVERY 3 TO 5 YEARS.

Visit http://www.nhwellwatertest.org/

You can't see it. You can't smell it. You can't taste it.

"I had no idea the water we were drinking and cooking with was unsafe. I have lived in my house for 10 years and didn't realize I had arsenic in my water that could affect my family's health. It looked, smelled and tasted fine. The fix was easy and not too expensive. I feel so much better knowing the water is safe to drink."

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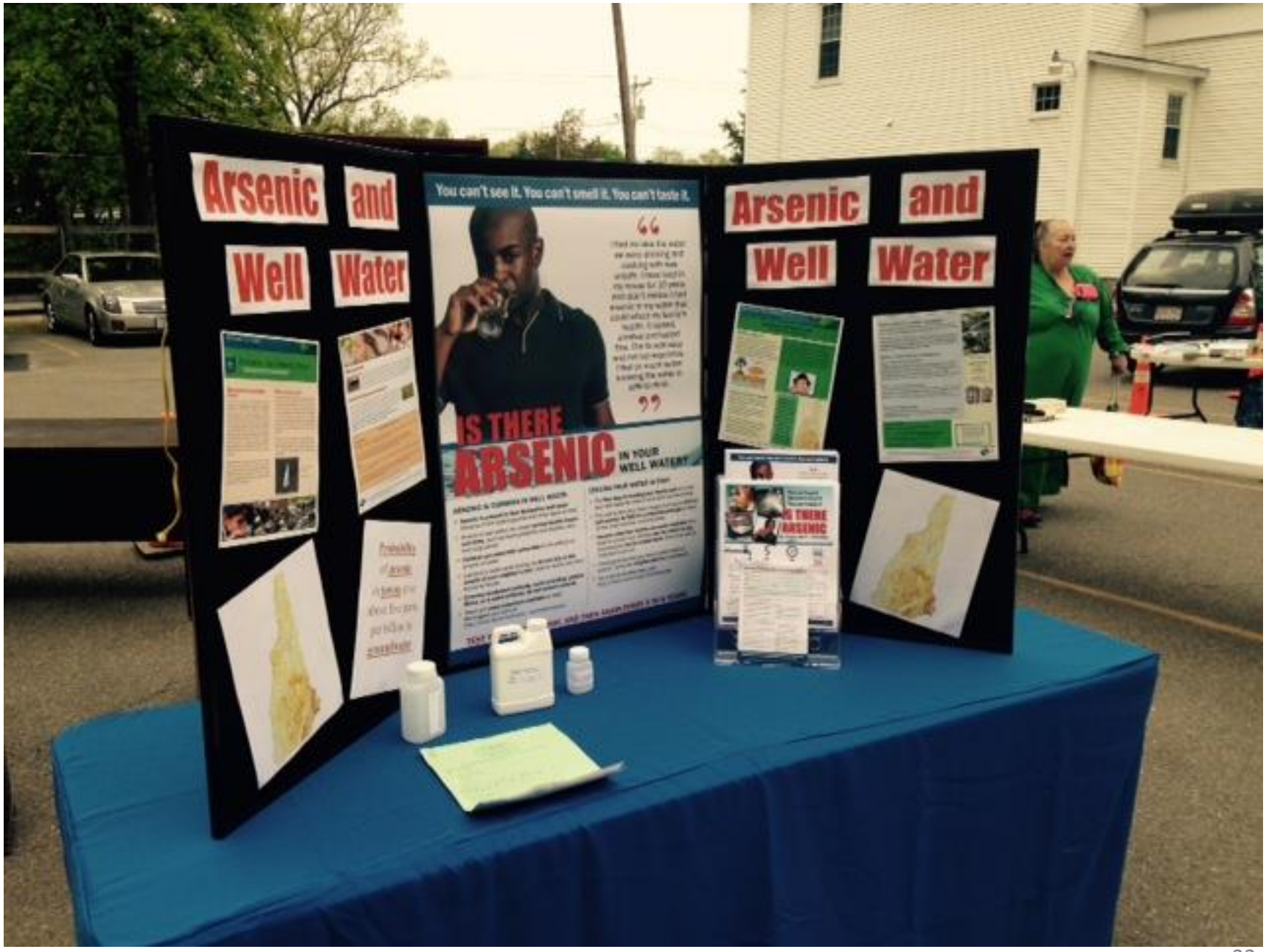
Arsenic and Well Water
You can't see it. You can't smell it. You can't taste it.
IS THERE ARSENIC IN YOUR WELL WATER?
Arsenic and Well Water


Locations in New Hampshire with Estimated Arsenic Concentrations Above 10 ppb
Predicted probability
High : 1.00
Low : 0.00
Town boundaries
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ARSENIC IS COMMON IN WELL WATER.
TESTING YOUR WATER IS EASY.
Understand
Your
Well
Water
GEISEL
SCHOOL OF
MEDICINE
AT DARTMOUTH

3. What have we learned so far…?

- ✓ Nuance!! Many shades of **Grey** /**Gray**
- ✓ People are confused about how to prioritize their health risks if no obvious danger
- ✓ Method of Communication:
  - ✓ Best: Community member to community member-tell your story
  - ✓ Next Best: Respected Authority→ Academic Inst. →State gov.
- ✓ Use Target audience for good ideas about how to reach people
- ✓ Need time to generate this type of campaign in thoughtful and interview intensive way
- ✓ Need time, $ and people to implement outreach/intervention activities
- ✓ Always pieces you can't anticipate when partnering w/community
- ✓ Grant restrictions can be helpful and hurtful
- ✓ Low survey response rate
- ✓ Difficulty for NH as we cannot obtain address information

4. Where do we go from here…?

- Examine results from our interventions to determine effectiveness
- Continue conversation on communicating low-dose, long term risk from chronic exposure
- Explore where storytelling fits in
- Positive/negative/neutral message depends on subset-audience?
- Connect Outreach V. Risk Communication principles and guidelines
- Lower cost, simplify process, make testing part of everyday life so folks not afraid to know
- Reverse message so that having a treatment system increases value of home for sale
- Follow sample group willing to participate and give us test results
- Link to MtBE effort or other human-made contaminant
- Many studies in this area converging and data will be available soon

Acknowledgements:

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- *Community Partners*

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Superfund Research Program

Contact Information

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Arsenic in Private Wells in NH Year 1 Report:
http://www.dartmouth.edu/~toxmetal/assets/pdf/Wellreport.pdf

http://www.dartmouth.edu/~toxmetal/

Questions?