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Leveraging healthcare communication channels for environmental health outreach in New Jersey

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Abstract

Households with pregnancies and young children are a priority group for outreach on private well water screening due to the widespread occurrence and toxicity of common groundwater contaminants such as arsenic. Given the trusted role of healthcare providers as communicators of health risk, Columbia University investigators and New Jersey government partners collaborated with Hunterdon Healthcare to offer free well testing to residents of Hunterdon County, a hotspot for naturally occurring arsenic in New Jersey. Through practice-based test kit distribution and online patient portal messages, supported by a public multimedia campaign, we tested 433 private wells and alerted 50 families about elevated arsenic found in their drinking water. These healthcare-facilitated outreach strategies allowed for targeting based on geographic and demographic risk, and suggested opportunities to better leverage communication channels, such as incorporating questions on home water source into the electronic medical record.

Keywords

private well; water testing; drinking water; arsenic; healthcare providers

Introduction

Private well water in the U.S. is largely unregulated, leaving individual homeowners responsible for the safety of their family's drinking water. Facing a range of barriers against taking protective actions, including testing,[1–3] many families remain vulnerable to exposure from common microbiological and chemical contaminants in groundwater. Naturally occurring arsenic is one example of particular public health concern because of its known

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(Intervention images provided in Hunterdon_SupplementaryFigs.pdf)

toxicity and widespread occurrence. Private well water screening is a necessary first step to reducing arsenic exposure.[4]

While chronic exposure to arsenic is strongly associated with numerous adverse health effects such as cancer, cardiovascular disease, and lung disease, research has associated exposure to arsenic in utero and early life with particular vulnerability to adverse health effects.[5–7] Households with pregnancies and young children must therefore be a priority group for private well testing outreach and interventions.

Community of focus

Since 2002, New Jersey's pioneering Private Well Testing Act (PWTA) has required testing for arsenic during real estate transactions in counties where concentrations as high as 250 μg/L are naturally occurring due to local geology.[8] Before New Hampshire followed in 2019, New Jersey was the only state with a drinking water standard for arsenic (5 μg/L) more protective than the federal standard (10 μg/L). With tens of thousands of wells tested to date, arsenic has been one of the most frequently found contaminants, exceeding the state standard in 8.9% of wells tested.[9] However, despite nearly two decades under the PWTA, the majority of wells in New Jersey are yet to be tested due to the pace of housing turnover.[10]

Hunterdon County has emerged as a particular hotspot for arsenic contamination, with over 16% of private wells tested exceeding the state standard, and up to 70% in some municipalities.[11] In a county where a majority of households relies on private wells as a source for drinking water,[12] arsenic exposure is a significant public health concern.

Collaborative partnership

Through our Superfund Research Program (SRP) on the health effects and geochemistry of arsenic, Columbia University has built a strong relationship with New Jersey government partners, investigating barriers to private well testing and treatment and assisting with community outreach. A primary output has been the development of a New Jersey Arsenic Awareness website with guidance and resources for private well owners and healthcare providers (http://tinyurl.com/arsenichelp). There is a public health need to reach households with pregnant women and small children at risk of arsenic exposure. Given that healthcare providers are often trusted communicators of risk messaging, we partnered with Hunterdon Healthcare, the primary medical system in the county, to offer patients with private wells free drinking water tests for arsenic and lead. Lead was included in the hopes of increasing participation given widespread national press coverage of lead problems in drinking water. We chose three primary strategies for outreach to promote well testing.

Practice-based outreach (Strategy A)

We gave a Grand Rounds lecture on arsenic prevalence and risks to Hunterdon Medical Center doctors in late 2016. With the support of Hunterdon Healthcare's Population Health team, three family medicine practices and one OB/GYN practice were selected in areas with known high arsenic prevalence. In early 2017, we held kick-off presentations to medical staff on arsenic in Hunterdon water, the health risks for their patients, and testing and

treatment at 3 of the 4 clinics. We provided an FAQ sheet for the providers and posters for their waiting and exam rooms promoting the availability of free tests for patients. Each clinic was stocked with test kits for patients to take home which included sample bottles, instructions and an informational brochure in a pre-paid FedEx return box.

Patient portal outreach (Strategy B)

A year after launching the practice-based testing, we launched a new campaign coinciding with Earth Day 2018, in which the free arsenic and lead testing offer was sent to over 10,000 patients through the Hunterdon Healthcare online patient portal. This was the first time the portal was used for such large-scale population health outreach. Although it was not possible to target the message to those with private wells only, since home water source was not collected in the electronic medical record, messages were targeted to all patients in zip codes with known arsenic occurrence who were either pregnant, a parent of a child under 18, or a woman of reproductive-age. Patients were alerted by email to the existence of a new message in their portal inbox, but had to go to the site to read the contents. The message included a link to an online request form for test kits, which were sent by mail with pre-paid USPS return packages.

Multimedia outreach (Strategy C)

As part of a multimedia outreach campaign, Hunterdon Healthcare hosted a special arsenic Q&A event on their Facebook page and issued a press release about arsenic and the testing collaboration, promoting the Facebook event. Columbia SRP used Facebook posts and ads, plus two highway billboards in a high arsenic area, to promote our existing Arsenic Awareness website, which then featured a link to a second online request form for test kits. Given the wider reach of these multimedia efforts, we did not restrict the testing offer to Hunterdon Healthcare patients only, but opened it to any Hunterdon residents with both a private well and children in the home or on the way. Test kits were sent by mail with pre-paid USPS return packages.

Results

After 18 months of practice-based distribution (Strategy A), we had given over 300 test kits to clinics and received 113 (38%) water samples, a low return. While few households (7%) were already treating their water for arsenic, 16.8% of the water samples we tested exceeded 5 μg/L arsenic (Table 1), consistent with the county average prevalence. A survey of participants revealed that most learned of the testing through seeing the posters and test kits in the clinic rather than through conversation with one of their healthcare providers.

Although over 10,000 portal messages were sent (Strategy B), only 20% were opened by patients, so most did not see the testing offer. Online forms to request test kits were available for nearly 3 months. We mailed out 281 test kits requested through the portal message and 176 test kits requested through our NJ arsenic awareness website (Strategy C), with 320 well samples returned overall. The return rate was significantly higher for kits requested in response to the portal message than kits requested through our website (73.3% vs. 64.8%,

p<.01), although both were higher than for kits taken from the clinics. Similar to the clinic-based efforts, few households (8%) were already treating for arsenic. Arsenic exceeded the standard in 11.6% of samples collected through the portal message and 6.1% of samples collected through the website.

Overall, 50 private wells were found to exceed the New Jersey MCL for arsenic of 5 μg/L, 14 exceeded the federal MCL of 10 μg/L, and the maximum arsenic concentration measured was 69 μg/L. These households were given explanations of their results, recommended to treat their drinking water or switch to another source, directed to certified drinking water labs in New Jersey for follow-up testing, and given guidance on appropriate home arsenic treatment systems as well as the availability of interest-free loans through the Potable Water Program of the New Jersey Housing and Mortgage Finance Agency. A majority of participants reported never having tested for arsenic before (Table 1). The patient portal message yielded the highest proportion of households with children in the home. Those who requested a kit through the website reported learning about the testing opportunity through various social media, interpersonal, and news media sources. About 18% of participants who requested a kit through the patient portal message link reported that they had also seen Facebook ads/posts, the billboard, the arsenic awareness website, or newspaper coverage about arsenic.

Implications for Policy and Practice

- Healthcare providers can be an important messenger for environmental health risks such as drinking water quality, particularly to biologically vulnerable populations.
- Online patient portals offer promising opportunities for large-scale population health outreach through trusted messengers, while targeting for risk based on demographics and geographic residence.
- In areas of high reliance on private water supply, questions about home drinking water source should be incorporated into electronic medical records to allow for ongoing risk-targeted messaging, both interpersonal outreach by healthcare providers and digital outreach through patient portals.

Discussion and Conclusion

This project demonstrates the potential for public health collaboration between state agencies, academic researchers, and health care professionals around an environmental health issue. Through this Hunterdon County outreach, 433 private wells were tested for arsenic. The majority of these wells were tested for the first time and 50 families were alerted to their elevated exposure. While the greatest proportion of high arsenic tests came from kits distributed through practices (Strategy A), which targeted a geographically narrower population located in high prevalence areas, the greatest number of wells tested (and highest proportion with children at home) came from participants who received the patient portal message (Strategy B), which was also demographically targeted. Furthermore, the mass portal message generated more tests in a much shorter period than the clinic-based

outreach. The public multimedia campaign on arsenic (Strategy C) was successful in reinforcing the message to patient portal recipients and by allowing non-patients to request free tests we were also able to expand the reach of this community testing intervention.

We learned several lessons from this multi-pronged approach to testing promotion through healthcare providers. First, we found that despite enthusiastic reception to the arsenic issue by health care providers at the grand rounds and clinic-specific presentations, many other competing priorities for attention during brief patient interactions makes it difficult to rely at this time on doctors and other healthcare providers to be the primary messengers of environmental health risk. However, patients confirm that their healthcare provider's recommendation can be a significant motivator to perform well water testing,[13] therefore there is still value in leveraging this channel for targeted outreach. We have recently incorporated two questions about drinking water source and testing history into the Hunterdon Healthcare electronic medical record; eventually patients will be flagged to doctors based on their risk level, with the goal that they receive guidance on private well testing during their visits. Furthermore, with such data we can also better target future patient portal messages. For example, in the portal messaging described here we cannot be sure how many of the over two thousand Hunterdon patients that opened the message actually drink from a private well at home. Incorporating drinking water risks into the electronic medical record both validates the public health importance of this issue to providers and patients and provides a foundation for more sustainable long-term outreach efforts through the healthcare system.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1.

Demographics and well water results of participants based on outreach strategy

Strategy	# Wells tested	% Never tested	% Children home	% Pregnant	# Wells >5 μg/L
Medical practice (A)	113	63%	53%	7%	19 (17%)
Patient portal (B)	206	61%	86%	7%	24 (12%)
Multimedia (C)	114	49%	78%	9%	7 (6%)