



DRINKING THE DISEASE: ARSENIC IN WELL WATER IN THE MIDWEST

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LEARNING OBJECTIVES

- To be aware that there is a paucity of knowledge about chronic arsenic exposure from well water in the Midwest.
- To be able to identify a variety of serious, yet common, medical conditions that may arise from chronic arsenic exposure, some of which are life-threatening.
- To be able to counsel patients on the importance of well water testing for their and their families' long-term health.



**THIS PRESENTATION IS
INSPIRED BY A PATIENT CASE**



Image from: https://www.etsy.com/listing/1251022501/pet-memorial-sleep-well-dear-friend?gpla=1&gao=1&&utm_source=google&utm_medium=cpc&utm_campaign=shopping_us_c-pet_supplies-urns_and_memorials-pet_urns&utm_custom1=_k_CjwKCAiA_aGuBhACEiwAly57MwKxJLjHp3HxPqUMdKax_g01dD3SMJWXmVb4v0lldp9fr6okvUrmnhoCNFEQAvD_BwE_k_&utm_content=go_12563609708_125210518451_507234014621_pla-352969481933_c_1251022501_12768591&utm_custom2=12563609708&gad_source=1&gclid=CjwKCAiA_aGuBhACEiwAly57MwKxJLjHp3HxPqUMdKax_g01dD3SMJWXmVb4v0lldp9fr6okvUrmnhoCNFEQAvD_BwE

WELL WATER IN MINNESOTA

- City and town water is tested regularly for arsenic (& other contaminants)
- **Personal well water testing is only overseen by the homeowner**
- Epidemiological studies link water pollution to health outcomes in rural populations
- Arsenic levels vary geographically, even over small distances
- A new well is only required to be tested **once** in its lifetime

HEALTH RISKS OF CHRONIC ARSENIC EXPOSURE

- Symmetrical sensorimotor polyneuropathy. This can mimic vitamin B12 deficiency and diabetic neuropathy
- Hypertension and prolongation of the QTc interval
- Diabetes mellitus type 2
- Chronic respiratory symptoms: Cough, dyspnea and hemoptysis present in dose-response relationship
- Hematologic abnormalities: Most commonly anemia, leukopenia, thrombocytopenia and elevated liver function tests
- Skin cancer
- Lung cancer
- Renal and bladder cancer

Arsenic can't be seen, tasted or smelled.

Contaminated water can appear normal.

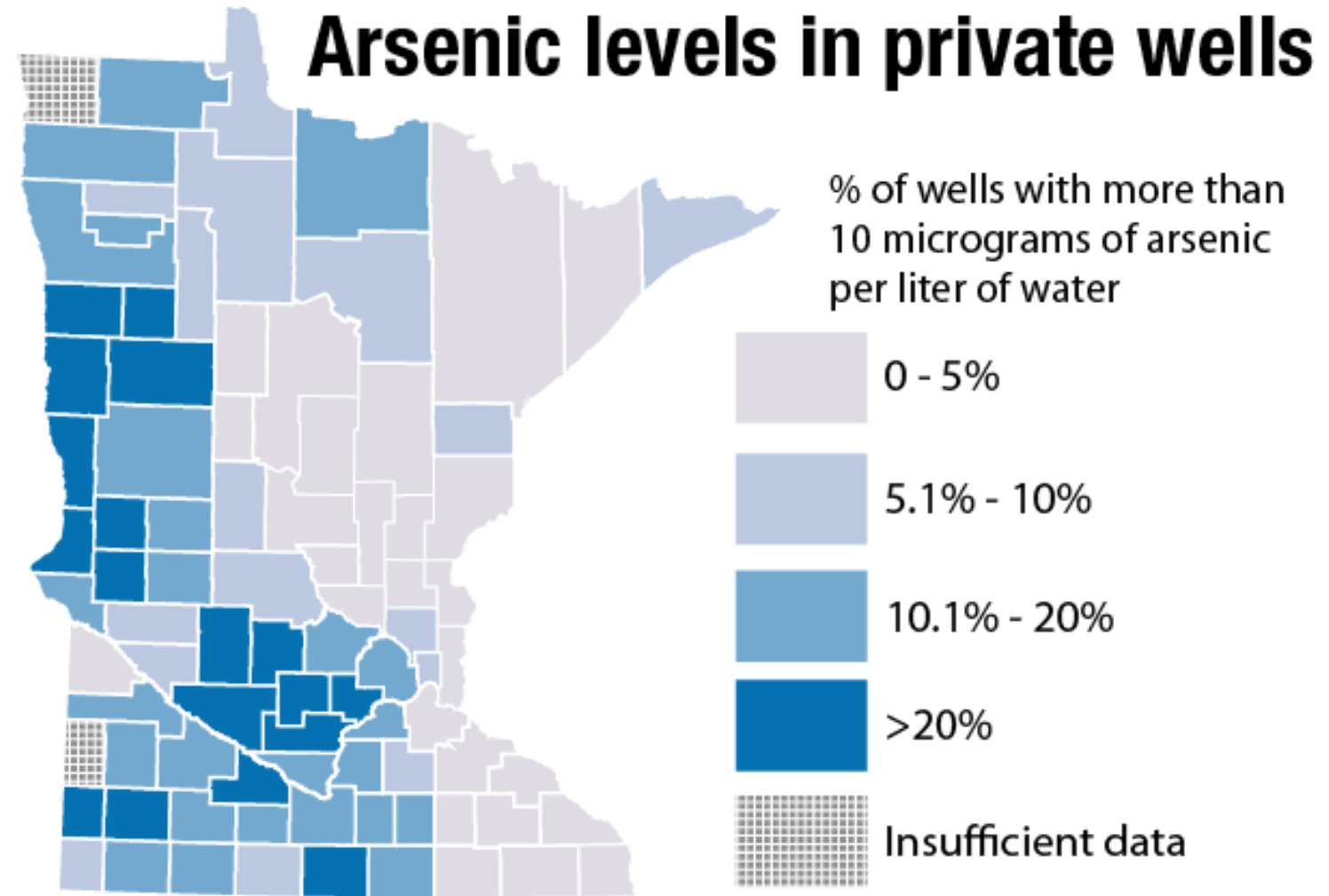


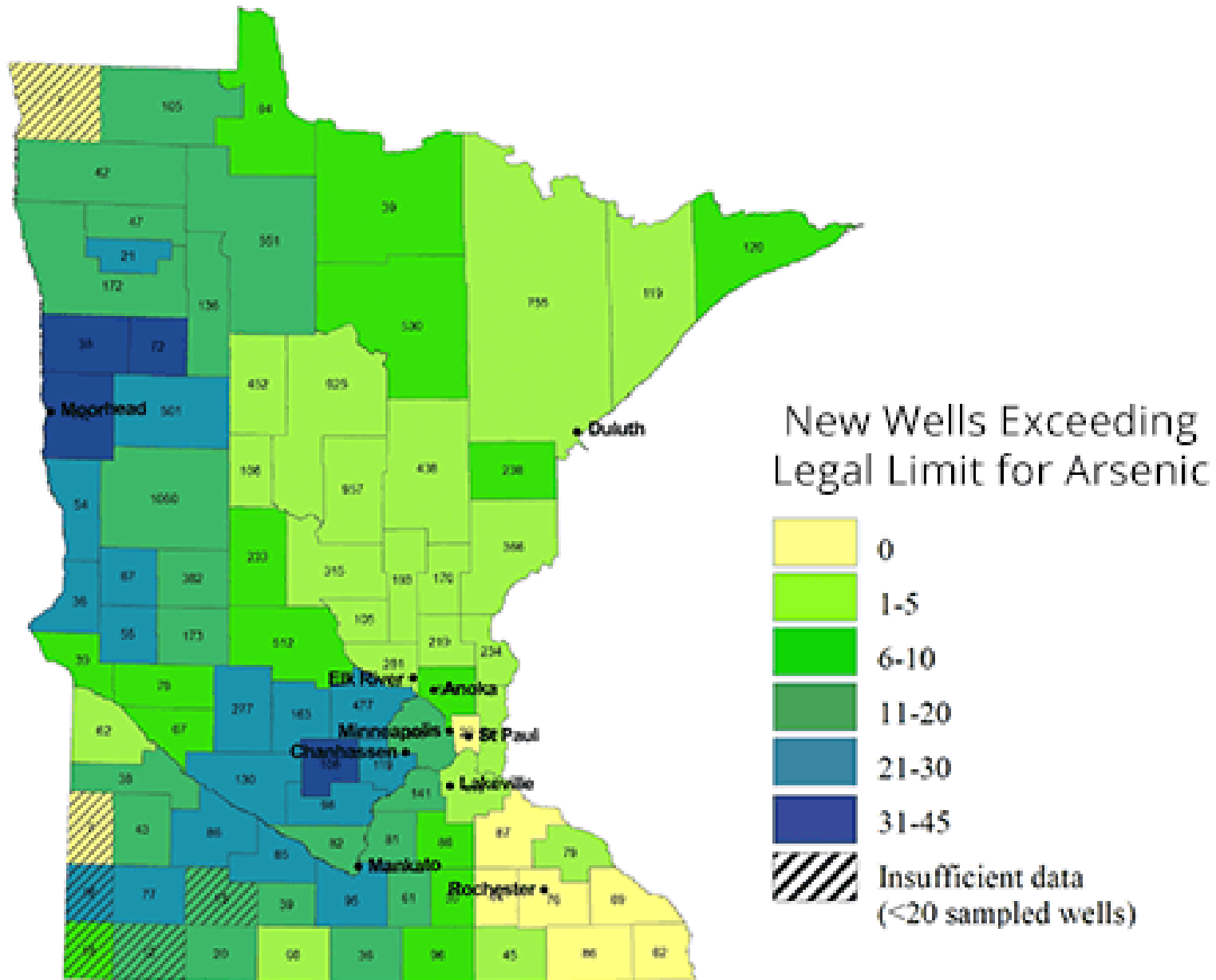
21% of
Minnesotans
(1.2 million
people)
obtain their
drinking
water from a
private well.



HOW PREVALENT IS ARSENIC?

- Arsenic has been detected in 40% of new wells drilled since 2008 in Minnesota. (detection level > 2 µg/L.)
- 10% of Minnesotan tested wells have arsenic levels higher than 10 µg/L (international standard for safety)





OUR STUDY TEAM AT MAYO CLINIC IN MINNESOTA & WISCONSIN



**Dr Jessica
Sosso, MD**



**Dr Randy
Foss, MD**



**Dr Brandon
Hidaka, MD
PhD**



**Dr Stephen
Stacey, DO**



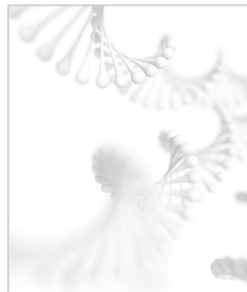
**Dr Tom
Thacher, MD**



**Dr Matthew
Bernard, MD**




**Julie
Maxson,
CCRP**



**Karen
Fischer, MPH**



**Dr Rachael
Passmore,
DO**



WHAT DO PATIENTS AND CLINICIANS KNOW?

OUR STUDY GOALS



To estimate prevalence of personal well water use in homes among patients in the Midwest (MN, WI, IA), their testing frequency, their concern about their well water and interest in additional information on water testing.



To ascertain how much clinicians know about arsenic toxicity, how often they ask about well water in their practice and whether they would find additional information for patients useful.

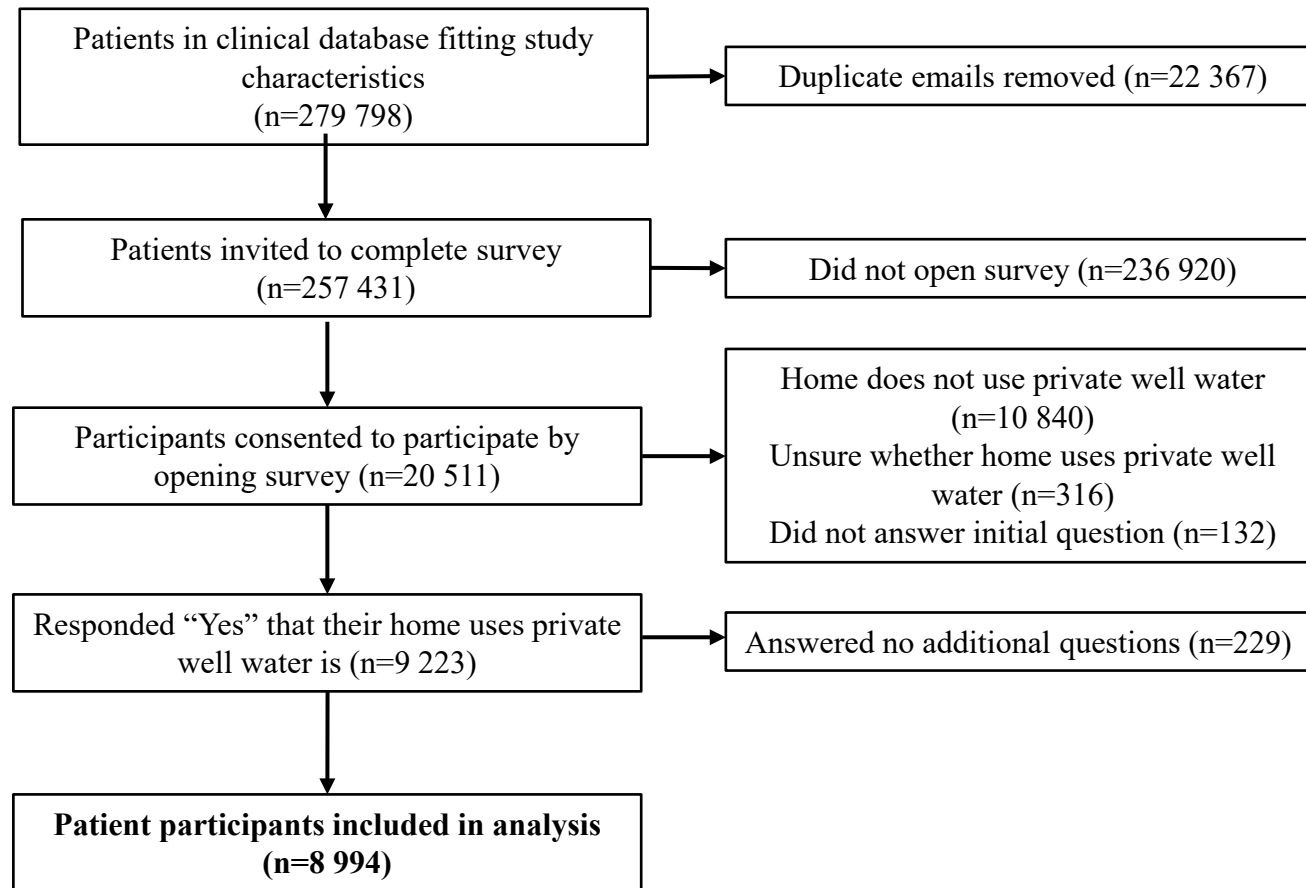


Figure 1 – Study protocol for inclusion of patients.

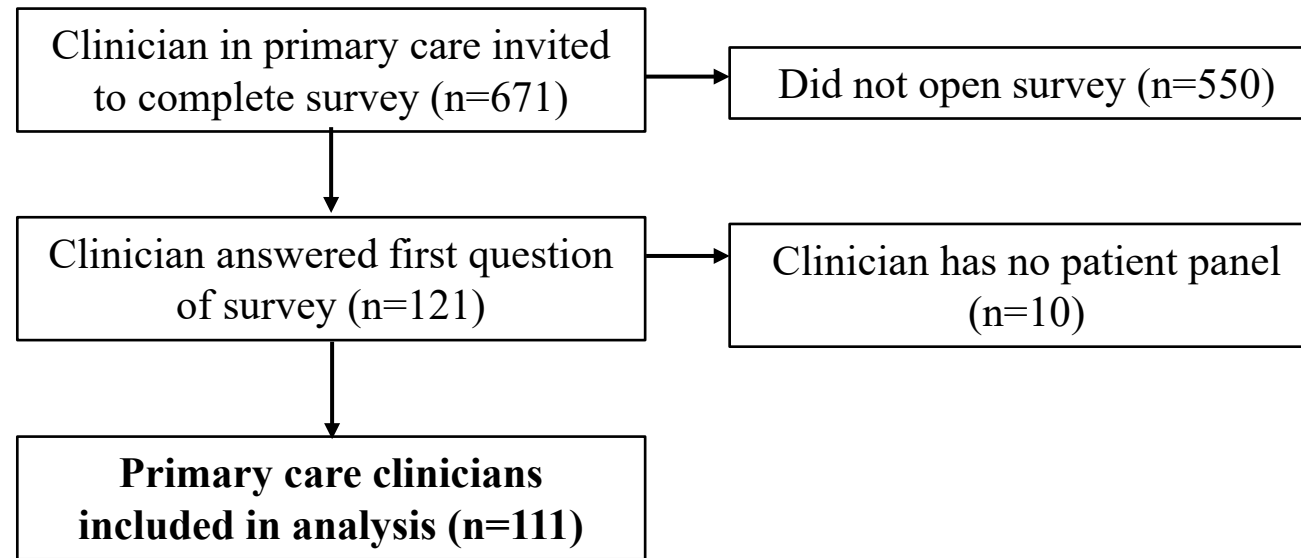


Figure 2 – Study protocol for inclusion of clinicians.

PATIENT RESULTS

	Total (N=20511)
Does your primary home use well water, n (%)	
No	10840 (53%)
Yes	8994 (44%)
Not sure	316 (2%)
Yes but did not answer any additional questions	229 (1%)
Missing	132

	Total (N=8994)
How often do you have your well water tested, n (%)	
Never	1923 (21%)
Once	1415 (16%)
Once a year	1016 (11%)
Every 2 to 5 years	1857 (21%)
Every 6 to 10 years	1214 (14%)
Not sure	1547 (17%)
Missing	22

Tables 1 & 2: Patient Survey Results.

PATIENT RESULTS

	Total (N=20511)
Does your primary home use well water, n (%)	
No	
Yes	8994 (44%)
Not sure	
Yes but did not answer any additional questions	229 (1%)
Missing	132

	Total (N=8994)
How often do you have your well water tested, n (%)	
Never	1923 (21%)
Once	
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Tables 1 & 2: Patient Survey Results.

PATIENT RESULTS

- 39% of patients reported that their well water had **never been tested or were unsure.**
- Both younger adults aged **18-30** and older adults **older than 71 years old** reported testing their well water more frequently than other age groups.
- Having children in the home was **not** associated with worrying about water safety or testing behavior.
- **53%** reported information about how to evaluate well water for arsenic would be very or extremely useful.

PATIENT RESULTS – ARE THEY WORRIED?

- **37% of patients reported never worrying** about the overall health effects of their well water; **62% never worried about arsenic** levels specifically.
- Respondents in age groups 18-30 and 51-60, and female respondents as a whole, were more likely **to often or always worry** about health effects of their well water.
- Women and non-White respondents more likely to worry about arsenic specifically.

CLINICIAN RESULTS – DO THEY ASK?

- 43% of clinicians estimated a **very low proportion of their patients** use well water (estimated 0-20% of their panel).
- **15%** of clinicians report frequently or always asking about well water use.
- **Physicians** were more likely than advanced practice practitioners to report asking about well water.
- **Pediatricians** were more likely to ask than family medicine or internal medicine physicians.

CLINICIAN RESULTS – WHAT DO THEY KNOW?

- 67% reported being **unaware of the health risks of chronic arsenic exposure** in drinking water, and 76% **did not know the physical exam** findings of chronic arsenic toxicity.
- 39% of clinicians **did not know their community's resources** for well water testing.
- **55%** reported it would be very or extremely useful to have information about well water testing.

NEXT STEPS

- Ask patients if they use well water.
 - If so – recommend testing with a commercially available kit.
- Consider arsenic toxicity as cause of medical symptoms.
- If in doubt, reverse osmosis filtration recommended.
- Our study: planning free arsenic testing kits statewide.
- Minnesota Well Owners Organization has free testing clinics this summer → <https://mnwoo.org>



Arsenic Contamination in our Well Water

21%

Of Minnesotans rely on personal water wells for their household water. These wells are **not** tested for arsenic and other harmful toxins.

RISKS OF HIGH ARSENIC LEVELS

Diabetes, neuropathy, lung cancer, kidney and bladder cancer, and cardiac rhythm changes are some of the health effects due to exposure.



OUR PEOPLE, OUR WATER

In collaboration with Mayo Clinic experts and the State of Minnesota, we aim to provide complimentary arsenic testing kits to individuals interested in obtaining them.

WHAT WILL FUNDING PROVIDE?

Free kits available to be shipped to the home for testing, and returned to the lab.

Confidential analysis sent to their email with resources for results and how to improve their well water.

Our goal is to **help** households in the **highest risk counties** by offering accessible testing.

Test Now for a Healthy Future

TAKE HOME POINTS #1

Arsenic is a well-known toxin which may contaminate potable water sources. It is undetectable to human senses. It is harmful when ingested over prolonged periods of time.

TAKE HOME POINTS #2

Chronic arsenic exposure has been associated with diabetes mellitus, hypertension, skin cancer, renal, bladder and lung cancers, polyneuropathy, and cardiac QTc prolongation. While these conditions are correlated with arsenic exposure, the time of exposure and disease latency mean that direct causation is extraordinarily difficult to prove.

TAKE HOME POINTS #3

Symptoms attributed to other conditions may in fact be due to chronic arsenic exposure given their overlap in presentation and latency. The presence of increased concentrations of water contaminants are associated with greater cancer-related mortality in rural populations.

TAKE HOME POINTS #4

It is within your role as health advocates to inform and educate patients and fellow clinicians about the importance of well water testing and mitigation with filtration of unhealthy water.

QUESTIONS & ANSWERS



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