

Dowsing for Knowledge: Probing the Depth of Arsenic Awareness in Rural Newfoundland to Effect Change in Policy and Health Outcomes

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1.0 ACKNOWLEDGEMENTS

We thank the Harris Centre - RBC Water Research and Outreach Fund and its funders for making our project possible, the Primary Healthcare Research Unit for assisting us with our analysis, and the citizens of Gander Bay, Valley Pond, New World Island and the Codroy Valley for their gracious participation.

2.0 EXECUTIVE SUMMARY

Background: Arsenic is an odourless, colourless and tasteless carcinogen that can contaminate well-water. Research in Nova Scotia suggests that well-owners misunderstand the issues and risks related to arsenic and do not take necessary precautions. *Rationale:* Given that no similar study has occurred in Newfoundland, we examined knowledge gaps about arsenic and related water safety issues among well owners in three rural Newfoundland jurisdictions affected by arsenic (Cormack, New World Island, Gander Bay) and one control area unaffected by arsenic (Codroy Valley). *Research Methodology & Approach:* We mailed 1380 semi-structured surveys to the four regions, aiming to collect 100 surveys. *Results:* We received 247 responses (17.8% response rate). A very low response rate from Cormack (n=2) meant the community could not be included in most analyses. We conducted descriptive analyses and Chi Squares in SPSS. *Discussion:* While the majority of respondents in New World Island had previously tested their water for arsenic, most in Gander Bay and the Codroy Valley had not. Some respondents listed ServiceNL as their go-to tester for arsenic despite the fact that the organization can only test for coliforms, and some respondents also mentioned using sensory cues and ineffective purification strategies (e.g. boiling, using a Brita filter). *Conclusion & Recommendations:* This study revealed encouraging and concerning results that are informative for both the public and policymakers. We recommend the provincial government develop a new online well-water safety resource, devise strategies to clarify the limitations of ServiceNL water testing, and facilitate citizens' access to affordable water tests for arsenic.

“Arsenic is a class I carcinogen. It’s like tobacco, like smoking... We need to treat it as a very significant public health issue affecting rural Newfoundland and other rural areas in Canada.”

- Daniel Hewitt

3.0 INTRODUCTION

3.1 Project Background: Rural communities in Newfoundland and Labrador have been dealing with issues related to safe drinking water for decades. For instance, a 2015 report¹ identified five jurisdictions with boil orders in effect since the 1980s. Chief among the dangers for citizens, however, is when boil orders, filtering and other such precautions have no effect on the contaminant. Such is the case for arsenic², a naturally occurring element and carcinogen abundant in Atlantic Canadian bedrock. Arsenic is colourless, odourless and tasteless, yet one study found that Nova Scotian³ well-owners rely on these sensory cues to detect problems with their water, underestimate the risks posed to them by arsenic contamination, and do not follow water testing guidelines.

3.2 Rationale: While no similar study of the knowledge of well-owners has been conducted in Newfoundland and Labrador, there have been situations that would warrant such an investigation. In one case, widespread illness and concerns led citizens of two rural Newfoundland communities to discover they had been drinking well-water far above the safe limit of arsenic (0.010 mg/L) for decades, sometimes even 1000 times the limit. Some of the illnesses could have been adversely affected by long-term and ongoing arsenic exposure, including cancer (e.g. bladder, kidney, lung, liver)³, type II diabetes,⁴ and skin conditions.⁵ In response to this situation, we studied the arsenic and related water safety knowledge of well-owners in four Newfoundland jurisdictions with the aim of developing educational materials.

3.3 Objectives: Our objectives for this study were to:

- a) Determine what well-owners in Cormack, Codroy Valley, New World Island and Gander Bay know about arsenic and well-water safety.
- b) Discover what well-owners in these jurisdictions are doing about arsenic and related well-water safety issues.
- c) Understand why some well-owners are not doing anything about arsenic and related well-water safety issues.

2.0 RESEARCH METHODOLOGY & APPROACH

2.1 Setting: This study focused on four jurisdictions in Newfoundland, the island portion of Canada's easternmost province Newfoundland and Labrador. Three of these jurisdictions (Cormack,⁶ New World Island,⁷ Gander Bay⁸) had documented issues with arsenic in well-water, while the fourth (Codroy Valley) was selected as a point of comparison for the results (not known to have high levels of arsenic in the water). These communities were also selected due to their proximity to the primary investigators, which limited travel expenses and facilitated buy-in. Figure 1 shows the geographical locations of the four jurisdictions.

2.2 Study Design: This study had two phases: 1) survey citizens in all four areas to determine their knowledge of arsenic and related water safety issues; 2) develop educational materials and hold community meetings based on the survey results. A second half of the project where we planned to repeat phases one and two with health professionals was cancelled due to a major logistical issue (see below).

2.3 Research Team: Our interdisciplinary team was led by two co-primary investigators who are family doctors affiliated with Memorial's Faculty of Medicine (Daniel Hewitt, Wendy Graham). Co-investigator Dr Shabnam Asghari advised on biostatistics and research methodology and Mr. Thomas Heeley supported project management and reporting. Mr. Cameron MacLellan, a graduate assistant, provided research assistance to the team. Dr Amanda Hall (assistant professor) and Ms. Andrea Pike (research manager) from the Primary Healthcare Research Unit were contracted to analyse the survey data.

2.4 Sample Size: Factoring in the potential for non-response, and based on an alpha of 0.05 and power of 0.8, we calculated a sample size of 100 surveys (about 25 from each area).

2.5 Data Collection: We developed a six-page survey through a consensus building approach, creating and refining questions together until we reached a version that would address our objectives and was acceptable to ethics. Survey packages were assembled by a group of student volunteers who formed an assembly line and took turns inserting the following documents into a business-reply mail envelope: 1) the survey, 2) a letter of information, 3) a postage-paid return envelope. Survey booklets were colour coded according to their intended jurisdictions, and all documents were written at or below a grade 6 reading level (verified by the Flesch-Kincaid readability test). We also offered entry into a draw for five, \$100 gift cards as an incentive. Using the Canada Post precision targeter tool, we selected the exact routes along which the surveys would be sent, disseminating 1380 survey packages in May 2018.

2.6 Data Entry & Analysis: As the surveys arrived, an intern entered the data into Survey Monkey, which our team then extracted later for analysis with SPSS. Surveys that had already been entered were filed in a cabinet secured under lock and key, in a locked office, inside a key card protected office space. We arranged a one-week grace period between the time of the last survey arriving and data extraction to

ensure all surveys were included in the analyses as possible. We then imported the raw data into SPSS 25 and performed descriptive statistics (means and frequencies) and Pearson chi-squares using a Bonferroni adjusted alpha of 0.0083.*

2.7 Changes to Protocol: In the original application we proposed surveying health professionals in the four jurisdictions. We disseminated approximately 50 surveys shortly after an extension was granted to our project in summer 2018 but an issue with the envelopes caused the majority of the surveys to be lost and untraceable by Canada Post. Very few were returned and the team decided not to proceed with this arm of the project due to time constraints.

3.0 CLEARANCES

Ethics clearance was obtained from the Health Research Ethics Authority on July 16th, 2017, and renewed on November 6th, 2018. See Appendix A for a copy of the approval letter.

4.0 RESULTS

“This is an issue about which I know nothing and have heard nothing.”

- Citizen

4.1 Knowledge about Arsenic in Well-Water: We achieved a 17.8% response rate with 247 citizens responding to the survey. Eight respondents were not well-owners, and one did not know if they owned a well. These participants were excluded from further analysis. The majority of respondents (86.0%, n=203) recognized that arsenic is harmful to their health, but 13.9% (n=33) of participants either did not know or did not believe it to be harmful. For the Codroy Valley, 98.0% (n=99) respondents did not know about any arsenic contamination issues in their community, compared to 62.9% (n=39) in Gander Bay and 19.7% (n=13) in New World Island (see figure 2). Pearson chi-square analyses found that Gander Bay ($\chi=36.484$, $p<.0001$, Cramer’s V=0.473) and New World Island ($\chi=110.861$, $p<.0001$, Cramer’s V=0.815) respondents were more likely to be aware of problems with arsenic in their community’s water than Codroy Valley respondents. Cramer’s V indicated moderate and strong effect sizes, respectively. A comparison between Gander Bay and New World Island found that New World Island respondents were more likely to report being aware ($\chi=24.741$, $p<.0001$), and the effect size was moderate (Cramer’s V=0.440). About a third of respondents (36.9%, n=87) did not know how to tell if water contains arsenic, but the majority of respondents (61.0%, n=144) selected professional water test as one possible method.

4.2 Water Testing: 64.1% (n=41) of Gander Bay respondents had not tested their water, compared to 52.5% (n=53) in the Codroy Valley and 31.9% (n=22) in New World Island (see figure 3). Pearson chi-square analyses found that Gander Bay and Codroy Valley respondents were just as likely to test their wells ($\chi=1.162$, $p=0.281$), whereas New World Island respondents were significantly more likely than Codroy Valley respondents to have tested their wells ($\chi=39.355$, $p<.0001$, Cramer’s V=0.491). Gander Bay respondents were significantly less likely than New World Island respondents to have had their wells tested ($\chi=21.59$, $p<.0001$, Cramer’s V=0.409). Cramer’s V was in the 0.4 range for all comparisons, indicating moderate effect sizes. Of all respondents who had their water tested, 28.7% (n=31) did not know when they last had their water tested, followed by a tie for either having their water tested within the past year or in the last four to five years (14.8%, n=16). 31.8% (n=75) believed that a well should be checked for arsenic once a year, and 2.5% (n=6) believed they did not have to have it tested. The most popular source for previous water testing was Service NL/Public Health (14.4%, n=34). The top three

* Bonferroni adjusted alpha = 0.05 (standard alpha level)/6 (# significance tests performed) = 0.0083

reasons respondents forewent a test was not knowing who could test their water (20.3%, n=48), cost (14.4%, n=34), and not knowing they had to have their water tested (14.0%, n=33).

4.3 Guideline Awareness: Most (93.2%, n=218) respondents were unaware of any water safety guidelines regarding arsenic. Of the sixteen (6.8%) community members who said they were aware of guidelines, only nine listed what guidelines they were aware of. Of these nine community members, five mentioned that arsenic needed to be tested for professionally, three were aware of the Health Canada guidelines regarding the amount that is considered safe (i.e. 10 parts per billion) and one reported awareness of a purification method (reverse osmosis).

4.4 Other Safety Precautions: When asked what they would do to stay safe if arsenic was found in their water, the majority of community members chose effective strategies like using an alternate water source (e.g., bottled water) (49.2%, n=116) or installing a home water purification system (34.7%, n=82). However, 29.2% (n=69) of respondents were not sure what they would do and even more reported ineffective actions that would not remove arsenic from their water source, including boiling their water (20.8%, n=49) or using a commercial filter (e.g. Brita filter) (14.0%, n=33). Only one person said that arsenic is harmless and they do not need to protect themselves (0.4%).

4.5 Information Channels: Respondents' preferred mediums for information regarding arsenic and well-water safety are displayed in Table 2. More respondents indicated they would look to an allied health professional (i.e. family doctor, public health nurse, nurse practitioner) for information on arsenic (64.9%, n=153) than for information on well-water safety (34.0%, n=80). Internet resources were popular for both well-water safety (61.0%, n=144) and arsenic information (62.7%, n=148). Other favourites for well-water safety were local officers of health and safety (54.7%, n=129), and an information pamphlet or government website (44.1%, n=104) (see figure 5). When asked what would help promote awareness of arsenic in well-water among citizens, most people answered information pamphlet (74.2%, n=175), followed by website (48.3%, n=114) and townhall meeting (45.3%, n=107).

4.6 Community Presentations: We presented our findings to enthusiastic and engaged audiences at three public townhall meetings (one per jurisdictions, excluding Cormack). To promote the meeting in Upper Ferry, we published a small advertisement in the local paper (see appendix B). A 30-minute slideshow (see appendix C) was followed by a question and answer period. Wendy Graham delivered a delivered the first session in Upper Ferry (30 attendees), and Daniel Hewitt the second and third in Valley Pond (33 attendees) and Wing's Point (35 attendees), respectively. A reporter attending the Valley Pond presentation published an associated article in The Central Voice on December 14th (See Appendix D).

5.0 DISCUSSION

'[The] results clearly show the impact of the awareness campaign in the Moreton's Harbour area.'
- Dr. Cynthia Coles

5.1 Interpretation of Results: In this study we examined well owners' knowledge of arsenic and related water safety matters by surveying 247 citizens predominantly from three rural jurisdictions (Codroy Valley, New World Island, Gander Bay). Most respondents had a general but accurate concept of arsenic and recognized it as a danger to their health. While it was encouraging to find that New World Island respondents were statistically the most aware of local issues with arsenic and well-water (perhaps due to prior awareness work in the area),⁹ we were surprised by the high level of awareness but low level of testing by respondents in Gander Bay despite the arsenic problems in their region.⁸ In fact, the number of Gander Bay respondents who reported testing their well for arsenic was statistically no different from

Codroy Valley where arsenic in well-water is a lower risk. This suggests a need for knowledge mobilization and engagement in the area if community buy-in can be achieved.

We also found evidence of a lack of understanding in the current guidelines and services. Most respondents (n = 229, 93.5%) were unaware of any water safety guidelines regarding arsenic. Consequently, the Department of Municipal Affairs and Environment 'Well Aware' guide (which dates to 2005), and their 'arsenic and well-water' webpage. Many respondents also mentioned that their last water test was done by ServiceNL, yet ServiceNL only tests for coliforms. What is more, the majority of respondents in Gander Bay and the Codroy Valley either did not know when their last water test occurred or had not had a water test annually. While an annual water test is recommended range by the Department of Municipal Affairs and Environment, this rule of thumb is not on the website and should be included in a future update.

Allied health professionals were respondents' preferred sources of arsenic and water safety information, followed by the internet, and local officers of health and safety. Since these topics are not detailed in the medical curriculum, and public health and safety officers may have limited training (especially in unofficial municipalities), anyone in these positions should be well versed on arsenic and water safety in case citizens consult them for advice. The fact that the internet was the second most popular choice reflects the increasing trend of Canadians searching for health information online¹⁰ and the need for reliable information. The internet has made both valid and misleading health information more accessible and available, and thus it is encouraging that the Department of Municipal Affairs and Environment is the first result of a Google search for 'arsenic and Newfoundland.' However, as previously mentioned the webpage needs updating and a more intuitive layout.

5.2 Study Strengths: This study has several strengths, including an outstanding 17.8% response rate to the survey (over double the required sample size), and leadership from physicians living and practicing in the areas of study. This enhanced interest in our community presentations, which collectively drew 98 citizens, plus reporters, water treatment representatives and more. Further, arsenic and well-water safety are important topics for citizens across the province. As such, the recommendations drawn from our results (see section 6) may improve water safety for the public at large and not just those from the regions of study.

5.3 Study Limitations: Our main limitation is the low response rate from Cormack, which effectively ruled out one of our four study areas. We believe this was a dissemination issue since the town of Cormack has only two mail routes, one large route (about 1000 households) shared with neighbouring Deer Lake and Reidville, and a small lockbox unit (about 30 boxes). The Canada Post precision targeter system requires users to send mail along whole routes, thus our options were to either a) nearly double our number of surveys and potentially receive hundreds of responses from citizens outside our jurisdictions of study, or b) send surveys to the lockbox unit, risking a small but precise response rate. We chose option b. This said, a low response from Cormack has likely not detracted from our study scope since the response rates from the other three areas were outstanding. While we were unfortunately not able to hear the voices of Cormack citizens in the survey, we are engaging with contacts in the area to mobilize our findings despite the low response rate.

5.4 Next Steps: We look forward to working with the communities, government and the Western and Central Regional Health Authorities to mobilize our findings. Our team is already in conversation with Newfoundland and Labrador's Chief Medical Officer, the Department of Municipal Affairs and Environment, and Central Health's Vice President of Medical Services regarding an information pamphlet and other approaches to bring our knowledge to action. We are also planning to publish an

article in a peer-reviewed journal in 2019, potentially publications like the Canadian Family Physician, Canadian Journal of Public Health, or Health Promotion and Chronic Disease Prevention in Canada: Research, Policy and Practice.

6.0 RECOMMENDATIONS

'People could be given [more guidance] about searching online to find information relevant to arsenic in drinking water.'

- Dr. Cynthia Coles

Based on our findings we propose the following recommendations for policymakers:

- a) The Department of Department of Municipal Affairs and Environment should update the 'Well Aware' manual from 2005. This new resource should include current safety concerns and detailed information about arsenic and other contaminants, like uranium.
- b) When testing well water, it may be helpful if ServiceNL included a sticker with the results of the water test. This sticker can be used as a simple reference tool for well owners, outlining the elements that were included in the test as well as those that were not so that they are aware of what contaminants require further testing. Additionally, a number to call or a website to visit can both be included on the sticker to direct individuals to further resources of information.
- c) ServiceNL could use its infrastructure as a point of referral for arsenic testing. For example, whenever a water sample is received, the Department could refer well owners to certified testers that perform further analysis of contaminants not included in the present testing. What is more, the Department should consider making arrangements with an accredited tester to be the sole referral point in exchange for reasonably priced water testing, encouraging more individuals to make use of this cost-friendly service.
- d) There may be an opportunity for a community engagement initiative in Gander Bay, depending on citizen buy-in. Given the importance of communication between community members and allied health professionals, we believe it would be beneficial to the public for provincial government and regional health authorities to be involved.
- e) The Department of Municipal Affairs and Environment could provide more guidance on searching for information around arsenic and well-water safety, and/or provide all the necessary information on one user-friendly page with direct answers to common questions (e.g. How often should I have my well water tested? What substances should I be testing for?) and a directory of references for additional information.

7.0 CONCLUSION

Our study found evidence of misconceptions and general confusion regarding arsenic and water safety in three rural Newfoundland jurisdictions. We hope the provincial government will take heed of our recommendations in section 6, which will improve well-water safety in Newfoundland and Labrador for all.

8.0 REFERENCES

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TABLE 1. PROFILE OF SURVEY RESPONDENTS

Demographics		N (%)
Age	20 to 29 years	3 (1.2)
	30 to 39 years	17 (6.9)
	40 to 64 years	123 (50.0)
	65 years and older	103 (41.7)
Sex	Male	107 (43.5)
	Female	139 (56.5)
Education	No certificate, diploma or degree	52 (21.5)
	High school diploma or equivalent	91 (37.6)
	College diploma	67 (27.7)
	University Bachelor Degree	23 (3.7)
	University Graduate Degree	9 (3.7)
Well-type	Drilled (artesian)	145 (59.2)
	Dug	60 (24.5)
	Does not have a well	8 (3.3)
	Don't know	1 (0.4)
	Other	31 (12.7)

Note. Non-well owners were not part of the study population. Their responses were excluded from analyses but were included in the gift card raffle. The same applies to the respondent who did not know if they owned a well; it was ambiguous whether they owned a well. Respondents who chose 'other' had both a drilled and dug well, relied on spring water, or used a community water system.

TABLE 2: RESPONDENTS' PREFERRED MEDIUMS FOR INFORMATION

Answer Choices	Responses	
	#	%
Information pamphlet	183	74.4
Internet based resources	119	48.4
Town hall meeting	114	46.7
Newspaper article	78	31.7
Radio Broadcast	78	31.7
Research article	72	29.3
Training course	50	20.3
I don't know	28	11.4
Other (please specify)	9	1.2

Note. Respondents could select more than one response.

FIGURE 1: MAP OF JURISDICTIONS SURVEYED

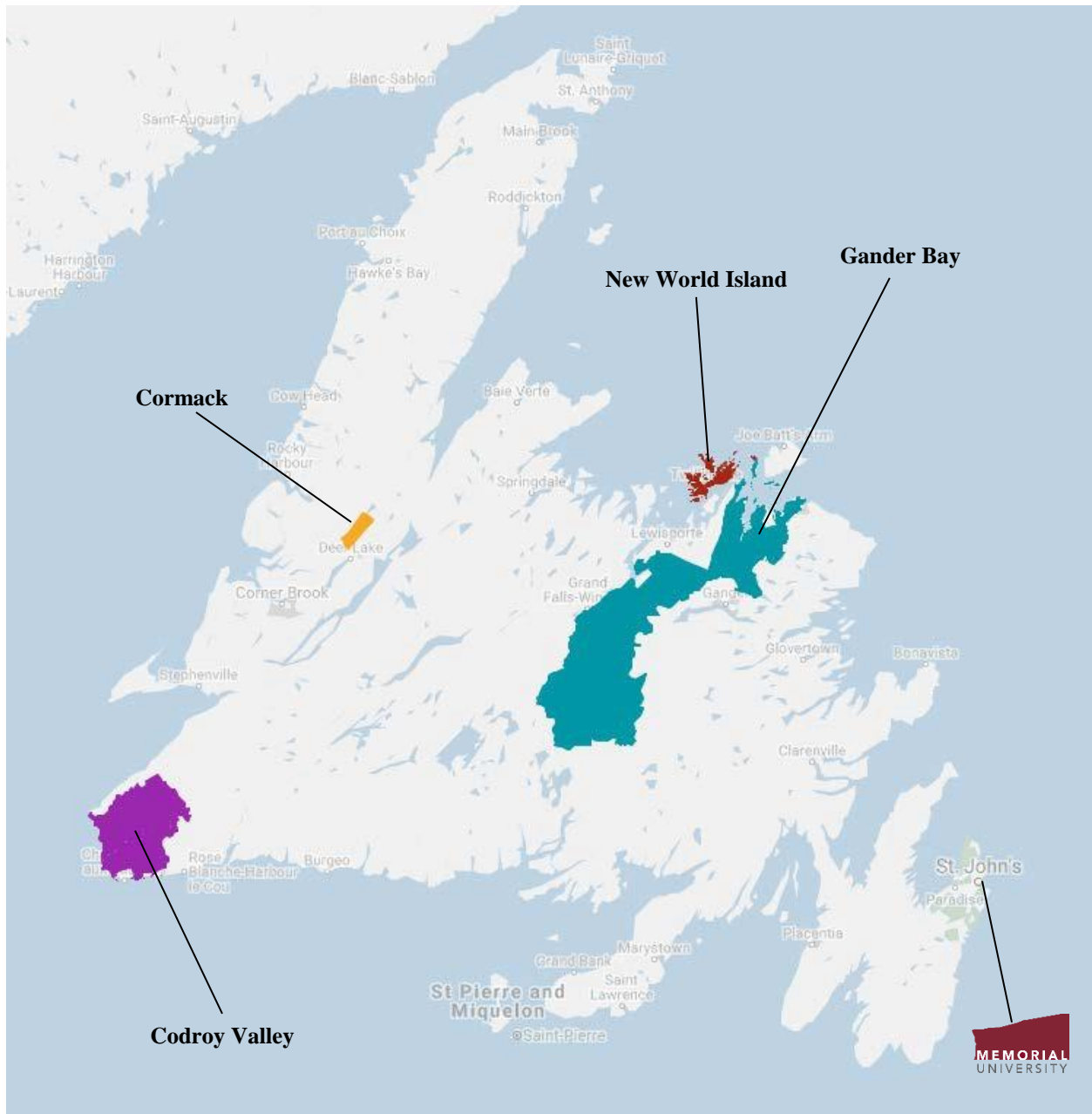
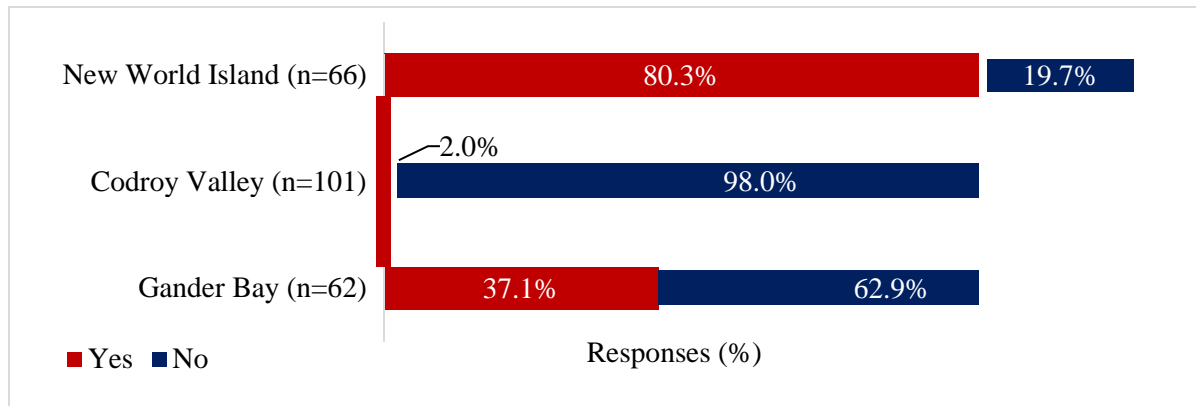
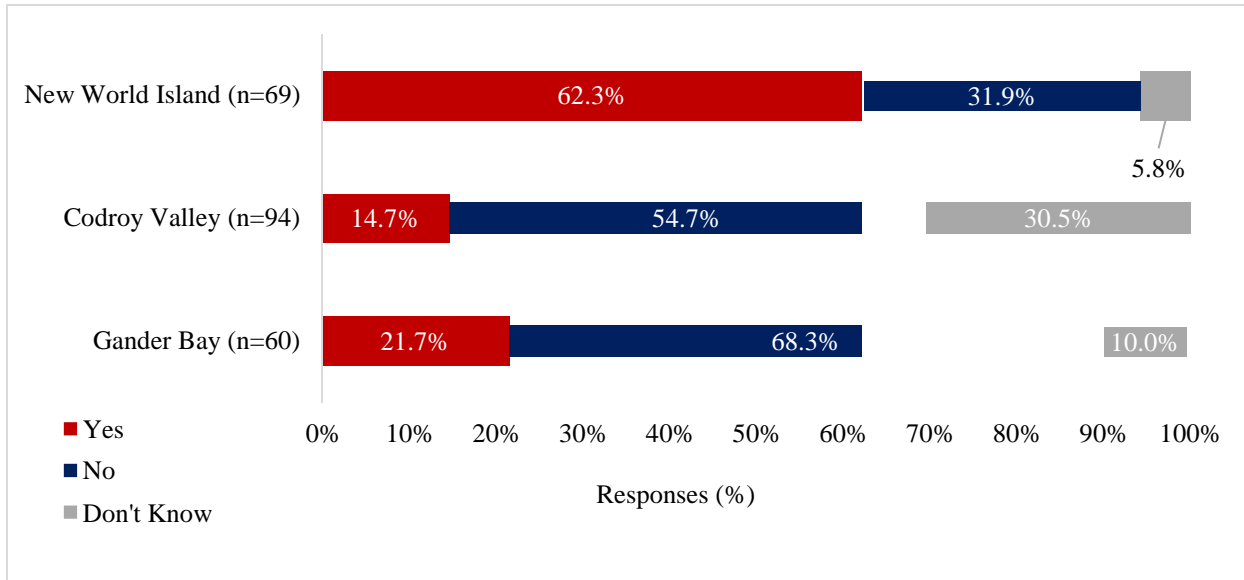


FIGURE 2: AWARENESS OF ARSENIC PROBLEMS IN THE COMMUNITY



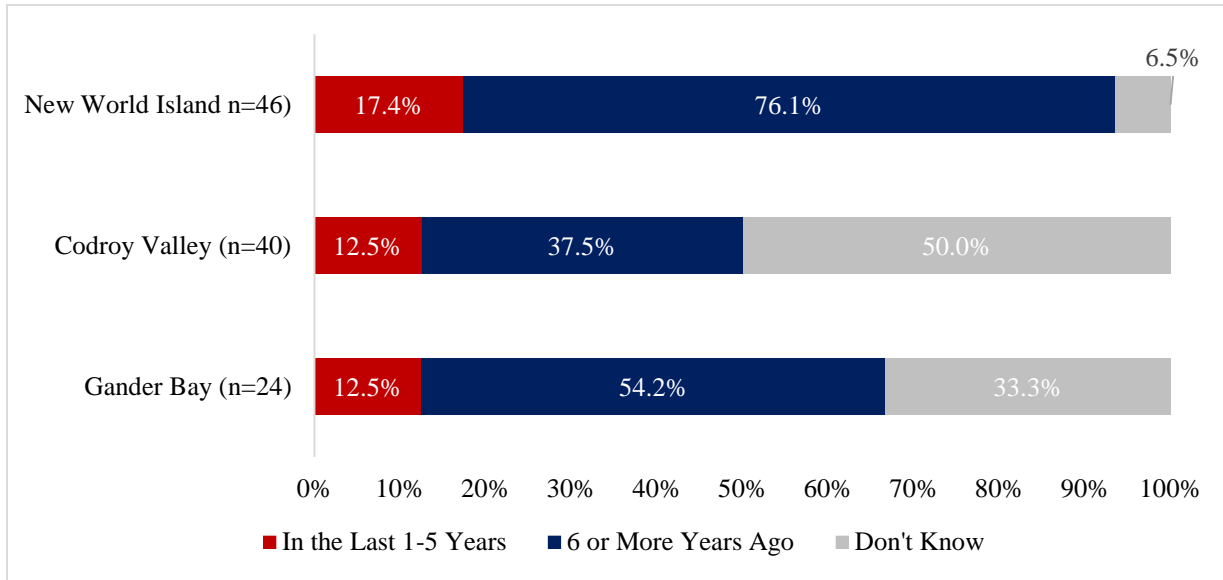
Notes. Cormack is excluded due to the low response rate.

FIGURE 3: TESTING STATUS OF RESPONDENTS WELLS FOR ARSENIC



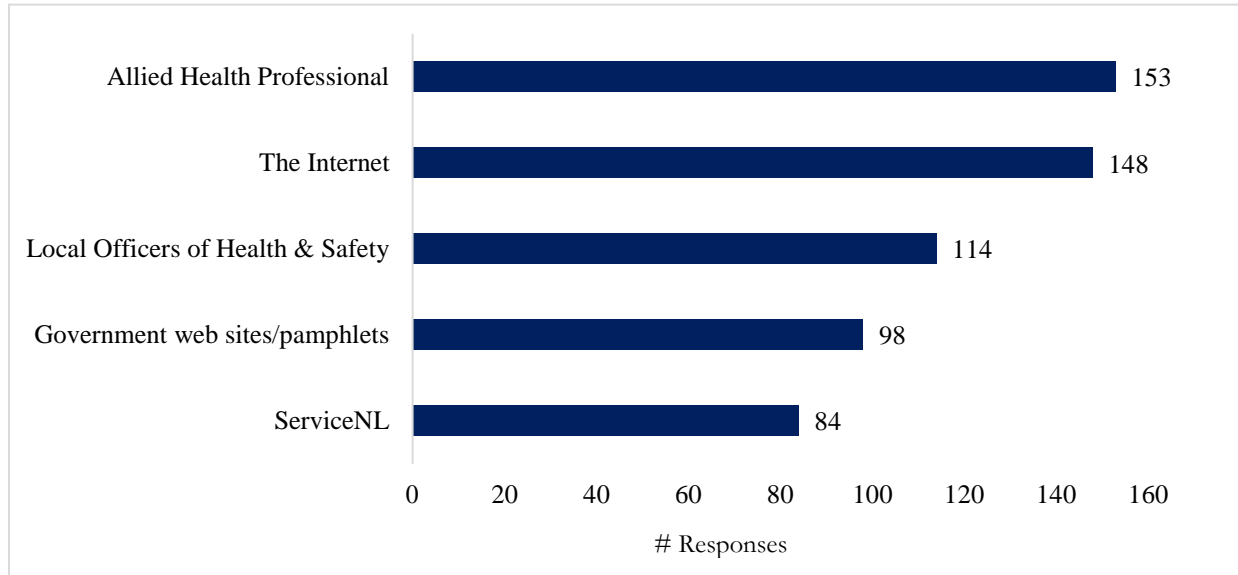
Notes. Cormack is excluded due to the low response rate.

FIGURE 4: TIMING OF RESPONDENTS LAST WATER TEST FOR ARSENIC



Notes. Cormack is excluded due to the low response rate.

FIGURE 5: PREFERRED SOURCES OF ARSENIC & WATER SAFETY INFORMATION



APPENDIX A: ETHICS CLEARANCE LETTER



Ethics Office
Suite 200, Eastern Trust Building
95 Bonaventure Avenue
St. John's, NL
A1B 2X5

January 31, 2018

Faculty of Medicine
Disciple of Family Medicine

Dear Dr. Hewitt:

Researcher Portal File # 20181198
Reference # 2017.257

RE: "Arsenic Awareness in Rural Newfoundland"

This will acknowledge receipt of your correspondence.

This correspondence has been reviewed by the Chair under the direction of the Health Research Ethics Board (HREB). **Full board approval** of this research study is granted for one year effective **November 23, 2017**.

This is your ethics approval only. Organizational approval may also be required. It is your responsibility to seek the necessary organizational approval from the Regional Health Authority (RHA) or other organization as appropriate. You can refer to the HREA website for further guidance on organizational approvals.

This is to confirm that the HREB reviewed and approved or acknowledged the following documents (as indicated):

- Application, approved
- Research Proposal, approved
- Citizen Survey, approved
- Health Professionals survey, approved
- Letter of information Citizens, approved
- Letter of information Health Professionals, approved
- Advertisement, approved
- Town hall advertisement, approved
- Interview guide health professionals, approved
- Interview guide citizens, approved
- Community update postcard, approved

MARK THE DATE

This approval will lapse on November 23, 2018. It is your responsibility to ensure that the Ethics Renewal form is submitted prior to the renewal date; you may not receive a reminder. The Ethics Renewal

APPENDIX B: COMMUNITY MEETING NEWSPAPER ADVERTISEMENT

17 Grand Bay Rd
Port aux Basques, NL, A0M 1C0
Telephone 709-695-3671 Fax: 709-695-7901
Email: charlene.blackmore@gulfnews.ca

To place a Word Ad call:
1-866-979-9811.

MS lives here. Multiple sclerosis never hits just one person. It affects the entire family.

MS Multiple Sclerosis Society of Canada
1-800-268-7582 www.msociety.ca

This includes the soccer field, baseball field, playgrounds, etc. These recreational vehicles cause damage to our fields that is costly to fix. Violators will be charged for damages incurred.

Please send your resume to: Human Resources
Or fax to: 1-204-6...

View job descriptions located in Carleton Place, ON or on our website

CO-OP Arctic Co-operatives Limited

MEMORIAL UNIVERSITY

Community Meeting
Arsenic and Well-Water Safety

Hear about Dr. Wendy Graham's (MD) latest research and ask your questions!

When: December 4th, 6:30pm - 7:30 pm
Where: Belanger High School, Upper Ferry
Light refreshments will be provided.

For Questions: (709) 864-6421 6for6@med.mun.ca


Inflammatory bowel disease often strikes teenagers and young adults.

NORTHERN LAKES COLLEGE

Northern Lakes College is a publically owned Community Institution (CCI) with 23 campus access point sites, located in 50 communities across Alberta. Diploma and certificate programs in upgrading, business administration, sciences and human services, trades and technical studies, and a variety of continuing education certificates and courses. We support a variety of development and wellness opportunities.

20 PILLS

APPENDIX C: COMMUNITY MEETING SLIDESHOW



Arsenic and Well Water Safety

Dr. Wendy Graham

Research Team



Dr. Wendy Graham
Family Physician



Mr. Thomas Heeley
Research Assistant



Dr. Daniel Hewitt
Family Physician



Mr. Cameron MacLellan
Research Assistant



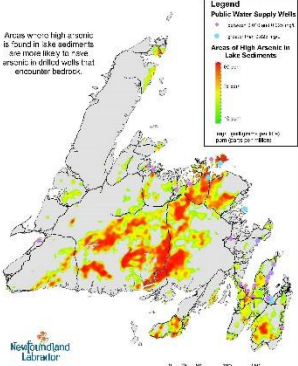
Dr. Shabnam Asghari
Faculty Member

Study setting:

- Codroy Valley
- New World Island
- Gander Bay
- Cormack

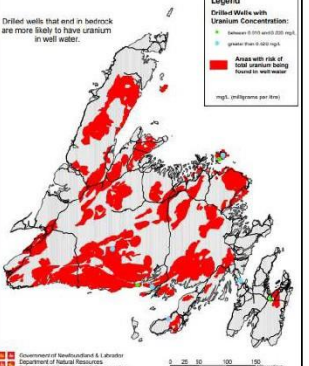
Why Arsenic?

- Hotspots in Newfoundland
- Hard to detect
 - Complications are detected too late for treatment
- Previous work by Dr. Daniel Hewitt suggests that people don't know about arsenic



Other chemicals:

- Uranium is also found around Newfoundland
- Especially near Codroy Valley
 - This presentation will focus on Arsenic only



What did we do?

- We delivered a survey to Codroy Valley, Gander Bay, New World Island, and Cormack.
 - Asked questions about well-owners' awareness of arsenic safety in rural Newfoundland.
- We heard the voices of many rural well-owners through our survey.

Who Answered our Survey?

- Largely over 40 years old
- 60% own a drilled well / 25% own a dug well
- Most (86.2%, n=212) use well-water as their main source of water.
- Majority (86.2%) thought arsenic is harmful

know think water natural poisonous metallic Arsenic
 chemical element mineral poisonous chemical poison
 poisonous substance found deadly chemical toxic element ground
 cause substance

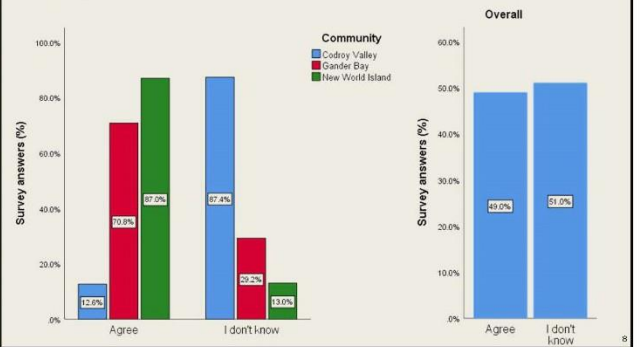
They are right – Arsenic is harmful.

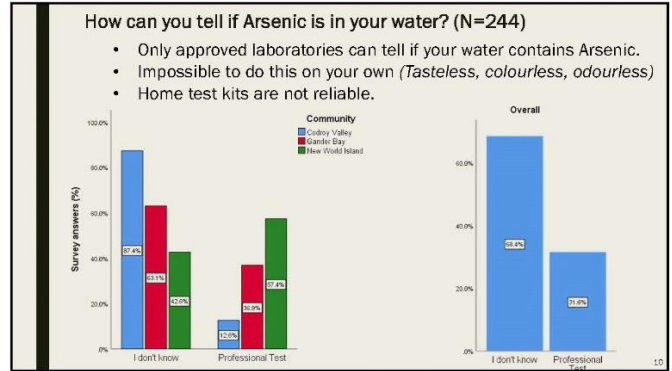
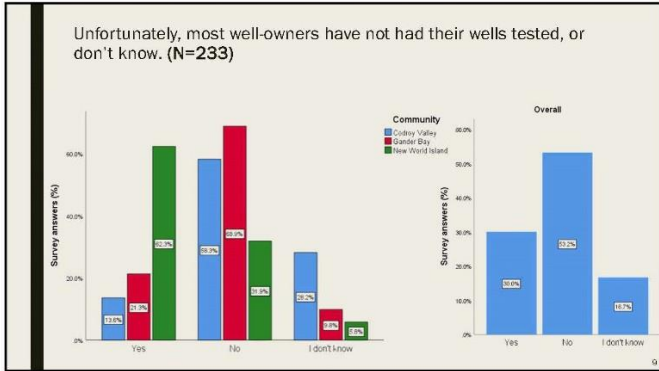
- Cancer
 - Kidney, liver, skin, lung
- Blackfoot disease
- Linked to the development of type 2 diabetes

Is this an issue in Newfoundland?

- Artesian/drilled wells rely on water near sources of arsenic
- For many well-owners, arsenic could be a problem

(N=245)





Testing a Well for Arsenic

- Three quarters of survey participants are unaware of the right time to test for Arsenic.
 - Every two-five years
 - Test more often if you live in high risk area
- Always test when buying a new house, planting an edible garden, or if industrial processes (mining, smelting, fracking) are nearby.
- Tests cost from \$20 - \$200
 - Don't just choose any facility
 - Service NL only tests for bacteria

Professional Water Testers
Maxam Analytical Inc. (St. John's)
 Tel: (709) 754-0203
Avalon Laboratories (NL)
 Tel: (709) 726-9345

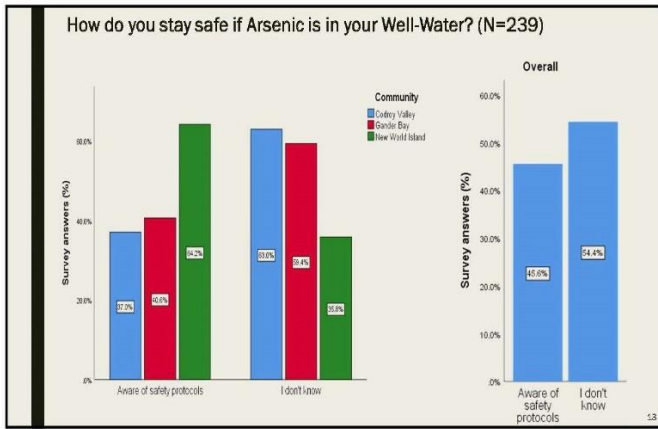
For more info:
<https://www.mae.gov.nl.ca/waterres/cycle/groundwater/well/arsenic.html>

Guidelines for Arsenic and Well-Water Safety

- The Newfoundland government considers it your responsibility as private well-owners to get your water tested.
- 0.010 mg/L** is the maximum level of arsenic deemed to be safe to consume.
- A detailed resource for guidelines around arsenic can be found here:
 - <https://www.canada.ca/en/health-canada/services/publications/healthy-living/guidelines-canadian-drinking-water-quality-guideline-technical-document-arsenic.html>

How do you stay safe if Arsenic is in your Well-Water?

- Many well-owners are unaware that boiling the water and using a Brita filter are ineffective.
- Only two ways to stay safe:
 - Find a new source of water
 - Buy a purification system



Resources from the internet

- The most reliable source of information about arsenic and Well-Water safety can be found here:
 - nl.ca/waterres/cycle/groundwater/well/arsenic.html
 - <http://www.who.int/news-room/fact-sheets/detail/arsenic>
 - <https://www.canada.ca/en/health-canada/services/food-nutrition/food-safety/chemical-contaminants/environmental-contaminants/arsenic.html>

Arsenic and Well-Water Promotion Pamphlet

- Survey results suggested that a pamphlet is the best way to spread awareness
- Any feedback on our pamphlet would be helpful!

Any questions or feedback? 😊

Email 6for6@med.mun.ca for more information.

APPENDIX D: NEWSPAPER ARTICLE IN THE CENTRAL VOICE

19/12/2018 Doctors and Kinsmen Club seeking solutions for elevated arsenic levels in some NewWorld Island wells | Local | News | The Central Vo...

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[N.L. crab fishers taken aback by DFO's latest details on](#)

Doctors and Kinsmen Club seeking solutions for elevated arsenic levels in some New World Island wells

Kyle Greenham (Kyle.greenham@thecentralvoice.ca) (mailto:Kyle.greenham@thecentralvoice.ca)
Published: Dec 13 at 3:09 p.m.
Updated: Dec 14 at 1:20 p.m.



Kinsmen Club for Bridgeport, Moreton's Harbour and Valley Pond president Winston Dearing is working with Memorial University associate professor Dr. Cynthia Coles on a potential community water supply for the area. Because of the high concentration of water and low concentration of arsenic, the artesian well at the Kinsmen Club is being looked at as the likely location for the community well. - Kyle Greenham

On Monday, Dec. 10, Dr. Daniel Hewitt was in New World Island with a new presentation to continue his investigations into the region's water quality.

The communities of Bridgeport, Moreton's Harbour and Valley Pond have a long history of arsenic in private water wells throughout the area. The issue is particularly of concern in Moreton's Harbour, where traces of arsenic are most prominent.

<https://www.thecentralvoice.ca/news/local/doctors-and-kinsmen-club-seeking-solutions-for-elevated-arsenic-levels-in-some-new-world-island-wells-26...> 1/7

19/12/2018 Doctors and Kinsmen Club seeking solutions for elevated arsenic levels in some New World Island wells | Local | News | The Central Vo...

Hewitt presented results from a recent survey related to arsenic at the area's Kinsmen Club. The survey was administered to residents from Bridgeport, Valley Pond and Moreton's Harbour, as well as residents of Codroy Valley on the west coast and in Gander Bay.

The survey looked at people's understanding of the harms of arsenic, its presence in each area, how to get wells tested and if communities are aware of these issues.

With this survey work completed, Hewitt told the over 30 people in attendance at the session he is hoping to create an updated information pamphlet on arsenic well water and to work with Service NL to ease some issues around getting wells tested.

"Once we get input from these community meetings, we're going to ask Department of Municipal Affairs and Environment if we can use Service NL as a receptor of arsenic and make a deal with a testing lab to reduce the costs," Hewitt said. "Because of the nature of this issue it hits rural areas, and unfortunately rural areas are often not the top priority no matter what.

"I think this community has made a good pitch for saying this is important to us, but these areas have to work hard to try and make people pay attention."

Because of Hewitt's work and the past efforts of residents in the area, the New World Island survey results showed significantly higher awareness around arsenic issues than in Gander Bay or Codroy Valley.

For example, when asked if residents are aware of an arsenic problem in the area, the New World Island responses shown that 80 per cent were aware of the potential dangers of arsenic in their water, while only 35 per cent said they were aware in Gander Bay.

The results were also presented in Codroy Valley by Dr. Wendy Graham.

Arsenic awareness

Hewitt was formerly the area's physician, working out of the New World Island Health Clinic in Summerford until he left in 2015. It was around this time he began investigating arsenic in well water, particularly in Moreton's Harbour where the traces of arsenic are high and frequent.

In 2014 Hewitt did initial tests on 12 wells in Moreton's Harbour and Valley Pond. The two dug wells tested had arsenic traces that were below 10 parts per billion (ppb), 10 ppb being the maximum accepted concentration for arsenic in drinking water, according to Health Canada.

But nine of the 10 drilled wells tested positive for arsenic traces above 10 ppb, ranging from 16 to 207 ppb.

With this showing signs for concern, the following year residents of Moreton's Harbour and the neighbouring communities of Valley Pond and Bridgeport had their own tests conducted. Particularly in Moreton's Harbour, the results showed a strong presence of arsenic in the wells of the community. Out of 22 wells, 20 had an arsenic concentration above 10 ppb. One well tested had an extremely high concentration of 1,130 ppb.

"This may be one of the worst areas in the province for arsenic, but my fear is that there are other communities yet to be discovered," said Hewitt.

In the Department of Municipal Affairs and Environment's report on arsenic, cancer is listed as the primary health concern from exposure to arsenic. It also lists other health effects such as causing an abnormal heart beat, poor blood production and diarrhea. Hewitt noted that lung, bladder and skin cancer are particularly linked to arsenic intake, as well as its negative impacts on kidney and liver function.

The survey results showed the strongest awareness around arsenic issues was in the New World Island area, and Hewitt says their work has resonated in other nearby communities as well.

"Because you've had an interest you've had a good effect on the surrounding area," Hewitt told attendees during the presentation. "In the north side of Lewisporte they don't have the town water supply and because they knew of the willingness here to get their water checked, people out there had their drilled wells tested and some did have traces of arsenic."

Seeking solutions



Dr. Daniel Hewitt presented results from a recent survey around arsenic in well water, done in the New World Island, Codroy Valley and Gander Bay areas. The presentation was held at the Kinsmen Club in Valley Pond.

<https://www.thecentralvoice.ca/news/local/doctors-and-kinsmen-club-seeking-solutions-for-elevated-arsenic-levels-in-some-new-world-island-wells-26...> 2/7

19/12/2018 Doctors and Kinsmen Club seeking solutions for elevated arsenic levels in some New World Island wells | Local | News | The Central Vo...

Dr. Cynthia Coles is an associate professor with Memorial University's Faculty of Engineering and Applied Science. She spent the summers of 2017 and 2018 in Moreton's Harbour testing the arsenic levels of various wells and potential solutions for cleaning the water. Using a combination of filters and reverse osmosis, she tested a small-scale system on four different wells.

"Two of them worked and two didn't," Coles said. "There are so many different properties of the water that have to be taken into account for it to work.

"To try and give everyone a household system is not very much of a long-term solution. I don't think it's very sustainable compared to a community system."

Hewitt also expressed that the diverse range of arsenic levels across the area makes it difficult to implement a filtration system that would work in every household.

"Reverse osmosis does not work with water with higher levels of arsenic. It will take some of the arsenic out of the water, but not all," said Hewitt. "The artesian well at the Kinsmen Club does not have a high concentration of arsenic and reverse osmosis may work fine, but down the road the concentrations are very high. Just a stone's throw to your neighbour's property and things could change."

With this in mind, the Kinsmen Club is working in partnership with Coles for a potential community water supply, likely located at the club's location in Valley Pond.

Local Kinsmen president and Moreton's Harbour resident Winston Dearing says the club recently met with the chair members for each local service district and asked them to bring the proposal to their communities. A subsequent meeting will occur in January to see if there is enough community support to move the project forward.

"If there's any money to come from government, it's better to have full support of the community. They don't want to be seen that they're doing this for just a select group," Dearing said. "If there is enough support we're going to do a big more digging into exact costs for funding, maintenance, etc."

But one major area of contention is that many residents of Moreton's Harbour, Bridgeport and Valley Pond have installed their own filtration systems for their home wells. Dearing says many people are worried about the costs and practicality of a facility because of the personal investments many have already made with their own water.

However, Coles hopes the community will see a community water supply as the most viable option.

"In a larger scale system you can do a lot more for people. To have one dedicated system will be much less work overall than having separate systems for each individual well," she said. "It doesn't affect anyone adversely, people should want their neighbours to have clean water."

According to Dearing and Cole, the installation of this system is expected to cost around \$30,000, with a 90/10 cost share between the federal government and the communities of Moreton's Harbour, Bridgeport and Valley Pond.

Dearing does not have a filtration system for his home well. While he may install a system in the future, he is awaiting to see what may come of a proposed community well first.

"We've had sickness and cancer in this community, but no one here knows for sure what's the cause of it," Dearing said. "But when they're telling you if you've got high levels of arsenic you shouldn't be taking too many hot showers, it certainly gets people thinking."

In an emailed response, the Department of Municipal Affairs and Environment says the testing, care and maintenance of private drinking water wells is the responsibility of well owners, and well owners are encouraged to get their water tested by an accredited laboratory at least once a year.

Arsenic levels

In 2014-15 residents of Moreton's Harbour, Valley Pond and Bridgeport had their home water wells tested for arsenic.

An arsenic concentration of 10 parts per billion (ppb) is the maximum accepted concentration of arsenic suitable for drinking water, according to Health Canada's Guidelines for Canadian Drinking Water Quality.

- Moreton's Harbour: Twenty-two wells were tested, 20 tested positive for arsenic concentrations above 10 ppb. The average concentration was 280 ppb, and the highest concentration was a very high level of 1,130 ppb.
- Valley Pond: Nine wells were tested, five tested positive for arsenic concentrations above 10 ppb, the highest concentration found was 232 ppb.
- Bridgeport: Twelve wells were tested, only four had arsenic concentrations higher than 10 ppb. The highest concentration of arsenic found in Bridgeport was 28 ppb.

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