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CASE 11

**Knowledge Dissemination and Private Well Water Testing
in Middlesex County, Ontario¹**

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INTRODUCTION

David Killarney, Manager of the Safe Water and Rabies Team of the Environmental Health Department at the Middlesex-London Health Unit (MLHU), stood in the office kitchen filling his tea kettle with tap water. He took a moment to reflect and appreciate the comfort and safety associated with municipal drinking water, readily available at the touch of a tap. While most Canadians receive drinking water from municipal sources, it is estimated that over four million Canadians receive drinking water from private wells, the responsibility and maintenance of which reside with their respective owners (Jones et. al., 2006). Well water contamination is often of low concern to residents with good reason; in many cases, ground water has remained pristine and safe for hundreds of years without requiring any treatment. However, Ontarians in rural areas are no longer exempt from potential concerns around their drinking water. Ground water is subject to contamination by a variety of sources including *E. coli* and other harmful bacteria, as well as pesticides and chemicals from surface runoff. These risks are especially prevalent in agricultural communities. In 2006, an estimated 45% of all waterborne disease epidemics in Canada involved non-municipal water systems, largely in rural or remote areas (Jones et. al., 2006).

To address the issues associated with well water, the Province of Ontario provides a well water testing service free of charge to well owners with the support of local health units, including the MLHU. However, participation in private well water testing by well owners has been declining in some areas in recent years, which places this group at risk of waterborne illnesses. Reflecting on the unique characteristics of Middlesex County's rural population, Killarney wondered where the gaps in the MLHU's information dissemination were and how services and information could be organized and applied to better reach out to the community. As he prepared his tea, Killarney questioned what communication strategies the MLHU was using to connect with Middlesex County's rural population to convey public health messages.

BACKGROUND**Middlesex County**

The MLHU serves two different populations in Southwestern Ontario: The City of London and Middlesex County. London is located approximately half way between the urban centres of Toronto and Windsor. The surrounding areas form Middlesex County and include eight

¹ The case description, while based on a real experience, is adapted for learning purposes.

municipalities: Adelaide Metcalfe, Lucan Biddulph, Middlesex Centre, North Middlesex, Southwest Middlesex, Strathroy-Caradoc, Thames Centre, and the Village of Newbury. Middlesex County encompasses over 3,300 square kilometres of land (Middlesex County, 2012), the majority of which serves agricultural purposes – the primary economic driving force of the area. According to 2013 data, the population of Middlesex County was approximately 75,000 people (Middlesex County, 2013); 25% of whom lived in a household with a private well (MLHU, 2012b). As a predominantly urban centre, London has very few residents who relied on well water, receiving municipal water from Lakes Huron and Erie depending on geographical location within the city. Exhibit 1 features the municipalities located in Middlesex County and Exhibit 2 features the population of these municipalities.

Private Well Water Testing Procedures in Ontario

The management of private water wells is part of the provincial Safe Water program that operates under the Ontario Public Health Standards (OPHS) (MLHU, 2012). Requirement No. 6 of the OPHS reads: “The board of health shall provide information to private citizens who operate their own wells, cisterns, rain or lake water system to promote their awareness of how to safely manage their own drinking-water systems” (OPHS, 2008 p. 63). The health unit (“board of health”) is responsible for promoting well water testing and making the service accessible, whereas Public Health Ontario (PHO) completes the laboratory testing component, conveying results back to the health unit and well owners. At the MLHU, this program is housed within the Environmental Health and Chronic Disease Prevention (EHCDP) service area. The well water testing service is free for all Ontario residents. PHO recommends that well owners sample their water three times per year: in the spring, summer, and fall (MLHU, 2012), although testing may be completed more frequently if desired. Additional testing for chemicals and dissolved minerals may also be requested by well owners, but these supplemental services are not provided by PHO. Instead, it is recommended that well owners use the services of private laboratories that have been accredited by the Ministry of the Environment and Climate Change, with well owners absorbing any associated costs.

The recommendations provided by PHO are simply recommendations; there is no overarching organization that enforces sampling and there are no penalties for non-compliance with such recommendations. While local health units such as the MLHU are doing their part to encourage and facilitate well water sampling, their reach does not extend beyond providing the services and ensuring they are available. In short, the responsibility of water testing relies on the property owners and no one else.

Services Available at the MLHU

There are 12 pick-up locations across Middlesex County for residents to obtain water testing sample bottles, although only five drop-off locations for water samples. As a result, it is often required of residents to drive significant distances to drop off their water samples, travelling outside of their municipality or into the City of London. A list of drop-off locations is available online on the MLHU website with additional information on the process, including a contact number for further questions. In Middlesex London, the hours of operation for the drop-off locations are limited, with the exception of the MLHU office at 50 King Street in London and the public health laboratory, which is at the St. Joseph’s Regional Mental Health Care building, located in East London.

If a laboratory result tests positive for *E. coli* or total coliform contamination (could include a variety of other bacteria), the MLHU is notified immediately, usually within 1-2 days. Bacterial contamination, particularly *E. coli* 0157:H7 could cause severe illness including stomach cramps, diarrhea, and vomiting (Public Health Agency of Canada, 2014). More serious cases

could lead to kidney failure and even death (PHAC, 2014). Next, a letter is mailed to the homeowner with the test results, and a public health inspector provides a follow-up phone call. The purpose of the phone call is to answer any questions and discuss the possible causes of the adverse result. Once receiving an adverse result, well owners are accountable for incurring the costs of treatment or repair to the structure or water themselves. The system appears to work effectively for those who use it, yet there are fewer residents using the service each year.

The Walkerton Tragedy

Canada's "worst-ever" outbreak of *E. coli* contamination took place fourteen years ago in Walkerton, Ontario, in neighbouring Bruce County (CBC News Canada, 2010). Walkerton's water source was groundwater (or well water) and became contaminated by surface water runoff. Negligence on the part of several parties contributed to insufficient chlorination leading to 2,300 reported cases of *E. coli* and 7 deaths in a town of only 5,000 people (CBC News Canada, 2010). This tragedy was not far from the minds of Ontario residents, particularly Killarney and the Environmental Health team at the MLHU.

THE DILEMMA

With a publically funded water testing service available to residents, the low number of households that regularly sampled their private well water was alarming. Killarney's discussions with PHO identified that a meagre 1% of private water well owners tested their water three times per year as recommended and only 15-20% of well owners tested at all across the province. Exhibit 3 provides the proportion of tests submitted by municipality. At the same time, it was estimated that up to 45% of all incidents of waterborne illness in Canada were related to non-municipal water systems such as private wells or small drinking water systems (Jones et. al., 2006). It became clear that sampling rates in Southern Ontario were failing to meet the public health recommendations, demonstrating a disparity between what was suggested and what was being done (Hexemer et. al., 2008). Furthermore, data provided in a study completed in Hamilton, Ontario, a short distance from Middlesex County, confirmed through a survey that residents were indeed concerned about water safety (Jones et. al., 2006). This information prompted Killarney's questions as to why there was disconnect between clear concerns for water, yet low testing rates in the community.

THE PRIVATE WELL WATER TESTING PROJECT

Killarney determined that there was a need to assess the knowledge level and perceptions of the local population around well water testing in order to strategically build and implement a communication plan that would better meet the needs of the community. Data would need to be collected from private well owners, a unique population that differed from urban residents in London. The transfer of information regarding the importance of well water testing clearly was not working effectively with the target population. In order to gauge the needs of the local community regarding well water testing, Killarney decided to complete a needs assessment. Exhibit 4 includes the Needs Assessment Questionnaire used. The needs assessment was completed at the MLHU in the summer of 2014 with the support of the Safe Water and Rabies team and Angela Gray, a Master of Public Health student from Western University. It was important for Killarney to understand the perceptions, values, and beliefs of the target population, including attitudes and relationships towards water, in order to develop new communication strategies that would motivate behaviour change.

Working with a number of professionals at the MLHU, background information was gathered and a research question developed. The research question for the needs assessment was: "What are perceived facilitators and barriers related to private well water testing in Middlesex County?" The needs assessment would entail one-on-one interviews with community members

who owned or resided at a property with a private water well (the target population). The goals of the project were as follows:

- To identify the knowledge level among owners/residents of private wells regarding private well water testing and safe well water practices;
- To identify the facilitators and barriers to private well water testing and safe well water practices among owners/residents; and
- To identify potential effective strategies identified in the research literature to facilitate private well water management.

RESULTS

Initial visits to the more rural municipalities in Middlesex County were planned with the idea that township offices, community centres, and libraries may be good places to start. As it turned out, these community spaces did not offer nearly as much pedestrian traffic as expected. The first scheduled site visit was made by Gray to the Middlesex Centre Municipal Office located in the town of Ilderton on a Thursday afternoon. It was the week taxes were due, and municipal staff anticipated high traffic as a result. The first few people Gray spoke with were all employees and all lived in homes with municipal water sources. While the municipal personnel were pleasant and very accommodating, if Gray hoped to reach the rural residents on private wells, a different approach would need to be taken.

Gray began by taking a look at any and all potential opportunities of locating groups of rural residents together at the same time. While county fairs and special events would be the ideal places to complete interviews with residents, they were sparsely distributed throughout the summer and fall, and would not provide enough data before the collection deadline at the beginning of July. It was also planting season, and with a very late spring and heavy rains, it was a crucial time for farmers who were in the process of completing their planting. Community centres, libraries, and municipal offices were also good options, but in most cases, the farming community would be working in the field and not visiting these places during working hours. The target population also did not work standard office hours or take a traditional hour lunch from 12-1pm, so seeing these individuals on a lunch break was impractical. Local coffee shops, restaurants, and corner stores could be sensible venues to catch local people, but were also located in more developed areas with municipal water access. It became clear that simply reaching the target population would be the greatest challenge of the project.

Gray's next plan of action was to target building and farm supply stores as close to rural areas as possible. In addition, perhaps more than a few hours at each location would be required to speak with enough residents. Kenwick Mall in Strathroy was also home to a MLHU office as well as a grocery store and restaurant, which could be an option for locating the appropriate population. The Strathroy office also served as a drop-off location, meaning that well owners could drop off their water samples there on Mondays and Tuesdays to avoid transporting them to the lab themselves. Another option was to piggyback on visits to homeowners who had experienced adverse results. A new program at the MLHU had one public health inspector completing follow-up home visits to improve client service regarding well water sampling, treatment, and maintenance. In addition, discussions with the MLHU staff that worked with rural populations took place in order to strategize where to best reach the target group. Gray utilized each of these strategies in order to complete the necessary interviews to collect data for the needs assessment.

Strategic planning for interviews resulted in mediocre success. As stated by one resident in the Village of Newbury, "Everyone's got town water here, my dear. They put lots of lines in." As

spoken by a library employee in the same town, “Lots of people work and commute. I’m not so sure you’d find anyone during the day. Then again, evenings are hit and miss.” The MLHU ethics policy would not support door-to-door visits and, even if possible, how many rural residents would be sitting inside their homes during the day as opposed to working in the fields? The Private Well Water Testing Project’s needs assessment hit a turning point one evening in Parkhill, located in the far north of Middlesex County, only a short 15 minute drive from Grand Bend on the shores of Lake Huron. When approached, one resident turned to Gray and said, “80% of people have town water [...] Farmers are in the field. It’s a busy time for them. In town you’re going to catch single moms, kids using the library’s internet, and young families from town. I can tell you right now this is the wrong place for you.”

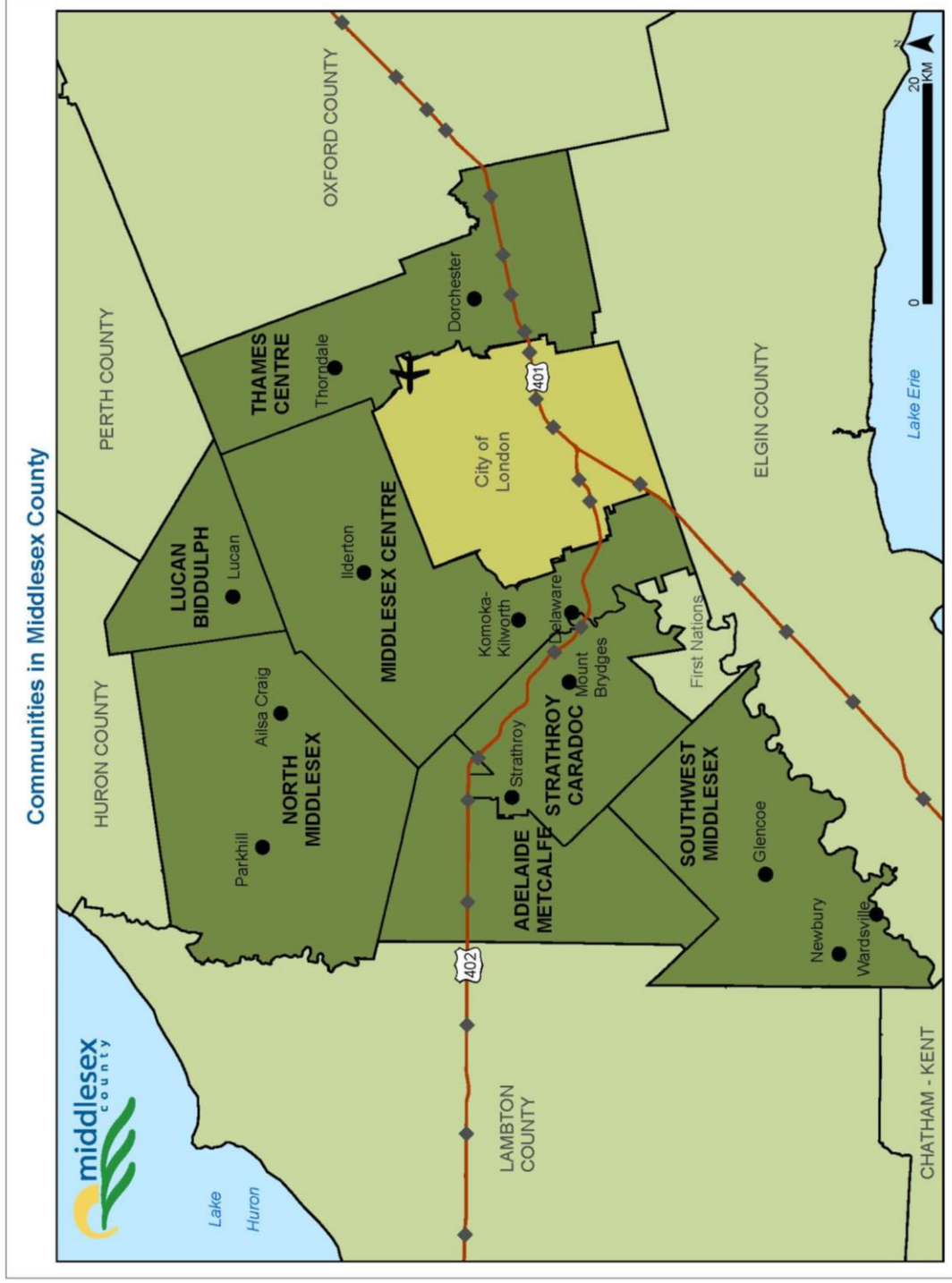
Communication Challenges Identified

In addition to the sampling challenges associated with the Private Well Water Project needs assessment, other barriers related to communication became evident. Through interviews conducted during the needs assessment, Gray found that the test instructions were complicated and unclear for some well owners, requiring time and careful review. This incomplete information could lead to an inaccurate sample or refusal for testing by the lab. One resident turned on the bypass to his treatment system because he thought that was what he was supposed to do. This was a well-educated man who lived with a private well for many years. Looking at the instructions, they did not mention whether the sample was to be a treated or required a raw sample of water. This information gathered from residents did not come without verification. According to the Water Testing Information System database, approximately 9% of samples were not tested for a number of reasons including: insufficient information on the sample, the sample was warm upon receipt, the sample was not collected in the proper bottle, the sample was too old, a unique identifier was missing or mismatched, and many more (Ministry of Health and Long-Term Care, 2013).

UNRESOLVED ISSUES

The Private Well Water Testing Project was a useful initiative in gathering feedback from the local community related to knowledge of, and perceived barriers to, regular well water testing. Yet there were now more challenges than ever. The most significant communication barrier became evident through the question, “Are you aware that Public Health Ontario recommends testing your well water three times per year?” In response, a vast majority of participants reported “no”. Killarney had a significant task here to address. If the target population was unaware of the well water testing guidelines, not testing nearly as frequently as possible, and challenging for public health professionals to connect with, what would he need to do to increase testing rates? Was the problem with knowledge dissemination or did communication need to exist as more of a two-way relationship? In what ways could the MLHU support this community in protecting health from waterborne illness? Killarney would need to determine an effective and appropriate way to communicate *with* and *to* the target population, in a way that would motivate change in health behaviours.

EXHIBIT 1
Map of Middlesex County



Source: Middlesex County, n.d.

EXHIBIT 2
Middlesex County Population by Municipality

Municipality	2006	2011	2016
Middlesex County	68,917	70,903	78,558
Adelaide Metcalfe	3,028	3,315	3,593
Lucan Biddulph	4,187	4,338	4,538
Middlesex Centre	15,589	16,487	18,546
Newbury	439	447	460
North Middlesex	6,740	6,658	7,268
Southwest Middlesex	5,890	5,860	6,094
Strathroy-Caradoc	19,959	20,978	22,183
Thames Centre	13,085	13,000	15,877

Source: Middlesex County, 2013.

EXHIBIT 3

**Annual Average Tests Submitted as a Proportion of Total Number of Dwellings,
by Municipality, 2009-2013**

	London	Lucan Biddulph	Middlesex Centre	Thames Centre	Strathroy- Caradoc	North Middlesex	Adelaide Metcalf	Southwest Middlesex
Avg. annual tests submitted	1780	413 (5%)	3052 (11%)	1988 (8%)	1746 (4%)	347 (3%)	1120 (21%)	1011 (8%)
2011 Private dwellings	n/a	1653	5808	4836	8162	2483	1064	2470

Source: Ministry of Health and Long-Term Care, 2013.

EXHIBIT 4
Needs Assessment Questionnaire

The MLHU Private Well Water Testing Project

The purpose of the project is to gather feedback from residents of Middlesex County who have private water wells. We would like to better understand the reasons that influence well water testing, including the challenges that residents may face. Your feedback is important to help us improve the health unit's services in order to encourage well water testing.

1. **Screening:** What is the source of water for your house? Is your water supplied by a Municipal water source (i.e. you periodically receive a water bill) or from a well on your property? If asked, by "well", I'm referring to any means of getting water from the ground, including dug, bored or drilled wells, and sand point.

Municipality: _____ **Type of well:** _____

2. Do you or any member of your household drink water from your well?

Yes ___ **No** ___ If no, please explain why not? _____

3. Do you treat the water supplied by your well to your house?

Yes ___ what is the treatment method/device that you use?

- | | | |
|--|--|--|
| <input type="checkbox"/> Water softener | <input type="checkbox"/> Iron filter | <input type="checkbox"/> Sediment filter |
| <input type="checkbox"/> Carbon filter | <input type="checkbox"/> UV (ultraviolet) disinfection | |
| <input type="checkbox"/> Constant chlorination | <input type="checkbox"/> Reverse osmosis system | |
| <input type="checkbox"/> Boil drinking water | <input type="checkbox"/> Other (please describe) | |
| <input type="checkbox"/> I don't know | | |
- _____

No ___

4. Has the water from your well ever been tested for bacteria (E.coli, total coliforms)?

If yes, when was the last time your well water was tested for bacteria? _____

If yes, how often is the water from your well tested for bacteria?

- More than twice a year
- Once or twice a year
- Every two or three years
- Less often than every three years

If no (or can't recall), why have you never tested your well water for bacteria?

5. Have you ever tested your well water for chemicals such as fluoride, sodium, nitrates?

If yes, when was the last time your well water was tested for chemicals? _____

If yes, how often is the water from your well tested for chemicals?

- More than twice a year
- Once or twice a year
- Every two or three years
- Less often than every three years

If no (or can't recall), why have you never tested your well water for chemicals?

6. (**Note:** Asked only of those that have ever tested their well water) Have you ever received a bad test result (i.e. an adverse test result) for any type of testing? If so, what did you do?

7. Are there any difficulties that you experience in testing your well water? Do you experience any challenges related to well water testing? Please describe the challenges. [Record responses verbatim; use check-boxes later for analysis]

Inconvenience of pick-up / drop-off locations

- Travelling distance too far
- Hours of operation limited

Lack of time

Costs of testing are high (e.g. for some testing not covered by government)

Lack of knowledge/skill regarding how to appropriately take a water sample

Lack of knowledge regarding the frequency of recommended sampling

Lack of knowledge/skill in interpreting test results

Lack of perceived problem/complacency

Attitude that water testing is a low priority and/or unnecessary

Privacy Concerns with submitting water samples to lab

Other, please specify: _____

No challenges or difficulties identified

8. Please describe what could be done to help you adopt a regular routine of testing your water (at least once a year). For example, is there anything that can be done to help you or remind you to get your water tested regularly (at least once a year)?

9. If a new drop-off/pick-up location was available in this community, what are some convenient locations?

10. We are exploring other options to encourage residents in your community to test their well water. Specifically, we are looking into creating an annual "Well Water Week" where we would have Public Health Inspectors at a specific location in your community for a one-week timeframe (5-6 days) for residents to bring water samples for testing. Is this something that would be convenient for you? Would this encourage you to bring your sample for testing?

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11. Are you interested in receiving a reminder service from the MLHU 3x per year? (If yes, provide information).

12. Are you aware that water should be tested 3x per year?

13. Any additional comments:

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INSTRUCTOR GUIDANCE

Knowledge Dissemination and Private Well Water Testing in Middlesex County, Ontario¹

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BACKGROUND

The Middlesex-London Health Unit (MLHU) is challenged with regards to influencing health behaviours of private well water users. Private well owners are responsible for the testing of their water, and it is recommended by Public Health Ontario to do so three times per year. However, testing rates are either declining or at best, remaining stagnant across Middlesex County. It appears that well owners are unaware of the risks of not testing their drinking water, or if they are, they have become complacent. In short, the health unit is lacking an appropriate knowledge and education dissemination strategy that is suitable and well-adjusted for the target population. The unique characteristics of the target population made this group especially challenging to engage with. Such features are associated with the agriculture industry: seasonal work patterns, limited visits to town, distrust in government, varying education and literacy levels, resilient and “tough” attitudes towards health, remote residential areas, and more. The case introduces the steps taken by the protagonist and his summer student in order to determine the knowledge level of well water testing information, attitudes towards the program, and needs of local community members around this issue. Background information on well water testing services provided by the MLHU and Province of Ontario, history from the Walkerton Tragedy, and importance of well water testing are provided. The reader is left with the challenge of developing strategic ways to engage in knowledge exchange with the community, design and deliver appropriate communication tools, and work with the community to address health behaviour change.

OBJECTIVES

1. Think critically about ways to communicate and engage in knowledge exchange with unique and sometimes challenging populations.
2. Assess barriers to transferring information and influencing health behaviours amongst rural private well owners.
3. Diagnose communication problems and formulate potential solutions to these problems.

DISCUSSION QUESTIONS

1. Why is communication important in public health?
2. Who do we need to consider when developing communication tools and strategies?
3. What are outcomes of poor communication?

¹ The case description, while based on a real experience, is adapted for learning purposes.

4. Make a list of health communication initiatives you have seen that stand out in your mind. What was exceptionally good or bad about these? (Consider print sources, commercials, social media, billboards, radio, etc.)
5. What makes a health communication tool or strategy effective? How will you know it is effective?

KEYWORDS

Private well-water; communication; knowledge dissemination; needs assessment; rural; facilitators; barriers.