A qualitative study of the experiences and information needs of public health inspectors that inspect small drinking water systems in Ontario, Canada

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Abstract: Public health inspectors (PHIs) play an important role in enforcing the regulation and monitoring of approximately 9000 small noncommunity drinking water systems across Ontario. These small drinking water systems (SDWS) are diverse and face unique challenges. The purpose of this research was to explore PHIs’ insights and needs related to these SDWS in Ontario, Canada, to inform future policy and training initiatives to support safe drinking water. Data were collected through teleconference-conducted focus groups. Transcripts were analyzed and three major themes were found: the operator–PHI relationship, PHI training and information needs, and operational challenges. Overall, participants reported that they felt confident in their ability to inspect SDWSs. Main concerns to water safety were the technical ability of the water operator to manage their water supply and the impact of having a long time period between inspections of water systems. Future research should explore the cost-benefit of increasing inspection frequency in SDWSs and a variety of training and education initiatives for PHIs and operators of SDWSs.

Key words: drinking water, small drinking water systems, public health inspector (PHI), qualitative research.

In Ontario, small noncommunity drinking water systems (SDWSs) are defined as businesses or premises that provide drinking water to the public and do not get their water from a municipal water supply, such as those serving recreational camps, restaurants, and trailer parks (Government of Ontario, 2008). The regulation of these systems is a responsibility of the Ontario Ministry of Health and Long-Term Care (MOHLTC) and local health units. SDWSs undergo risk assessments and inspections, conducted at a minimum of every 2 years for high-risk systems and every 4 years for low and moderate risk systems, by public health inspectors (PHIs) (Ontario Ministry of Health and Long-Term Care, 2019).

Risk assessments of drinking water systems are a cornerstone of the preventative and multi-barrier approach needed to support safe drinking water (Dunn et al., 2014; Health Canada, 2008; Huck and Coffey, 2004). As part of the risk-assessment process in Ontario, PHIs conduct an on-site inspection of SDWSs in their jurisdiction, using a standardized inspection tool, developed by the MOHLTC. The risk tool considers water safety factors such as the water source, treatment, and the distribution system for PHIs when conducting on-site risk assessments to determine if the system is operating in a safe manner (Ontario Ministry of Health and Long-Term Care, 2018). SDWS operators are required to routinely test the water supply for E. coli and total coliforms. The frequency of these tests is determined by the PHI during the risk assessment and may vary from once every week to once every 3 months (Ontario Ministry of Health and Long-Term Care, 2018).

SDWS operators are responsible for ensuring their system meets provincial requirements. Several studies have examined challenges faced by SDWS operators across Canada (Boag et al., 2010; Jalba and Hrudey, 2006; Kot et al., 2011; Pons et al., 2014); however, no studies that specifically address the challenges and information needs of PHIs who inspect SDWSs were found in a review of the relevant literature. The purpose of this research was to explore the insights and needs of PHIs working with SDWS in Ontario, Canada, through teleconference-conducted focus groups related to how SDWSs are inspected and where knowledge gaps exist.

Methods

Participant selection

The target population for this study were the approximate 60 PHIs working with SDWSs in Ontario, Canada.
of PHIs (20/60) with SDWS inspection responsibilities from local public health units with SDWSs, and approximately one-third (47%) of PHIs (20/60) with SDWSs in the province. Of those that were invited and did not participate in one of three focus groups, representing 16/34 in total. Twenty PHIs went to each of the three teleconference-conducted focus groups. Participants were purposively selected from local health units. If participants declined the invitation, they were asked to suggest someone else in the health unit that might be interested. No incentive was provided to participants. This research was approved by the University of Guelph Research Ethics Board (REB#14MR018).

Data collection

Data were collected through three teleconference-conducted focus groups of 6–7 participants each in May 2014. Each session lasted approximately 1.5 h. Focus groups were conducted using a semi-structured interview guide containing 10 questions, based on Krueger and Casey (2000) and Pham et al. (2010). The questions focused on the participants’ water safety knowledge, confidence in their SDWS knowledge and ability to inspect these systems, the factors that have been important in forging successful working relationships between PHIs and operators, identifying future training and resource needs of PHIs to enrich their skills and address knowledge gaps, and their perception of current and future SDWS water safety issues. The guide was pilot tested and questions that were vague or difficult to understand were revised. The focus groups were moderated by the primary researcher and field notes were taken by a co-researcher. All focus groups were audio-recorded and transcribed verbatim by a professional transcriptionist and reviewed for accuracy.

Data analysis

Interview transcripts were imported into NVivo 10 (QSR International Pty Ltd, 2012) for thematic analysis (Braun and Clarke, 2006). Two researchers independently reviewed all transcripts and identified key concepts and ideas through written memos. Each researcher then independently coded the transcripts and findings were discussed and compared when complete. Themes were developed and agreed upon by categorizing codes that corresponded to similar concepts.

Data validation was conducted by contacting participants by email and asking them to review the concept map and provide feedback to ensure the results accurately captured the discussion of the group in which they participated. Participant comments were integrated into the final results and interpretation. The results presented here are punctuated by unattributed verbatim quotes for illustration.

Results

Participant characteristics

A total of 31 PHIs with SDWS inspection responsibilities from 27 health units were contacted and invited to participate in any of the three teleconference-conducted focus groups. Twenty PHIs participated in one of three focus groups, representing 16/34 (47%) local public health units with SDWSs, and approximately one-third of PHIs (20/60) with SDWS inspection responsibilities in the province. Of those that were invited and did not participate: six did not respond, four could not participate due to scheduling conflicts, and one did not show up. Five participants provided additional feedback during data validation.

Three major themes were identified in the focus group discussions: operator–PHI relationships, PHI training and information needs, and operational challenges.

Theme 1: PHI–operator relationship

The SDWS operator was frequently cited as being key to drinking water safety. Participants mentioned the operator’s willingness to provide safe water and meet legal requirements, the operator’s education and knowledge of their drinking water system, and due diligence (i.e., taking reasonable care of the water supply before a problem occurs) as factors that were important to the operator’s ability to oversee and protect the water supply. One participant commented that,

“what it [water safety] boils down to for me is the willingness of the owner/operator wanting to ensure that they are providing potable water and what is the operator or owner’s knowledge of providing potable water, because people think potable water’s just a zero-zero count [negative water sample for E. coli and total coliforms] on a water sample, which we know is a lot more in-depth. So it is their willingness to provide a secure system.”

The relationship between the operator and the PHI was frequently cited as an important aspect to drinking water safety. A “good” relationship with the operator was described as professional, having mutual respect and trust between both parties, and when the operator would comply with the requirements outlined by the PHI. Participants felt that if the relationship between the PHI and operator was good, then the operator would contact them if there was a water safety issue. One participant commented,

“They could still get results that are very good if they’re sampling every three months and have a UV [ultraviolet] light, but what happened in between you may not know and unless you have a good relationship with them then they let you know.”

Factors that were reported as contributing to a successful relationship with the operator were taking additional time to explain and educate the operator on their requirements during inspections; having patience; maintaining frequent contact with the operator through in-person visits, telephone or email; and having clear expectations of what the operator needs to do to meet the legal requirements.

Theme 2: SDWS training

PHI training and confidence. The majority of PHIs reported feeling very confident in their day-to-day working knowledge of the SDWSs they inspect. However, they noted that there is great variety in the SDWSs they inspect, which allows them to constantly learn new things. Participants cited both formal and informal sources of information when asked where they acquired their SDWS knowledge. Formal training methods included workshops held by various agencies including the MOHLTC, private water companies, and the Walkerton Clean Water Centre. Participants also mentioned a desire for more hands-on training or having a PHI who had experience with SDWSs deliver the training.

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Many participants cited informal training methods as a key source of information. Informal methods included consultations with private water treatment companies, using their colleagues as resources (“We’ve got a few people in the office that have kind of specialized in it or really taken a focus on it and they tend to be really good resources”, as outlined by one participant), reading material provided by various health or water agencies, mutual learning with the operator, and the Internet. Several participants spoke of the challenge of having only one PHI in a health unit doing this work, so they do not have extra support if needed. One participant felt this put a lot of pressure on him, explaining it as:

“I am the only one that is conducting inspections and doing assessments, so I guess a lot has been on my shoulders to look up information and deal with different people to try to get it right.”

Information sharing needs. Two of the three focus groups brought up the need for a forum where PHIs can share information and experiences. Two formats were discussed with a great deal of agreement among participants. The first was an online vehicle for sharing information, fact sheets, or experiences. For example, one participant explained:

“It would be great to have one place to go, whether it’s on-line... some kind of place where all these... information fact sheets, could go and if all these things were stored in one big portal... that would be a great resource to have.”

The second format was an annual or semi-annual meeting of PHIs, consisting of neighbouring health units, where they could informally share experiences and difficulties with SDWSs.

**Theme 3: Operational challenges**

*Water testing limitations.* Participants considered water testing to be an important component to maintaining a safe water supply. However, challenges to water testing were mentioned in all three focus groups. PHIs said that operators find it difficult, or in some cases impossible, to deliver their water samples to private labs because of the remote location of their SDWS. One participant commented,

“We have quite a geographic area here, so the access to... private labs seem to be quite an issue, quite an exorbitant cost to get samples to these labs, especially when you’re a couple hours or so away from that.”

Water samples must be received by a private laboratory within 24 h of collection. In remote locations samples must be couriered by boat or air. Participants stated the added cost of water sampling that began with the transfer of regulation to the MOHLTC initially put some strain on the relationship between the PHI and operator, as operators were not happy with the increase in cost and did not always understand it. This was mentioned as a challenge, but one that has primarily been overcome with education and time.

Participants also stressed the limitations of water sampling, as it only provides a snapshot in time of the water’s safety. Additionally, there is more to water safety than satisfactory water samples including routine monitoring and maintenance of the water supply, such as monitoring chlorine residuals, turbidity levels, and water treatment systems to ensure they are operating at optimum efficiency.

*Frequency of inspections.* Participants stated that the current schedule of inspection frequency was inadequate. Several participants felt that 4 years between inspections is too long, and that this gap contributes to drinking water safety concerns. Participants mentioned that when they returned after 4 years to conduct a second routine inspection, they often needed to re-educate the operator, and in some cases they felt the safety of the drinking water supply was compromised in the time between inspections. One participant explained,

“I think it should be a yearly inspection of these facilities...they may be taking their samples, but are they really looking at their treatment and equipment...You kind of find it out...where those people say, ‘yeah, a couple of years ago we had this problem’.”

On the other hand, participants also noted that they currently do not have the time to visit these premises more often because of the number of SDWSs each PHI inspects, travel time to each system, the seasonal operation of some systems, and competing time commitments required for other inspections.

**Discussion**

This research explored the strengths and challenges of PHIs inspecting SDWSs in Ontario, Canada. The PHIs involved in this research are widely distributed across the province; this study captured the views of 20 of these PHIs in 16 boards of health with telephone focus groups. Although this research was conducted in Ontario, it provides insight into the challenges and dynamics between PHIs and operators that can exist across Canada. Safe drinking water is a significant priority for public health organizations across Canada and the PHIs responsible for this program play an important and very visible role in community health.

In this study, PHIs reported they were confident in their knowledge of SDWSs but believe they needed increased and regular information sharing and networking opportunities. In many cases, there are one or two PHIs in each health unit that conduct SDWS inspections, as such, some PHIs felt isolated in their workplace and would like more opportunities to share knowledge and experiences with other PHIs. Creating a community of practice (CoP) for SDWSs would be valuable for both PHIs and operators to promote knowledge exchange and develop capacity among and between these groups (Ranmuthugala et al., 2011). This can be used to enhance knowledge, generate a body of knowledge that members can utilize, and allow peers to interact, which enhances learning and information sharing (Li et al., 2009).

The importance of the operator in ensuring a safe water supply was discussed in all three focus groups. There are five components to a robust water supply: source quality, treatment, a secure distribution system, water monitoring, and responding to adverse events (Huck and Coffey, 2004). Each is critically important to the water supply, and it is the role of the operator to ensure that these five components are not compromised. During the focus groups, participants concentrated on the operator and their control over many aspects of the water supply. The lack of discussion of these other factors may be a result of the interaction between the PHI and the operator during the inspection, with the recognition that the operator’s ability can have a direct impact on water quality.
In a 2011 survey of SDWS operators in Ontario, the operator’s role in water safety was found to be a function of their confidence as an operator, their knowledge level of the water system, and the relationship between the operator and PHI (Pons et al., 2014). Only 37% of operators had completed formal training, and the operators surveyed felt less confident in their ability to handle issues when the system malfunctioned or an adverse water sample is received than in their day-to-day tasks when operating the water system (Pons et al., 2014). One challenge with small community water supplies in Canada is access and availability of operator training (Boag et al., 2010; Kot et al., 2011). Operators need to be trained and supported so that they understand the system and priorities of water safety (Jalba and Hrudey, 2006). Participants noted that the operator’s knowledge is important to ensuring a safe water supply.

Water sampling and testing were identified as another limiting factor in the provision of safe water by SDWSs, particularly in remote locations. Participants reported that water sampling was a challenge for operators located in remote communities because of the difficulty of delivering the water sample to a private laboratory and the added cost to the operator. Water sampling costs are not exorbitant but can add up based on the frequency of testing required as well as the cost of couriering the sample or the time an operator must spend delivering the sample. However, sampling frequency can be reduced when protection measures are added to the water supply. A greater investment in water safety measures by the operator can reduce the reliance on water testing as the only measure of safe water.

The frequency of SDWS inspection by PHIs was also discussed as an issue affecting water safety; participants felt the length of time between inspections had an eroding impact on an operator’s knowledge and the operator–PHI relationship. Increasing inspection frequency would significantly increase the cost of delivering the SDWS program and create an added human resource challenge. Another option includes maintaining the operator–PHI relationship through regular contact through means other than routine inspections (e.g., telephone calls or emails, communities of practice, online resources, phone apps). Operators should be encouraged to contact the PHI for assistance and support. Strengthening the operator’s ability through building the operator–PHI relationship can mitigate the impact of a 4-year gap between inspections.

This research sampled one-third of the target population, providing a good cross-section of possible issues PHIs might identify. Telephone focus groups are an accepted method of data collection in health research (Cooper et al., 2003; Frazier et al., 2004) and have been used to explore health-related topics such as health practices, knowledge, and training needs (White and Thomson, 1995; Cooper et al., 2003). Telephone focus groups were ideal for use in this research because the target population was widely dispersed across Ontario and a traditional focus group structure would have excluded many potential participants.

The focus group format can cause a tendency toward normative discourse (Smithson, 2000) and some individuals may dominate the discussion (Krueger and Casey, 2000). The moderator attempted to minimize these effects by stressing that there were no right or wrong answers, verbally directing the conversation to all participants and ensuring each person shared their thoughts on each question. Further strengths to this work was having participants check the results of this work and having two independent reviewers analyze the data and come to a consensus on the results.

This research found that there is a need for enhanced information sharing and the creation of networks among PHIs inspecting SDWSs across Ontario. One format that might be successful includes the creation of CoPs. PHIs can also work to improve or maintain the PHI–operator relationship through regular contact with the operator, in place of increasing inspection frequency; future research could explore the cost-benefit of increasing inspections of SDWSs and evaluate training opportunities designed specifically for SDWS operators and PHIs.

References


QSR International Pty Ltd. 2012. NVivo qualitative data analysis software; Version 10.

