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Description of calls from private well owners to a national well water hotline, 2013

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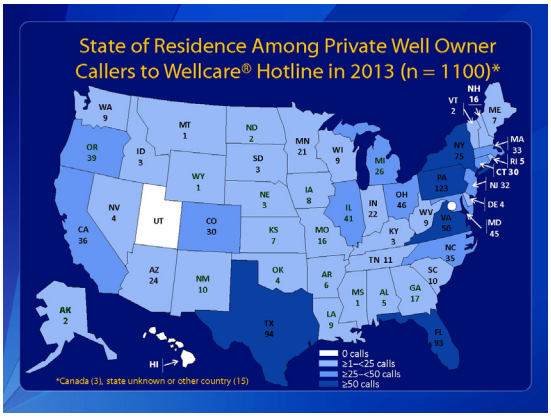
HIGHLIGHTS

- The wellcare® Hotline is a national source of well-owner data in the U.S.
- Private well owners have information gaps in well stewardship practices.
- Information gaps include how to test well water and how to interpret results.

GRAPHICAL ABSTRACT



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ABSTRACT

Water Systems Council (WSC) is a national, non-profit organization providing education and resources to private household well owners. Since 2003, WSC has provided wellcare®, a toll-free telephone hotline to answer questions from the public regarding well stewardship. In order to identify knowledge gaps regarding well stewardship among private well owners, we obtained data from WSC and reviewed calls made during 2013 to wellcare®. WSC records data from each wellcare® call—including caller information, primary reason for call, main use of well water, and if they were calling about a cistern, private well, shared well, or spring. We searched for calls with key words indicating specific contaminants of interest and reviewed primary reasons for calls. Calls classified as primarily testing-related were further categorized depending on whether the caller asked about how to test well water or how to interpret testing results. During 2013, wellcare® received 1100 calls from private well owners who were residents of 48 states. Among these calls, 87 (8%) mentioned radon, 83 (8%) coliforms, 51 (5%) chemicals related to fracking, 34 (3%) arsenic, and 32 (3%) nitrates key words. Only 38% of private well owners reported conducting any well maintenance activities, such as inspecting, cleaning, repairing the well, or testing well water, during the previous 12 months. The primary reason for calls were related to well water testing (n = 403), general information relating to wells (n = 249), contaminants (n = 229), and well water treatment (n = 97). Among calls related to testing, 319 had questions about how to test their well water, and 33 had questions about how to interpret testing results. Calls from private well owners to the wellcare® Hotline during 2013 identified key knowledge gaps regarding well stewardship; well owners are generally not testing or maintaining their wells, have questions about well water testing treatment, and concerns about well water contaminants.
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1. Introduction

Approximately 44.5 million people (about 14% of the U.S. population) rely on domestic wells as their primary source of drinking water (Maupin et al., 2014). The quality of private well water is determined by local factors, such as aquifer characteristics, including hydrogeochemistry (i.e., the chemical interactions between water and surrounding rocks and soils); local land use; precipitation; the quality of ground water recharge; and well characteristics. Since these domestic wells are not regulated by the Safe Drinking Water Act, routine testing to ensure water quality falls on individual well owners (Title XIV of the public service act, 2002). Without regular testing and maintenance, domestic wells may become compromised by various contaminants, including chemicals, radionuclides, and microbes, which may increase risk of adverse health outcomes. In a U.S. Geological Survey-National Water-Quality Assessment Program study of water quality conditions among 2100 domestic wells within 48 states, more than one in five (23%) of the sampled wells contained one or more contaminants at a concentration greater than a human-health benchmark (DeSimone et al., 2009). Although a few states require private well testing on real estate transactions, routine testing requirements do not exist in most states.

Currently, there are no national data on the number and location of private wells in the United States or the characteristics of private well water testing and few (11) states have chosen to include questions on private wells in national surveys (Centers for Disease Control and Prevention, 2013). However, regional assessments of the knowledge, attitudes, and practices of private well owners and their water testing practices (Kreutzwiser et al., 2011; Jones et al., 2005; Jones et al., 2006; Liukkonen et al., 2009; Murti et al., Under review; Flanagan et al., 2015; Imgrund et al., 2011; Schubert et al., 1999) have demonstrated a gap in knowledge among well owners about the importance of well maintenance and water testing.

There are many potential sources of information for well owners which include local and state health departments, agricultural extension agents, National Ground Water Association's hotline (National Groundwater Association Website) for household well owners, and the United States' Environmental Protection Agency's Safe Drinking Water Hotline (United States Environmental Protection Agency website). In addition to these, Water Systems Council (WSC), a national, nonprofit organization that works to provide education and resources to individual well owners has provided since 2003 a toll-free telephone hotline called wellcare® for individual well owners and other interested parties including government employees, elected officials, and realtors with questions regarding health concerns, well water testing, or well maintenance. Information about the hotline is available on the WSC website, social media pages, and information sheets that are accessible to the public. Approximately 2000 calls are received annually. To describe the problems and determine common concerns among well owners across the United States regarding their wells, we analyzed previously collected data from calls made to wellcare® by private well owners. This information can be used in the future to help inform decisions about implementation of well owner education programs and interventions to promote routine well testing.

2. Methods

Using SAS 9.3 (SAS Institute, Cary, North Carolina) for data cleaning and generating frequencies, we characterized calls to wellcare®, focusing on calls from individuals who identified themselves as private well owners. Only calls from January 1, 2013 through December 31, 2013 were available for analysis as a new electronic data collection form was implemented on January 1, 2013 and included many data fields not collected in previous years. WSC operators, trained on groundwater, water quality, well operation, and maintenance issues, recorded data from each wellcare® call including caller demographic information, nature of the call, and information about the well water system on a standardized form. Specifically, WSC-collected variables available for analysis were: type of caller (i.e., well owner, business) and state of residence; well system type (i.e., private well, shared well, cistern, spring); if the caller performed well maintenance activities in the past 12 months; main use of water from the well; and primary reason for the call.

To ensure that priority contaminants, previously identified by public health departments as being important due to potential for exposure and existence of known health effects, were completely described, rather than relying solely on calls that were classified as contaminant-related, we also identified all calls that mentioned arsenic, coliforms, chemicals related to hydraulic fracturing (fracking), nitrates, or radon. We searched unstructured free-text fields (e.g., caller profile details, questions asked, reason for testing, contaminant of interest, and actions taken) for these key words using the following terms: “arsenic”, “coli”, “bac”, “frack” “hydraulic”, “nitr”, and “radon”.

For calls categorized as primary reason for call related to contaminants, contaminants were classified in analysis as metals (aluminum, barium, copper, iron, lead, manganese, and mercury), arsenic, coliforms, nitrates/nitrites, radon, or other. For calls categorized as primary reason for call related to testing of wells, we describe reasons for testing. By reviewing free-text fields (e.g., questions asked and actions taken), we further classified testing-related calls as either “how to test well water”, “how to interpret testing results”, “other”, or “not able to classify” for analysis. The classification “how to test well water” included the following categories: questions related to where to submit samples to test well water; what to test well water for; and how to collect samples. For calls primarily related to treatment, we described the type of treatment of interest.

3. Results

During 2013, wellcare® received a total of 1690 calls, including 1100 calls from private well owners residing in all states except Hawaii and Utah (Table 1). Descriptive characteristics of the 1100 calls made by private well owners to wellcare® are presented in Table 2. Almost all private well owners (96%) primarily used their well water for drinking and household use. Only 38% of private well owners reported conducting any well maintenance activities, such as inspecting, cleaning, repairing the well, or testing well water, during the previous 12 months.

Free-text fields for all calls were searched for key terms: arsenic, coliforms, fracking, nitrates, and radon (Table 3). Nine calls containing “back” were incorrectly identified as related to coliforms and were excluded from analysis. Of the 1100 calls from private well owners, 273 calls (24.8%) mentioned at least one key term. Radon was cited most frequently (n = 87, 8%), followed by coliforms (n = 83, 8%), fracking (n = 51, 5%), arsenic (n = 34, 3%), and nitrates (n = 32, 3%). A list of top 3 states of residence of private well owner callers to wellcare® mentioning these key terms is presented in Table 4. Among the 273 calls mentioning at least one key term, the primary reason for call was classified as contaminant related for the majority (n = 137), however they were also classified as related to testing of well water (n = 87), miscellaneous calls about well systems (n = 249), and treatment of well water (n = 22).

The primary reasons for calls from private well owners are presented in Fig. 1. The majority of calls were classified as relating to well water testing (n = 403, 37%), well systems (n = 249, 23%), and contaminants (n = 229, 21%). For primary call reason classified as related to well water testing (n = 403), the majority, 319, were about how to test; 33 were about interpretation of well test results (Fig. 1). A specific reason for testing was given for only 191 of the calls classified as relating to testing of well water. The reasons included questions about annual testing (n = 74), the owners noticed a change in water quality (n = 34), someone in the household was ill (n = 32), concerns related to fracking (n = 25), someone recommended testing (n = 17), a previous well