



Meeting the public health challenge of protecting private wells: Proceedings and recommendations from an expert panel workshop



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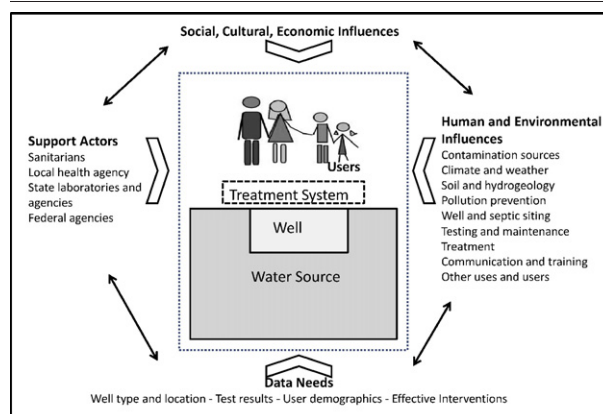
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HIGHLIGHTS

- About 43 million Americans use federally unregulated private wells for drinking water.
- Private wells may be contaminated with naturally occurring and man-made chemicals.
- Protecting well water requires an “infrastructure for stewardship”.
- Recommendations to advance private well protection are offered.

GRAPHICAL ABSTRACT



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ABSTRACT

Private wells serving fewer than 25 people are federally unregulated, and their users may be exposed to naturally occurring agents of concern such as arsenic and radionuclides, as well as anthropogenic contaminants. The Centers for Disease Control and Prevention's Clean Water for Health Program works to protect private wells and prevent adverse health outcomes for the roughly 15% of Americans who rely on them. To understand current and emerging challenges to the private drinking water supply, an interdisciplinary expert panel workshop on “Future and Emerging Issues for Private Wells” was organized to inform strategic planning for the Clean Water for Health Program. The panel assessed current conditions of ground water as a source for private wells, identified emerging threats, critical gaps in knowledge, and public health needs, and recommended strategies to guide future activities to ensure the safety of private drinking water wells. These strategies addressed topics of broad interest to the environmental public health community including: development of new methods to support citizen science;

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Private wells
Unregulated drinking water

addressing contaminant mixtures; expanding capacity for well testing; evaluating treatment technologies; building an evidence base on best practices on well owner outreach and stewardship; and research and data needs.

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1. Introduction and approach

1.1. Unregulated drinking water and public health

Approximately 43 million Americans (about 15%) receive their household drinking water from groundwater drawn from private sources, such as wells, cisterns, and springs (United States Geological Survey, USGS, 2004; USEPA, 2012). These sources, unlike public drinking water systems, are not federally regulated and therefore are not required to undergo routine monitoring to ensure that water contaminants are present at concentrations below levels of health concern. A wide array of chemical and microbial contaminants of concern have been measured in private wells, including hormones, nitrates, nanomaterials, organic wastewater compounds, personal care product ingredients, pesticides, pharmaceuticals, and microbes such as *Legionella* and *Campylobacter* (Beer et al., 2015; Schaidler et al., 2014 and Schaidler et al., 2016; Squillace et al., 2002). Health effects associated with exposures to these contaminants can include endocrine disruption, cancer, liver and kidney problems, gastrointestinal illness, reproductive issues, and neurological disorders (Villanueva et al., 2014).

The population using private well water – and potentially at risk of exposure to contaminated water – is not well characterized (Vanderslice, 2011). The burden of disease attributable to use of water from contaminated private wells is also unknown; however, the wide-spread nature of various contamination concerns and the many potential health effects of these contaminants suggests that it could be significant. Sampling by the USGS found that 23% of private wells had at least one contaminant present at concentrations exceeding federal drinking water standards or other health-based levels of concern (DeSimone, 2009), and numerous emerging contaminants that lack health-based standards are detected in groundwater nation-wide (Barnes et al., 2005). Assessing the disease burden resulting from exposure to drinking water contaminants will be challenging and epidemiological studies are needed to better understand long-term low-dose exposures and risks (Villanueva et al., 2014).

1.2. Challenges to protecting private wells

There are a number of emerging threats to wells including the direct and indirect impacts of climate change such as drought and flooding or new agricultural practices, and the potential impacts of energy extraction, such as hydraulic fracturing (National Climate Assessment, 2014; USEPA, 2015; Vengosh et al., 2014). Assessments of how these emerging threats might impact private water supplies are limited.

The Safe Drinking Water Act (Public Law 93-523) that empowered EPA to set national health-based, enforceable standards for natural or man-made contaminants in drinking water excludes private wells serving fewer than 25 people. In absence of federal standards, many states and localities have regulations in place for construction of new wells and water testing, for instance requiring that wells are dug or drilled by a certified contractor or that the water from wells initially be tested for nitrate and coliform bacteria (DeSimone, 2009; Rogan et al., 2009). A few states and localities have gone further with regulations requiring that well water be tested upon resale of the property (e.g., State of New Jersey, 2001; State of Rhode Island Department of Health, 2015; Oregon Real Estate Transaction Law, 2013; Westchester County Private Well Water Testing Legislation, 2007). When testing is done, it is up to the private water well owners themselves to request and pay for the tests and to implement any necessary remediation. Private well testing in

the US is a patchwork of varied requirements, and private well users are not afforded the same protections from contaminant exposure as public water supply users (DeSimone, 2009).

1.3. Addressing the public health challenge of protecting private wells

The Health Studies Branch of the CDC National Center for Environmental Health (NCEH), leads the Clean Water for Health Program (CWH), created to understand and address the public health impact of drinking water sources that are not federally regulated. Specifically, CWH addresses non-infectious waterborne exposures by: 1) building the state and local epidemiologic capacity needed to prevent harmful non-infectious waterborne exposures; 2) advancing public health science to further our understanding of the health risks from non-infectious waterborne exposures; 3) translating science into effective interventions; and 4) responding to environmental health threats that impact drinking water (NCEH, 2012).

Considering the fragmented regulatory environment and new threats to water supply quality and safety such as climate events and changing technologies for energy and agriculture, the CWH Program sought expert advice to plan, assess and respond to emerging issues and improve outreach and interventions. An expert panel was organized by the Johns Hopkins Bloomberg School of Public Health that included persons with expertise in hydrology/hydrogeology, environmental engineering, environmental public health, exposure assessment, groundwater contamination and remediation, agriculture, and climate change. Agencies and organizations represented included the Alaska Native Tribal Health Consortium, US Department of Agriculture, US Geological Survey, New Jersey Department of Environmental Protection, the Rhode Island Public Health Laboratory, Garret County (Maryland) Health Department, Drexel University, Iowa State University, University of Utah, and University of Wisconsin. The panel convened in Baltimore, Maryland at a workshop in January 2015. The discussion and recommendations presented here were developed to inform future work of CWH as well as engage the environmental public health community to improve the evidence base and practice of private well protection.

2. Expert panel discussion

2.1. Discussion overview

The workshop discussion was centered on private well users/owners tapping into a water source. The private well user/owner is the steward, responsible for testing, treating (if necessary), and maintaining the well. In addition to the well user/owner there are a number of other support actors including sanitarians and other environmental public health practitioners involved in protecting private well water at the local, state, and national levels.

The many human and environmental factors and activities that may affect the water source and the private well include climate and weather, soil and hydrogeology, various sources of contamination, and other users or uses of the water source. Many data needs were identified including details of the well type and location, results of water sample analysis, user demographics, contaminant health effect information, and data on the effectiveness of treatments. Having these various types of data help inform the activities of the well user/owner and other actors. Collecting and analyzing the data, interpreting, communicating and responding to it occur in a dynamic social, cultural and economic context.

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