As many as 43 million people in the U.S. get their drinking water from private wells, yet the quality of the water from those wells is largely unknown. A new report from the U.S. Geological Survey (USGS) provides a comprehensive survey of these private wells. The report also documents areas where residents may be at risk of exposure to both natural and human-made contaminants. The 214-contaminant assessment includes dozens of metals; radionuclides such as radon; organic compounds, including pesticides such as atrazine; and other compounds of concern.

Leslie DeSimone and her USGS colleagues analyzed water from more than 2000 wells sampled from 1991 to 2004. Groundwater generally moves—and therefore changes—slowly, so levels of contaminants are generally lower than those found in surface water.
natural compounds should remain fairly constant, DeSimone explains. The team added to existing data for areas long known to be of high concern for arsenic, such as New England (DOI 10.1021/es051972f; 10.1021/es803141m). The researchers also found in some areas detectable levels of newer human-made compounds such as methyl-\textit{ tert }-butyl ether (MTBE) and currently used pesticides in drinking-water wells.

“We identified microbial contaminants, which are possible indicators of sewage contamination, as one of the most frequently occurring contaminants of potential health concern,” notes DeSimone. Her team detected total coliform in about one-third of 400 sampled wells, an indicator of bacteria present and possible contamination from human or animal waste from septic tanks or agricultural waste ponds.

Unregulated wells serve about 15% of the U.S. population, according to USGS estimates based on state and other local databases. Overall, the contaminants found in the groundwater were generally at lower levels than the maximum contaminant levels (MCLs) set by the U.S. EPA for known human-health hazards. If no MCLs had been set for certain contaminants, USGS used its own human-health benchmarks, known as health-based screening levels (HBSLs). These levels were determined in partnership with EPA. For example, USGS uses an HBSL of 1000 micrograms per liter (\( \mu g/L \)) for boron. There is no EPA MCL for boron, but the agency has a health advisory level of 600 \( \mu g/L \).

The great unknowns, says DeSimone, are the human-health impacts from exposure to mixtures of multiple compounds over a long period of time. Some pairings, such as nitrate and atrazine, could react in the human body to form suspected carcinogens, and these particular compounds were detected together in a small fraction of the wells tested, as were other potentially hazardous combinations.

Nearly three-quarters of the wells contained two or more contaminants at levels greater than 1/10 their health benchmarks. Mixtures that frequently occur at these levels provide a starting point, say DeSimone and her colleagues, for evaluating which mixtures may merit investigation for potential human-health impacts.

\textit{J\'rg Drewes} of the Colorado School of Mines says that although the new approach to assessing
mixtures is “questionable,” the reported data on pathogen exposures are important.

Possible exposure to bacterial and other sewage-related contaminants from these wells is worrisome, agrees Ben Stanford, a postdoctoral researcher at the Southern Nevada Water Authority, a regional public water agency and drinking-water research facility. But in the context of past reports on arsenic, pesticides, and other compounds in groundwater from USGS and other researchers, the study’s broader findings about contaminant levels are “not that surprising,” he says. However, this USGS survey provides huge data sets, and its value lies in its breadth, Stanford adds.

The report highlights the need to educate homeowners about point-of-use treatment and other issues, Drewes says. The National Ground Water Association (NGWA) has backed proposals for tax credits for homeowners who test their wells. “Owners are responsible for their own treatment devices,” says NGWA director Kevin McCray. NGWA offers best-practice guidelines for well owners and is working with the Centers for Disease Control and Prevention to evaluate owners’ drinking-water habits.
no detections of either.
USGS