

How Do I Know If My Water Is Safe?

Interpreting Data Resources for Tap Water Quality

By Kelly A. Reynolds, MSPH, PhD

Recent events and media headlines seem to indicate that tap water quality in the United States is worsening. Reports of widespread lead contamination, *Legionella* outbreaks and emerging contaminants such as endocrine-disrupting compounds or PFAS (the forever chemicals), have raised consumer awareness of the health risks associated with drinking water. Some reports, however, verge on fear mongering. There are a number of databases designed to help consumers track water quality in their area; however, there is a need for helping those same individuals understand the magnitude of the risks so they can make informed management decisions.

Water quality and health perceptions

On World Water Day, March 22, an article was published in *National Geographic* magazine titled: “We can’t assume our water is safe to drink. But we can fix it.” The article subtitle further states that “One-fourth of Americans drink water from systems that don’t meet safety standards.”¹ US EPA states that “...over 90 percent of the nations’ community water systems (serving over 300 million Americans) were in compliance with all published US EPA standards.”² So, which of these sources is telling the truth?

In reality, data can be found to support both sources but the interpretation of that data relative to human health effects is much more complicated. Firstly, we realize that everything is toxic at some dose, even pure water itself if too much is consumed too rapidly. As the famous toxicologist, Paracelsus, stated nearly five centuries ago, “the dose makes the poison.”

A simple example is found with the most commonly ingested psychoactive drug in the world: caffeine. While naturally present in foods like coffee and chocolate, a surge of products with synthetic caffeine additives, such as energy bars and drinks, have increased in popularity. For most adults, caffeine consumption is safe in moderation but others, including children, pregnant women and those with cardiac or vascular disease, are more susceptible to the toxic effects of caffeine.

Adverse effects occur over a wide range of doses based on an individual’s health status, body weight and overall sensitivity. According to the Federal Substance Abuse and Mental Health Services Administration, emergency-room visits related to consumption of energy drinks more than doubled across all age groups in the IS (from 10,068 to 20,783) from 2007 to 2011.³ During this same period, ER visits quadrupled for the 40 and older age group (from 1,382 to 5,233), presumably due to this group’s increase in energy-drink consumption. Most of us can self-regulate our coffee consumption before the effects of restlessness or insomnia set in but controlling our own exposure levels and health effects related to drinking-water contaminants is less obvious.

Data-driven evidence

Exposure to drinking-water contaminants may cause immediate acute effects (i.e., diarrhea from *Cryptosporidium*) or long-term chronic effects (i.e., liver cancer from PFAS). For many chemicals, although they are known carcinogens and any dose may start the process of cancer cell production, the rate of that cancer cell production may be so slow that the disease is never realized over a person’s lifetime. Here we come to a potential difference in interpretation: 1) Is the consumer exposed to carcinogens in drinking water? The answer is yes. 2) Is the carcinogen-tainted water safe to drink? The answer may still be yes, depending on the lifetime expected dose, the rate or severity of response in an individual and defined acceptable risk levels.

Recently, the Environmental Working Group (EWG), a nonprofit environmental watchdog organization, developed an extensive tap-water database of water utility test results from tap water pollutant monitoring.⁴ The database provides information from over 32 million state water records collected since 2012. Accessing information from a regional supplier is as simple as entering the ZIP code and hitting the ‘Go’ button. Advanced search options provide information by state or specific utility.

Some have accused EWG of instilling unnecessary fear.⁵ But a summary of these water quality reports, known as *consumer confidence reports (CCR)*, has always been available to utility customers and is mandated by federal law to be provided at least annually in billing statements. Information on the EWG website is linked to these same public utility records and state reports submitted to the US EPA. If someone else pays the water bill (i.e., the owner of rental property), the information may be obtained from the building manager or online at www.epa.gov/ccr. Although water quality data is available to consumers, EWG, with the help of the media, extensively marketed the use of their tool and made the information more accessible for laypersons.

Translating water quality data into quantitative health risks and effectively communicating those risks remains a challenge. In some instances, the EWG used more stringent guidelines than the federal maximum contaminant levels (MCL) or developed their own values based on current research when reporting exceedances. How this information was derived from current research, however, was not reported in detail or thoroughly vetted through peer-review.

Population vulnerabilities

Despite some of the concerns with the EWG’s reporting style and data interpretation liberties, there is little doubt that drinking water in the US is subject to unpredictable, adverse events. Persons served by small and large municipal drinking-water suppliers alike have been exposed to unacceptable amounts of microbial

and chemical contaminants, resulting in disease outbreaks effecting millions.^{6,7} Changing environmental conditions, such as drought, flooding, infrastructure aging, modified use patterns, biofilm growth and more, present additional challenges relative to maintaining consistent water quality. Additionally, a lack of assessment on combined exposures or unregulated emerging contaminants present a large unknown regarding long-term health effects.

Populations most at risk of exposure to uncontrolled water contaminants include those on private well supplies. These systems are outside the jurisdiction of the US EPA and are not routinely monitored or treated. No federal standards exist for private water supplies. The EWG's report and subsequent media attention was beneficial for raising awareness and pointing out the fact that we have technologies to improve water quality.

Managing the risks

A final note about the *EWG 2019 Tap Water Database* is related to their *Water Filter Guide*. Again, the group has presented information to consumers in an easy to understand and access format evaluating costs and effectiveness. One could make the argument that due to the uncertainties of water contamination potentials, a proactive and holistic POU treatment approach is warranted. Treatment method recommendations, however, are probably best communicated by local dealer networks who are familiar with the specific regional concerns. It is critical that the POU drinking-water treatment industry engages in the conversation and aids in the delivery of accurate information relative to treatment claims and technology applications.

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