# As Fracking Booms, Dearth Of Health Risk Data Remains

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## Abstract

In March 2015 the Environmental Protection Agency (EPA) released a report with significant public health implications: an analysis of "fracking fluid," the slurry of water, sand, and chemicals that gets blasted into formations of shale, a type of rock, to release the entrapped natural gas. The analysis was one component of the EPA's ongoing five-year study of the potential risks to drinking water from the process widely known as hydraulic fracturing, or "fracking." The EPA compiled the fracking fluid report from an industry database of more than 39,000 filings on fracking events that occurred between 2011 and 2013. The agency found that the median number of additives in each fracking event was not hundreds of chemicals, as some had suspected, but fourteen. Scientists say that even if the interest in the potential dangers of fracking loosens up more funding for research, it will take years before a complete picture of the health effects emerges.

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## Full Text

**Headnote**
Researchers continue to ask whether the controversial method for capturing natural gas is safe. So far, the answer is "maybe or maybe not."

In March 2015 the Environmental Protection Agency (EPA) released a report with significant public health implications: an analysis of "fracking fluid," the slurry of water, sand, and chemicals that gets blasted into formations of shale, a type of rock, to release the entrapped natural gas.1 The analysis was one component of the EPA's ongoing five-year study of the potential risks to drinking water from the process widely known as hydraulic fracturing, or "fracking." (A draft of the full study is expected to be released later this year.)

The EPA compiled the fracking fluid report from an industry database of more than 39,000 filings on fracking events that occurred between 2011 and 2013. The agency found that the median number of additives in each fracking event was not hundreds of chemicals, as some had suspected, but fourteen. Moreover, in most cases these ingredients accounted for less than 1 percent by mass of the total fluid.

Environmentalists and many public health officials fear that the millions of people living near recently developed natural gas wells could be exposed to dangerous levels of chemicals from fracking. The process produces millions of gallons of contaminated water, which is stored in pits, treated, and reused or pumped back

underground. Industry advocates say that research fails to support claims that fracking wastes contaminate drinking water sources, although the results are mixed.

As with most things related to fracking, observers disagreed about what the EPA's most recent findings meant. Energy in Depth-a website and blog of the Independent Petroleum Association of America, an industry group-declared that the results "directly contradict much of the misinformation that has been perpetrated" about the chemicals used in fracking.2The blog reported that despite opponents'"scary claims," common additives such as hydrochloric acid, methanol, and hydrotreated light petroleum distillates-which were all present in at least 65 percent of cases-are already widely used in the production of commercial and consumer products.

In contrast, environmentalists reacted to the EPA analysis with alarm, citing other salient facts from the report: the total of almost 700 different chemicals identified as additives when all of the fracking events were taken into account, the 11 percent of ingredients considered trade secrets and not disclosed, and the database's reliance on voluntary submissions by industry. As for hydrochloric acid, methanol, and hydrotreated light petroleum distillates, the most frequently used additive chemicals, the website EcoWatch-citing state and federal health agencies-warned that "even in low doses, these are known to cause skin irritation, chemical burns, headaches and blurred vision....At higher concentrations, exposure to these chemicals can cause shortness of breath, blindness and possibly death."3

The stakes are high in the escalating fight over the public health impacts of what is often called unconventional naturalgas development,so it'snotsurprising that interested parties might read the same evidence in radically different ways. But one reason such dueling interpretations remain viable, almost a decade into the country's aggressive expansion of efforts to access its natural gas reserves, is that the body of research into the public health impacts is surprisingly slim and inconclusive.

Without Clear Evidence, Policy Makers Struggle

The paucity of information about potential public health impacts of fracking has hindered effective policy making, say experts."Inorder to makegoodpolicy,you need good data and good studies," said Madelon Finkel, a professor of health care policy at Weill Cornell Medical College, who has studied the health effects of fracking and supports restrictions until the implications are better understood.

"We know something is happening where fracking is going on, we've heard this anecdotal information from too many places," she said. "But to what extent, to what degree-that's what we need to empirically document."

Richard Jackson, a professor of environmental health at the University of California, Los Angeles, and former director of the National Center for Environmental Health at the Centers for DiseaseControlandPrevention, blamed the current lack of data on the shortsightedness of federal and state agencies. Health officials should have aggressively tracked the community impacts of the energy boom from the very beginning, with well-designed prospective studies, he said.

"For society to have put such enormous amounts of resources into an enterprise of this magnitude with no resources for careful health oversight has been negligent and derelict," he said. "If this had been an infectious agent instead of an industrial process, they [government officials] would have been all over it."

The boom in production of natural gas, which consists primarily of methane, coincided with the financial crash of the late 2000s. A bright spot in the gloomy economic landscape, the expansion generated job and revenue growth in many regions of the country. State health officials have often played a secondary role to natural resources departments in policy development and regulatory decision making.

In addition, the pace of well construction has far outstripped the ability of studies to capture slow-developing health outcomes, such as cancers and the effects of endocrine-disrupting chemicals. That could start changing soon, predicted Finkel. "Fracking has been going on in sufficient locations for a sufficient period of time that we should be able to start seeing certain morbidity and mortality figures," she said.

Technically, the term hydraulic fracturing refers only to the process of well stimulation, the high-pressure injection of the fluid to crack open the shale. But the entire cycle of development includes many other events-the transportation of tons of materials and millions of gallons of waterto the site, theconstruction of the well and supporting structures, and the removal and disposal of wastes after the gas has been extracted. These all generate their own environmental effects and community disruptions, beyond those of the actual fracking.

And the new wells are being constructedmuch closer to residential areas than before, amplifying their impact. According to a Wall Street Journal analysis, more than fifteen million people live within a mile of a well that was drilled and fracked since 2000.4 This proximity to any oil or gas development project is likely to have as significant an impact on people's health as issues related more specifically to fracking, said John Adgate, chair of the Department of Environmental and Occupational Health at the Colorado School of Public Health.

"There are millions more people living close tothisprocessthat didn't live close to it before," said Adgate. "To me, as a public health person, that's the salient statistic, because that's the population at risk."

Many studies from across the country have associated fracking with a wide range of air and water pollutants, with multiple potential pathways of contamination.5 In May a study in the Proceedings of the National Academy of Sciences of the United States of America pinpointed gas drilling operations in Pennsylvania's Marcellus Shale formation as the "likely" cause of drinking water contamination in three nearby homes.6 Other research has not found elevated levels of pollutants.7

In any event, information on individual exposures and on local environmental conditions before the fracking boom are often unavailable or hard to obtain. These and other data gaps have hindered the kind of large-scale epidemiological studies that can link exposures to actual health outcomes, with valid comparison groups.

The American Petroleum Institute, the leading trade association, and other industry groups argue that fracking technology has been used safely for more than sixty years. While small-scale fracking has been practiced for decades, it is the combination of fracking with more recent technological advances, such as the ability to drill long horizontal wells deep under the surface of the earth, that has fueled the current boom.

Congress approveda provisiontucked into the Energy Policy Act of 2005 that exempted fracking processes from compliance with the Safe Drinking Water Act. At the time, critics noted that the chair of the George W. Bush administration's energy task force was Vice President Dick Cheney, former CEO of Halliburton, a large energy corporation with significant interests in fracking. As a result, the exemption became widely referred to as "the Halliburton loophole."

New Technology Raises New Concerns

Whereas earlier wells might have used tens of thousands of gallons of water in the fracking process, current technology requires millions of gallons for well stimulation. Much of the injected water resurfaces, mixed with undergroundwater reserves. In addition to the chemicals already added to the water, the process can flush up salts, toxic metals, radioactive materials, and volatile organic compounds such as benzene and formaldehyde.

The waste fluids are stored in tanks or pits, injected back underground, or treated and recycled in subsequent fracking or other operations. Last year California regulators acknowledged that they had allowed companies to pump fracking waste and other fluids down through disposal wells into deep aquifers containing

protected drinking water-an apparently inadvertent error that had continued for years.8 In April 2015 the US Geological Survey released a report finding that the injection of wastewater deep underground had caused an increase in earthquakes in multiple states.9

As in many public health debates, one source of dispute over the impacts of fracking is the appropriate evidentiary threshold for action. Environmental and public health advocates have urged officials to apply the precautionary principle-a standard that requires evidence of safety before regulatory approval is granted-instead of banning something only after proof that harms have occurred. Although this regulatory philosophy is far more popular in Europe than the United States, the New York State Department of Health appeared to heed the appeal last December, when it released a long-awaited review of the public health impacts of hydraulic fracturing.10 The state had already imposed a moratorium on the practice.

The review citedevidenceof potentiallyserious threats to airandwater quality and seismic safety, as well as health risks related to community disruption. But it also noted that gaps in the science left too many important questions unanswered.

"While a guarantee of absolute safety is not possible, an assessment of the risk to public health must be supported by adequatescientific informationtodetermine with confidence that the overall risk is sufficiently low to justify proceeding," declared the report. "The current scientific information is insufficient."10

Until data are sufficient to determine whether the public health risks are manageable, the report concluded, the procAs ess "should not proceed in New York State."10 Gov. Andrew Cuomo, a Democrat, immediately banned the practice, making New York the second state- after Vermont-to do so.

The American Petroleum Institute declined to comment for this story. In a statement, the organization called the New York ban "politically motivated," "misinformed,""short-sighted," and "reckless."11 Katie Brown, a spokeswoman for Energy in Depth, said that the New York review relied mainly on studies written or peer-reviewed by "antifracking activists" and failed to consider research that had found no harms. "When you look at the actual report that was used to justify the ban, it says over and over that they have no evidence to link health impacts to fracking," said Brown.

Larry Wolk, executive director and chief medical officer of the Colorado Department of Public Health and Environment, said that he was surprised by the New York health review and Governor Cuomo's subsequent ban. And he does not expect other states to follow New York's lead. "It doesn't reflect an evidence-based decision," he said. "It reflects fear, it reflects politics, and it reflects not being fully informed about what these processes entail."

No one denies that the chemicals used in fracking are potentially toxic, added Wolk; the issue is how and to what degree are people exposed, and whether those exposures are harmful. "If you're going to ban fracking, then why not ban dry cleaning or other industrial processes?" he said.

A major obstacle to answering many of the outstanding questions about fracking, say many researchers, is industry's legal right in most states to shield the identity of chemical additives as confidential business information. Moreover, even when measurements of water, air, or soil identify the presence of potentially toxic substances, it can be difficult to rule out other possible natural or industrial sources, especially in the absence of baseline measurements for a region.

Given the shortage of data on the human health effects of proximity to gas drilling and fracking operations, some researchers have investigated the impacts on livestock and companion animals. A 2012 report documented multiple case studies in several states of negative health outcomes-including stillbirths and failure to breed; sudden deaths; and neurological, gastrointestinal, and dermatological disorders- among cattle, sheep, horses, poultry, and dogs living near gas drilling sites. "Because animals often are exposed continually to air, soil, and groundwater and have more frequent reproductive cycles, animals can be used as sentinels to monitor impacts to human health," concluded the authors.12

Opponents Dig In

Scientists say that even if the interest in the potential dangers of fracking loosens up more funding for research, it will take years before a complete picture of the health effects emerges. In the meantime, researchers have made some efforts to conduct population-based studies, despite the serious data limitations.

In January 2014 scientists from the Colorado School of Public Health reported in Environmental Health Perspectives that babies born to women living in areas that contained many natural gas wells were 30 percent more likely to have congenital heart defects than those born to mothers who didn't live in such areas.13 The study reviewed 125,000 births in the state over thirteen years but did not include information about maternal health, prenatal care, previous residence, and other factors that could also affect birth outcomes.

Energy in Depth had criticized previous research from the same Colorado School of Public Health scientists.14 With the publication of the birth defects study, the blog dubbed them "activists' favorite fracking researchers."15

In this case, Wolk, the state health department's chief medical officer, appeared to agree with the industry misgivings. In a statement, he noted that "a reader of the study could easily bemisled to become overly concerned."15 Citing some of the data gaps, he added that "I would tell pregnantwomen and mothers who live, or who at-the-time-of-theirpregnancy lived, in proximity to a gas well not to rely on this study as an explanation of why one of their children might have had a birth defect."

To Finkel, the health care policy professor, the negative response to the study was not only an overreaction but a symptom of the current impasse. "Sure, the study had some limitations, and you could poke holes," she said. "But I think it was a very good study given the tools we have at the moment, and it was sufficiently rigorous to say we needtoinvestigate this further andsee if we see the same pattern in another place. Sweeping it under the rug is not helping to advance knowledge." ?

**Sidebar**
Wells and health: Workers adjust piping during a short pause in water pumping for a natural gas hydraulic fracturing operation at an Encana Oil and Gas (USA) Inc. drilling site outside Rifle, in western Colorado. There is a lack of data on the public health impact of this industry practice.

As in many public health debates, one source of dispute over the impacts of fracking is the appropriate evidentiary threshold for action.

**Footnote**
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## Details

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