

Hydraulic Fracturing

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PSR: Your study of natural gas "fracking" wells in Colorado found volatile organic chemicals at five times the "safe" threshold (the level below which emissions are considered unlikely to cause health problems, according to the federal Environmental Protection Agency's Hazard Index). Tell us about your study. Why did you choose to conduct it?



: We were contracted to do a Human Health Risk Assessment about options for a proposed natural gas drilling operation in a rural residential area in Battlement Mesa in Colorado. The project proposes about 200 wells on nine pads, making about 20 wells per pad. Some of the pads would be as close as 500 feet from some homes, and some homes would be that close to more than one pad.

Since this was a proposed project, we wanted to look at data from a similar neighborhood already located near natural gas operations. We found an existing drilling field in rural

Health Risk Assessment of Natural Gas Drilling in Colorado

Interview with Lisa McKenzie, PhD, MPH

Garfield County. The County already had data from air samples at fixed sites, taken every six days for the past three years. In addition, they had "fenceline" air samples taken near the drilling sites during the completion phase of drilling. The completion phase occurs after the well has been injected with fluids under pressure. The flowback, consisting of hydraulic fracturing fluids, drilling muds and various gasses, is flushed from the system before saleable natural gas is produced.

PSR: Tell us about your findings. Would you expect similar findings in other states? Why or why not?



: We had three major findings. First, residents closest to the well pads were more likely to have higher risks for

respiratory and neurological effects based on their exposure to air pollutants. The highest potential exposures occurred in the completion phase of drilling. Second, someone who lives close to a natural gas well is at a higher excess lifetime risk for cancer than residents who live farther from the wells. The effect is probably pretty small, but it is still there. Lastly, emissions measured by the fenceline at completion were statistically higher ($p \leq 0.05$) than emissions at the fixed location station. These pollutants include benzene, toluene, and several alkanes.

It is important to note that these pollutants were released into the air without being captured or flared; they were uncontrolled releases. So the potential risk for health effects may only apply to situations where emissions are direct and uncontrolled. Because different gas fields vary in their composition, the magnitude of effects may vary from well field to well field.

PSR: The EPA has proposed air quality regulations for gas drilling and completion, including green well completions, which capture air emissions and wastes after a well is drilled and hydrofractured; reducing leaks from compressors and tanks, and leak detection and repairs at gas processing plants. Are these adequate?

Lisa McKenzie, PhD, MPH



Dr. McKenzie is a Research Associate at the Colorado School of Public Health, University of Colorado. In addition to her PhD in Environmental Chemistry and Masters of Public Health in Epidemiology, she worked for many years in the private sector as a human health risk assessor and chemist. She is the lead author of the paper "Human Health Risk Assessment of Air Emissions from Development of Unconventional Natural Gas Resources" recently published in *Science of the Total Environment*, an international journal for scientific research.



: The EPA proposed these regulations in April of this year. The regulations do have the potential to reduce emissions. What we need in order to answer questions about adequacy is data; we need to measure before and after implementation. What distance should a well be located from a home? As far as I know, the data don't exist. We also need to look at other air pollutants, other hydrocarbons, other polycyclic aromatic hydrocarbons, and ozone. There are also various carbonyls and diesel pollution coming from engines being used to run machinery at the drill sites, and transporting equipment to the sites. And pollutants found in hydraulic fracturing fluids and drilling muds. We need information about gradient by distance, how these pollutants distribute themselves over distance. Weather and topography will affect these gradients, so each site is going to be a little different.

PSR: What is the role of a scientist like you in the regulatory process? Is there an adequate role for health professionals? For ordinary citizens?



: For me, the scientist's role is doing the research without preconceived notions, with an open mind. We provide information to regulators. I believe we need to talk to whoever would like to ask us questions: activists or industry. We don't have much control over how our findings are used, but we need to give the most

accurate information we have through peer-reviewed scientific literature. Public health professionals and people in the community need to decide what to do with the data. The citizens need to be aware of what's going on and decide if and how they should take action.

PSR: How concerned are you about the health impacts of exposure to intermittent but on-going high levels of volatile organic compounds (VOCs)?



: I am most concerned about short-term health effects. I do think the EPA needs to regulate these sites, and I think the proposed regulations are a great start.

PSR: Are you concerned about the health impacts of methane release?



: Methane release is more about climate change, and that is really not my area of expertise. My colleague Gabrielle Patron here at NOAA is working on ozone related to propane and methane levels in Utah and Colorado.

PSR: Overall, how serious a public health issue do you think fracking is?



: I prefer the term 'hydraulic fracturing,' which is just one process in natural gas development. I am also concerned about the related truck traffic, diesel emissions and other activity going on around the development. I think this can impact human health, especially as gas development moves closer to residential communities.

PSR: What should be the response of the medical and public health community?



Fracking & Air Pollution in Texas



: As we recommended in our paper, we need more studies, more epidemiology to test for health impacts. We need to collect data in a systematic way and get away from the anecdotal. Funding is a challenge. I have heard more about funding this year, but have seen no increase in the actual number of requests for proposals.

We continue to look at more data from Garfield County, to look at source apportionment, that is, how many sources might be contributing to the air pollution. How much can be attributed to natural gas development, to Interstate 70, to other sources. The Colorado Oil and Gas Conservation Commission issued revised rules in 2009 about well development, completion, and production. We are looking at data before and after the changes to see if we can detect differences.

I don't take a personal position on natural gas development. It's not going away; it's going to be with us for awhile. I ask, how can it be done in such a way to protect the public's health?

For more information, please visit <http://www.psr.org/environment-and-health/environmental-health-policy-institute/>



1111 14th St., NW
Suite 700
Washington, DC
20005
Ph: (202) 667-4260
Fax: (202) 667-4201
www.psr.org

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—Dr. McKenzie