

“fracking,”^a is a newer and more dangerous version of natural gas and oil extraction. Designed to enable the extraction of previously untapped gas and oil reserves, fracking pumps a high-pressure mixture of toxic chemicals and water underground to fracture deep shale rock formations. The shale-gas boom of the past 15 years is unprecedented, bringing heavy industry into proximity with over 15 million Americans.¹



Fracking wastewater, laden with toxic chemicals, is often held in open-air pits. In this one, misters are used to encourage evaporation, sending toxics airborne.⁴

A growing body of scientific evidence links the fracking boom to serious risks to air quality and health. Unfortunately, public health studies of fracking-related health effects have been complicated by factors such as the short length of time that the process has been documented, so-called medical “gag rules,”² nondisclosure

^a “Fracking” is a term commonly used to describe both the intensive process of hydraulic fracturing and the associated operations related to unconventional oil and gas extraction. Drilling, wastewater extraction and storage in open-air pits, flaring and venting of gas,

Hydraulic Fracturing and Your Health: Air Contamination

The process of hydraulic fracturing, or

agreements in private settlements between farmers and industry,³ and the refusal of some oil and gas companies to disclose the identity of chemicals they use in hydraulic fracturing.

Many chemicals known to be used in hydraulic fracturing fluid, as well as the volatile organic compounds (VOCs) released during the gas drilling process, are extremely toxic.⁴ The high toxicity of these chemicals, and the frequency with which they pollute the air around fracking operations, are cause for concern. Additionally, recent studies show that natural gas operations leak high rates of methane—an extremely potent greenhouse gas—meaning that natural gas is emerging as a leading driver of climate change.

Fracking Emissions Increase Smog

Hydraulic fracturing operations release gases that combine to form smog, a costly, serious public health risk. Smog exposure can cause irreversible damage to the lungs⁵ and significantly increase the chance of premature death.⁶ Specifically, fracking operations release VOCs “at each stage of production and delivery.”⁷ The VOCs mix with nitrogen oxides from the exhaust of diesel-fueled trucks and equipment to form ozone. VOCs and ozone pollution have been detected at dangerous levels at fracking sites in Colorado, Wyoming, and Utah.

- One study in Northeastern Colorado found exceptionally high levels of VOCs in the air and traced the chemical signature of around 55% of them directly back to gas and oil operations.⁸

gas or oil processing, disposal of wastes, light and noise pollution, social stressors and continuous diesel truck traffic are among the sources of potential harm to health from this industrial process.

- For parts of 2011, the level of ozone pollution in rural Wyoming’s gas drilling areas exceeded that of Los Angeles and other major cities.⁹ The peak, at 116 parts per billion, significantly exceeded the EPA’s healthy limit of 75 parts per billion.
- Uintah County, Utah, home to one of the highest-producing oil and gas fields in the country, has experienced dangerously high levels of VOCs and resultant ozone for over five years. The amount of VOCs released in 2013 in Uintah County alone was calculated as the equivalent of emissions from 100 million automobiles.¹⁰



Uintah County, Utah ranks in the American Lung Association’s list of the top 10 Most Ozone-Polluted Counties.¹⁸

Other Toxic Chemicals

A landmark study out of the University of Colorado Denver School of Public Health documented dangerous airborne levels of benzene near hydraulic fracturing operations.¹⁹ Benzene is known to cause multiple forms of leukemia and other blood disorders. The study found elevated risks of cancer for residents within half a mile of a drilling site.

Ambient air testing near gas drilling operations in northern Texas found excessive amounts of many toxic chemicals, including benzene and carbon disulfide, an extremely high-risk pollutant with “disaster potential” as categorized by the Texas Commission on Environmental Quality. These chemicals were traced back to the drilling operations, as the testing location had “virtually no heavy industry other than the [natural gas] compression stations.”²⁰

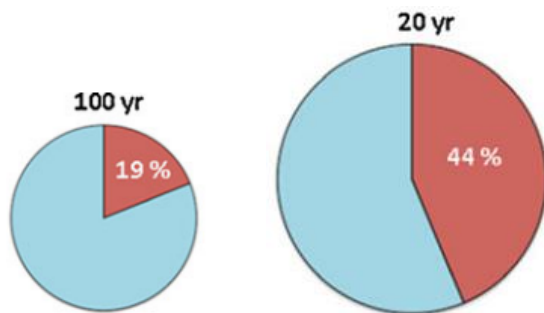
Another study identified significant amounts of over 40 health-harming chemicals in the air near drilling sites in Colorado.²¹ While none were detected at levels above EPA limits, that study and others have noted that the EPA’s ambient air quality standards may not be strict enough.²² Health standards often do not fully account for long-term health effects of chemicals²³ and enhanced risks to especially sensitive populations²⁴ such as pregnant women, young children and the elderly.

Air Contaminants Associated with Hydraulic Fracturing

Benzene	Known carcinogen. May cause anemia; can lessen white blood cell count, weakening the immune system. ¹¹ Prolonged exposure may result in blood disorders like leukemia, reproductive and developmental disorders, and other cancers. ¹²
Toluene	Long-term exposure may affect the nervous system, cause irritation of the skin, eyes, and respiratory tract, and birth defects. ¹³
Ethylbenzene	Long-term exposure may result in blood disorders. ¹⁴
Xylenes	Short-term exposure to high levels may cause irritation of the nose and throat, nausea, vomiting, gastric irritation, and neurological effects. Long-term exposure at high levels may affect the nervous system. ¹⁵
Nitrogen Oxides	Short-term exposure causes airway inflammation and aggravates asthma. ¹⁶ Combines with VOCs to form ozone.
Methane, Ethane, Propane	May cause rapid breathing, rapid heart rate, clumsiness, emotional upset and fatigue. At greater exposure, may cause vomiting, collapse, convulsions, coma and death. ¹⁷

Methane Leaks at Multiple Stages

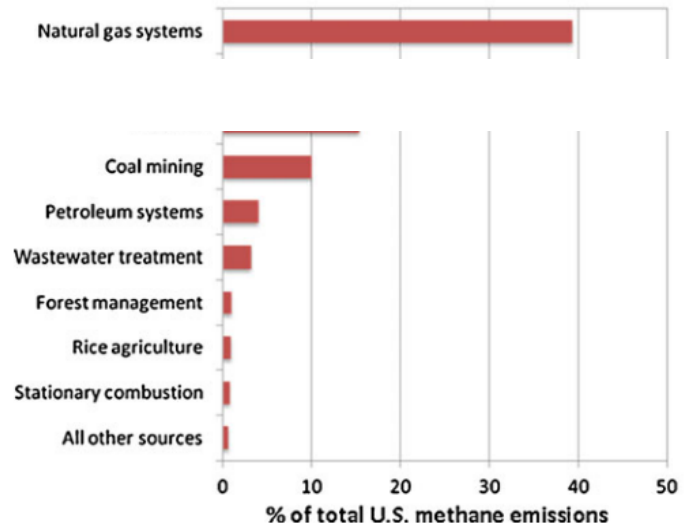
Methane, the main component of natural gas, is an extremely potent greenhouse gas: 28 to 34 times as heat-absorbing as carbon dioxide over a 100-year timeframe, and up to 86 times as warming for the first 20 years it is in the atmosphere.²⁵ Using the more relevant 20-year timeframe, natural gas production and use provoke far greater change in our climate than coal,²⁶ precluding a role for natural gas as a “transition fuel.”



Methane is an extra strong greenhouse gas over shorter time periods. Over a 20 year timespan, methane (red) accounts for nearly half of the US's contribution to global warming. (Howarth et al. 2011)

Methane leaks occur at multiple points during fracking operations: both intentionally during the initial drilling of a well and as gas extraction begins, and accidentally during extraction, processing, transportation, and from faulty wells.²⁷ Recent studies of the entire natural gas life cycle, from hydraulic fracturing operations through delivery to end users, have found surprisingly—and dangerously, for climate change—high methane leak rates.^{28, 29, 30, 31}

In fact, natural gas production and systems account for the largest single part of the U.S.'s methane emissions. This extent of leakage, combined with the high volume of natural gas extraction, makes it urgent to control leakage immediately and to stop extracting and burning natural gas.³²



Natural gas systems: Largest source of U.S. methane emissions.

PSR's Conclusion: Ban Fracking

Based on the intense heat-trapping properties of methane, the dangerous toxicity of chemicals used in hydraulic fracturing, and fracking's multiple other environmental health impacts, **Physicians for Social Responsibility calls for a ban on fracking and a rapid transition to cleaner, healthier, carbon-free sources of energy.** As we make that transition, the oil and gas industry must make significant changes in their operations, including: These changes would include (although would not be limited to) the following:

- Full and timely public disclosure of the chemicals and chemical mixtures they use, amounts of waste generated, and procedures used for waste disposal;
- Appropriate strategies to manage safely the threats to health and the environment; and
- Independent testing of water supplies and bodies of water during and after fracking, and full and timely public disclosure of findings.

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