



**Friends of
the Earth
Scotland**

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Public health impacts of fracking: Friends of the Earth Scotland Supporters Briefing

There is growing evidence that shale gas and coalbed methane extraction are linked to numerous potential adverse health impacts. Communities living near gas fields report a wide range of immediate symptoms, while academic studies point to very serious medium and longer-term effects. Researchers in the US have warned that the unconventional oil and gas industry is an 'uncontrolled health experiment on an enormous scale'.¹ From the toxic chemicals used in drilling and fracking fluids, to the pollution caused by heavy site traffic and equipment, it seems increasingly clear that the fracking industry is bad for our health.

Health symptoms

One of the most detailed public health studies to date was conducted by the New York State's Department of Health, leading to the state's recent ban on fracking.² The review discussed numerous findings of increased symptoms reported by residents living near gas drilling sites, including skin rashes, nausea and vomiting, abdominal pain, breathing difficulties, coughs, nosebleeds, anxiety and stress, headaches, dizziness, eye and throat irritation. These symptoms are consistent with exposure to chemicals used in unconventional oil and gas extraction.

Researchers in Pennsylvania found that increased rates of hospitalisation correlated with a dramatic increase in drilling and fracking activity in the state and that data suggested a link between well density and increased numbers of patients with heart and skin conditions as well as tumours and urological conditions.³

Children and babies are much more vulnerable to exposure of harmful chemicals. A number of studies have established links between unconventional oil and gas extraction and adverse health outcomes in babies born to mothers living in the vicinity of well pads, including increases in low birth weights,⁴ congenital heart defects⁵ and even a rise in infant mortality.^{6,7} Further, researchers from the Yale School of Public Health have recently identified 20 compounds associated with childhood leukemia and lymphoma in fracking fluids and waste.⁸

Toxic cocktail

The drilling and hydraulic fracturing processes used to extract unconventional oil and gas use a range of chemicals that are harmful to health, while also mobilising toxic and radioactive substances that

¹ Bamberger, M and Oswald, R E, (2012) 'Impacts of gas drilling on human and animal health', *New Solutions*, 22(1).

² New York State Department of Health. (2014, December 17). A public health review of high volume hydraulic fracturing for shale gas development. Retrieved from http://www.health.ny.gov/press/reports/docs/high_volume_hydraulic_fracturing.pdf

³ Jemielita T., et al., (2015), Unconventional gas and oil drilling is associated with increased hospital utilization rates. *PLoS ONE* 10, doi: 10.1371/journal.pone.0131093

⁴ Shaina, L. S., et al., (2015). Perinatal outcomes and unconventional natural gas operations in southwest Pennsylvania. *PLoS One*, 10, doi:10.1371/journal.pone.0126425

⁵ McKenzie, L. M., et al., (2014). Birth outcomes and maternal residential proximity to natural gas development in rural Colorado. *Environmental Health Perspectives*, 122, 412-417. doi:10.1289/ehp.1306722

⁶ Solotaroff, P. (2015, June 22). What's killing the babies of Vernal, Utah? *Rolling Stone*. Retrieved from <http://www.rollingstone.com/culture/features/fracking-whats-killing-the-babies-of-vernal-utah-20150622>

⁷ American Lung Association. (2013). American Lung Association state of the air 2013. Retrieved from <http://www.stateoftheair.org/2013/states/utah/uintah-49047.html>

⁸ 'Meyer, D L, Fracking Linked to Cancer-Causing Chemicals, New YSPH Study Finds', October 2016, <http://publichealth.yale.edu/news/article.aspx?id=13714>

naturally occur in shale rock and coal. A 2011 US study questioned 14 major fracking companies and found that they were using many chemicals that are toxic to humans including benzene, naphthalene, methanol, ethylene glycol, caustic soda and formaldehyde.⁹ A 2011 study led by the Endocrine Disruptor Exchange found that of 353 identifiable chemicals used in 944 industry products, more than 75% could affect the skin, eyes, other sensory organs, the respiratory and gastrointestinal systems; 40-50% could cause nervous, immune and cardiovascular system and kidney problems; 37% could affect the endocrine system; and 25% could cause cancer and mutations.¹⁰

Of particular concern are chemicals used in fracking that are known to disturb hormones in humans and animals, called endocrine disruptors. Exposure to hormone-disrupting chemicals is linked to sperm abnormalities, reduced foetal growth, cardiovascular disease, respiratory dysfunction and asthma.^{11,12} Studies on the long-term effects of fracking chemicals on female mice indicates that exposure reduces fertility.¹³ Endocrine disruptors include benzene, toluene, ethylbenzene and xylene (or BTEX), which are naturally occurring in shale and coal, and there are many studies documenting extremely high BTEX concentrations in air and water surrounding fracking operations.¹⁴

The 2016 Yale study cited above further found that of the 1,117 water pollutants and 143 air pollutants found in fracking fluids and waste water assessed, 55 chemicals could be classed as known, probable or possible human carcinogens.

Air pollution and water contamination

Toxic chemicals used in or mobilised by the drilling and fracking processes can leach into and contaminate nearby soils and groundwater from leaky wells. Conservative estimates put well failure on newly drilled wells at between 5-9%, and at upwards of 50% during their lifespan. Spills and accidents of fracking and drilling fluids or waste at the surface can also pose a threat to water, air and soil. A 2014 study by the Pennsylvania Department of Environmental Protection revealed that 243 private water supplies had been contaminated or had lost flow and dried up as a result of nearby drilling and fracking operations over seven years, with pollutants including methane, metals and salts.¹⁵

Both coalbed methane extraction and shale gas fracking create tens of millions of litres of waste-water per well. The waste 'flowback fluid' contains both substances introduced during the drilling and fracking processes and toxins naturally occurring in the ground, including carcinogens like BTEX chemicals and naturally occurring radioactive materials (NORMS). These wastes must be handled, treated and disposed of extremely carefully in order to avoid serious environmental pollution and subsequent health risks.

Air born chemicals can leak from pipes, well-heads and other infrastructure, including cancer-causing chemicals like benzene. Combined with air pollution from heavy site traffic and equipment, the resulting air pollution is thought to be the key cause of many of the health symptoms reported by people living

⁹ US House of Representatives Committee on Energy and Commerce, *Chemicals used in hydraulic fracturing*, 2011, <http://conservationco.org/admin/wp-content/uploads/2013/02/Final-Rebuttal-Exhibits.pdf-Adobe-Acrobat-Pro.pdf>

¹⁰ Colborn, T. et al., (2011), Natural gas operations from a public health perspective. *Human and Ecological Risk Assessment: An International Journal*, 17 (5), 1039-1056. doi: 10.1080/10807039.2011.605662

¹¹ Bienkowski, B., (2015, April 15). Scientists warn of hormone impacts from benzene, xylene, other common solvents. *Environmental Health News*. Retrieved from <http://www.environmentalhealthnews.org/ehs/news/2015/apr/endocrine-disruption-hormones-benzene-solvents>

¹² Bolden, A. L., Kwiatkowski, C. F., & Colborn, T. (2015). New look at BTEX: are ambient levels a problem? *Environmental Science & Technology*, 49, 5261-76. doi: 10.1021/es505316f

¹³ Kassotis, C. D., et al., (2016) Adverse Reproductive and Developmental Health Outcomes Following Prenatal Exposure to a Hydraulic Fracturing Chemical Mixture in Female C57Bl/6 Mice. *Endocrinology*.

¹⁴ Concerned Health Professionals of New York & Physicians for Social Responsibility. (2015, October 14). *Compendium of scientific, medical, and media findings demonstrating risks and harms of fracking (unconventional gas and oil extraction)* (3rd ed.). See pp.16-51.

¹⁵ Pennsylvania Department of Environmental Protection. (2014 August 29). *Water supply determination letters*. Retrieved from http://files.dep.state.pa.us/OilGas/BOGM/BOGMPortalFiles/OilGasReports/Determination_Letters/Regional_Determination_Letters.pdf

near gas fields. Fugitive methane and ethane also leak from fracking wells and onsite equipment, and these emissions have been measured hundreds of miles from fracking operations.¹⁶

Community impacts

The fracking industry brings with it wider changes at the community level that can detrimentally impact on health and wellbeing. Around wellpads, workers and nearby residents are exposed to continuous noise from drilling, flaring, and compressor stations. Exposure to noise pollution is linked to cardiovascular disease, cognitive impairment and sleep disturbance. Nearby residents and workers are exposed to light pollution for sustained periods lasting many months, and there is emerging evidence that continuous artificial light exposure is linked to breast cancer in women.¹⁷

Huge increases in traffic and congestion from thousands of trucks during the construction, drilling, fracking and wastewater disposal stages have seen rises in the rates of road accidents linked to the fracking industry in the US.¹⁸ Additionally there are concerns around the mental health and wellbeing of people living close to unconventional gas operations who face numerous disturbances and health risks from these industrial activities.

Occupational health

There are serious concerns about the occupational health of workers at unconventional oil and gas sites. An investigation of occupational exposures found high levels of benzene in the urine of wellpad workers, especially those working in close proximity to flowback fluid returning from wells following fracturing activities.¹⁹ Because of the need for sand in fracking fluids, workers risk exposure to silica dust, which is definitively linked to silicosis and lung cancer.²⁰ Drilling and fracking jobs also involve workplace hazards including head injuries, traffic accidents, blunt trauma, burns, toxic chemical exposures, heat exhaustion, dehydration, and sleep deprivation.²¹

Precautionary Principle

As the health impacts of fracking are only relatively recently being documented and studied, a growing number of health professionals are concerned that the long-term impacts are not properly understood. A large part of the reason why fracking was banned in New York State was that 'significant gaps' existed in the knowledge of potential public health impacts from fracking, and that all the potential impacts have not been adequately studied.²² In March 2015, several senior health professionals signed a letter to the British Medical Journal stating that, 'The arguments against fracking on public health and ecological grounds are overwhelming. There are clear grounds for adopting the precautionary principle and prohibiting fracking.'²³

Health practitioners have called for the 'precautionary principle' to be used for fracking, meaning that the industry should not be allowed to proceed until there is robust evidence that it causes no serious

¹⁶ Vinciguerra, T. et al., (2015). Regional air quality impacts of hydraulic fracturing and shale natural gas activities: evidence from ambient VOC observations. *Atmospheric Environment*, 110, 144-50. doi: 10.1016/j.atmosenv.2015.03.056

¹⁷ Shonkoff, S. B. C., et al., (2015, July 9). Volume II, Chapter 6: Potential impacts of well stimulation on human health in California. In: *An Independent Scientific Assessment of Well Stimulation in California*. California Council on Science and Technology, Sacramento, CA. Retrieved from <http://ccst.us/publications/2015/vol-II-chapter-6.pdf>

¹⁸ Olsen, L. (2014, 11 September). Fatal truck accidents have spiked during Texas' ongoing fracking and drilling boom. *Houston Chronicle*. Retrieved from <http://www.houstonchronicle.com/news/article/Fracking-and-hydraulic-drilling-have-brought-a-5747432.php?cmpid=email-premium&cmpid=email-premium&t=1a9ca10d49c3f0c8a9#0>

¹⁹ Esswein, E., et al., (2014). Evaluation of some potential chemical risks during flowback operations in unconventional oil and gas extraction: Preliminary results. *Journal of Occupational and Environmental Hygiene* 11

²⁰ Morris, J., Hopkins, J. S., & Jameel, M. (2015, June 30). Unequal risk: Slow-motion tragedy for American workers. *The Center for Public Integrity*. Retrieved from <http://www.publicintegrity.org/2015/06/29/17518/slow-motion-tragedy-american-workers>

²¹ Concerned Health Professionals of New York & Physicians for Social Responsibility. (2015, October 14). *Compendium of scientific, medical, and media findings demonstrating risks and harms of fracking (unconventional gas and oil extraction)* (3rd ed.). See particularly p. 79 <http://concernedhealthny.org/compendium/>

²² Department of Environmental Conservation, New York State Department of Health Completes Review of High-volume Hydraulic Fracturing, press release, 17 December 2014, <http://www.dec.ny.gov/press/100055.html>

²³ Robin Stott et al., *Public Health England's draft report on shale gas extraction*, Letter to the BMJ, March 2015, <http://www.bmj.com/content/348/bmj.g2728/rr>

risks or harms. In contrast, there is a growing body of evidence highlighting extremely serious impacts that fracking poses on human populations as well as the wider environment.

Ban fracking to protect public health!

We are calling on the Scottish Government to ban unconventional fossil fuels because of the unacceptable risk they pose to public health, as well as the very serious impacts on the local environment and our efforts to fight climate change.

Responding to enormous public pressure, the Scottish Government has already announced a ban on underground coal gasification. We are positive about winning on shale gas and CBM too, but this will only happen if huge numbers of people tell the Scottish Government that it is the right thing to do.

Take action, find out more and sign up for updates at: www.stopfracking.scot



Friends of the Earth Scotland's work on unconventional fossil fuels is part of our campaign for a Fossil Free Scotland: A just transition to a 100% renewable, nuclear-free, zero-fossil-fuel Scotland

find out more at: www.fossilfree.scot