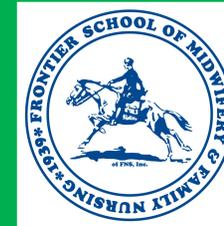


# Health and the Natural Gas Industry: What Every NP Needs to Know

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## Background

Unconventional gas extraction or natural gas drilling activities have proliferated across the United States since 1990s. Drilling has included the Barnett Shale in the Western part of the United States and most recently the Marcellus Shale in the Eastern part of the United States.



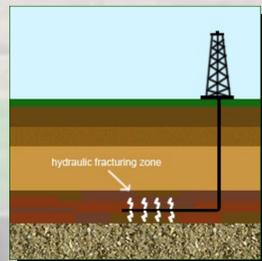
Individual living close to the extraction activities and industrial workers are at increased adverse health risk related to pollution and social changes brought about by the “boom and bust” cycles experienced by local communities.

## Issues

- ▲ Too early for long term epidemiological studies of individual and community long term health effects related to natural gas extraction
- ▲ Exact chemical used and concentration propriety information – many are known carcinogens, endocrine disruptors, and may result in epigenetic alterations
- ▲ Natural gas industry exempt from the Safe Air & Water Act
- ▲ Health effects related to natural gas extraction activities are often overlooked, not taken into account, or not addressed by health care providers
- ▲ Since the proliferation of natural gas drilling activity is a relatively new phenomenon, health care provider education may not have addressed the potential community and individual health risks related to natural gas drilling process

## Overview of Issues and Health Concerns

- ▲ Seismic testing
- ▲ Pad construction
- ▲ Deep drilling - up to 8,000 feet down
- ▲ Hydraulic fracturing of rock to release the trapped gas
- ▲ Diesel trucks transporting 2-10 million gals water-mixed with sand, chemicals (salts, heavy metals, organic chemicals) some more hazardous than others - 24/7
- ▲ Silica dust from sand used in drilling
- ▲ Waste water management, 3%-80% returns to surface with chemicals, naturally occurring radioactive materials (NORMS), microbes- stored on site or trucked to processing facilities
- ▲ Open waste water pits with plastic liners- misters to evaporate waste water until transported or plowed under in ground
- ▲ Flaring of gas- light 24/7
- ▲ Gas production & processing- onsite condensing stations
- ▲ Gas pipelines to transport gas
- ▲ Industrial sites near residential area



## Common Physical Complaints of Residents near Sites

- ▲ Sleep/stress/fatigue
- ▲ Burning eyes
- ▲ “Sweet metallic taste” in mouth
- ▲ Lack of smell & taste over time
- ▲ Dermal- rashes/chemical burns/precancerous skin lesions
- ▲ Pulmonary sx - Asthma, COPD
- ▲ Neurological- Headache, confusion
- ▲ Abdominal pain
- ▲ Blood dyscrasias - nose bleeds, enlarged spleen

## Potential Source of Chemical Contamination & Human Exposure

- ▲ Chemical exposure - air & water
- ▲ Potential sources of air contamination – Diesel exhaust, flaring, emissions form well head, condensation tanks, compression stations
- ▲ Potential sources of water, air, ground soil contamination – Impoundments leakage affecting food supply (i.e. crops, undetected animal exposure meat/dairy)

## Potential Airborne Hazards from Natural Gas Extraction

(SWPA-EHP, 2013)

- ▲ Barium
- ▲ Arsenic
- ▲ Volatile organic compounds (VOCs)
- ▲ Poly-aromatic hydrocarbons (PAHs)
- ▲ Benzene, Ethylbenzene, Toluene, & Xylenes (BTEX)
- ▲ Methylene chloride
- ▲ Fine particulate matter
- ▲ Carbon monoxide
- ▲ Glycoles
- ▲ Silica dust
- ▲ Radium
- ▲ Acetaldehyde/Formaldehyde

## Potential Waterborne Hazards from Natural Gas Extraction

(SWPA-EHP, 2013)

- ▲ All chemicals above
- ▲ Biocides
- ▲ Microbial contamination
- ▲ Components of drilling solvents
- ▲ Lithium – used in place of oil as a lubricant (neurotoxicity)

## Potential Source of Non-Chemical Contamination & Human Exposure

- ▲ Noise – from compressor stations, truck traffic, drilling operations
- ▲ Traffic – hauling water, chemicals, sand, and waste water
- ▲ Light – from flaring of gas



## Considerations R/T History Taking

- ▲ Ask if there has been recent activity in community r/t natural gas extraction
- ▲ Ask if home is near or down wind/down stream from any industrial sites, especially recent natural gas drilling activities, compressor stations, pipelines, impoundments
- ▲ Ask about water source- well or “city” water
- ▲ Ask about sleep, stress, changes in activities of daily living (ADLs), concerns about spending time outside, drinking water, pets, air quality

## Consideration R/T Presenting Problem(s)

- ▲ Onset – related to drilling activities
- ▲ Location- of symptoms- system affected/anyone else in family with similar symptoms
- ▲ Duration- timing related to activities
- ▲ Character of symptom
- ▲ Aggravating factors
- ▲ Relieving factors
- ▲ Timing of symptoms



## Considerations R/T Physical

- ▲ Check changes in Vital Signs- esp. B/P
- ▲ General survey -observe affect, demeanor, signs of stress
- ▲ Dermatological
- ▲ Endocrine
- ▲ Pulmonary
- ▲ Cardiac
- ▲ Abdominal
- ▲ Neuro/muscular

## Special Consideration – Children

- ▲ Children are closer to the ground & have a faster metabolism-breathing in/absorbing potential contaminates faster than adults
- ▲ Assess if drilling activities are near home/school/play areas
- ▲ Special consideration if water source is well water

## The Precautionary Principle

- ▲ “When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically”(Wingspread, 1998).
- ▲ Nurses have an ethical obligation toward disease prevention and health promotion. When there is an absence of evidence-based studies the Precautionary Principle serves as a guide to practice.

## Health in the Context of the Environment - findings from a qualitative study in the gas fields of Southwestern Pennsylvania

(Resick, Knestrick, & Counts, 2013)

- ▲ Health in the context of the Environment is that place matters – the essence of health was related to proximity of living space to industrial sites
- ▲ Powerlessness
- ▲ Impacting health
- ▲ Affecting living space

## NPs & Environmental Justice

“The U.S. Environmental Protection Agency (EPA) defines environmental justice as “the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies”

<http://www.cdc.gov/HealthyHomes/EJ/definition.htm>

## Environmental Justice

**Fair treatment:** no group of people should have to deal with an unequal share of the harmful environmental effects that happen because of policies or operations run by businesses or government. (<http://www.cdc.gov/HealthyHomes/EJ/definition.htm>)

**Meaningful involvement:** “potentially affected community residents have an appropriate opportunity to participate in decisions about a proposed activity that will affect their environment or health, or both; the public's contribution can influence the regulatory agency's decision.

The concerns of all participants will be considered in the decision-making process and the decision-makers will seek out and facilitate the involvement of the populations potentially affected.” (<http://www.cdc.gov/HealthyHomes/EJ/definition.htm>)

## NPs as HCPs, Researchers and Advocates for Individual, Family, and Community Health

- ▲ Know what environmental issues are going on in the community of your patients
- ▲ Keep track of environmental related health issues
- ▲ Become involved in your state nursing associations - know the issues regarding natural gas drill & other extraction industries & industrial sites in your home/work place communities
- ▲ Know the policies of your local, state, & federal elective officials regarding safe guarding the health of individuals and communities

## References/Resources

- Kaktins, N. M. (2011). Drilling the Marcellus Shale for natural gas: Environment health issues for nursing, *Pennsylvania Nurse*, p. 4-9.
- Resick, Knestrick, Counts (2013). The meaning of health among mid-Appalachian within the context of the environment. *Journal of Environmental Studies and Science*, DOI 10.1007/s13412-013-0119-y
- Southwestern Pennsylvania Environmental Health Project, <http://www.environmentalhealthproject.org/>
- Wingspread Conference on the Precautionary Principle. (1998). Johnson Foundation, Racine, Wisconsin.