

Asthma is a chronic disease that affects breathing. Asthma attacks, also known as exacerbations, may be triggered by indoor and outdoor air pollution, stress, and other physical and environmental factors. During an exacerbation, various triggers cause airways to become inflamed and narrowed, resulting in shortness of breath, cough, chest pain, and wheezing.

In the U.S., more than 25 million people (7.9%), including six million children, have asthma (CDC, 2018). While the link between air pollution and asthma exacerbations is well understood, some research suggests that exposure to air pollution, especially early in life, may play a role in actually developing the disease (American Academy of Allergy Asthma & Immunology, 2020).

Since 2005, shale gas development, also known as unconventional natural gas development (UNGD), has grown rapidly. Shale gas infrastructure is often constructed and operated close to where people live. In Pennsylvania, for example, approximately 1.5 million people live within one-half mile of a shale gas facility (FracTracker Alliance, 2020). Both air quality impacts and social/psychological effects are serious public health concerns for asthma patients living near to shale gas development.



AIR POLLUTION

Air pollutants such as carbon monoxide (CO), hydrogen sulfide (H₂S), nitrogen oxides (NO_x), particulate matter (PM), and volatile organic compounds (VOCs) are released from various stages of shale gas development. NO_x and VOCs mix in the presence of sunlight to form ground level ozone (smog). Exposure to shale gas air pollution and resulting ground level ozone may impair lung function and trigger asthma attacks.

- In a case-control study conducted by Rasmussen et al. (2016), records of 35,508 asthma patients were examined to determine their incidence of seeking medical treatment for mild, moderate, and severe asthma exacerbations in relation to exposure to unconventional natural gas development (UNGD). Those with the most exposure to UNGD activity had significantly higher rates of new oral asthma-related medication orders, emergency department visits, and hospitalizations.
- In a study conducted by Willis et al. (2018), Pennsylvania children and adolescents exposed to newly built UNGD wells had 25% greater odds of being hospitalized for asthma compared to children and adolescents not exposed to UNGD wells. In addition, exposure to existing UNGD infrastructure resulted in a 19% increase in the odds of hospitalization for asthma compared to those not exposed to UNGD. This suggests that exposures continue after drilling, when the well is in operation.



Earthworks' optical gas imaging footage shows normally invisible air pollution at a typical compressor station in southwestern PA

STRESS

Stress can also trigger asthma attacks. In communities close to shale gas development, stress may result from social upheaval, worries about family health, persistent noise and light pollution, and sleeplessness.

- A qualitative study, conducted by Fisher et al. (2018), examined the quality of life impacts on 34 residents who lived and worked amid UNGD in Appalachian eastern Ohio. The authors reported quality of life impacts in five categories – psychological stress, social stress, environment, physical health, and traffic. Psychological stress was a significant theme for residents living near UNGD, and included:
 - Concern for the future related to UNGD
 - Frustration with interactions with industry officials
 - Stress about noise or light pollution
 - The need to leave the region or adapt to changes
- A quantitative study, conducted by Casey et al. (2018), evaluated the association of unconventional natural gas development with depression symptoms. Medical records of 4,762 Pennsylvania adult primary care patients were reviewed for mild, moderate, moderately severe, or severe depression symptoms. Associations were observed between living closer to more and bigger wells and depression symptoms.

HOW TO BEST PROTECT LUNG HEALTH

To protect lung health and to reduce asthma attacks when near shale gas development:

- Be aware of changes in the air where you live, work, and play
- Identify what types and how many shale gas facilities are located nearby, and find out if related diesel truck traffic uses roads in the same vicinity
- Realize that shale gas emissions are invisible to the eye: shale gas facilities may appear not to have any emissions until viewed through a FLIR (forward-looking infrared) camera, which can visualize gases that cannot be seen by the naked eye

- Exposure risk may increase with the number of pollution sources: keep windows closed and stay indoors when the wind is blowing from pollution sources
- When air is cooling and settling, such as at night, pollution becomes more concentrated closer to the ground: keep windows closed and make use of indoor air filters to reduce air pollution exposures indoors
- Talk to your health care provider about your concerns related to shale gas pollution exposure and asthma exacerbations
- Keep a diary of symptoms and any environmental factors – such as smells, noise, and smog – that are evident, along with dates and times, that you can share with your health care provider

Air pollution from shale gas infrastructure tends to be episodic, so symptoms may come and go. Being able to identify what may be causing asthma attacks can help you take appropriate steps to minimize exposures. Contact EHP for additional information on protecting your health and about how to talk with your health care provider if you have concerns related to environmental exposure and shale gas development.

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