

# Shale Gas Extraction & Your Health: *What we know & what we can do about it*

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# A Day in the Life of the Shalefields





## EHP Mission

***“Our mission is to respond to individuals’ and communities’ need for access to accurate, timely and trusted public health information and health services associated with natural gas extraction.”***

# Role of EHP in the Community

- Respond to clients' needs
  - Assess individual health issues
  - Identify pathways of environmental exposure
  - Conduct air and water quality monitoring
  - Interpret air and water lab results
  - Monitor soil impacts
- Work with clients to manage and improve their health and wellbeing



## The Team That Does All This

### Health Care Professionals

- Family Nurse Practitioner
- Psychiatric Nurse Practitioner
- Nurse Educator
- Occupational Medicine Doctor
- Pediatrician
- Public Health Specialists
- Case Worker

### Community Outreach

- Community Organizers
- Community-University Outreach Specialist

### Environmental and Data Specialists

- Environmental Health Educator
- Toxicologist
- Data Analyst/Statistician

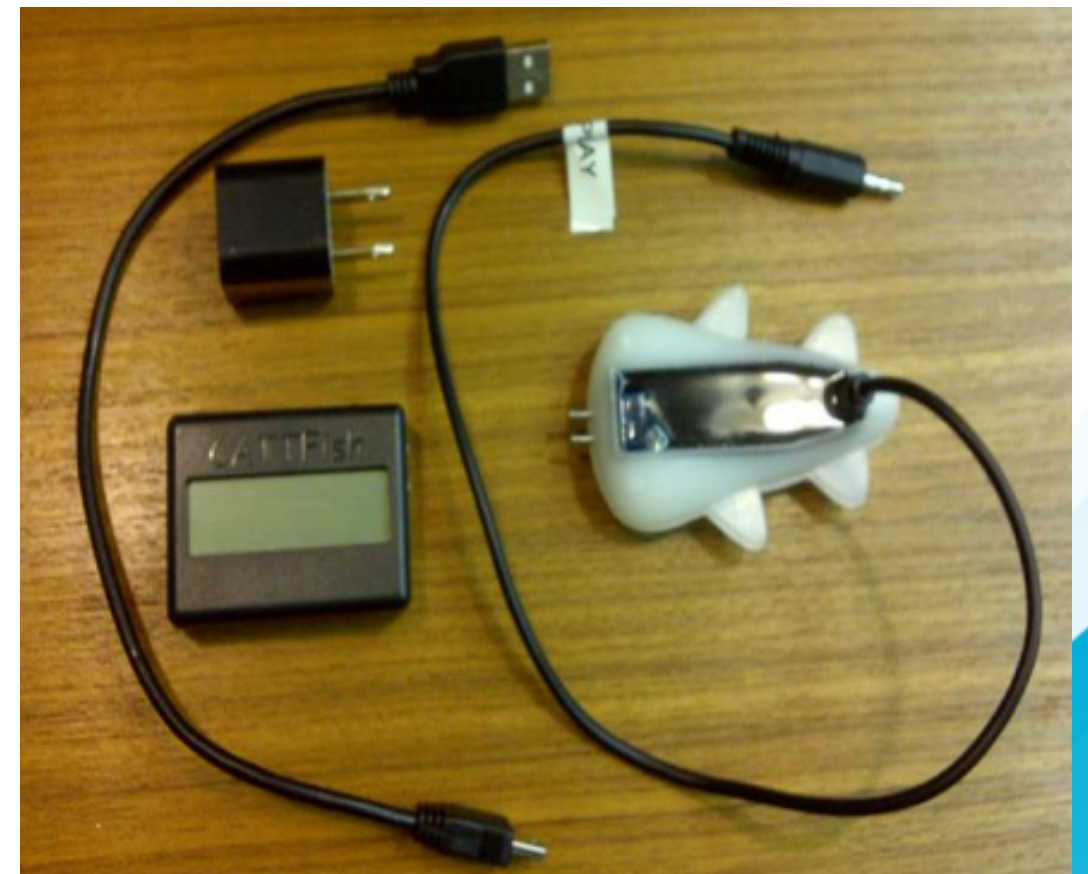
***And lots of interns!***

# Emissions Monitoring

## Speck Air Quality Monitor



## CATTfish Water Quality Monitor



Monitors total  
dissolved solids



# Truck transport of water, fluids, and sand



Mark West facility, WV, 2013

Photo from FracTracker.Org

## *AIR*

- particulate matter (PM)
- Diesel

## *Water*

- Leaks or accidents
- Contaminated water lines to withdraw water
- Illegal dumping





# Casing, Drilling, & Hydraulic Fracturing

## **AIR**

- VOCs
- silica dust
- diesel emissions
- particulate matter (PM)

## **WATER**

- failure of well casings
- methane migration



# Compressor Station

## *AIR*

- methane
- VOCs
- nitrogen oxides
- particulate matter (PM)



Photo by Bob Donnan



## ***AIR***

- methane
- ethane
- radon
- PCBs
- contaminants in the pipeline

## ***WATER***

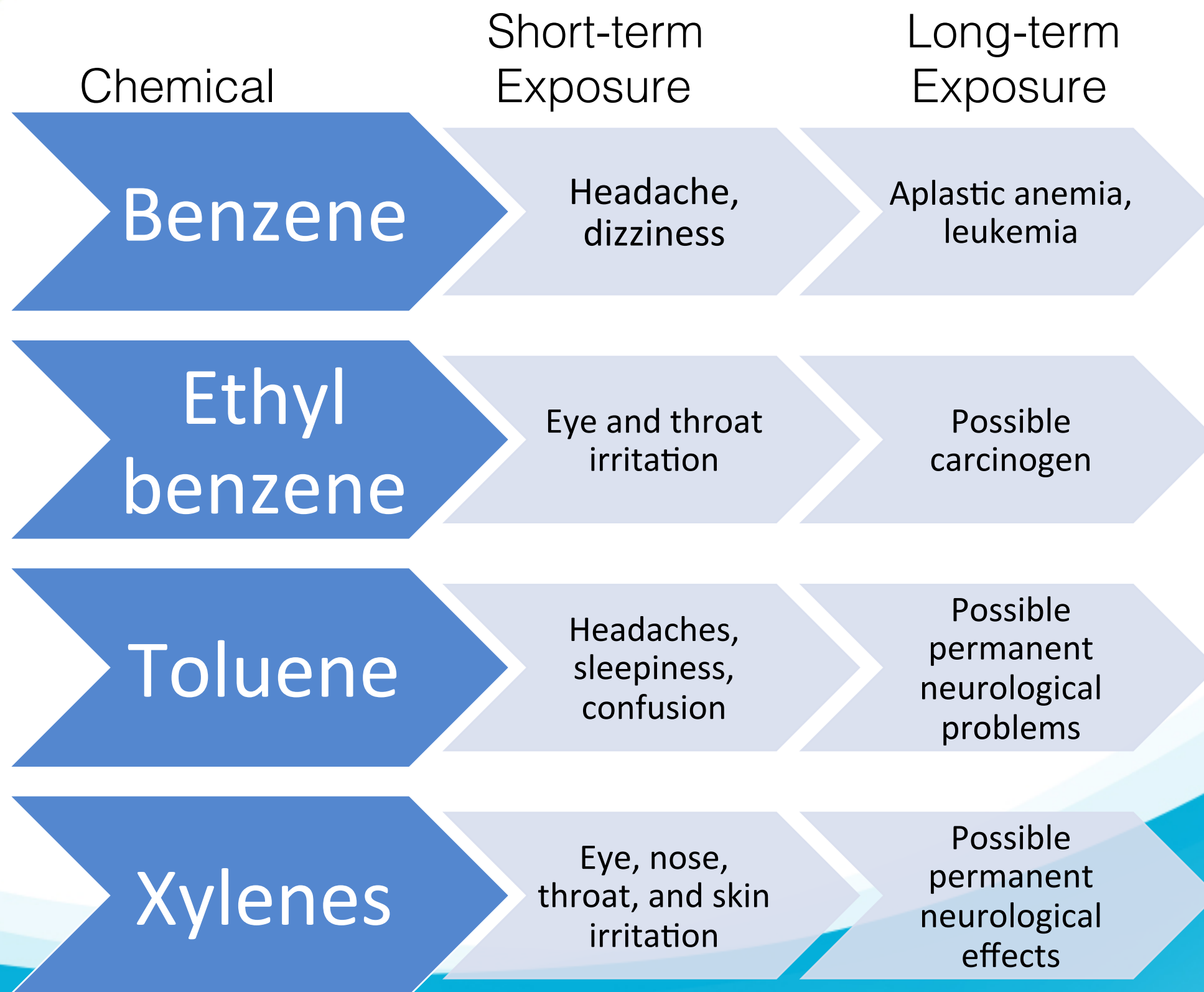
- spray
- leaks

# Pig Launcher





# Health Effects of Known VOCs in Shale Gas Emissions



# Health Effects of Some Other Chemicals Associated with Fracking

Chemical

Short-term  
Exposure

Long-term  
Exposure

Formaldehyde

Nose & eye  
irritation, impaired  
short term  
memory, asthma  
attacks

Asthma, eczema,  
nasal & throat  
cancer

Diesel Exhaust  
VOCs & PM2.5

Eye, nose, throat  
& lung irritation,  
headaches  
dizziness, nausea

Worsening  
respiratory  
disease, lung  
cancer

Particulate  
Matter 2.5

Asthma attacks,  
acute bronchitis,  
possible heart  
attacks

Reduced lung  
function, chronic  
bronchitis



FOR THE 56% OF  
FRACKING  
CHEMICALS WE  
CAN IDENTIFY



**58%**  
SOLUBLE  
IN WATER



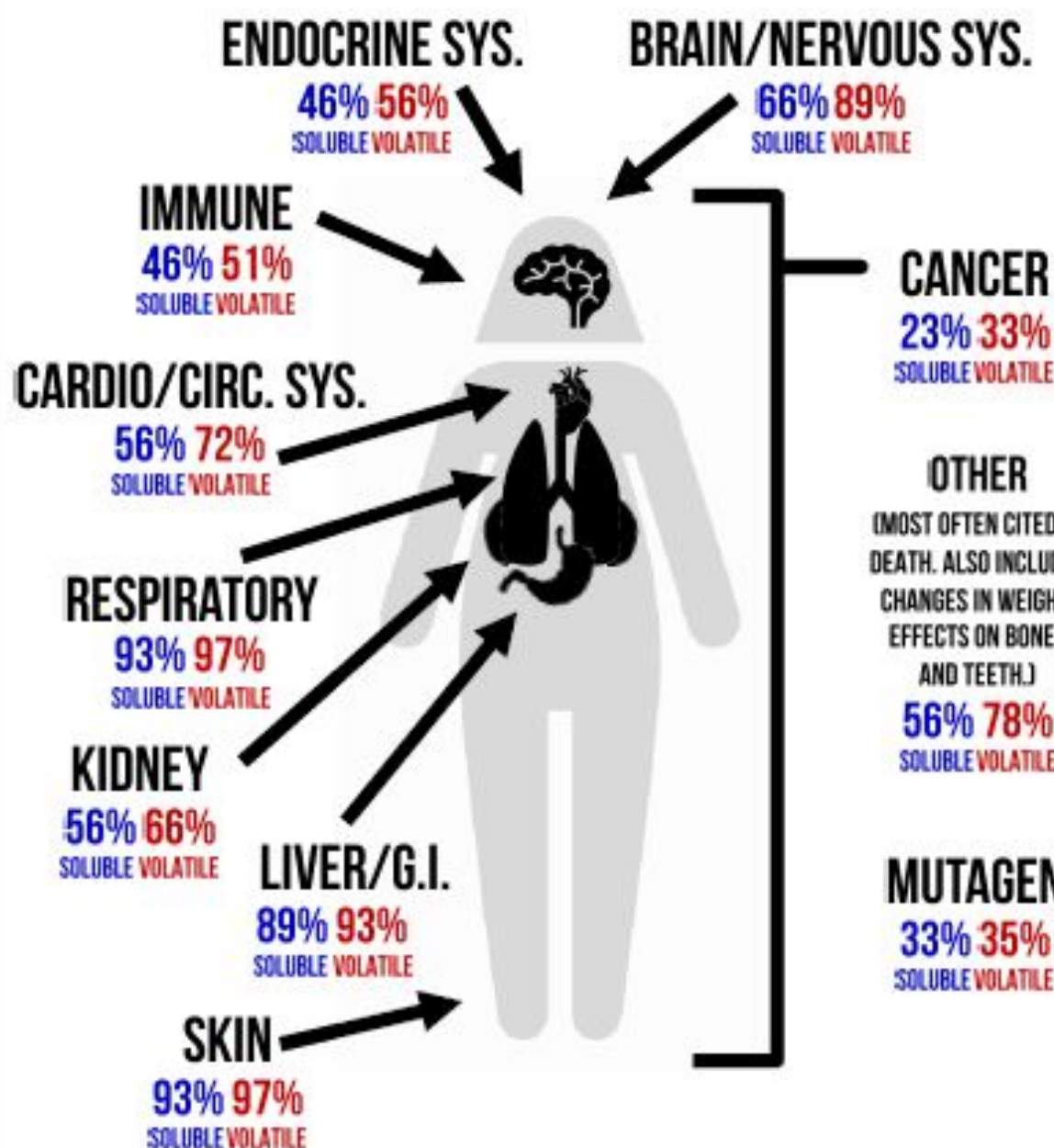
**36%**  
VOLATILE

SMALLER PERCENTAGE,  
BUT BIGGER IMPACT. THESE  
CHEMICALS CAN BE  
INHALED, SWALLOWED,  
AND/OR ABSORBED  
THROUGH THE SKIN

ALL IMAGES FROM  
THE NOUN PROJECT —  
FRACKING: TOM ANANTWERP,  
STOMACH: SERIO DELGADO  
GARCIA, HEART: CATHERINE  
PLEASE, LUNGS: JORIS HOOGEN-  
DOORN, WATER DROP: CRIS  
DOBBINS, CLOUD: JAMES FEN-  
TON, QUESTION CLOUD: ANAS  
RAMADAN, WOMAN: LUIS PRADO

## BODY SYSTEMS AFFECTED BY FRACKING CHEMICALS\*

SHOWN WITH % OF CHEMICALS AFFECTING EACH BODY SYSTEM  
(SOLUBLE CHEMICALS IN BLUE AND VOLATILE CHEMICALS IN RED)



CHEMICALS  
WITH A "CAS"  
NUMBER

WHAT'S A "CAS"  
NUMBER?



A "CAS" NUMBER IS A UNIQUE NUMBER ASSIGNED TO EVERY  
CHEMICAL DESCRIBED IN OPEN SCIENTIFIC LITERATURE.

2013



Physicians for  
Social Responsibility  
Los Angeles



THE ENDOCRINE  
DISRUPTION EXCHANGE  
Partners in Science

2001 Waterdam Plaza Drive, Suite 201, McMurray PA 15317  
 (724)-260-5504 (724)-260-5031 Fax

### Individual Health Exposure Assessment

*Adapted from ACMT and ATSDR*

**Instructions:** It will be helpful if you answer the questions as best you can. Please don't worry if you can't answer everything, but give as much detail as you can remember. All information you give about your health is strictly confidential.

PLEASE PRINT

Last Name:		First Name:		Middle Name:	Date:
Street Address:		City:		State:	Zip Code:
Date of Birth:		Age:	Marital Status (circle): Married Single Widow/Widower Divorced Partnered Separated		Gender:
Name of Primary Care Provider:		Phone of Primary Care Provider: ( )			
Email Address:		Preferred method of contact:			
May we leave a message: Yes/No If yes, where:		May we add this information to the confidential registry? Yes / No			

I, (print your name) \_\_\_\_\_, voluntarily consent to the EHP's exposure and health assessments, possible examination and/or testing for myself that will be completed by the authorized consultants of EHP. I acknowledge that no guarantees have been made to me as to the outcome of my assessment or examination.

*I have been given a copy of EHP's privacy policy.*

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Witness: \_\_\_\_\_ Date: \_\_\_\_\_

(Print Name)

(Signature)

Why are you here today? Do you have a current health concern? If so, please describe.

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Have you seen other health care providers for this concern? If so when, and what tests were ordered?

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# Individual Health Exposure Assessment

## Home Exposure Assessment



# SYMPTOMS TEMPORALLY RELATED TO UOGD

SYMPTOM CATEGORY	n	%	Symptom	n	%
UPPER RESPIRATORY SYMPTOMS	39	64%	Nose or throat irritation	25	41%
			Sinus pain or infections	17	28%
			Nose bleeds	8	13%
			Sleep disruption	26	43%

SYMPTOM CATEGORY	n	%	Symptom	n	%
UPPER RESPIRATORY SYMPTOMS	39	64%	Nose or throat irritation	25	41%
			Sinus pain or infections	17	28%
			Nose bleeds	8	13%

LOWER RESPIRATORY SYMPTOMS	30	49%	Worry	6	10%
			Cough	21	34%
			Shortness of breath	19	31%
			Weezing	14	23%
GASTRO-INTESTINAL SYMPTOMS	27	44%	Nausea	13	21%
			Abdominal pain	12	20%
EYE SYMPTOMS	23	38%	Itchy eyes	11	18%
			Painful or dry	10	16%
DERMATOLOGICAL SYMPTOMS	19	31%	Rash	10	16%
			Itching	7	11%
			Lesions or blisters	6	10%
CARDIAC SYMPTOMS	17	28%	Palpitations	9	15%
			Chest pain	6	10%
			Other cardiac symptoms	6	10%
HEARING CHANGES OR TINNITUS	10	16%	Hearing loss	3	5%
			Tinnitus (ringing in the ear)	10	16%
MUSCULOSKELETAL	10	16%	Painful joints	9	15%
			Aches	7	11%
ENDOCRINE	7	11	Hair loss	7	11%

**Findings from  
EHP Health Intakes**

**Distance: within  
1 km (0.6 miles)**

n = Number of clients reporting symptom, out of 61 clients assessed

% = Percentage of clients reporting symptom, out of 61 clients assessed

Adapted from: <http://environmentalhealthproject.org/resources/4/click/93>

# Symptoms Temporally Related to Shale Gas Activity by Water Source

SYMPTOM CATEGORY	WATER SOURCE							
	ANY WATER SOURCE n=61		PUBLIC WATER n=15		PRIVATE SOURCE n=41		PRIVATE SOURCE WITH CHANGES n=24	
	n	%	n	%	n	%	n	%
UPPER RESPIRATORY	39	64%	10	67%	27	66%	19	79%
CONSTITUTIONAL	33	54%	9	60%	23	56%	16	67%
PSYCHOLOGICAL	32	52%	11	73%	19	46%	14	58%
LOWER RESPIRATORY	30	49%	7	47%	21	51%	14	58%
GASTROINTESTINAL	27	44%	5	33%	22	54%	14	58%
EYE	23	38%	3	20%	19	46%	13	54%
DERMATOLOGICAL	19	31%	3	20%	16	39%	15	63%
CARDIAC	17	28%	6	40%	10	24%	6	25%
HEARING	10	16%	2	13%	7	17%	5	21%
MUSCULOSKELETAL	10	16%	1	7%	9	22%	7	29%
ENDOCRINE	7	11%	1	7%	5	12%	4	17%

Findings from EHP health intakes

n = number of clients reporting symptoms, out of 61 clients assessed

% = percentage of clients reporting symptoms, out of 61 clients assessed

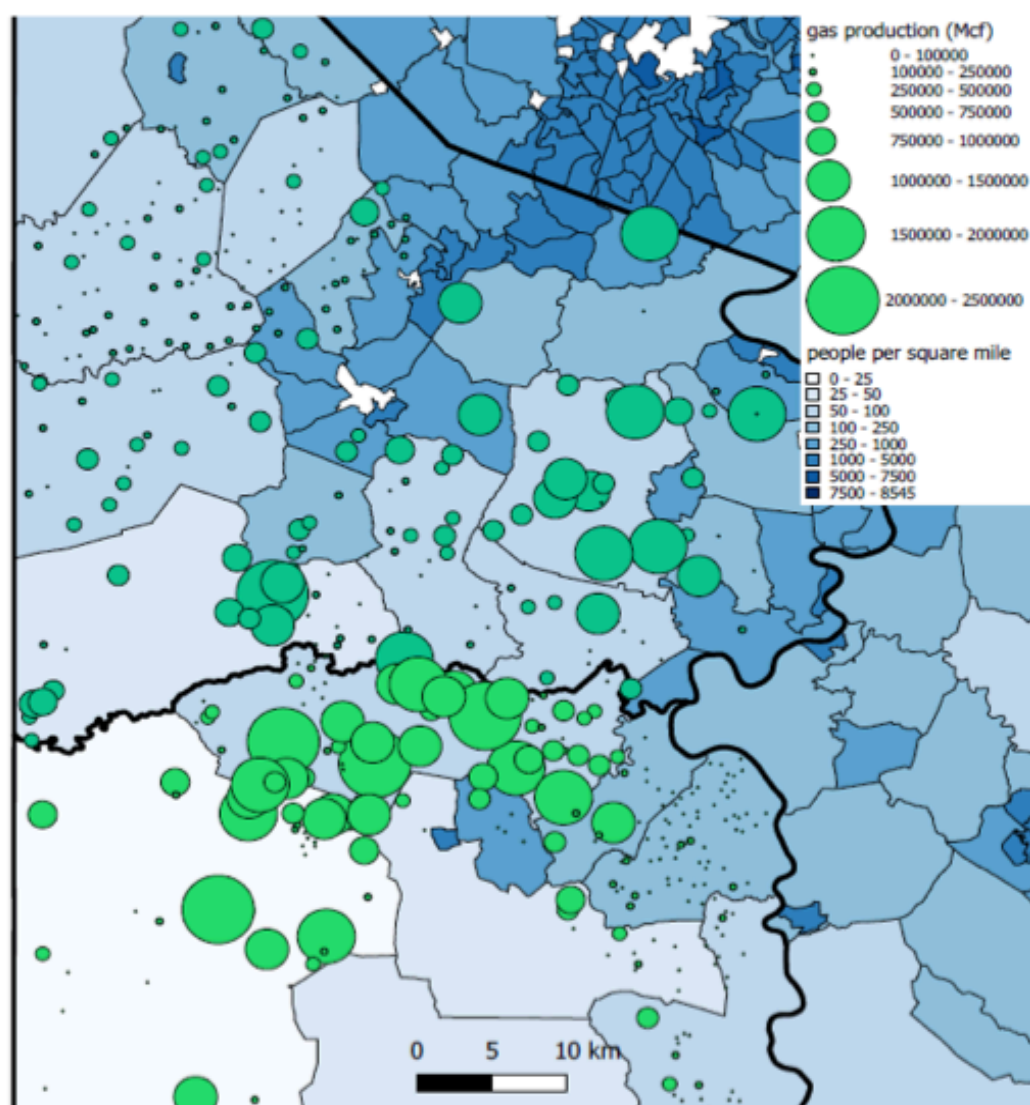
[www.environmentalhealthproject.org/resources/4/click/93](http://www.environmentalhealthproject.org/resources/4/click/93)



# Comparison of Health Symptoms:

Findings from health intakes of residents within 1 kilometer of shale gas wells in low and high production zip codes (MCF)  
Washington and Greene Co. Pennsylvania

Findings from EHP health intakes,  
PA DEP 2016, PA Spatial Data Access 2016



	Low MCF N=32	High MCF N=22
Sleep loss	31.25%	71.43%
Stress/anxiety	31.25%	57.14%
Throat irritation	37.50%	50.00%
Headache	31.25%	50.00%
Sinus	28.13%	42.86%
Fatigue	12.50%	42.86%
Cough	34.38%	35.71%
Irritable/moody	12.50%	35.71%
Shortness of breath	28.13%	28.57%
Itchy eyes	12.50%	28.57%
Weak& drowsy	6.25%	28.57%
Dizziness	6.25%	28.57%

# THE SCIENCE ON SHALE GAS DEVELOPMENT

## A Survey of the Environmental Public Health Literature

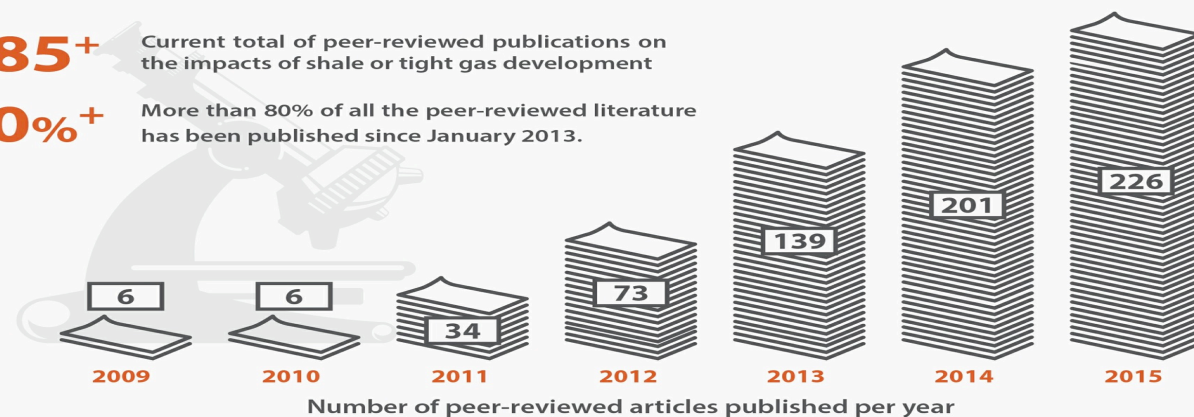
The scientific community is **only beginning to understand** the impacts of shale and tight gas development on human health and the environment. Many data gaps remain, but **numerous hazards and risks have been identified**.

**685+**

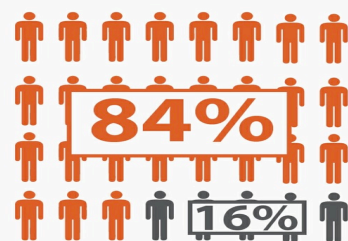
Current total of peer-reviewed publications on the impacts of shale or tight gas development

**80%+**

More than 80% of all the peer-reviewed literature has been published since January 2013.



### HEALTH



**26** studies contain findings that indicate **public health hazards, elevated risks, or adverse health outcomes**

**5** studies contain findings that indicate no significant public health hazards, elevated risks, or adverse health outcomes

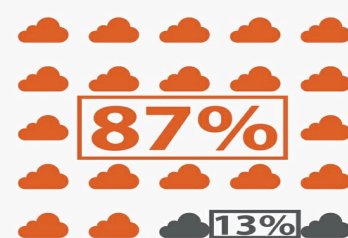
### WATER QUALITY



**40** studies contain findings that indicate **potential, positive association, or actual evidence of water contamination**

**18** studies contain findings that indicate minimal potential, no association or rare incidence of water contamination

### AIR QUALITY



**40** studies contain findings that indicate **elevated air pollutant emissions and/or atmospheric concentration**.

**6** studies contain findings that indicate no significantly elevated air pollutant emissions and/or atmospheric concentration

**It's not just EHP's data:**

*A 2016 "meta-study" by the Physicians, Scientists, and Engineers for Healthy Energy (PSE) shows that an overwhelming number of studies show health, air and water impacts*

#### SOURCE:

"Toward an Understanding of the Environmental and Public Health Impacts of Unconventional Natural Gas Development: A Categorical Assessment of the Peer-Reviewed Scientific Literature, 2009-2015", PLOS ONE. 2016.: <<http://dx.plos.org/10.1371/journal.pone.0154164>>

#### ATTRIBUTIONS:

Infographic by Yoonseo Cha. Some vector images in this infographic are based on free vector stocks available at following sources: <http://www.vecteezy.com/>; <http://www.freevector.com/>; Icons made by Freepik from <http://www.flaticon.com>



# Fracking and Health Research

Increased health risks correlated  
to potential exposures\*\*



**\*\*The health risks depicted in this graphic are aggregated from findings of separate peer-reviewed studies that have observed increased population health hazards, risks and impacts of living near oil and gas development. The graphic depicts the findings of the health studies cited in our paper and is not intended to indicate a causal relationship between oil and gas development and these health issues.**

# Recommended Steps to Take when You Think Your Health Is Impacted:

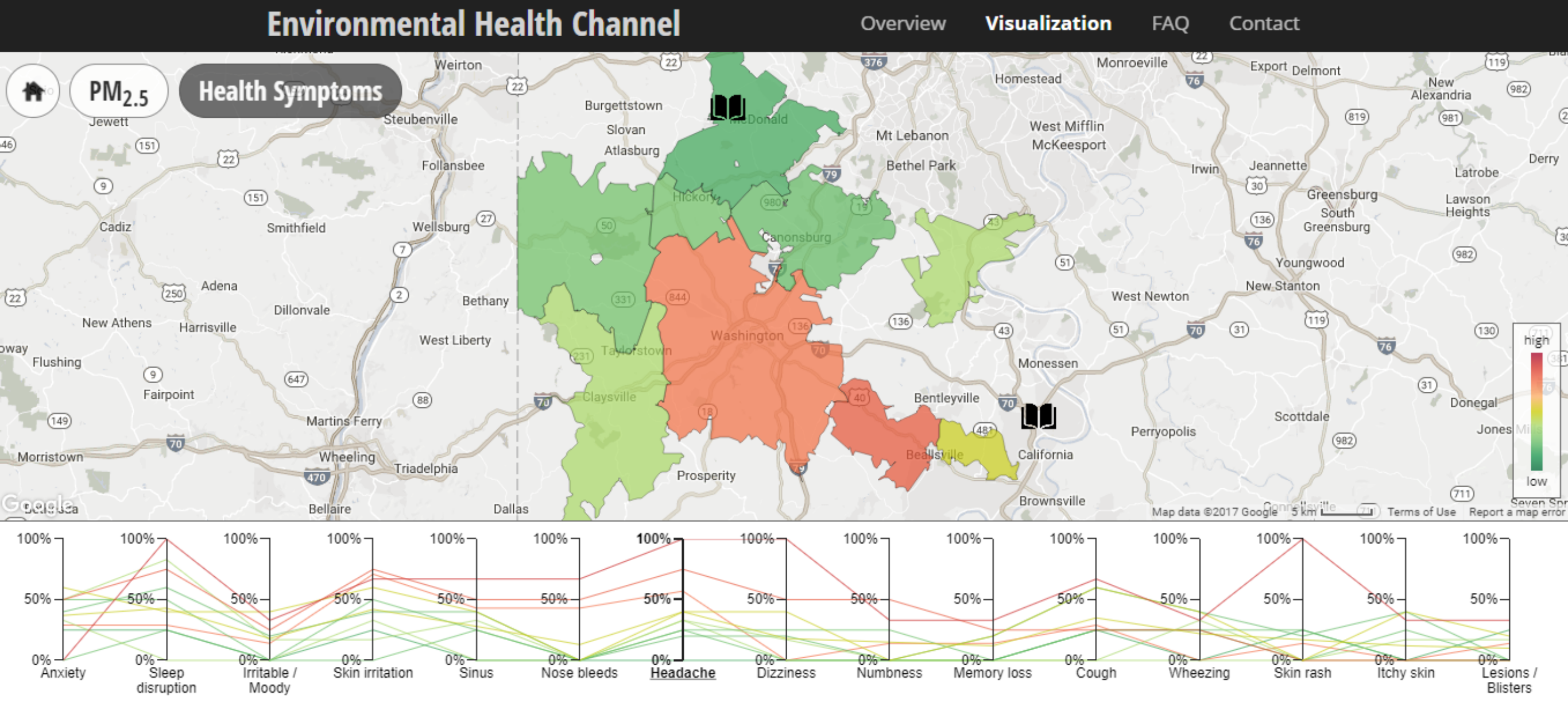
- Limit contamination in your **air**;
- Limit contamination in your **water**;
- **Monitor changes** in your health & environment;
- **Use “Tips** for talking to your health care provider” when you visit your doctor; and
- Check out our **website**:  
[www.environmentalhealthproject.org](http://www.environmentalhealthproject.org) and/or
- **Contact EHP** when you have health-related questions.



# OTHER EHP RESOURCES: [Envhealthchannel.org](http://Envhealthchannel.org)

## Environmental Health Channel

Visualizing Speck and Health Symptom Data by Zip Code



# If you live within 5 miles of Shale Gas Development...

Join the Health Effects Registry



[www.environmentalhealthproject.org](http://www.environmentalhealthproject.org)



# Why has EHP Launched a Registry?

- **Researchers** can better understand the health effects;
- **Policy makers** can recognize the size and scope of the public health problem (and implement protections);
- **EHP** can provide on-going information from the registry data and emerging research on health effects; and
- **At the national scale, no one else is doing this, and only limited health registries exist in CO and PA.**

## Fracking Risks in Your Community: Measuring, Monitoring, and Mitigating



### A CITIZEN SCIENCE ACTION GUIDE

**SW Pennsylvania Office**  
2001 Wierandem Plaza, Suite 304, Indiana, PA 15701  
Office: 724.298.5504 | Cell: 724.248.7500

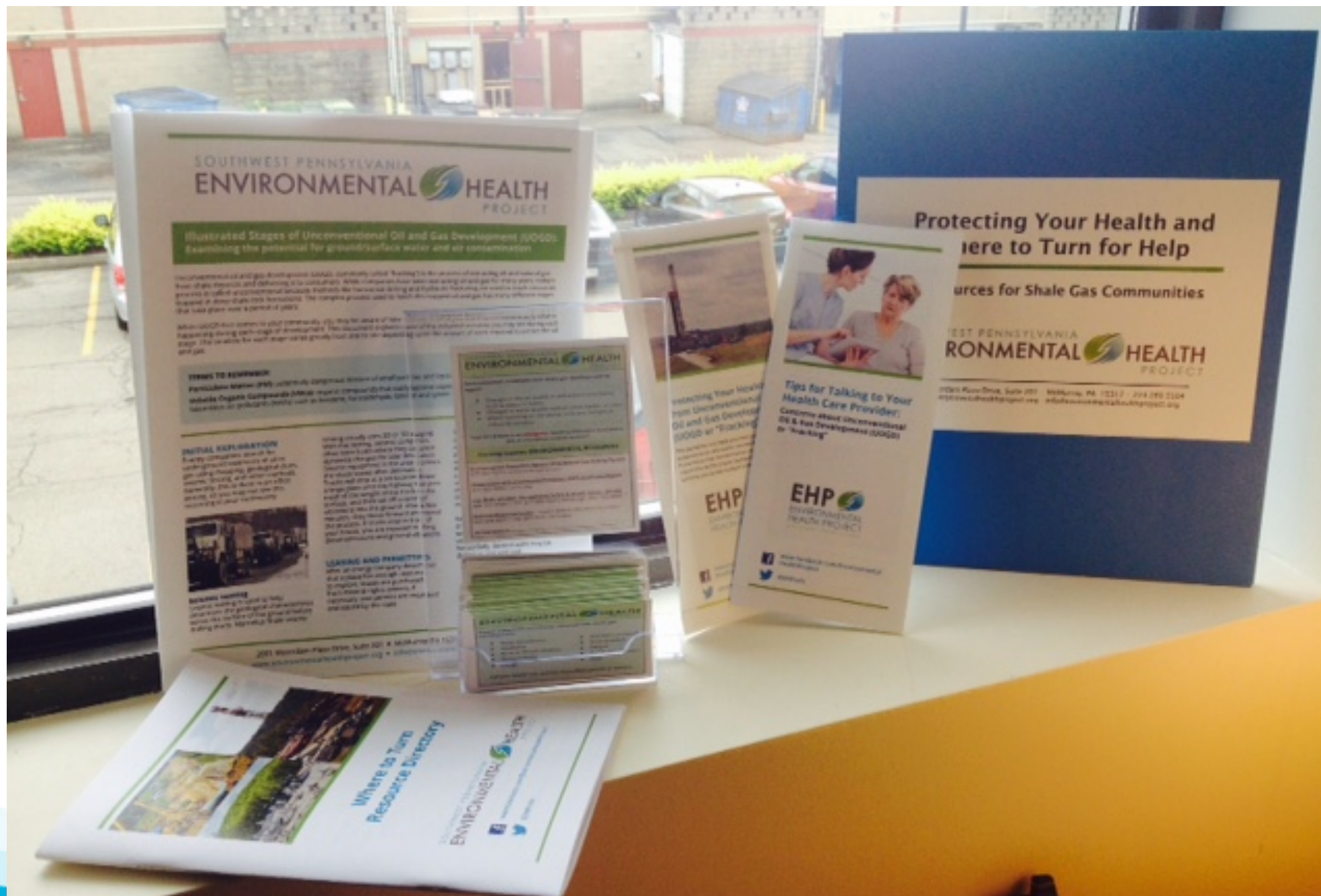
**Connecticut Office**  
780 Chapel Street, New Haven, CT 06510  
Fax: 203.893.7500

# Citizen Science Toolkit

An online  
interactive guide



# EHP Resources for Shale Gas Communities



## Contact Us

**[www.EnvironmentalHealthProject.org](http://www.EnvironmentalHealthProject.org)**

**724-260-5504**

 **[www.facebook.com/EnvironmentalHealthProject](http://www.facebook.com/EnvironmentalHealthProject)**

 **@EHPinfo**

**Most EHP services and resources are free to the public**