Southwest Pennsylvania Environmental Health Project

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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.

The Southwest Pennsylvania- Environmental Health Project

Health Evaluations and support

- Nurse Practitioner
- Health exams
- Consultations
- Referrals for health services
- Health Provider education
- Clinical toxicity profiles

Accurate, Trusted and timely Public Health information

- Identification of exposure pathways
- Measurement tools
- Consultation of water reports
- Assessment of air exposures
- Evaluation of health risks
- Information assessment

What We Do

Our nurse practitioner offers exams and consultations to people who think their health may be compromised by nearby gas drilling activities. She provides referrals, helps clients navigate the health care system and consults with environmental health specialists about residents' medical conditions.

Health Symptoms Temporally Associated with Gas Drilling Activities

- Most common symptoms experienced by individuals and families evaluated by Denise DeJohn, CRNP

Symptom	% of Individuals
Skin rash or irritation	48%
Nausea or vomiting	45%
Abdominal pain	38%
Breathing difficulties or cough	41%
Nosebleeds	21%

EHP Pilot Data:
Human Health Impacts

Other common complaints from our client population include:

- Anxiety/Stress

- Nervous system including headaches and dizziness

- Eye irritation

- Throat irritation

Further Analysis of EHP Data Related to Shale Gas Drilling

The necessary criteria for designating a symptom as attributable to gas extraction activities included:

- <u>Temporal relationship</u> – Development of symptom (or exacerbation of pre-existing symptom) *after* onset of gas extraction activities.

- <u>Plausible exposure</u> – Identifiable exposure source in proximity to individual experiencing symptoms.

- <u>Absence of more likely explanation</u> – Symptoms were not attributed to gas extraction activities if an individual had an underlying medical condition that was as (or more) likely to have caused the symptom.

Results/Conclusions from Further Analysis

Symptom	Number of cases attributable to gas extraction	Plausible primary source of exposure
Dermal	7	Water
Eye irritation	4	Air
Respiratory	13	Air
Neurological	3	Air

Our results are consistent with the following research study results

(and more):

- Investigating Links between Shale Gas Development and Health Impacts through a Community Survey Project in Pennsylvania, by Nadia Steinzor, Wilma Subra, and Lisa Sumi, **New Solutions**, Vol. 23, No. 1, 2013; and

- Assessment and longitudinal analysis of health impacts and stressors perceived to result from unconventional shale gas development in the Marcellus Shale region, by K. Ferrar, J. Kriesky, C. Christen, L. Marshall, S. Malone, R. Sharma, D. Michanowicz, and B. Goldstein, **International Journal of Occupational and Environmental Health**, 2013.

Additional Finding from Washington County Mental Health Assessment using SF-36 and Index of Social Control

- Survey completed between November 29, 2012 and January 28, 2013, by 279 adults who presented to Cornerstone Care Clinic in Burgettstown, PA.

- In the sample, the average score on each sub-scale as well as the physical and mental summary scale derived from the sub-scales was below normal.

- Perhaps most importantly, at least 30% of the 240 respondents who reside in Washington County are currently at risk of depression, compared to the expected rate of 19% nationally.

Potential Airborne Hazards from Natural Gas Extraction

- Barium
- Arsenic
- VOCs
- PAHs
- BTEX
- Methylene chloride
- Glycols

- Fine particulate matter
- Carbon monoxide
- Silica dust
- Radium
- Acetaldehyde/ Formaldehyde

Potential Waterborne Hazards from Natural Gas Extraction

- All the chemicals listed on the previous slide
- Biocides
- Microbial contamination
- Components of drilling solvents
- Lithium

PM 0.5 particulate counts (1000 s) at two homes about 1000 feet from a compressor station in Pennsylvania

Diesel engines emit fine PM. Peaks may reflect wind direction and/or stable air conditions. Background is 1000 to 2000 counts/cuft air.

Home one: 93 hours (4 days)
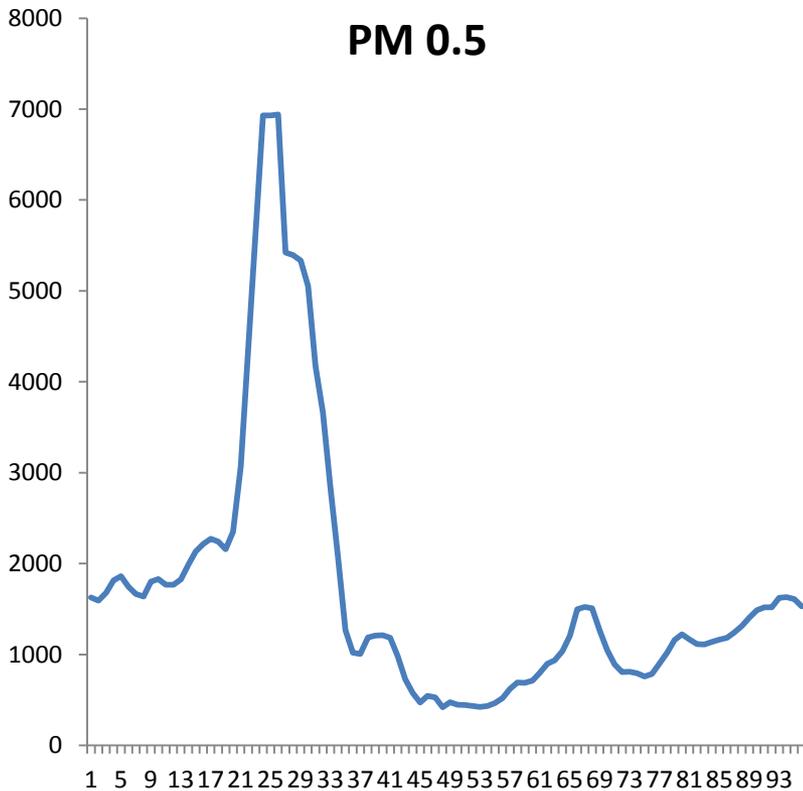
Home two: 115 hours (5 days)
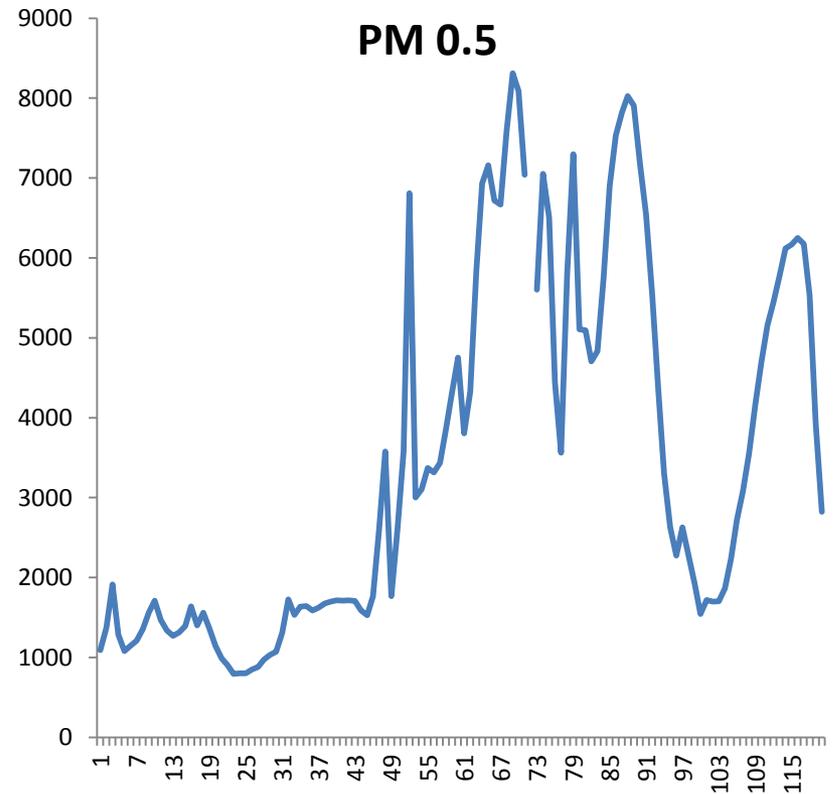
Hourly VOC Concentrations
1 km from compressor
(6 hr averages)

Day	Time	Wd Dir	ug/m3
1	night	south	237
1	morning	variable	60
1	afternoon	west	58
1	evening	north	299
2	night	calm	314
2	morning	variable	86
2	afternoon	west	67
2	evening	calm	458
3	night	south	457
3	morning	variable	29
3	afternoon	west	42
3	evening	south	140
4	night	calm	162
4	morning	variable	26
4	afternoon	variable	21
4	evening	south	207

VOC ug/m3
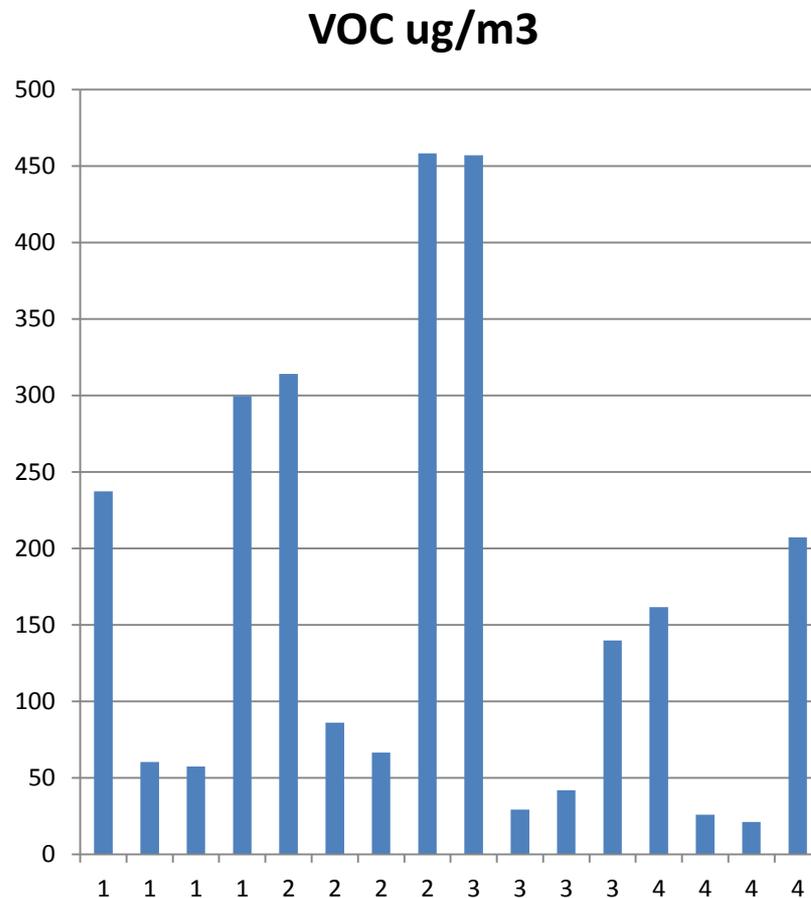
Hourly VOC Concentrations 1 km from compressor

(6 hr averages)

Variation in weekly air
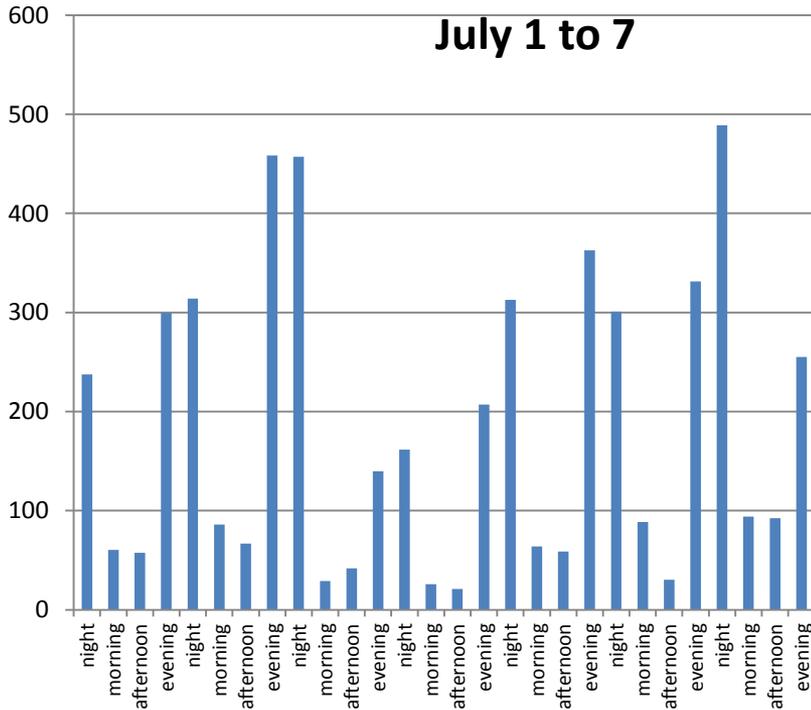
Variation in monthly air
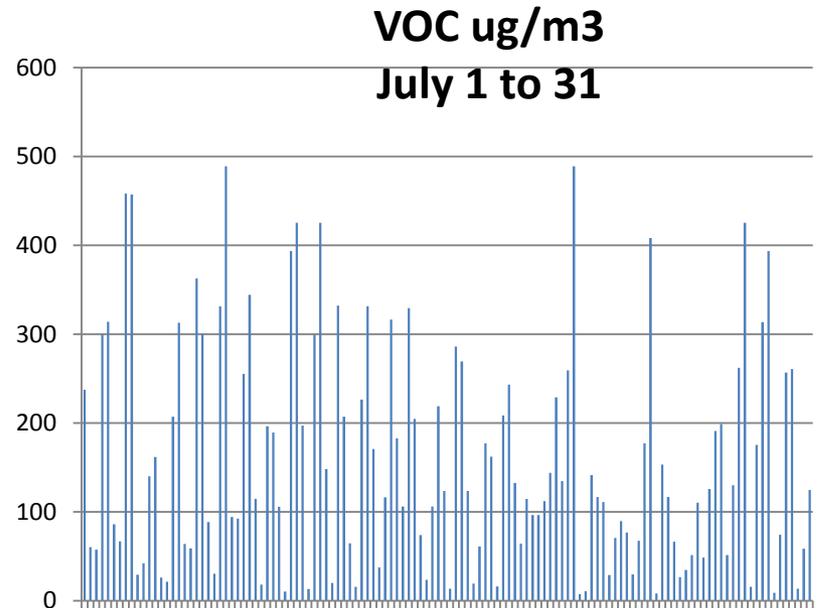
Relationship of stability class and source distance on air concentration

Stability Class	100 yds 0.1 km	360 yds 0.5 km	½ mile 1 km	1.2 miles 2 km	1.8 miles 3 km	3.1 miles 5 km	6.2 miles 10 km
A1	175.6	5.9	1.3	0.4	0.2	0.1	0.0
A-B2	138.0	8.8	2.6	0.6	0.3	0.1	0.0
B3	95.8	8.6	2.7	0.6	0.2	0.1	0.0
C4	135.1	22.5	7.9	2.2	1.0	0.4	0.1
C5	117.1	19.5	6.8	1.9	0.9	0.3	0.1
AB6	193.1	12.3	3.7	0.8	0.4	0.1	0.0
B7	150.5	13.4	4.3	0.9	0.4	0.1	0.0
B-C8	127.7	17.6	6.0	1.6	0.7	0.3	0.1
C-D9	189.1	28.1	10.1	3.5	1.7	0.7	0.2
D10	210.7	29.3	10.7	4.2	2.1	0.8	0.2
B11	210.7	18.8	6.0	1.3	0.5	0.2	0.1
C12	250.8	41.8	14.7	4.1	1.8	0.7	0.2
C13	159.6	26.6	9.3	2.6	1.2	0.4	0.1
D14	243.1	33.8	12.4	4.8	2.4	0.9	0.2
D15	210.7	29.3	10.7	4.2	2.1	0.8	0.2
D16	632.1	87.8	32.2	12.5	6.2	2.4	0.6
D17	451.5	62.7	23.0	9.0	4.4	1.7	0.4
D18	287.3	39.9	14.7	5.7	2.8	1.1	0.3
D19	243.1	33.8	12.4	4.8	2.4	0.9	0.2
D20	210.7	29.3	10.7	4.2	2.1	0.8	0.2
E21	877.9	173.7	73.2	35.3	21.9	10.4	3.3
E22	627.1	124.0	52.3	25.2	15.6	7.4	2.3
D23	287.3	39.9	14.7	5.7	2.8	1.1	0.3
D24	243.1	33.8	12.4	4.8	2.4	0.9	0.2
D25	210.7	29.3	10.7	4.2	2.1	0.8	0.2
F26	1404.7	243.1	117.1	56.4	33.3	15.6	5.9
F27	1003.3	173.7	83.6	40.3	23.8	11.1	4.2
E28	399.1	78.9	33.3	16.0	9.9	4.7	1.5
D29	243.1	33.8	12.4	4.8	2.4	0.9	0.2
D30	210.7	29.3	10.7	4.2	2.1	0.8	0.2

Guidance to reduce air exposures

- Use fine **particle measures as surrogate** of exposure to air pathway.
- Apply an air exposure **screening model** to determine time and intensity of high inhalation exposures
- Reduce outdoor activity during the high risk periods
- Remove children from polluted sources
- Remove particles and gases from inside of houses near sites. Consider use of filters and air cleaners.
- Inventory near by emission releases from each location of natural gas processing.
- Maintain an Environmental and **a health diary**

"Three good things to do"

- Clear the Air
  - Manage air ventilation of house
  - Do not track in toxic dust
  - Clean your house often
- Use clean water
  - Do not rely on one time water tests
  - Use clean water for cooking, showering and drinking
  - If water use appears to burn skin or causes rash after showers stop using and see a doctor
- Look for changes
  - Keep a health diary
  - Remember- children, the elderly and chronically ill are sensitive
  - Check water often for changes in conductivity
  - Learn to monitor air in your house

What can the people do?

- Exposure Reduction Interventions
  1. Improve your water quality
  2. Monitor air quality, filter indoor air
  3. Reduce exposure to contaminated surfaces, indoors and outdoors
  4. Reduce noise/light pollution in home
  5. Relocate (temporarily/permanently)

What can The Environmental Health Project do?

- Perform a Household assessment
  1. Air and water monitoring
  2. Model air pollution sources
  3. General and specific water tests
  4. Noise/light pollution
  5. Health assessment

SWP-EHP Case Study/Health Assessment approach

- Needs Assessment
- Health Provider and patient interviews
- Assessment of information on plausible routes of human exposure
- Qualitative examination of chemicals released
- Uncertainty analysis
- Characterization of plausible pathways of exposures
- Recommendations to ameliorate human exposure.

SWPA EHP Team,

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