

# SWPA-Environmental Health Project

Health /Exposure findings for air and water

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Webinar

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**EHP's 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.**

# A public Health Approach (Basic four steps)

- Needs assessment
- Proposals to address the problem
- Implementation
- Review and evaluate

# 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

# Needs Assessment (2012)

## Concerns of Medical Providers

### HEALTH ISSUES

- Noted elevated blood pressure in children
- Seeing failure-to-thrive in children
- Epistaxis/nose bleeds and skin conditions that look like acne
- Other lesions appear similar to skin cancers
- Priorities are the tests for air quality, heavy metals and water quality
- Sick and dying pets and live stock
- Children who need pediatric assessments are being sent to Occupational Physicians
- Need to be seen by a dermatologist mentioned often

### PROVIDER ISSUES

- People are “doctor shopping” for help
- Radioactive materials are a concern.
- Priorities are the tests for air quality, heavy metals and water quality
- People freely provide urine samples but an protocol is needed

### NEEDED ACTIONS

- Follow-up needed on health and wellbeing
- ‘Do not shower at home or drink water when there is a reason for concerns’
- The air is a problem, (Diesels ,Odors, Dust)
- School nurses should be consulted
- Some sort of disease registry would be helpful

### COMMUNITY ISSUES

- Some people who live close to sites feel powerless
- Some people are becoming “ industrial refugees”
- Past coal mining as a compounding effect
- Logistical issues when trying to relocate
- Lack of insurance limits opportunity for follow-up assessments
- **Limited trust** in all Health and Environmental agencies

# 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%

# 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

# EHP Pilot Data: Human Health Impacts

common complaints from the client population:

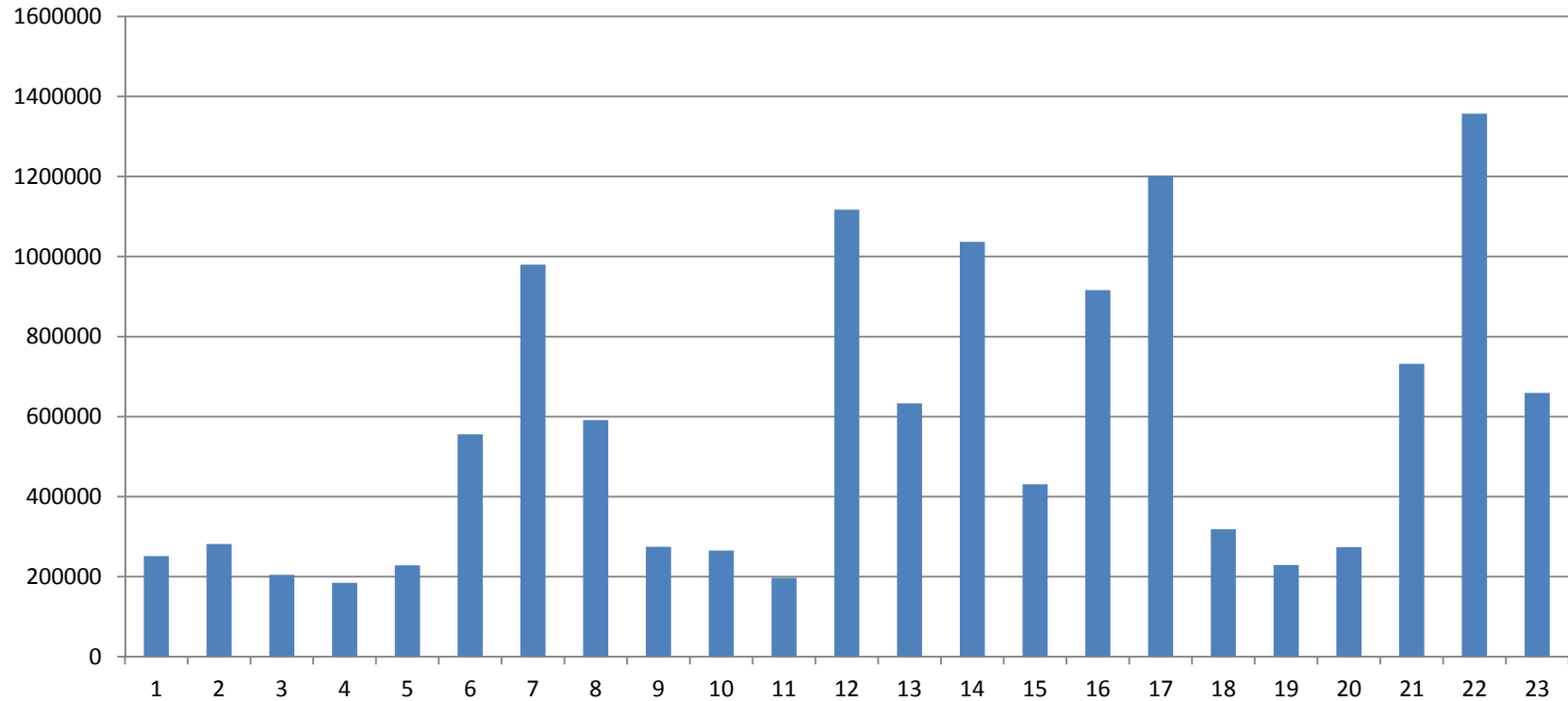
- Anxiety/Stress
- Nervous system including headaches and dizziness
- Cardiac symptoms
- Urinary symptoms
- Eye and throat irritation
- Low birth weights and APGAR Scores
- Reproductive concerns



## EXPOSURES ARE HIGHLY VARIABLE

Levels of salt ions (Na,CL,Ca,Ba) reported in Wyoming 20 drinking water wells near gas extraction sites.

*(The these results are comparable to the conductivity values)*

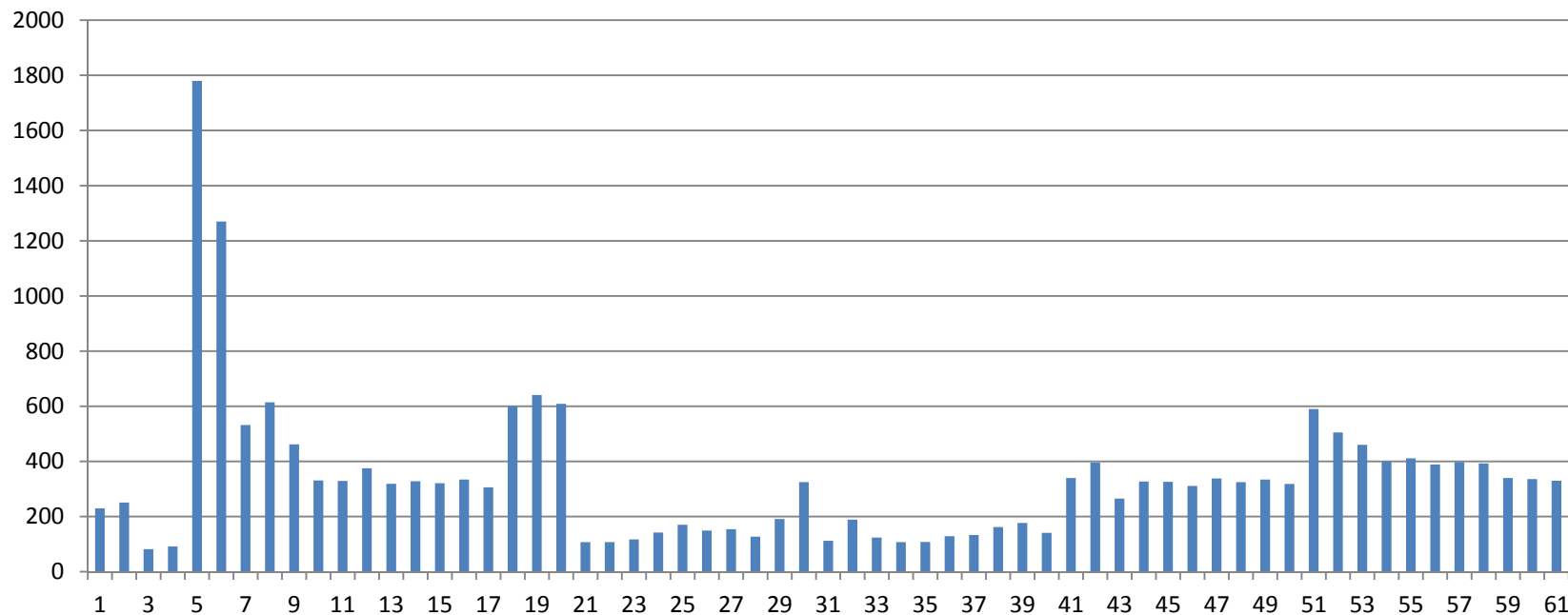


## EXPOSURES ARE HIGHLY VARIABLE

The Conductance reported in 13 Wells from Pennsylvania Drinking water wells ( Average 337.8) in regions with active natural gas extraction.

*SWPA-EHP recommends testing for Conductance weekly to protect potential drinking water exposure pathway from gas extraction wastes  
(Typical water is <500: Frack pits reported at 60,000 to over 80,000)*

### Conductance

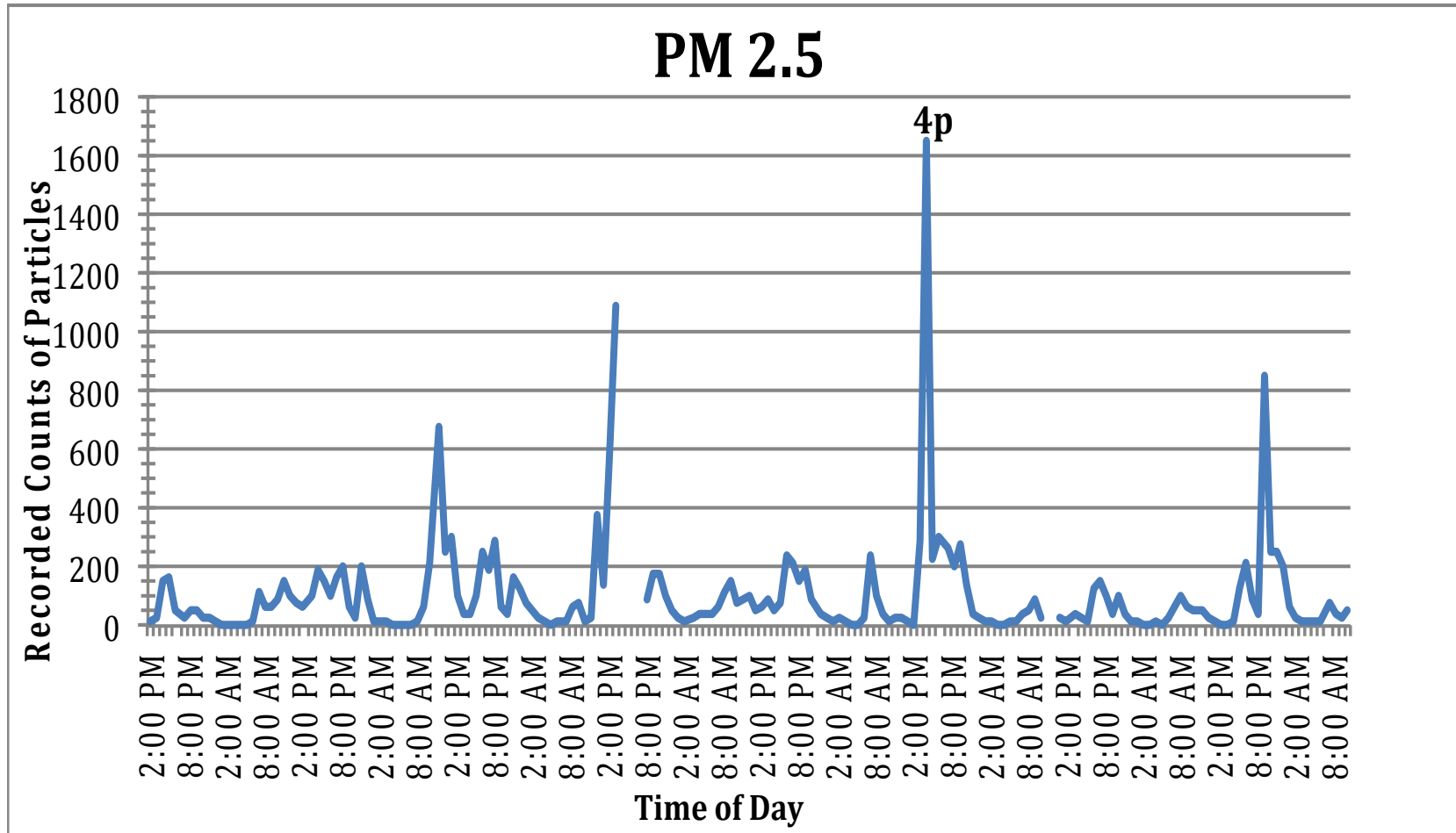


**EXPOSURES ARE HIGHLY VARIABLE**



**SWPA-EHP**  
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SOUTHWEST PENNSYLVANIA ENVIRONMENTAL HEALTH PROJECT

**A one-week sample of Dylos results for a house monitored in March 2013**



**Summary of peak PM2.5 count values for each house, given in number of hours, % total hours, times of day, and maximum peak value.**

(Median 50 cts/0.01ft<sup>3</sup>)

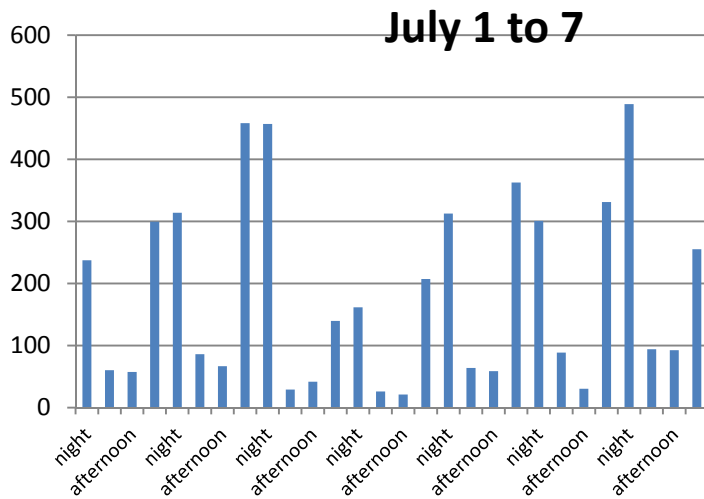
*6 hour average: night, morning, afternoon, evening*

House	Number of hours with peaks	% of total hours with peaks	Times of day of peaks*	Maximum Peak Value
1	12	8.5	N	2711
2	11	5	M, N	756
3	3	2.5	M	171
4	1	0.5	N	201
5	8	2.5	A, E	556
6	11	7.7	A, E, N	576
7	31	8.7	M, A, E	1654
8	29	15	M, A, E	991
9	9	12.6	M, E, N	1057
10	23	32	M, A, E, N	844
11	7	16	M, E	3846
12	2	1.4	E	203
13	3	4.3	M	164
14	57	34.3	M, A, E, N	1761

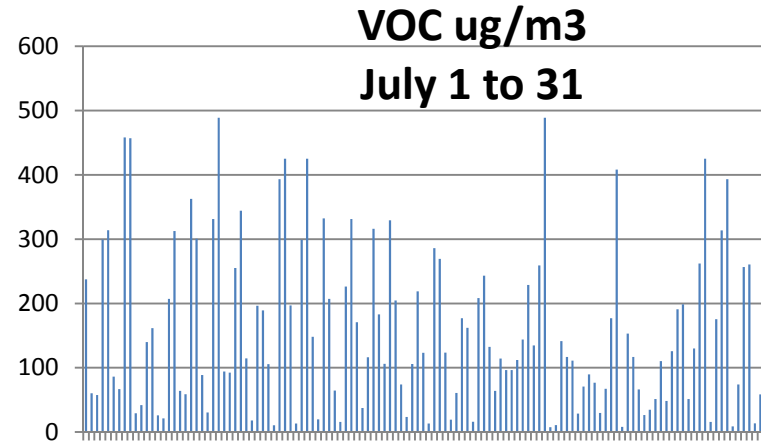
# EXPOSURES ARE HIGHLY VARIABLE

## Modeled Hourly VOC Concentrations 1 km from compressor (6 hr averages)

Variation in  
weekly air



Variation in  
monthly air





**Statistical demonstration of the effects of averaging the variability of exposures that occur in 6 hour increments, for each month of the year. Based on Pittsburgh, PA weather data in 2012.**

<b>Month</b>	<b>average*</b>	<b>6 hour average for 75<sup>th</sup> percentile</b>	<b>6 hour average for 90<sup>th</sup> percentile</b>
January	43	50	132
February	58	85	123
March	58	88	137
April	52	75	148
May	81	124	189
June	66	103	155
July	59	115	157
August	89	147	206
September	85	136	177
October	80	131	189
November	80	111	167
December	74	111	157
<b>Yearly Average</b>	68.5		

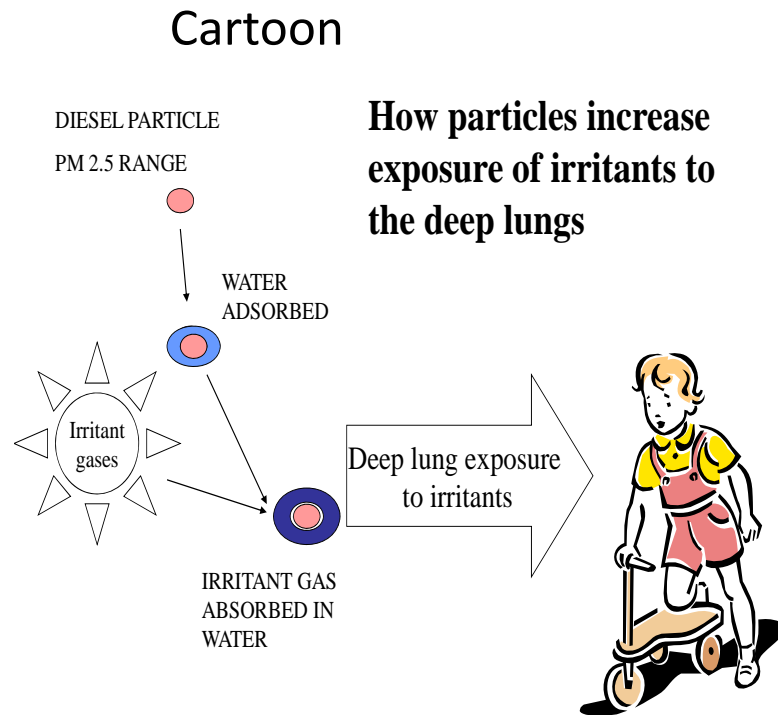
\*All 6 hour periods for each month

# 12 emissions of concern for immediate toxic responses

1. Barium, Arsenic
2. Fluoride salts\*
3. VOCs \*
4. PAHS
5. BTX\*
6. Methylene chloride,  
(halogenated alkanes)\*
7. Acetaldehyde/Formaldehyde
8. Fine particulate matter\*
9. Carbon monoxide
10. Glycols\*
11. Silica dust\*
12. Radium and radioactive decay  
products\*



## A serious synergistic toxic action; Fine particles increase transport of toxics into deep lung



- Bypass protective actions in upper respiratory tract
- Action is related to size and number of particles
- Increased surface area increases toxic responses
- Water solubility increases the attachment to particle surface
- Particles do not need to be reactive
- 3 to 20 fold increase in uptake
- PM prevalent toxic at UCGD Sites





## **Conclusions and Suggestions**

- Estimation of safety will require nested protocols that measure “real time” exposures.
- Protocols are needed
  - 1) to measure exposure patterns using surrogate chemicals
  - 2) to characterize the components of mixtures using sensitive canister or air badge sampling, and
  - 3) to characterize short-term local air dilution due to weather conditions
- Residents will need to maintain time structured daily diaries based on relevant physiological metrics