SWPA-Environmental Health Project

Measurement and assessment recommendations for air and water

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Background

Addressing the paradox between pure research and health investigations

- A common theme preventing evaluation of health and environmental risks is the absence of pre-drilling information.
- Such information is rarely available for evaluation of health disease outbreaks.
- Alternatives to the “before and after” comparisons used in academic research.
  - Dose -response comparisons
  - Proximity and intensity location comparisons
  - Comparison to the general populations
  - Assessment of time course of exposures and disease
  - Monitoring health and exposures of the communities

A “Health-Based” approach must:

- Protect of the health and safety of the exposed populations. (IRB approval)

- Be based on refined quantitative and qualitative measures of exposure.

- Development of a “case description” by identification and evaluation of the most intensely affected populations

Quantitative and qualitative measures of exposure.

- **Air and water levels vary over time, space and UNGD activity.**
  - **"Understanding Exposure from Natural Gas Drilling puts Current Air Standards to the Test",** ***Reviews on Environmental Health*****. (EHP.org)**
- Identify persistent compounds released into environment.
- Identify site specific levels of emissions
- Select surrogate chemical measures based on:
  - Acute and sub-acute actions
  - Practical monitoring opportunities (Hourly PM monitors)

Detailed assessment of health impact

- **SWPA's nurse practitioner conducts exams and consultations**
  - **Standardized health intake protocols**
  - **Exposure measures**
  - **Information for/from primary care providers**

- **People concerned that their health may be compromised by nearby gas drilling activities.**

- **Provides immediate referrals, and helps clients navigate the health care system.**

- **Consults with occupational and environmental health specialists about medical conditions**

Further Analysis of EHP Data Related to Shale Gas Drilling

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

- Temporal relationship – Development of symptom (or exacerbation of pre-existing symptom) *after* onset of gas extraction activities.
- Plausible exposure – Identifiable exposure source in proximity to individual experiencing symptoms.
- Absence of more likely explanation – 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.

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.

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Health findings and air monitoring reports are in conflict

Health Findings

- Reports of acute onset sequale in humans:
  - respiratory
  - neurologic
  - dermal
  - vascular bleeding
  - abdominal pain
  - nausea and vomiting

Monitoring Reports

- Assurances from air monitoring data that untoward exposures are not occurring.
  - Barnett Shale, Texas (Bunch et al- 2013)
  - Marcellus Shale Ambient Air sampling (PA DEP 2010)
  - City of Fort Worth Natural Gas Air Quality Study (ERG 2011)

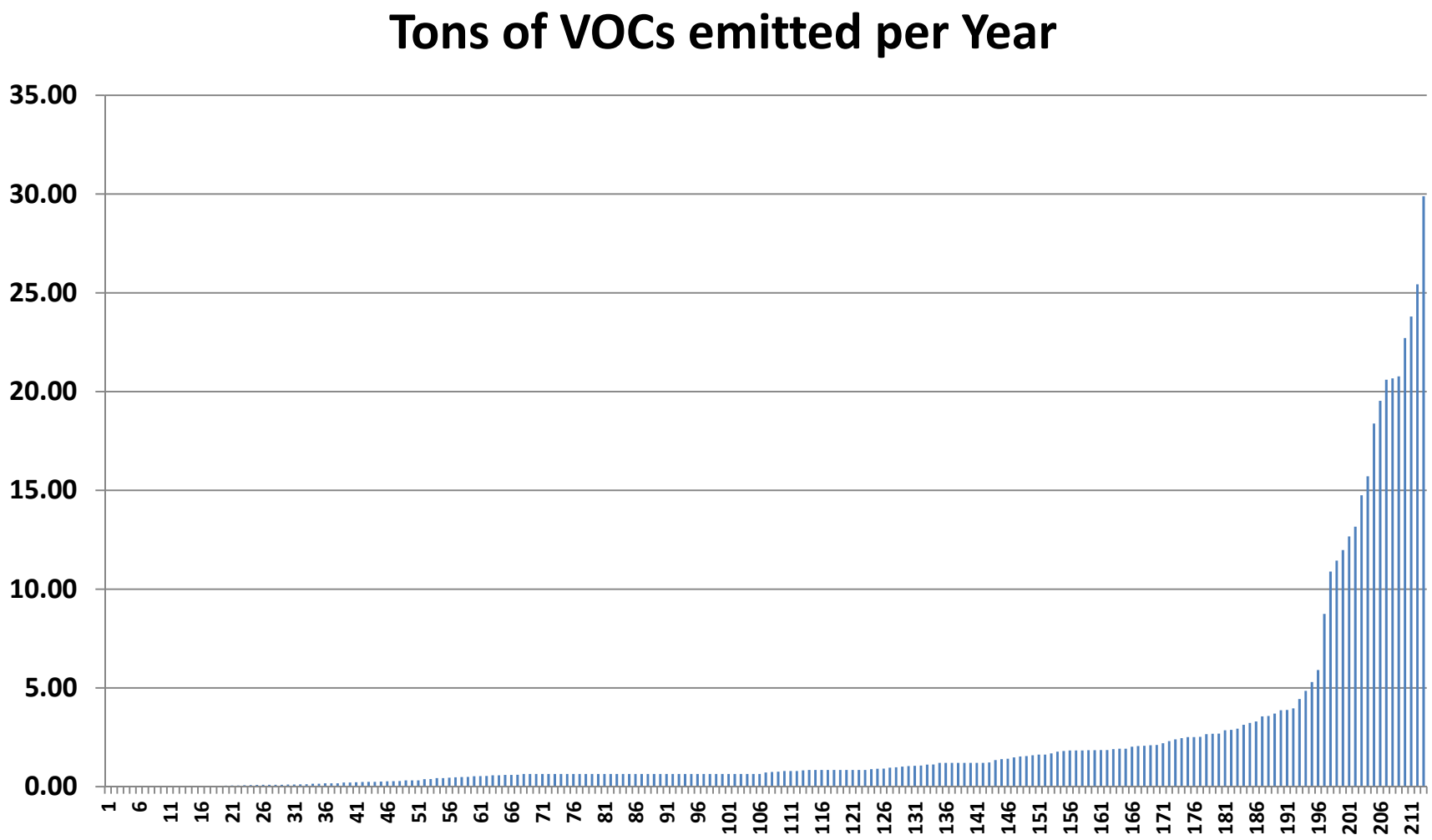
Findings from Washington County Mental Health Assessment using SF-36 and Index of Social Control: (Convenience Survey of General Health)

- 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.

- 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.

Emissions from UNGD facilities with in 5 km of 240 residents



Proximity and Density to UNGD Facilities

- 215 residences (80%) are within 5 km of one or more UNGD facilities.
- 107 residences (40%) have over 20 facilities with in 5 km
- 35 residences (15 %) have at least one facility with-in 1 km.

Comparison of the durations and intensity of emissions at a modeled residence

* estimates for a residence with three facilities within 5 km.

UNGD Source	**Days**	**Average/max ug/m3 VOCs***	**Frequency of peaks***
Drilling	5 months	19/465	5 to 6 per month
Hydrofracking	15 days	13/186	10 per month
Flaring and finishing	5 months	19/349	6 per month
Producing	Indefinite	21/425	6 to 7 per month
Compressor/Processing	Indefinite	10 – 56/ 169-450	9 to 16 per month

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

Measurement and assessment recommendations

1) Comprehensive evaluation of the signs and symptoms from at risk populations to obtain a " Case Description".

2) Characterize the Exposures with respect to:
   - A) Frequency, duration and intensity
   - B) Components of the mixture
   - C) Source identification
   - D) Health based comparison values
   - E) Local diurnal weather dilution

3) Assess plausible links between exposures and current and future health effects.

4) Follow exposed populations to determine chronic sequale.

BUT
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)

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 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

Medical Health Evaluation

(Possible components)

- **Structured Health Intake Assessment**
- **Self administered Health Assessment**
  - **SF 36,**
  - **Index of Social Control**

- **Toxics evaluation, blood or urine.**
  - **There is no known toxic screening protocol**
  - **Complete Blood Counts**
  - **Metabolic Panel**
  - **Thyroid Panel**

- **Support tools**
  - **“Three Good Steps”**
  - **“How’s The Weather”: local weather model.**
  - **“ Take Steps to Health”**
  - **Real time air and water assessment tools**

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For More Information

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