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Presentation on Hydraulic Fracturing Epidemiology Research Studies

Prepared by:

University of Pittsburgh School of Public Health

Under Contract with the Pennsylvania Department of Health

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For further information and access to the full report documents go to:

PA Health and Environmental Studies Website

<https://paenv.pitt.edu/>

Presentation Overview

Background: Orientation to topic

Major Findings: What did we find?

Health specific studies & results

- Asthma
 - Childhood cancer
 - Birth outcomes
-
- Strengths & Limitations

Background

Community Concerns & PADOH Contract



Wolf Administration Awards \$2.5 Million Contract To University Of Pittsburgh To Research Health Effects Of Hydraulic Fracturing In Pennsylvania

12/22/2020

Harrisburg, PA - The Wolf Administration today announced that a \$2.5 million contract is in place with the University of Pittsburgh Graduate School of Public Health to conduct research on the potential health effects of hydraulic fracturing in Pennsylvania.

70°
Mostly Cloudy

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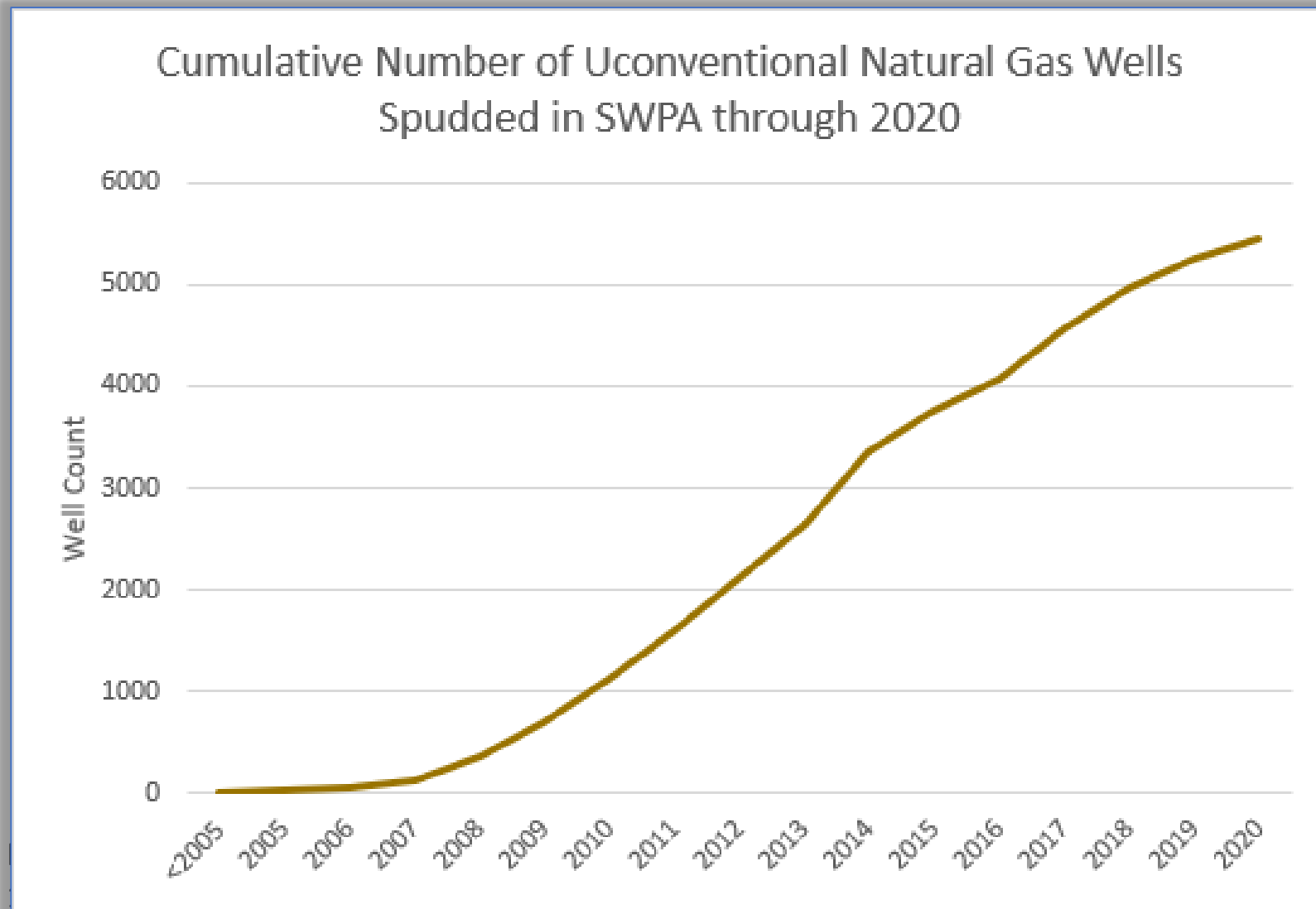
Explains cancer cluster results;
os call on Gov. Wolf, DOH to



hington County and Canon-McMillan
r of cancer cases in Southwestern
a Department of Health study that

Background:

Unconventional Natural Gas Development in Southwest PA



Overarching Question Is....

Does **living near** unconventional natural gas development (UNGD) activities or other environmental hazards in Southwest PA **increase the risk** for **specific health issues**?

What *health issues* did we look at?

2010 - 2020

- Adverse Birth Outcome
 - Prematurity (22-36 wks gestation) – **born too early**
 - Small-for-gestational age (< less than 10th %) – **born too small**
 - Reduced birthweight
- Asthma exacerbation
 - Severe: doctor’s visit that required medication
 - Hospitalization
 - Emergency room visit
- Childhood Cancer (0-19 yrs of age, Ewing sarcoma up to age 29)
 - Leukemia
 - Lymphoma
 - Malignant Brain Tumor
 - Malignant Bone Tumors (includes Ewing’s family of tumors)

PA DOH Birth Registry¹
(185,849 Births)

UPMC Medical Records²
(46,676 Exacerbations)

PA DOH Cancer Registry³
(498 All cancers)

1. Bureau of Health Statistics and Research, Department of Health, Pennsylvania

2. UPMC electronic health records: Department of Biomedical Informatics, Clinical and Translational Sciences Institute, University of Pittsburgh

3. Pennsylvania Cancer Registry, Department of Health, Pennsylvania

What did we find?

Asthma Exacerbations: People with asthma living close to active wells during the production phase had an increased chance of their asthma getting worse.

Childhood Cancer: Children living close to active wells or near many wells had a higher risk of developing lymphoma. We did not find any increased risk for other childhood cancers, including Ewing's family of tumors.

Birth Outcomes: Babies whose moms lived near active wells were 20-40 grams (about 1 ounce) smaller at birth. In most cases, this poses little health risk.

Our studies controlled for many known risk factors. Some of these were:

Birth Outcome

- Maternal age
- Maternal education
- Smoking before or during pregnancy
- Gestational diabetes
- Community socioeconomic deprivation index

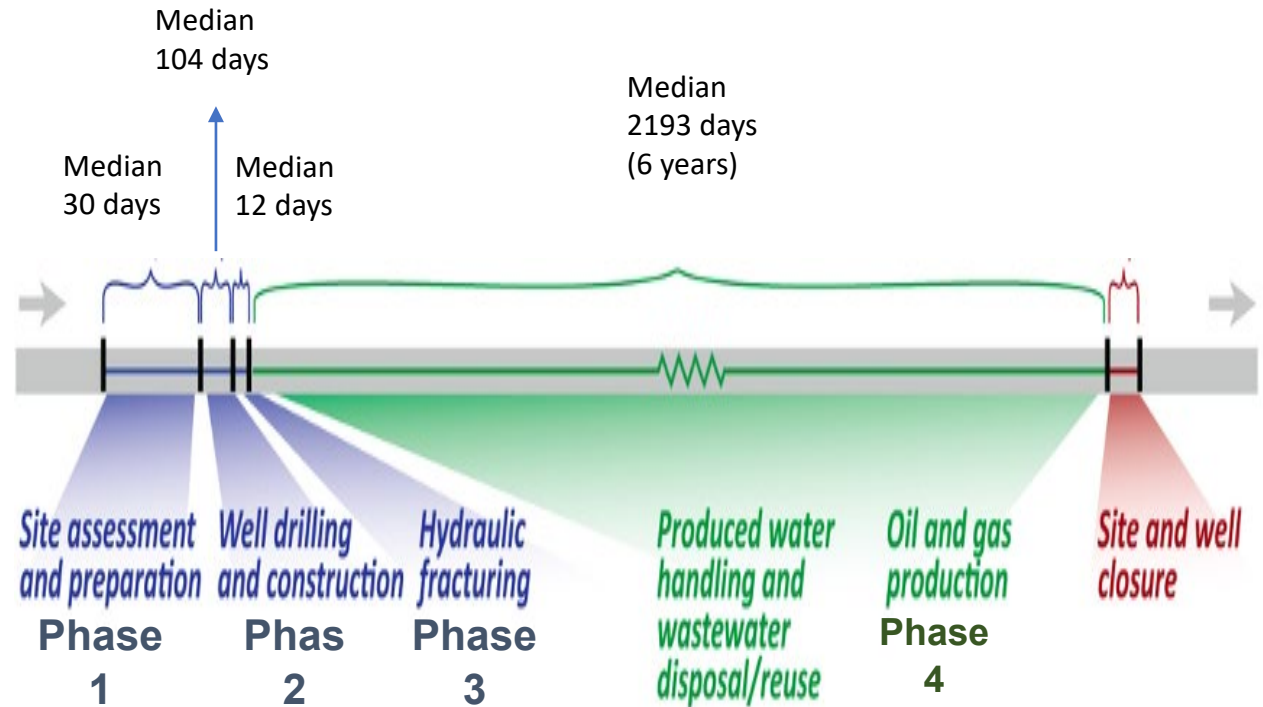
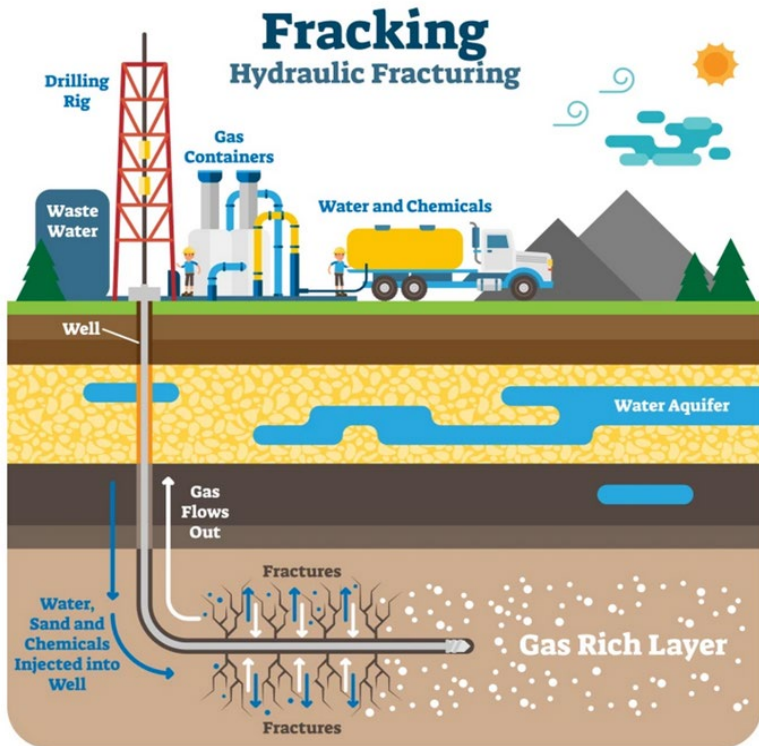
Asthma

- Family history of asthma
- Patient age
- Season
- Smoking
- BMI (kg/m²)

Childhood Cancer

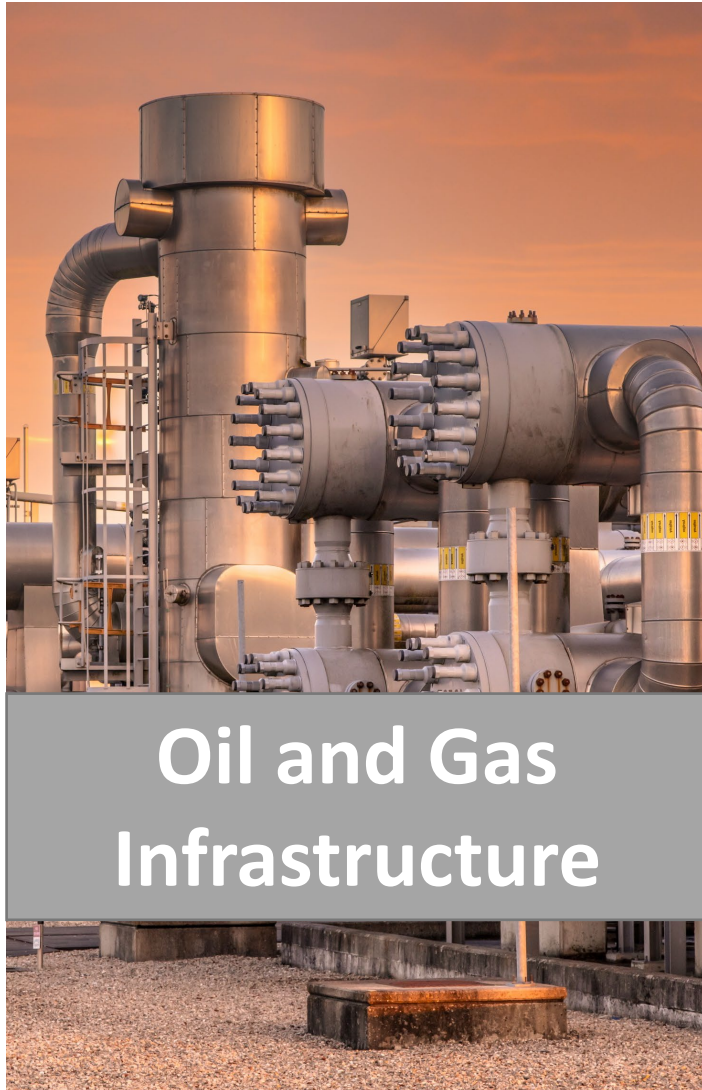
- Smoking during pregnancy
- Gestational age
- Maternal age at birth
- Maternal education
- Birth weight

What is *unconventional natural gas development* (UNGD)?



Well pad location, spud date, depth, activity metric, production volume, etc – PA-DEP, PA-DCNR online databases.

Additional Exposures Considered

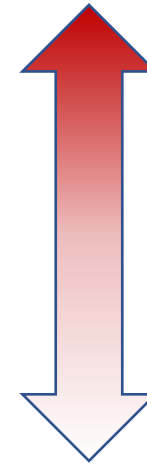


Hierarchy of Data for Exposure Assessment: *How do we measure exposure to hazardous substances?*

1. Quantified individual measurements
2. Quantified ambient measurements
3. Quantified surrogates
4. Distance, density and duration
5. Distance, density or duration
6. Residence or employment proximity
7. Residence or employment in geographic area



**Most Accurate
Least Uncertain
Hardest to do**



**Least Accurate
Most Uncertain
Easiest to do**

What were the time frames of exposure considered to be at risk?

Asthma exacerbations: 1 day prior to the event

Birth Outcome: 9 months of pregnancy

Childhood Cancer:

- 9 months of pregnancy
- Birth up until the cancer diagnosis



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Asthma Exacerbation Study

What We Found.

If you have asthma, you would have a 4 to 5 times greater chance of having an asthma attack by living near UNGD wells during the production phase.

Asthma Endpoints

Summary of Associations

UNGD Activity	Severe Exacerbations	ED Visits	Hospitalizations
Well preparation	None	None	None
Drilling	None	None	None
Hydraulic fracturing	None	None	None
Production	Strong	Strong	Strong



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Childhood Cancer Studies

What We Found.

- If a child had lived within 0.5 mile from a well they had a higher chance of developing cancer. This when we consider all types of cancer grouped together.
- Raises the question “*Which type(s) of cancer*”
- The chances of a child developing lymphoma were 5 - 7-fold greater when living within 1 mile of a well compared to children with no wells within 5 miles. Data suggests that highest risk was for those living closest and with highest density of activity.
- It is important to point out that lymphoma is a fairly rare cancer with an incidence of 0.0012% (12 thousandth of a percent) in children. Our study estimates that risks within 1 mile proximity to wells ranges from 0.0060% to 0.0085%
- We did not find associations for any other childhood cancers and UNGD, including Ewing’s family of tumors.

Childhood Cancer Study

- We examined 498 cases of childhood cancer from the 8 SW PA counties we focused on.
- Cases were identified from PA Cancer Registry records from 2010 to 2019 and compared to 498 controls matched for age, sex, race, and county using birth record data.
- Residence refers to address where the mother lived when the child was born.
- For any of the positive associations we found the window of birth to diagnosis to be important and not time corresponding to pregnancy.

Ewing's Family of Tumors

- There were 20 Ewing's cases identified as eligible in the 8-county study area using PA Cancer Registry from 2010 to 2019.
- It is the rarest of all the types childhood cancer we looked at.
- No evidence of association with residence within 5 or < miles of a well or overall UNGD density near the home
- There were no associations for Ewing's with any of the other environmental hazards examined. (Superfund, TRI, O&G infrastructure, UMTRA)
- **IMPORTANT:** The analysis IS NOT designed to determine a "cancer cluster".

Childhood Cancer

Summary of Associations

Cancer Type	All	Lymphoma	Leukemia	Brain Cancer	Malignant Bone Cancer (w/ Ewing's)
Distance to at least one UNGD well (0.5 – 1 mile)	Moderate	Moderate	None	None	None
Cumulative well count	Moderate	Moderate	None	None	None
Overall UNGD activity	Moderate	Moderate	None	None	None
Oil & gas infrastructure	None	None	None	None	None
Other industrial activities	None	None	None	None**	None

**Except for a suggestion of an association between Uranium Mill Tailing Remedial Action sites and brain tumors.



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Birth Outcomes Study

What We Found.

- **Proximity to UNGD was associated with small effect on fetal growth.**
 - About a 20 – 40 gm reduction in birthweight. (Likely not a major health risk)
 - Could contribute to the small elevation in risk for “small for gestational age”.
 - Again, this was most prominent for wells in the production phase.
- **Chance of being born prematurely was not specifically associated with UNGD.**
- **Living in areas of high ambient levels of particulate (PM_{2.5}) air pollution (from any source) was associated with increased chance of being born prematurely.**
 - This has been consistently observed by other researchers.

Birth Outcomes

Summary of Associations

Type of Exposure	SGA	Preterm birth	Reduced term birthweight
Cumulative well count	None	None	Moderate
UNGD Activity			
Well preparation	None	None	None
Drilling	None	Limited	Limited
Hydraulic fracturing	None	None	None
Production	Moderate-Strong	None	Strong
Non-Well Exposures			
Compressor stations	Limited	None	Moderate
Impoundment ponds	None	None	None
Facilities accepting oil & gas waste	Limited	None	Moderate
PM2.5	None	Moderate	None



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Summary

Strengths of studies such as these

- Large sample populations were included in the birth and asthma studies.
- Comprehensive space- and time-specific databases of UNGD and other environmental exposure based on existing data
- Some advancement in developing a metric that incorporated separation of specific stages of well development
- Controlled for multiple potential confounding factors



Limitations of studies such as these

- They examine **associations** with disease and not **causes** of disease.
- Rely on the quality of the existing data.
- Estimate associations for groups of people not, individuals.
- Assume *'All wells are created equal'* – do not include variability by source.
- Inability to accurately track changes in residential history after birth in all cancer cases.
- Do NOT identify what specific hazardous agent is associated with a health effect.

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Questions ?

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