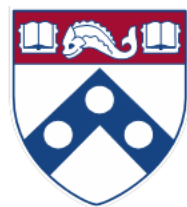


Chester Healthy Infant Research-to-Action Partnership (CHIRP)

George L. Gerton, PhD

Marilyn V. Howarth, MD, FACOEM

November 2019



Perelman
School of Medicine
UNIVERSITY of PENNSYLVANIA

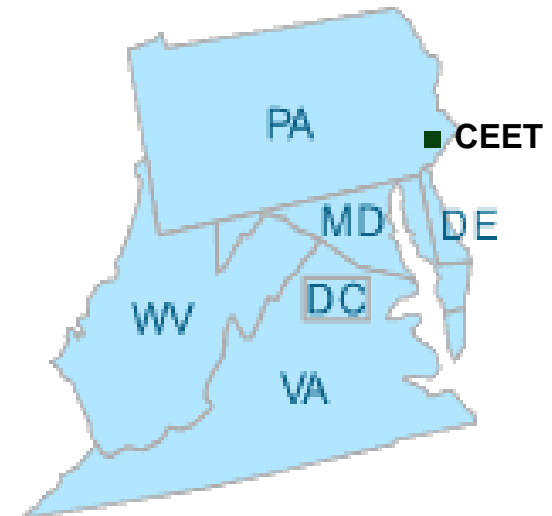
CEET

CENTER OF EXCELLENCE IN ENVIRONMENTAL TOXICOLOGY

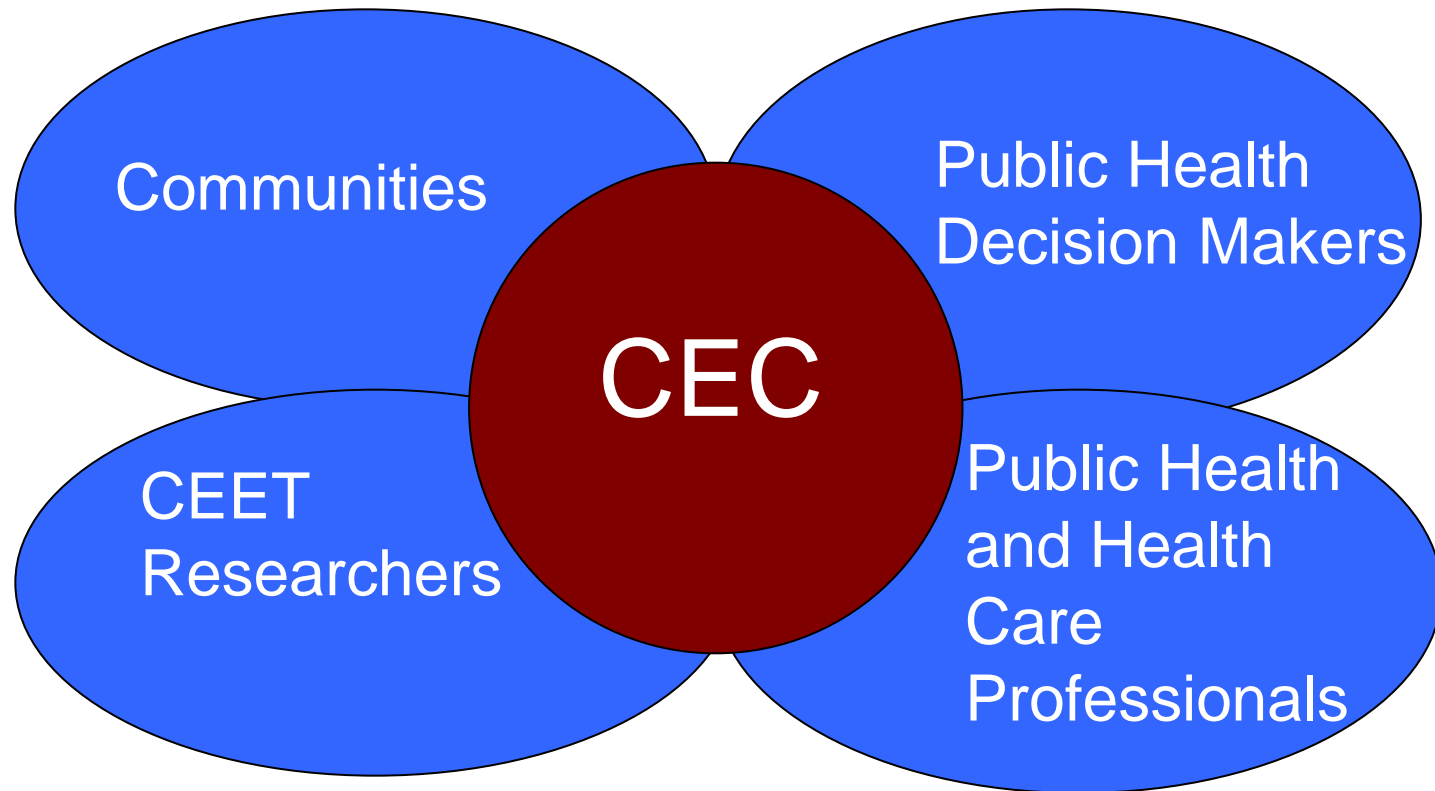
CEET Mission

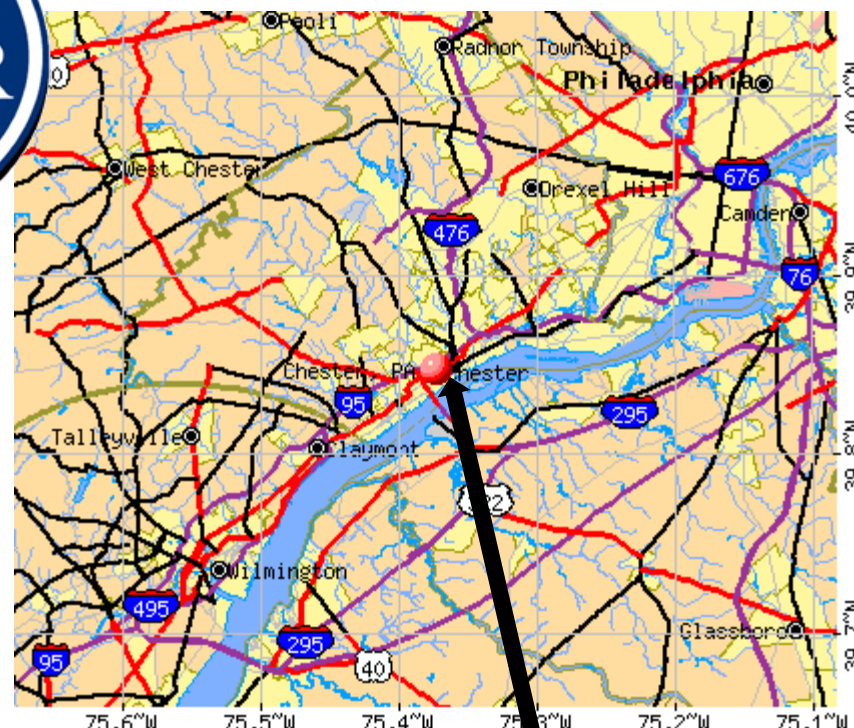
The CEET elucidates the mechanistic links between environmental exposures and human disease and translates its findings into action to improve the health of vulnerable individuals, and local, national and global communities.

CEET is the only NIEHS Environmental Health Sciences Core Center in EPA Region III



Community Engagement Core Promotes Relationships and Facilitates Action Among Stakeholders





34,000 residents

Median household income: \$29,000 while PA is \$56,000

Median property value \$67,000 while PA is \$170,000

36% residents live in poverty

Race 69% Black

10% unemployment while US is 3.6%

More than
170,000 vehicles
pass through
Chester on I-95
every day

Overburdened through Permitted and Unpermitted Industry



CEET Relationship with Chester

- ♦ **Community Engagement Core- Founding member of Chester Environmental Partnership**
- ♦ **Scientific and Health Technical Advisors**

- ♦ **Members**
 - ♦ **Delaware Valley Regional Planning Commission**
 - ♦ **Drexel Academy of Natural Sciences**
 - ♦ **PA DEP**
 - ♦ **Multiple industries in Chester**
 - ♦ **EPA Region 3**
 - ♦ **University of Pennsylvania**
 - ♦ **Widener University**
 - ♦ **Swarthmore College**
 - ♦ **Chester Crozer Hospital**
 - ♦ **Chester City Government**
 - ♦ **Sierra Club**
 - ♦ **Chester Residents**
 - ♦ **Penn Future**
 - ♦ **Penn Environment**
 - ♦ **Clean Air Council**
 - ♦ **Delaware Riverkeeper**
- To improve and sustain the quality of life, cleaner and healthier environment for the residents of Chester and the Commonwealth, while attracting positive economic development, sustainable growth, economic opportunities for the residents of Chester and reducing emission and negative environmental exposures to the citizens through collaborative partnerships.*



Chester Environmental Partnership

Chester birth weight disparities (2012-2016)

Birth weight category	Chester City (n=2,767)		Delaware county (n=33,057)	
	<u>n</u>	<u>%</u>	<u>n</u>	<u>%</u>
< 1,500 g Very low birth weight	85	3.1	628	1.9
< 2,500g Low birth weight	362	13.1	2943	8.9

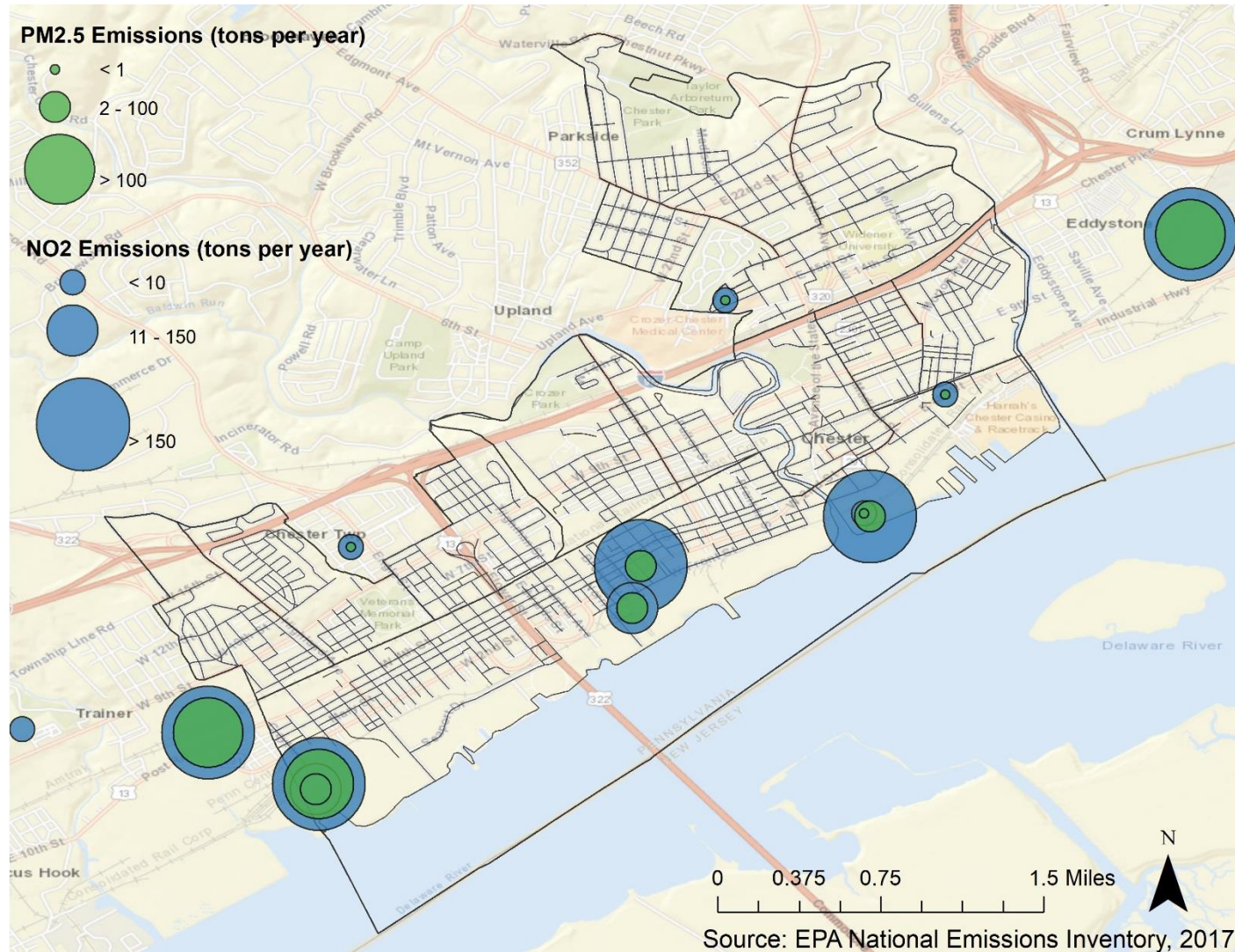
https://www.health.pa.gov/topics/HealthStatistics/VitalStatistics/BirthStatistics/Documents/Birth_BirthWt_MCD_2012_2016.pdf

Association of Air Pollution and Poor Birth Outcomes

- **Air pollution**
 - Higher levels of CO, NO₂, PM → lower birth weights
 - Third trimester exposure with preterm birth
 - Racial disparities in exposure, proximity to traffic and industry

*Andrews et al. Am J Ind Med. 1994; Stieb et al. Envir Res. 2012;
Pratt et al. Int J Environ Res Public Health. 2015; Liu, Y et al. BMC
Public Health, 2019*

PM 2.5 and NO2 Emissions from Point Sources in Chester, PA



Pilot Study: CHIRP

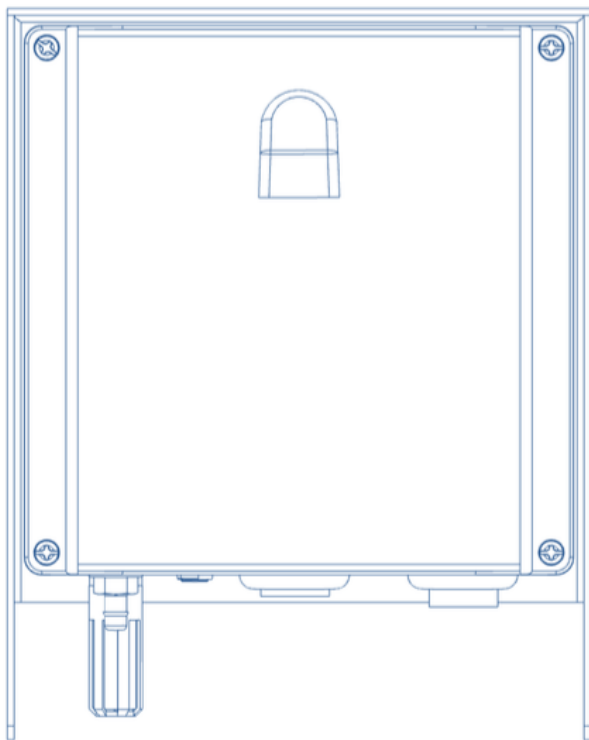
- ♦ **Overall hypothesis: Poor environmental conditions (air quality, heavy metal exposure, noise, and/or violence) negatively impact fetal growth.**
- **AIM 1. Measure air quality in residential areas where mothers are predicted to live.**
 - *Question: Do residential neighborhoods closer to sources of air pollution (incinerators, sewage treatment facilities, paper products plants, highway, etc.) have high levels of air pollutants?*
- **AIM 2. Perform spatial analysis of publicly available toxic release data and compare to the data gathered in this study.**
 - *Question: Are there “hot spots” of air pollution in different regions of Chester?*

Selection of Monitor: Aeroqual AQY-1

- ♦ **Air pollution compounds to measure:**
 - PM2.5 (industry, traffic, heating)
 - Ozone (secondary pollutant)
 - Nitrogen dioxide (traffic and urban heating)
- ♦ **Reviewed available literature and available devices**
- ♦ **Carefully considered testing performed by Air Quality Sensor Performance Evaluation Center (AQ-SPEC) program of the South Coast Air Quality Management District.**
- ♦ **Quality and price: Aeroqual AQY-1**

AQY 1

aeroqual[®]



Ozone



Particulate Matter
 $PM_{2.5}$



Nitrogen
Dioxide



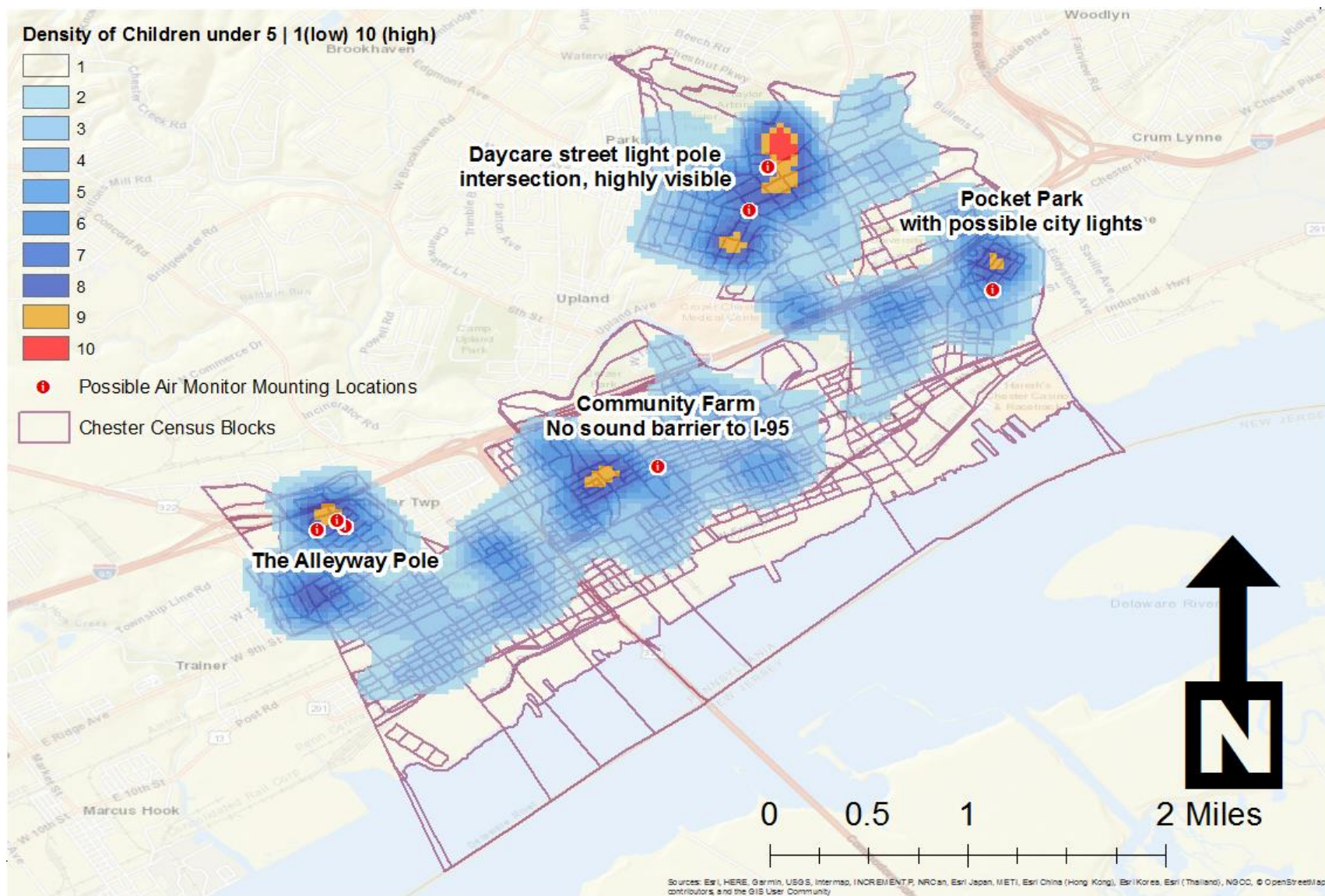
Temperature
Humidity & Dew Point



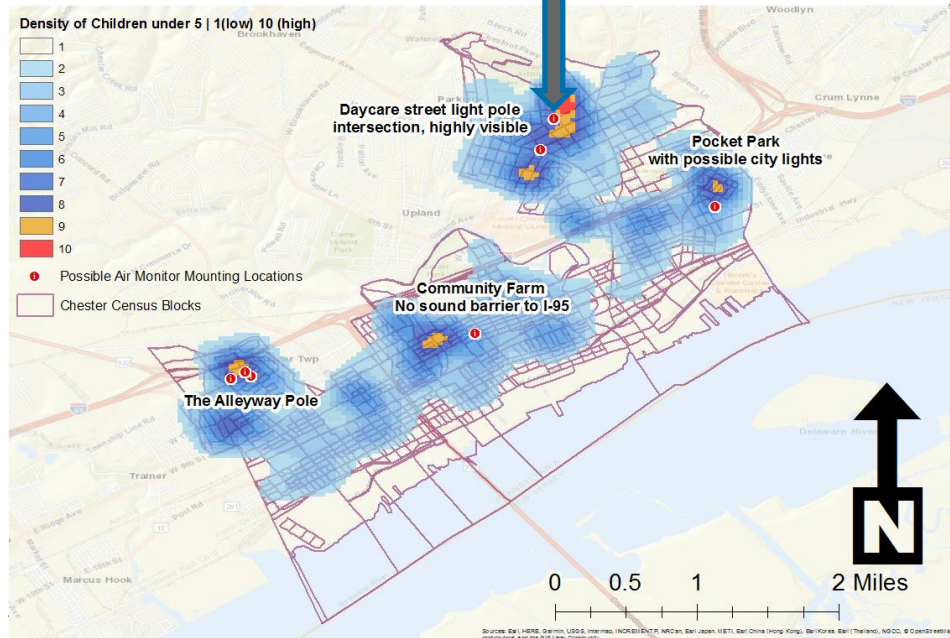
Steps to Project Initiation

- ♦ **Support of the Chester Environmental Partnership**
- ♦ **Approval of project by Chester City Council**
- ♦ **Gain approval of Chester City engineers for sites chosen**
- ♦ **Approval from the Chester Housing Authority**
- ♦ **Learn and troubleshoot the equipment**
- ♦ **Community-based assistant for battery charging/replacement**
- ♦ **Install and activate monitors**

Locations for Air Monitor Placement

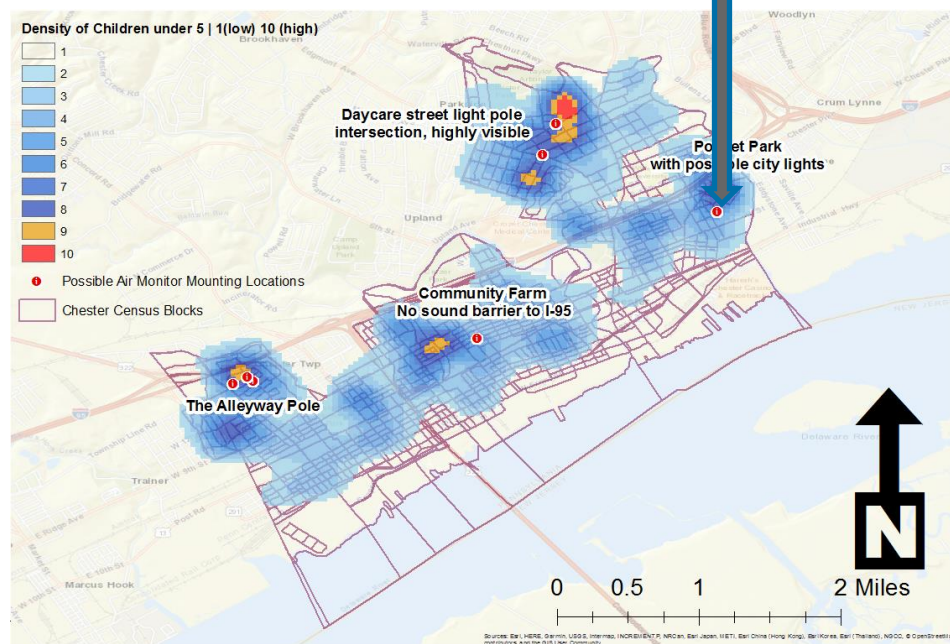


Street Light Edgemont ave and W 22nd street

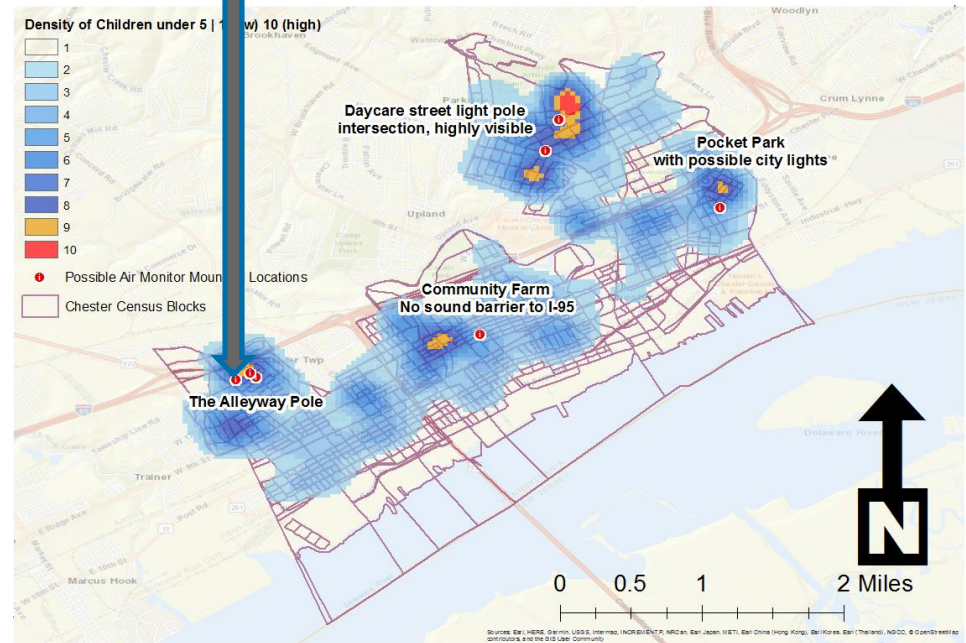




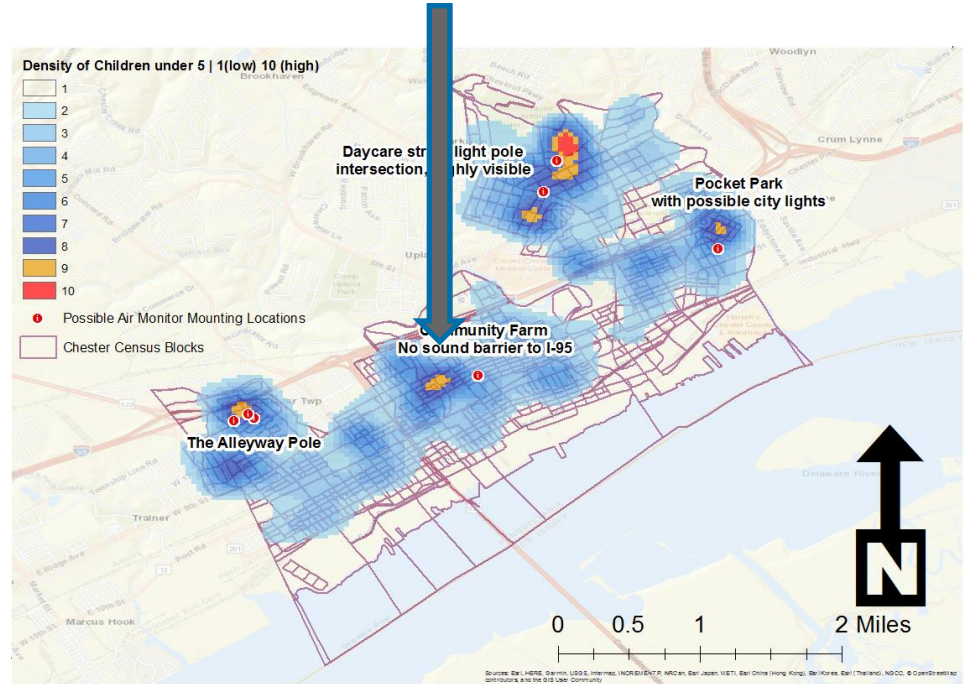
Pocket park with lights 9th St and Elsinore Place



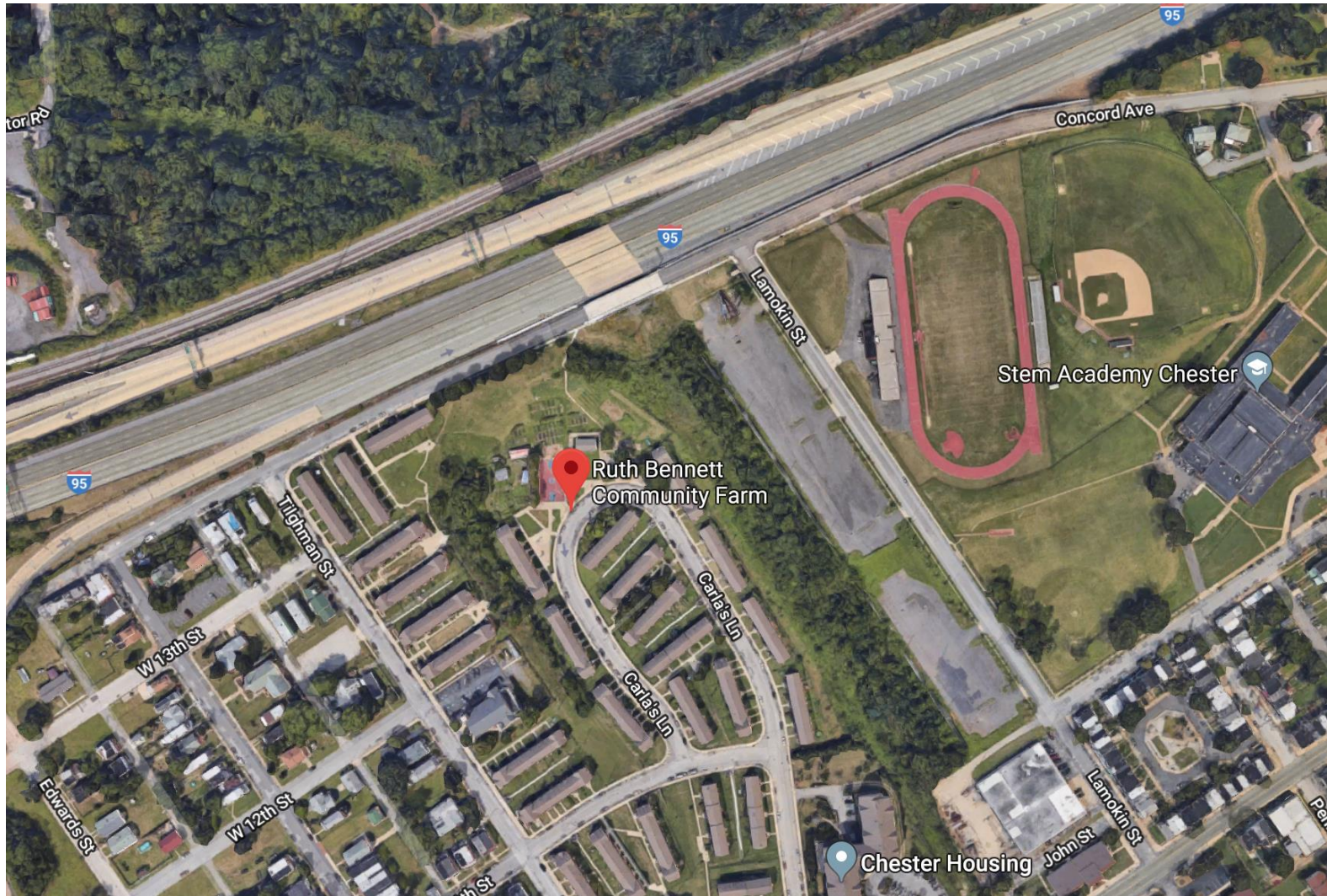
Residential alleyway pole Perkins St and Kane St



Ruth Bennett Community Farm

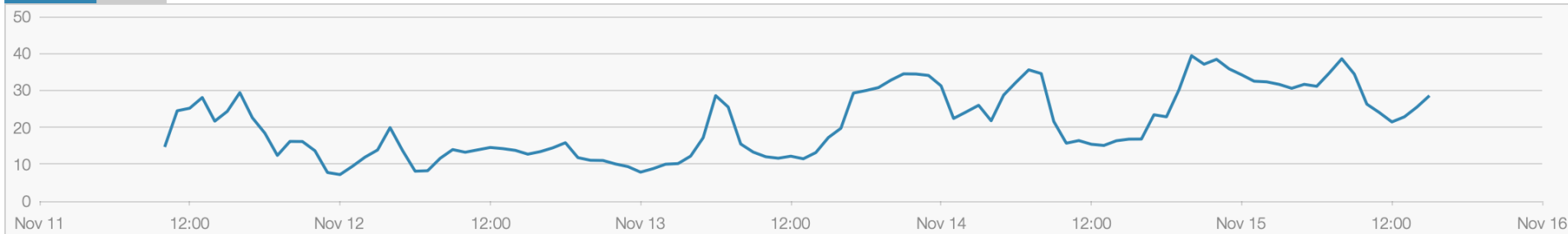


Chester Housing Authority

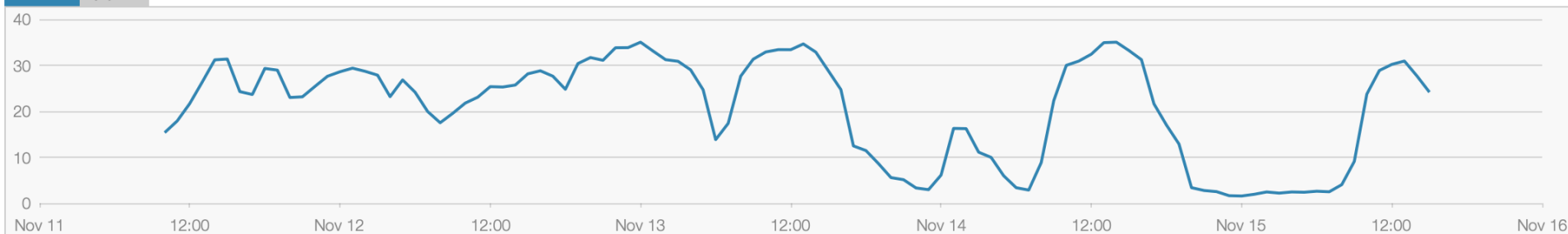


Sample Data (November 11-15, 2020)

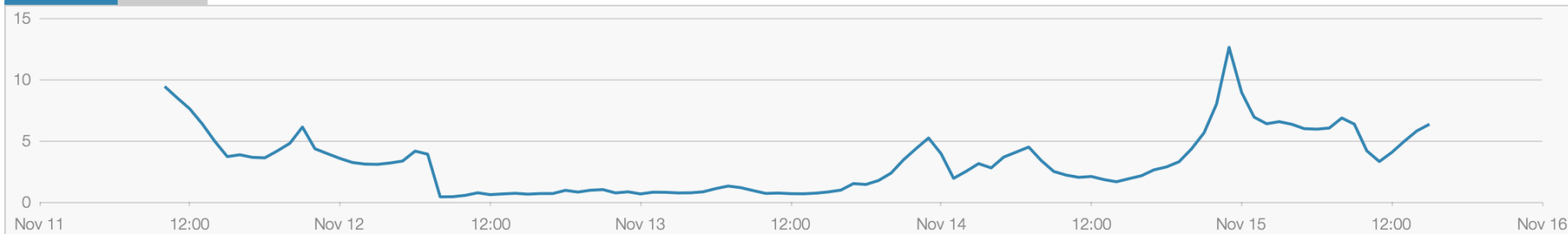
NO2 ppb



O3 ppb



PM2.5 $\mu\text{g}/\text{m}^3$



Analysis and Future Directions

- ♦ **Collect data every 30 seconds and average at 1 hour intervals**
- ♦ **Plot data over time to analyze the running values over a long-term period (weekly and monthly)**
- ♦ **Determine the variability in levels of air pollution for sites**
 - Time of day
 - Season
 - Impact of weather
- ♦ **Use handheld monitor to measure the levels of VOCs and SO₂ at our stationary sites as well as other locations.**
- ♦ **Accumulate knowledge to inform our hypotheses for our subsequent NIEHS grant proposal.**
- ♦ **Future: heavy metal exposure, noise, violence, etc.**

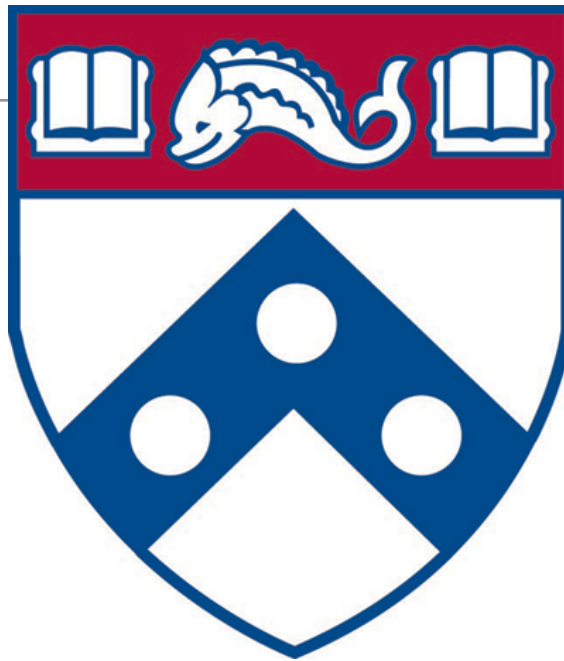
Thank you to Collaborators

Penn

- ◆ Heather Burris
- ◆ Mary Boland
- ◆ Thomas Mckeon
- ◆ Adrian Wood

Community

- ◆ Chester Environmental Partnership
- ◆ City of Chester
- ◆ Chester Housing Authority
- ◆ Darren Alston



<https://www.facebook.com/COECatCEET>



@UPennCEET_CEC