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

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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, a 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 birth weight disparities (2012-2016)

<table>
<thead>
<tr>
<th>Birth weight category</th>
<th>Chester City (n=2,767)</th>
<th>Delaware county (n=33,057)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>&lt; 1,500 g</td>
<td>85</td>
<td>3.1</td>
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<td></td>
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<tr>
<td>&lt; 2,500g</td>
<td>362</td>
<td>13.1</td>
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</tbody>
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Association of Air Pollution and Poor Birth Outcomes

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

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

PM2.5 Emissions (tons per year)
- < 1
- 2 - 100
- > 100

NO2 Emissions (tons per year)
- < 10
- 11 - 150
- > 150

Source: EPA National Emissions Inventory, 2017
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
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

Density of Children under 5 | 1(low) 10 (high)

Possible Air Monitor Mounting Locations

Daycare street light pole intersection, highly visible

Pocket Park with possible city lights

Community Farm No sound barrier to I-95

The Alleyway Pole

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

Density of Children under 5

Daycare street light pole
intersection, highly visible

Pocket Park
with possible city lights

Community Farm
No sound barrier to I-95

Possible Air Monitor Mount Locations
Chester Census Blocks

The Alleyway Pole

0 0.5 1 2 Miles

N
Ruth Bennett Community Farm
Sample Data (November 11-15, 2020)

NO2 ppb

O3 ppb

PM2.5 μg/m³
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