Community Air Research Experience (CARE): Engaging Students in Research on Air Pollution in Chicago Communities

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What is CARE?

- CARE engages underrepresented minority (URM) students in a paid research experience on air pollution in Chicago communities.
- CARE is a partnership involving scientists at Loyola University and Colorado State University who also work with community-based environmental groups: the Southeast Environmental Task Force (SETF) and the Edgewater Environmental Coalition (EEC).

Motivation

Fine particle air pollution is a major issue in Chicago. Monitoring of particle pollution in the city is too sparse.

Over 5 million people in Chicago are at risk from high levels of ozone and particle pollution (American Lung Association, 2022). Residents of low-income or high-minority neighborhoods of Chicago share a greater burden of air pollution than more affluent areas (King, 2015; Yeo, 2019), which makes air pollution in Chicago an environmental justice issue.

Our hypothesis is that we can increase students' interests and competencies in the geosciences by engaging them in air pollution research that has a direct impact on local communities.

We deployed PurpleAir Sensors to two communities in Chicago. We use these sensors because PurpleAir data is already being integrated into experimental maps (fire.airnow.gov) developed by the Environmental Protection Agency and U.S. Forest Service. Our project also leverages the PurpleAir network because prior work has evaluated the performance of these monitors. Newly established correction factors can be used to adjust reported PM2.5 values to agree better with Federal Equivalent Method (FEM) measurements (Magi et al., 2020; Malings et al., 2020; Mehadi et al., 2020; Barkjohn et al., 2020).

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CARE has three aims:

1) provide an applied, socially-relevant research experience for URM students, 2) increase understanding about the spatial distribution and temporal variation of pollution in Chicago, and 3) provide air quality data for community discussions about how to reduce air pollution and better protect public health.

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What does the CARE experience include?

The CARE experience for Cohort 2022 included:

- Eight 1-hour training sessions: Introduced students to fine particle pollution, PurpleAir, environmental justice, community-based research methods, and careers in geosciences.
- Field trips to the 2 communities: Visited Edgewater and Southeast Chicago, discussed concerns about air pollution with representatives from SETF and EEC.
- A 4-week research experience: From May 16 to June 10, 2022, students installed 9 PurpleAir sensors, learned and practiced computer programming, and analyzed data to answer research questions of interest to local communities.
- Presentations to the community organizations (SETF and EEC) and at the 2022 American Geophysical Union Fall Meeting.

CARE students learned how to conduct scientific research and how to build and sustain a scientist-community partnership.

CARE students met with SETF in March 2022.

CARE students met with EEC and SETF in March 2022.

CARE students met with SETF in March 2022.

CARE students met with EEC in March 2022.

CARE students installed a total of 9 PurpleAir sensors in 2022 in Edgewater and Southeast Chicago.

CARE students analyzed PurpleAir and other data to investigate these 8 topics:

1. Air quality improvement in Chicago region is not equal
   - Less improvement in south than north sides of Chicago
2. Fine particle pollution remains a real concern for residents in Southeast Chicago
   - Wildfires upwind aggravate this concern
3. Traffic contributes to fine particle pollution in Southeast Chicago
   - Residents living within 450 feet from major road should be alerted of air pollution impacts
   - Episodic peaks (>35 μg/m3) were often observed, causing greater health concern
4. Greater efforts needed to monitor the unequal air pollution burden in Southeast Chicago, understand how it affects residents’ daily outdoor activities and health, and devise effective strategies to improve air quality
   - Including concerns for residents who speak languages other than English

Future Directions

- Direct students to further study research topics that interest the 2 communities, e.g., the impacts of traffic, urban heat, and lake breezes on fine particle pollution.
- Devote more interaction with community groups especially during the summer research experience.
- Seek ways to expand our scientist-community partnership on air pollution to include more low-income or high-minority neighborhoods, while we sustain the current partnerships with EEC and SETF.

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References

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