

# Community Measurements of Aviation Emissions Contribution to Ambient Air Quality

## Boston University School of Public Health

PI: Kevin J. Lane PhD, MA

PM: Jeetendra Upadhyay

Cost Share Partner: Women's Health Study Initiative

### Research Approach:

- Collection and analysis of community air pollution measurements UFP, NO<sub>2</sub> and BC.
- Stationary sites and mobile monitoring are being conducted continuously at varying distances from flight paths for Boston Logan International Airport.
- Statistical analyses will compare the stationary and mobile measurements with flight activity data and meteorology to determine aircraft contributions to ground measurements for source attribution.

### Objective:

- Measure aviation-related air pollution such as ultrafine particles (UFP) using a stationary and mobile monitoring platform near Boston Logan International Airport.
- Quantify the contribution of flight activity to community air pollution.

### Project Benefits:

- Improved understanding of aviation-related UFP in communities near airports.
- Pairing of empirical monitoring data and source attribution models to validate dispersion air pollution models that could be applied at airports across the US.

### Major Accomplishments (to date):

- We have collected air pollution data at stationary sites across multiple seasons during COVID-19.
- Over 200 hours of mobile air pollution data has been collected covering a wide variation of meteorology and ramp-up of aviation activities.

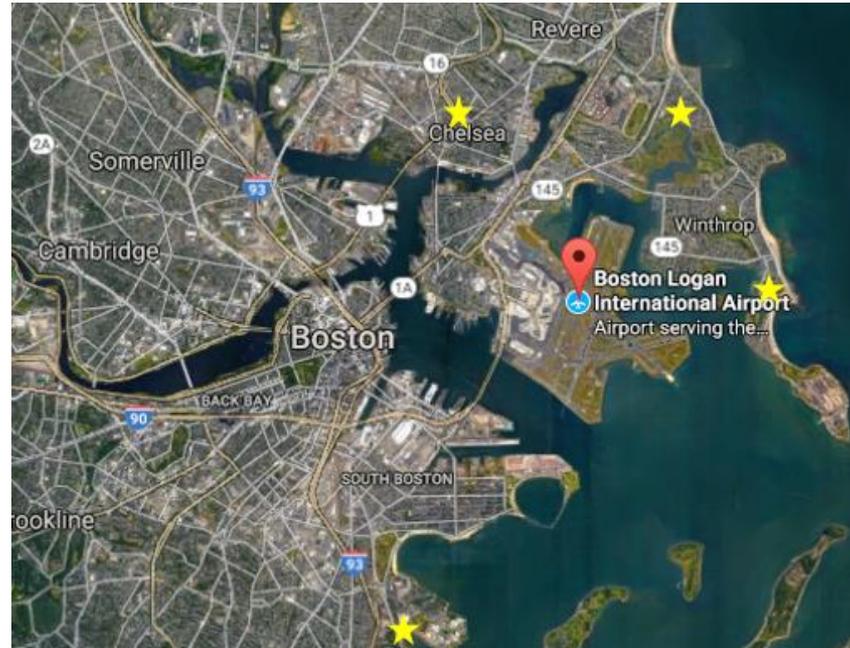
### Future Work / Schedule:

- Analysis of mobile and stationary data is being used to identify air pollution during COVID-19 that will inform source attribution modeling
- Regression modeled source attribution estimates will be compared to outputs from atmospheric dispersion models with ASCENT Project 19.

# Stationary and Mobile Monitoring

## Stationary Site Selection

- PNC Monitoring sites
- Sites chosen to be > 200 m from major roadways
- Near population areas
- At varying distances from multiple runways based in part on historical wind direction and runway usage



## Mobile Monitoring Route

- Routes chosen to be away from major roadways
- Through population areas
- Want to capture a wide range of meteorological conditions.



# Mobile Monitoring Routes and Data

**South Route Monitoring**  
**Oct 23, 2020**  
**1500-1800 hours**

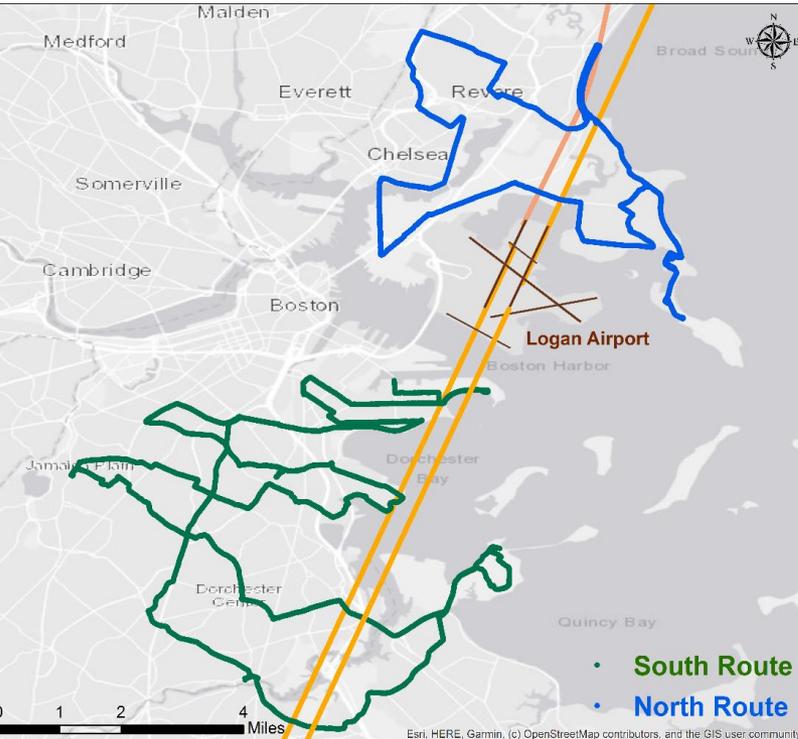
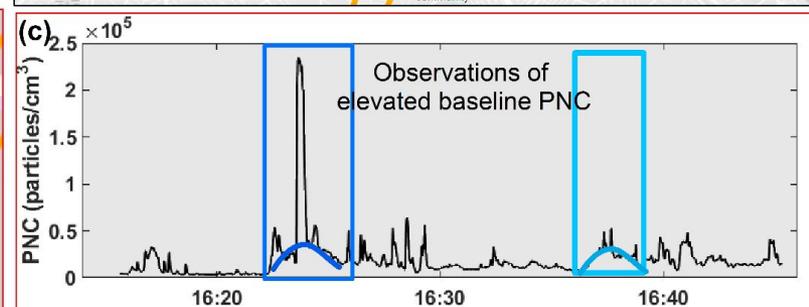
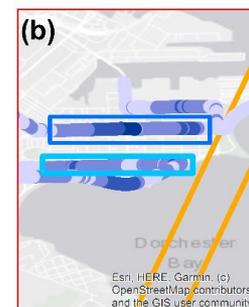
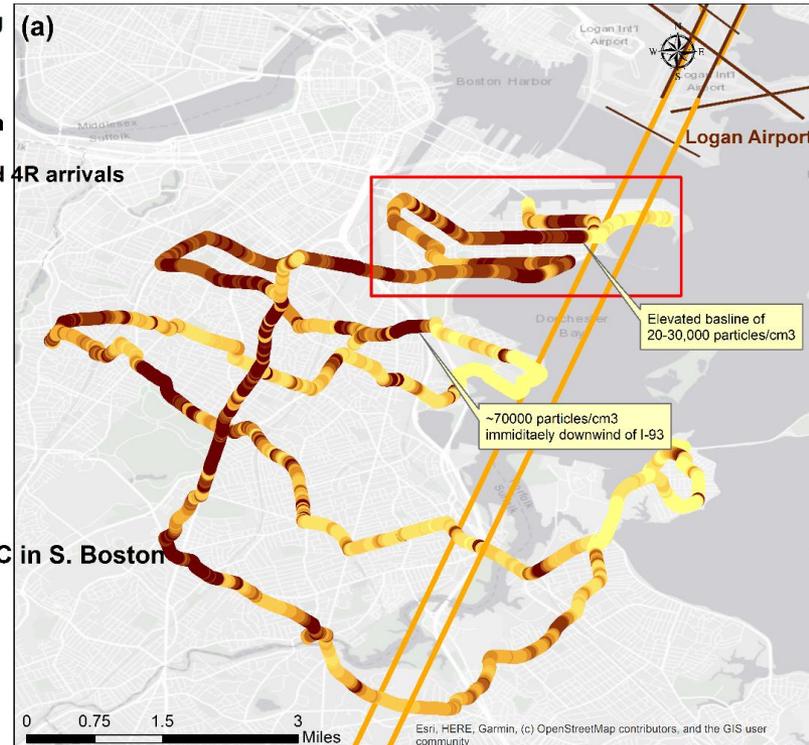
**Winds: E at 9-13 miles/h**  
**Temp: 59-62 F**  
**Runways Active: 4L and 4R arrivals**

**(a) Total on-road PNC**

- 3059 - 4615
- 4616 - 7072
- 7073 - 8943
- 8944 - 10944
- 10945 - 13891
- 13892 - 17926
- 17927 - 26103
- 26104 - 235010

**(b) Total on-road PNC in S. Boston**

- 3336 - 15884
- 15885 - 32115
- 32116 - 125257
- 125258 - 235010



- Over 200 hours of mobile air pollution data distributed across various seasons and meteorology.
- Descriptive analysis is being conducted to examine with the trends in PNC and NO<sub>2</sub> across communities to inform regression model development and increase understanding of spatial contributions of aviation-related exposures.

# UFP in Communities During COVID-19

Figure 2. Chelsea ultrafine particle concentrations measured as particle number concentration by month for 2017-2018 and 2020-2021 campaign.

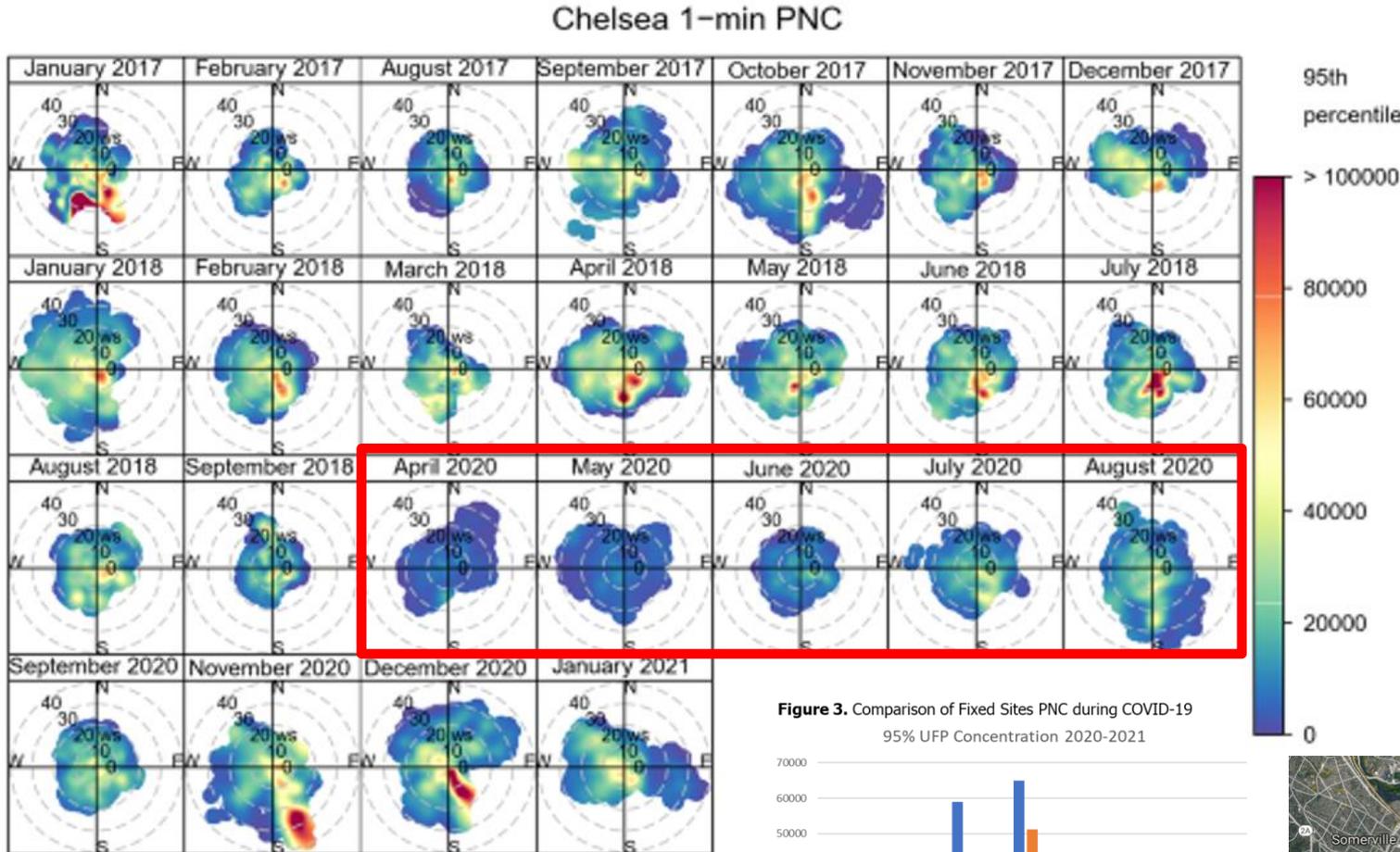
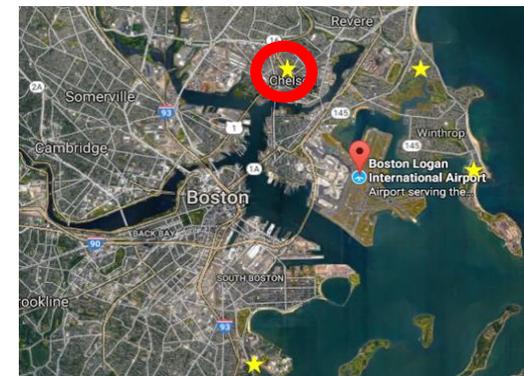
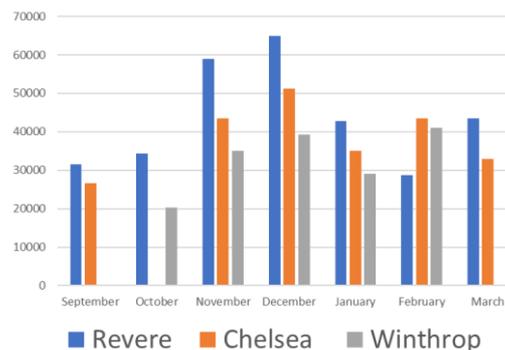


Figure 3. Comparison of Fixed Sites PNC during COVID-19  
95% UFP Concentration 2020-2021



# Summary/Next Steps



- Summary statement
  - Contributions of aircraft arrivals and departures to UFP concentrations are complex to characterize and vary greatly in time and space, and ultimately require fit-for-purpose monitoring and appropriate statistical analyses.
  - We are producing data and plots that have reinforced the complexity and variability in UFP concentrations over time and space that can be captured with a combined stationary and mobile monitoring platform.
- Next steps
  - Complete regression modeling of aviation-related UFP.
  - Continue analyzing the UFP concentrations in relation to particle size distribution.
  - Expand Monitoring to include NO<sub>2</sub> and SO<sub>2</sub>.
  - Complete Integrate statistical model outputs and data with ASCENT Project 19 for dispersion model validation.