Campus-Community Partnership for Reducing Air Pollution in the Bathurst Quay Neighbourhood

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Overview

Campus-community partnership approach to address air pollution exposure with:
- ❖ Bathurst Quay Neighborhood Association
- ❖ Billy Bishop Airport
- ❖ City of Toronto

- The neighbourhood is a possible air pollution hotspot, uniquely situated near three major transportation sources.
- Air quality monitoring campaigns were launched to:
  - ❖ Perform air pollution exposure assessment.
  - ❖ Identify main sources of air pollution.
  - ❖ Develop and propose policy scenarios.

Methods

Population exposure assessed through:
- ❖ Fixed monitoring on rooftops
- ❖ Mobile measurements
- ❖ Indoor vs. Outdoor Sampling

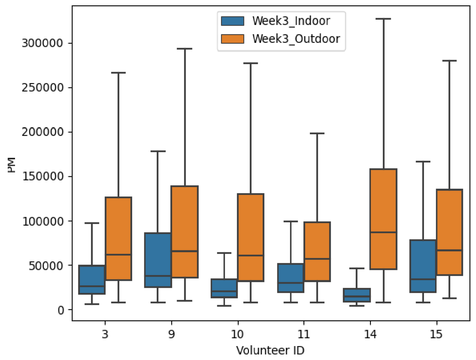
The research team has completed a fixed monitoring campaign and the indoor vs. outdoor sampling is in-progress. These methods are described below.

Indoor vs. Outdoor Sampling
- Synchronous indoor/outdoor data collection during two campaigns: summer and winter
- Dylos DC1700 Air Quality Monitors
  - ❖ Used to measure PM2.5
  - ❖ Calibrated through collocation
  - ❖ Rotated between citizen scientists
- Activity logs to detect potential indoor sources
- Citizen Scientists recruited by the Bathurst Quay Neighborhood Association

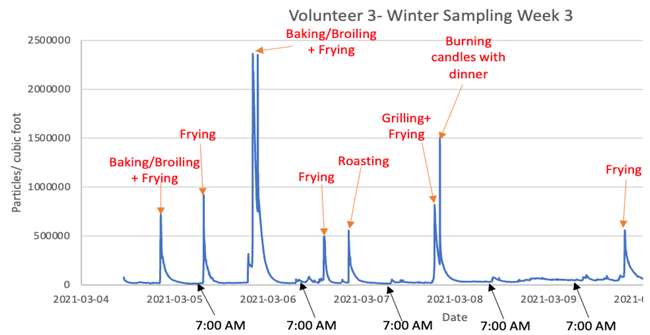
Fixed Rooftop Monitoring
- Simultaneous measurements from 3 rooftop stations throughout city, one in the neighbourhood
- Data collected for 3 periods: pre-lockdown, during the lockdown, and during recovery
- Measured ultrafine particles, black carbon, CO_2, NO_X, CO, O_3, $PM_{2.5}$, and integrated metals

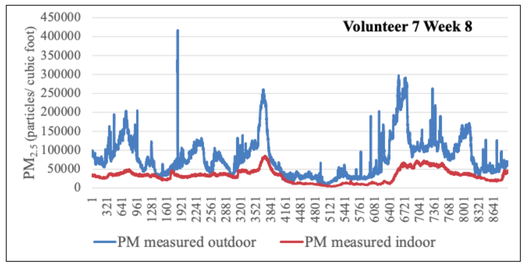
Initial Results

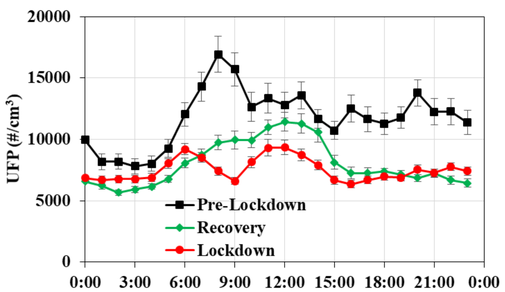
Indoor/Outdoor Particle Number Counts
- Observed that indoor levels within homes are typically lower than outdoor concentration.
- Variability of PM2.5 levels between different homes could be due to differences in indoor or outdoor sources



Time Series Analysis
- For some citizen scientists, we were able to match peaks with specific activities recorded in activity log.
- Indoor signal clearly follows the trend of outdoor signal.







Fixed Rooftop Monitoring
- Comparing data before and during the first COVID-19 lockdown shows that emissions from both the airport and Gardiner impact the neighbourhood
- UFP decreased by 40% in BQNA during the shutdown, indicating there may be other sources than traffic
- The contribution of the local sources varies by season due to the seasonality of wind direction

Future Research

- Correlate airport activity with indoor trends when pre-pandemic airport business resumes.
- Conduct dust analysis through window sweeping to characterize metals and carbonaceous particles in air samples.
- Investigate whether there are systematic differences in air quality between different buildings.
- Develop air quality improvement recommendations to inform policy decisions.

Acknowledgements

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- For more information, visit **https://www.socaar.utoronto.ca/bathurst-quay-neighbourhood-air-quality-study**