



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

Community 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
- Dylus DC1700 Air Quality Monitors
 - ❖ Used to measure PM_{2.5}
 - ❖ Calibrated through collocation
 - ❖ Rotated between citizen scientists
- Activity logs to detect potential indoor sources
- Citizen Scientists recruited by the Bathurst Quay Neighborhood Association

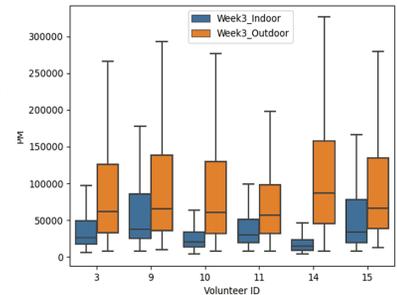
Fixed Rooftop Monitoring

- 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, CO₂, NO_x, CO, O₃, PM_{2.5}, and integrated metals

Initial Results

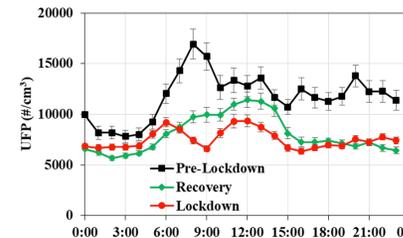
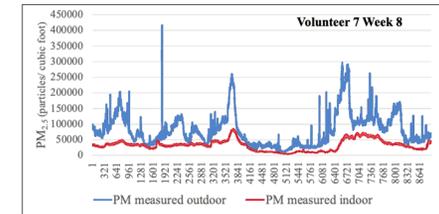
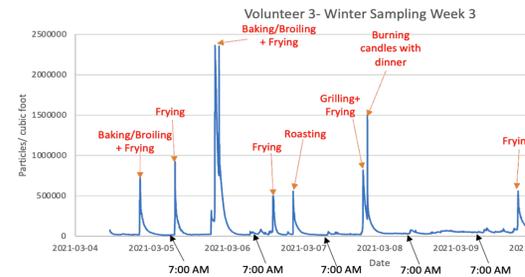
Indoor/Outdoor Particle Number Counts

- Observed that indoor levels within homes are typically lower than outdoor concentration.
- Variability of PM_{2.5} 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 specific 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.socaa.utoronto.ca/bathurst-quay-neighbourhood-air-quality-study>

