

## HEPA Filter Usage in an Environmental Justice Community: A Pilot Study\*

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**Background.** Particulate matter (PM) is a well-known air pollutant associated with premature death and adverse health impacts. Studies have highlighted the inequitable, higher distribution of PM exposure and related respiratory health outcomes in lower-income, communities of color. There is limited research assessing high-quality and long-term strategies to reduce exposure to PM in these communities, especially in the indoor environment. Through a five-month pilot study, we leveraged a strong academic-community partnership to assess High Efficiency Particulate Air (HEPA) filter usage and PM exposure in homes in the city of Chelsea, MA.

**Methods.** We recruited eight households in Chelsea, MA where at least one family member had a diagnosis of asthma. Recruitment materials were developed in English and Spanish by bilingual study staff, as the majority of participants were Spanish speaking or bilingual. In each participant household, a QuantaQ MODULAIR air quality sensor measured PM<sub>1</sub>, PM<sub>2.5</sub>, PM<sub>10</sub> (ug/m<sup>3</sup>), temperature (°F) and relative humidity (%). Usage of an Austin Air HealthMate HEPA filter was measured with a HOBO PlugLoad Data Logger. PM, temperature, relative humidity, and HEPA filter use was calculated for each participant at hourly and daily resolutions. Regression models predict how HEPA filter usage impacts PM concentrations for all participants. Lastly, personalized report-back materials were developed to share data with participants.

**Results.** We observed a decrease in all types of PM concentrations among all participants comparing pre-HEPA filter install and post-HEPA filter install PM concentrations. After filters were installed, daily average PM<sub>2.5</sub> concentrations decreased by 11.1 to 24.3%, with post-installation hourly averages ranging from 2.4 to 9.8 ug/m<sup>3</sup>. However, even with filters installed, some high PM concentrations were observed: hourly maximum concentrations ranged from 64.4 to 250.0 ug/m<sup>3</sup>. We observed different HEPA usage patterns in each household, including constant usage, nighttime only usage, and mealtime usage patterns. Our preliminary predictive model showed increased HEPA filter power levels were associated with decreased PM concentrations, however, these findings were only statistically significant for some participants.

**Conclusions.** This pilot study aimed to understand HEPA filter usage and PM concentrations in homes in Chelsea, MA. Results show a consistent decrease in PM concentrations in households when filters are used, with different filter usage patterns for each participant. Our findings support future investigation of household-level interventions including HEPA filters to reduce PM and other indoor sources of air pollution. We also highlight the importance of academic-community partnerships in developing community-driven report-back strategies and interventions.

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