

Use of Low-Cost Air Monitors to Measure Particulate Matter 2.5 Pollution in a NJ Community

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PM_{2.5}, or particulate matter with an aerodynamic diameter < 2.5 μm, is a regional air pollutant that has been linked to multiple adverse health effects including the exacerbation of asthma. In urban communities such as Elizabeth NJ, where traffic is a major source of PM_{2.5} and asthma is prevalent, community scientists are leading the way in making air pollution data more accessible. Groundwork Elizabeth, a local community organization that aims to reduce the impacts of environmental pollutants, partnered with Rutgers EOHSI to evaluate the accuracy and reliability of low cost PurpleAir monitors in measuring PM_{2.5} concentrations in Elizabeth, NJ. PurpleAir monitors are low-cost air quality monitors that allow communities to measure PM_{2.5} concentrations and view and share data in real time online. However, PurpleAir monitors tend to overestimate PM_{2.5} concentrations and are also subject to loss of data without reliable internet access, leading to validity concerns. We collocated three PurpleAir monitors with a NJ Department of Environmental Protection (NJDEP) reference monitor over a 2-week period. We used a linear regression model to develop a calibration equation based on the collocation. After placing the monitors in Elizabeth, NJ for a 3-week period, the calibration equation was used to correct the community PM_{2.5} concentrations, which were then compared to the central site reference monitor measurements. The correction increased agreement of PurpleAir measurements with reference measurements. The R-squared ranged from 0.636 to 0.663 and varied according to each monitor. The average slope prior to correction was 1.535 while the average slope after correction was 0.984. PurpleAir monitoring systems can be a reliable, inexpensive method for communities to estimate ambient PM_{2.5} levels if the data are appropriately adjusted prior to interpretation. Supported by R25ES020721.

