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Quantifying the health impacts of eliminating air pollution emissions in the City of Boston

Background. Cities around the world are taking action to limit greenhouse gas emissions through ambitious climate targets and climate action plans. These strategies are likely to simultaneously improve local air quality, leading to public health and monetary co-benefits. In this study, we sought to estimate the health impacts of the City of Boston's climate action plan, Carbon Free Boston, and in doing so consider the importance of evaluating the health impacts of local climate action alongside intended environmental impacts.

Methods. We simulated at a 4km resolution how the elimination of anthropogenic emissions from the City of Boston would impact air quality across a 120km by 120km study domain using the Community Multiscale Air Quality (CMAQ) model. We then estimated how this change in air quality would impact incidence of mortality and a number of additional annual health outcomes, as well as their monetary valuation, using the U.S. Environmental Protection Agency Benefits Mapping Analysis Program (BenMAP).

Results. We estimate that eliminating anthropogenic emissions from the City of Boston would result in a decline in PM_{2.5} concentration across the entire study region ranging from 8.5 ug/m³ in Boston to less than 1 ug/m³ elsewhere in the domain. In addition, we estimate that summer ozone would increase for the Greater Boston Area and areas west, and decrease elsewhere. The monetary impact of the change in air quality on health is estimated to be a \$2.4 billion per year savings across the full domain and \$1.7 billion within Suffolk County only, which is home to the City of Boston. The annual net monetary savings for Suffolk County is comparable to 1.5% of the gross city product of Boston. We estimate that 288 deaths would be avoided per year across the study domain, about six deaths avoided, annually, per 100,000 people. Within Suffolk County, we estimate that up to 47 deaths would be avoided per 100,000 people, around 16% of all-cause premature mortality in the county. Across the study domain, these health benefits would be disproportionately be conferred upon people of color.

Conclusions. Our findings suggest that the Greater Boston Area would realize substantial health benefits should the City of Boston achieve the ambitious climate policy goals set forth in the Carbon Free Boston plan. Our results suggest that municipal climate policies have great potential to achieve health co-benefits, and that health impacts merit consideration as a core part of the way climate policies are evaluated by policymakers and the public.