

June 2022

## The Short-term Effects of Fine Airborne Particulate Matter and Climate on COVID-19 Disease Dynamics

El Hussain Shamsa

Wayne State University, cq7290@wayne.edu

Kezhong Zhang

Wayne State University

Follow this and additional works at: [https://digitalcommons.wayne.edu/som\\_srs](https://digitalcommons.wayne.edu/som_srs)



Part of the Analytical, Diagnostic and Therapeutic Techniques and Equipment Commons, Computer Sciences Commons, Health and Medical Administration Commons, Health Information Technology Commons, Medical Sciences Commons, Medical Specialties Commons, Multivariate Analysis Commons, Statistical Methodology Commons, and the Statistical Models Commons

---

### Recommended Citation

Shamsa, El Hussain and Zhang, Kezhong, "The Short-term Effects of Fine Airborne Particulate Matter and Climate on COVID-19 Disease Dynamics" (2022). *Medical Student Research Symposium*. 130.  
[https://digitalcommons.wayne.edu/som\\_srs/130](https://digitalcommons.wayne.edu/som_srs/130)

This Research Abstract is brought to you for free and open access by the School of Medicine at DigitalCommons@WayneState. It has been accepted for inclusion in Medical Student Research Symposium by an authorized administrator of DigitalCommons@WayneState.

## **The Short-term Effects of Fine Airborne Particulate Matter and Climate on COVID-19 Disease Dynamics**

*El Hussain Shamsa, Kezhong Zhang*

**Background:** Despite more than 60% of the United States population being fully vaccinated, COVID-19 cases continue to spike in a temporal pattern. These patterns in COVID-19 incidence and mortality may be linked to short-term changes in environmental factors.

**Methods:** Nationwide, county-wise measurements for COVID-19 cases and deaths, fine-airborne particulate matter (PM<sub>2.5</sub>), and maximum temperature were obtained from March 20, 2020 to March 20, 2021. Multivariate Linear Regression was used to analyze the association between environmental factors and COVID-19 incidence and mortality rates in each season. Negative Binomial Regression was used to analyze daily fluctuations of COVID-19 cases and deaths with those of environmental factors in New York, NY.

**Results:** In Spring 2020, a 1 µg/m<sup>3</sup> increase in average county PM<sub>2.5</sub> concentration was associated with a 15.7% increase in incidence rate and a 9.3% increase in death rate. In Summer 2020, a 1 K increase in maximum temperature was associated with a 11.5% increase in incidence rate, but a 1.7% decrease in incidence rate in Fall 2020. For each 1 µg/m<sup>3</sup> and 1 K increase in daily PM<sub>2.5</sub> concentration and maximum daily temperature in New York, NY, daily COVID-19 cases increase by 5.2% and decrease by 2.3%, respectively.

**Discussion:** The effect of PM<sub>2.5</sub> concentration and maximum temperature on COVID-19 incidence and mortality rates varied greatly between different seasons. The temporality of COVID-19 could be linked to the seasonality of these effects. Furthermore, the significant association of daily measurements of environmental factors with COVID-19 cases and deaths warrants further analysis across multiple counties.

**Keywords:** Regression; Coronavirus; Environmental Factors; COVID-19; Temporality; PM<sub>2.5</sub>; Climate; Particulate matter