

Atmospheric pollution and COVID-19 spread in Italy

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The spread of SARS-CoV-2, the coronavirus responsible for the current pandemic outbreak, has been speculated to be linked to short-term and long-term atmospheric pollutants exposure, mainly particulate matters

(PMs). It is in fact possible for people living in highly industrialized areas, therefore exposed to higher pollution levels, to show more severe symptoms. Further studies have pointed out that atmospheric pollutants can act as virus carriers and boost pandemic diffusion.

A study recently published on *Environmental Pollution* searched for any potential short-term correlation between these two phenomena.

The research led by the Euro-Mediterranean Center on Climate Change (CMCC) Foundation and carried out in collaboration with the University of Salento and the Italian National Institute of Health (ISS) focused on the analysis of atmospheric pollutants concentrations (PM_{10} , $PM_{2.5}$, NO_2) along with the spatio-temporal distribution of cases and deaths (specifically incidence, mortality and lethality rates) across the whole Italian country, down to the level of individual territorial areas, including four of the most affected regions, i.e. Lombardy, Piedmont, Emilia-Romagna and Veneto.

"The data analysis has been limited to the first quarter of 2020 to reduce the lockdown-dependent biased effects on the atmospheric pollutant levels as much as possible", explains Prof. Giovanni Aloisio, corresponding author of the study and also member of the CMCC Strategic Board, Director of the CMCC Supercomputing Center and Full Professor at the University of Salento, Dept. of Innovation Engineering. "Our results suggest the hypothesis of a moderate-to-strong correlation between the number of days exceeding the annual regulatory limits of PM_{10} , $PM_{2.5}$ and NO_2 atmospheric pollutants and COVID-19 incidence, mortality and lethality rates for all the 107 Italian territorial areas under investigation, whereas weak-to-moderate correlations were found when the analysis was limited to four of the most affected regions in Northern Italy (Lombardy, Piedmont, Emilia-Romagna and Veneto)."

Overall, PM_{10} and $PM_{2.5}$ showed a higher correlation than NO_2 with

COVID-19 incidence, mortality and lethality rates.

Finally, PM₁₀ profiles have been further analyzed along with the COVID-19 incidence rate variation for three of the most affected territorial areas in Northern Italy (i.e., Milan, Brescia, and Bergamo) in March 2020. All areas showed a similar PM₁₀ time trend but a different COVID-19 incidence rate variation, that was less severe in Milan compared with Brescia and Bergamo.

The investigation will be extended in the future to account for confounding factors and outbreak dynamics, such as for example population size, ethnicity, hospital beds, number of individuals tested for COVID-19, weather, socioeconomic and behavioral variables (e.g. income, obesity, smoking habits), days since the first reported case of COVID-19, population age distribution, and days since the issuance of the stay-at-home order, etc.

The results of this study suggest in fact that confounding factors should be considered to justify why the almost identical PM₁₀ profiles observed in Milan, Brescia, and Bergamo during the first quarter of 2020 did not produce similar COVID-19 incidence rate variations. In addition, confounders might justify the differences in the statistical significance of correlations found when comparing a 4-region subset with the whole Italian country. Finally, [climate change](#) negatively affects [human health](#) and its potential role in the pandemic spread deserves further investigation.

More information: Gabriele Accarino et al, Assessing correlations between short-term exposure to atmospheric pollutants and COVID-19 spread in all Italian territorial areas, *Environmental Pollution* (2020).

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