

Improved air quality during first wave of COVID prevented 150 premature deaths in major Spanish cities

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Air quality in Spain temporarily improved during the first wave of COVID-19, largely as a result of mobility restrictions. Until recently,

however, the effect of this improvement on the health of the population was poorly understood. A new study led by the Barcelona Institute for Global Health (ISGlobal), a center supported by the "la Caixa" Foundation, together with the Barcelona Supercomputing Center (BSC-CNS), has estimated that this improvement in air quality prevented around 150 premature deaths in Spain's provincial capital cities.

Several analyses have estimated the [mortality reduction](#) from improved [air quality](#) during lockdown periods in China and Europe and found that a substantial number of premature deaths have been avoided. The new study, published in *Environmental Pollution*, is the first to focus on Spain, specifically 47 provincial capitals. First, the researchers assessed changes in levels of air pollution—[nitrogen dioxide](#) (NO₂) and ozone (O₃)—during the lockdown period (57 days) and deconfinement period (42 days) of the first wave of COVID-19, which occurred between March and June 2020. The team then estimated the impact of these air quality changes on mortality at the population level.

Lead author Hicham Achebak, a researcher at ISGlobal and at the Center for Demographic Studies (CED), explained the methodology used in the study. "We used machine-learning techniques to take into account the influence of meteorological factors when quantifying the effect of lockdown on air quality levels," he noted. "To estimate changes in mortality, we specifically fitted epidemiological models based on historical health and air pollution data in each provincial capital city."

The authors found that NO₂ levels decreased by 51% and 36% during the lockdown and deconfinement periods, respectively, during the first wave of COVID-19. The level of ozone decreased much less on average—by 1.1% and 0.6%, respectively—although it increased in some of the most populous cities.

Regarding the impact of the reduction in NO₂ on premature mortality,

the authors estimated that around 120 and 50 deaths were avoided during lockdown and deconfinement, respectively, for a total of approximately 170 premature deaths avoided. COVID-19 lockdowns led to "unprecedented reductions in NO₂ concentrations, especially when the most stringent measures to reduce viral spread were applied, reaching up to 65% in some of the cities studied," explained Hervé Petetin, researcher at BSC-CNS, who was responsible for the application of machine-learning techniques. Most of the NO₂ emissions in cities come from vehicles, in particular those with diesel-powered engines.

In the case of ozone, the decrease was so small that no [premature deaths](#) could be attributed to it. In fact, the researchers estimated that premature mortality attributable to this pollutant increased by approximately 20 deaths during the study period. Carlos Pérez García-Pando, ICREA research professor, AXA professor and head of the BSC-CNS Atmospheric Composition Group, which participated in the study, explained: "Even though, on average, there was a small reduction in ozone during the study period, ozone levels increased in the most populous cities, especially Barcelona and Madrid." He added: "Ozone is a secondary pollutant that can increase when levels of nitrogen oxides decrease in environments that are saturated with this pollutant, such as large urban areas." The study shows that "potential trade-offs between multiple pollutants should be taken into account when evaluating the health impacts of environmental exposures," he concluded.

Joan Ballester, researcher at ISGlobal and coordinator of the study, commented: "The number of deaths prevented by improvements in air quality in Spain could be greater." The researcher cited two main reasons for this assertion: "First, our study focused on provincial capitals, but there are other cities with high levels of air pollution. Second, we did not take into account reductions in [fine particulate matter](#), which were relatively modest compared to the reductions in NO₂ but most likely contributed to a further decrease in premature mortality."

"These findings demonstrate the major short-term health benefits associated with reducing air pollution," added Ballester. "With permanent reductions in emissions, the positive effects could be even greater." In addition to reducing premature mortality, improvements in air quality "could reduce the disease burden of epidemics that cause respiratory infections such as COVID-19, since diseases caused by long-term exposure to air pollution are in turn risk factors for the severity and [mortality](#) of coronavirus infection," concluded the researcher.

More information: Hicham Achebak et al, Trade-offs between short-term mortality attributable to NO₂ and O₃ changes during the COVID-19 lockdown across major Spanish cities, *Environmental Pollution* (2021). DOI: [10.1016/j.envpol.2021.117220](https://doi.org/10.1016/j.envpol.2021.117220)

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