



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.

# The Indirect Benefit on Respiratory Health From the World's Effort to Reduce Transmission of SARS-CoV-2



Frédéric Dutheil, MD, PhD  
Valentin Navel, MD  
Maëlys Clinchamps, MSc  
Clermont-Ferrand, France

**KEY WORDS:** air pollution; coronavirus; respiratory disease

Air pollution is recognized as a global public health issue. Exposure to environmental air pollutants amplifies respiratory illness.<sup>1-4</sup> The World Health Organization estimates that ambient air pollution

**AFFILIATIONS:** From the University Clermont Auvergne (Drs Dutheil and Navel); CNRS, LaPSCo, Physiological and Psychosocial Stress and Witty Fit (Dr Dutheil); CHU Clermont-Ferrand, University Hospital of Clermont-Ferrand, Occupational and Environmental Medicine (Dr Dutheil and Ms Clinchamps) and Ophthalmology (Dr Navel); NSERM, GReD, Translational Approach to Epithelial Injury and Repair (Dr Navel).

**FINANCIAL/NONFINANCIAL DISCLOSURES:** None declared.

**CORRESPONDENCE TO:** Frédéric Dutheil, MD, PhD, University Hospital of Clermont-Ferrand, Occupational and Environmental Medicine, 58 rue Montalembert, 63000 Clermont-Ferrand, France; e-mail: [fdutheil@chu-clermontferrand.fr](mailto:fdutheil@chu-clermontferrand.fr)

Copyright © 2020 Published by Elsevier Inc under license from the American College of Chest Physicians.

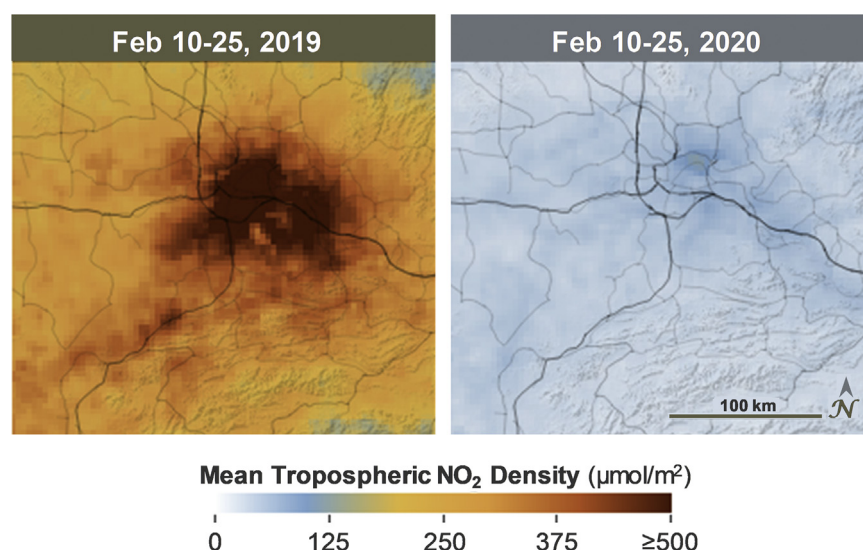
**DOI:** <https://doi.org/10.1016/j.chest.2020.03.062>

causes 25% of COPD cases (ie, 65 million cases) and 26% of respiratory infection deaths (ie, 600,000 preventable deaths per year).<sup>5</sup> Air pollution, particularly fine particulate matter and nitrogen dioxide, is also associated with asthma<sup>6</sup> and pneumonia<sup>7</sup> prevalence among children.<sup>8</sup>

In December 2019, pneumonia cases of unknown origin appeared in Wuhan, Hubei province, China. Analysis showed that symptoms were caused by a novel coronavirus labeled severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).<sup>9</sup> The movement of people, through worldwide tourism and business travel, led to rapid increases in the numbers of cases and countries affected. On March 1, 2020, a total of 87,137 cases were confirmed with 2,977 deaths according to the World Health Organization.<sup>10</sup>

To fight the increase in cases, local authorities of affected areas established quarantine periods that resulted in a decrease in industry activities, mass transit, and individual car circulation. All of these elements contribute to air pollution.<sup>11,12</sup> Pollution-monitoring satellites of NASA and the European Space Agency have detected significant decreases in nitrogen dioxide across China from January 1 to 20, 2020 (before the quarantine), to February 10 to 25, 2020 (during the quarantine). Nitrogen dioxide pollution was drastically reduced first near Wuhan, and eventually reduced across China and around the world (Fig 1).<sup>13</sup> A decrease of 6% in global pollution was measured following the decrease of global activities due to the coronavirus pandemic.<sup>14</sup> The public health benefit of the world's efforts to reduce transmission of SARS-CoV-2 may have indirect health benefits by lowering the impact of air pollution.

Figure 1 – Effect of quarantine due to severe acute respiratory syndrome coronavirus 2 on air pollution.<sup>12</sup>



## References

1. Zhang Z, Chai P, Wang J, et al. Association of particulate matter air pollution and hospital visits for respiratory diseases: a time-series study from China. *Environ Sci Pollut Res Int*. 2019;26(12):12280-12287.
2. Hendryx M, Luo J, Chojenta C, Byles JE. Air pollution exposures from multiple point sources and risk of incident chronic obstructive pulmonary disease (COPD) and asthma. *Environ Res*. 2019;179(pt A):108783.
3. Schraufnagel DE, Balmes JR, Cowl CT, et al. Air pollution and noncommunicable diseases: a review by the Forum of International Respiratory Societies' Environmental Committee, Part 2: air pollution and organ systems. *Chest*. 2019;155(2):417-426.
4. Schraufnagel DE, Balmes JR, Cowl CT, et al. Air pollution and noncommunicable diseases: a review by the Forum of International Respiratory Societies' Environmental Committee, Part 1: the damaging effects of air pollution. *Chest*. 2019;155(2):409-416.
5. World Health Organization. Ambient air pollution. 2016. <https://apps.who.int/iris/handle/10665/250141>. Accessed April 24, 2020.
6. Houdouin V, Dubus JC. What is the impact of outdoor pollution on children's asthma? *Arch Pediatr*. 2019;26(8):487-491.
7. Nhung NTT, Amini H, Schindler C, et al. Short-term association between ambient air pollution and pneumonia in children: a systematic review and meta-analysis of time-series and case-crossover studies. *Environ Pollut*. 2017;230:1000-1008.
8. Weinmayr G, Romeo E, De Sario M, Weiland SK, Forastiere F. Short-term effects of PM10 and NO2 on respiratory health among children with asthma or asthma-like symptoms: a systematic review and meta-analysis. *Environ Health Perspect*. 2010;118(4):449-457.
9. Huang C, Wang Y, Li X, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet*. 2020;395(10223):497-506.
10. World Health Organization (WHO). Coronavirus disease (COVID-2019) situation reports 41. [https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200301-sitrep-41-covid-19.pdf?sfvrsn=6768306d\\_2](https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200301-sitrep-41-covid-19.pdf?sfvrsn=6768306d_2). Accessed April 24, 2020.
11. Bergstra AD, Brunekreef B, Burdorf A. The effect of industry-related air pollution on lung function and respiratory symptoms in school children. *Environ Health*. 2018;17(1):30.
12. Wu Y, Zhang S, Hao J, et al. On-road vehicle emissions and their control in China: a review and outlook. *Sci Total Environ*. 2017;574:332-349.
13. NASA. Airborne nitrogen dioxide plummets over china. 2020. <https://earthobservatory.nasa.gov/images/146362/airborne-nitrogen-dioxide-plummets-over-china>. Accessed April 24, 2020.
14. Carbon Brief. Analysis: Coronavirus has temporarily reduced China's CO2 emissions by a quarter. 2020. <https://www.carbonbrief.org/analysis-coronavirus-has-temporarily-reduced-chinas-co2-emissions-by-a-quarter>. Accessed April 24, 2020.