

Letter to the Editor

Climate change and the origin of SARS-CoV-2

Esabelle Lo Yan Yam MSc Health Policy*

College of Health and Medicine, Australian National University, Canberra ACT 2600, Australia

*To whom correspondence should be addressed. Email Address: Esabelle.yam@anu.edu.au

Submitted 22 November 2020; Editorial Decision 23 November 2020; Accepted 29 November 2020

Key words: Climate change, COVID-19, Zoonosis, Migration

Climate change has been blamed for emerging infectious diseases. The increase in extreme climate events such as storms, typhoons, cyclones and heatwaves, and heavy precipitations and droughts that reduce land productivity and habitability have led to increased population mobility and human migration.¹ In 2019, environmental disasters displaced 24.9 million people in 145 countries and territories, more than 95% of which were weather-related.² Although migration may be less of a disease threat than travel and tourism due to the much higher number of the latter, disease transmission may still occur during migration due to suboptimal living conditions.³ Global warming also increases the geographic distribution of mosquitoes. Hence, a larger proportion of the world's population will be exposed to mosquito-borne diseases such as dengue, Zika and chikungunya.⁴ Indeed, Europe has seen the biggest rise of West Nile encephalitis in recent years.⁵ Could climate change also be blamed for the origin of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)?

The origin of SARS-CoV-2 is still unknown. Coronaviruses in humans such as SARS-CoV-1 and Middle East respiratory syndrome coronavirus (MERS-CoV) have a zoonotic origin. Although SARS-CoV-2 has not been isolated from a wild animal, 96.2% of its genome was found to be similar to bat SARS-related coronavirus, suggesting a probable origin in bats. The ecological distance between bats and humans also suggest intermediate hosts or amplifiers. For MERS and SARS, dromedary camels and civets may have been implicated, respectively, and for SARS-CoV-2 pangolins have been postulated to explain cross-species transmission.⁶

So where and how did the spill-over to humans occur? The link to the infamous wet market in Wuhan is intriguing, especially given that the genome sequences from environmental samples at the market showed close relation to viruses sampled from the earliest Wuhan patients. Nonetheless, cases of SARS-CoV-2 as early as December 2019 have been reported without known exposure to the Wuhan wet market. Without direct animal sampling in the market, it would be impossible to ascertain if the outbreak at the wet market was a result of animal reservoirs or has been introduced by human traffic at the market.⁶

The emergence story of COVID-19 may never be fully known. We can, however, suggest a few possible reasons related to environmental and climate change that could lead to zoonotic diseases. First, the impact of human activities such as deforestation on climate change and ecological changes may increase selection pressure on life forms including viruses. Second, human encroachment into wildlife habitats and exploitation of wildlife can lead to increase in interactions between humans and animals, and animals and animals, providing opportunities for viruses to jump between species. Third, the loss of biodiversity exacerbated by climate change reduces the buffer between animals for disease transmission, thereby increasing the chances for viruses to jump to humans.

Given the enormous diversity of viruses in wildlife and their ongoing evolution, the best strategy to reduce the risk of future outbreaks is to study the relationship of humans, animals and Mother Nature in the emergence and spread of zoonotic diseases. What is the implication for travel medicine? While climate change and air pollution will affect human mobility and tourism,⁷ including travellers' health, our natural curiosity to interact with wild animals and our desires to savour exotic foods will drive unhealthy wildlife trade. Stronger actions against illegal wildlife trade are needed, and removing mammalian and avian wildlife from food markets should be considered to control the emergence of zoonotic diseases.⁶ Many lessons can be learnt from the COVID-19 pandemic to prepare us for the next crisis.

Funding

No funding was used to support the writing of this manuscript.

Competing interests

No conflict of interest to declare.

References

- Schwerdtle PN, Bowen K, McMichael C, Sauerborn R. Human mobility and health in a warming world. *J Travel Med* 2019; 26: tay160. <https://doi.org/10.1093/jtm/tay160>.

2. *Global Report on Internal Displacement*. Geneva, Switzerland: Internal Displacement Monitoring Centre, 2020; 1–136.
3. Semenza JC, Ebi KL. Climate change impact on migration, travel, travel destinations and the tourism industry. *J Travel Med* 2019; **26**: taz026. <https://doi.org/10.1093/jtm/taz026>.
4. Liljepold K, Rocklov J, Liu-Helmersson J, Sewe M, Semenza JC. More arboviral disease outbreaks in continental Europe due to the warming climate? *J Travel Med* 2019; **26**: taz017. doi: [10.1093/jtm/taz017](https://doi.org/10.1093/jtm/taz017).
5. Barrett ADT. West Nile in Europe: an increasing public health problem. *J Travel Med* 2018; **25**: tay096. <https://doi.org/10.1093/jtm/tay096>
6. Zhang YZ, Holmes EC. A genomic perspective on the origin and emergence of SARS-CoV-2. *Cell* 2020; **181**: 223–7.
7. Vilcassim MJR, Thurston GD, Chen LC *et al.* Exposure to air pollution is associated with adverse cardiopulmonary health effects in international travellers. *J Travel Med* 2019; **26**: taz032. <https://doi.org/10.1093/jtm/taz032>.