Identifying the main culprit of the COVID-19 disaster

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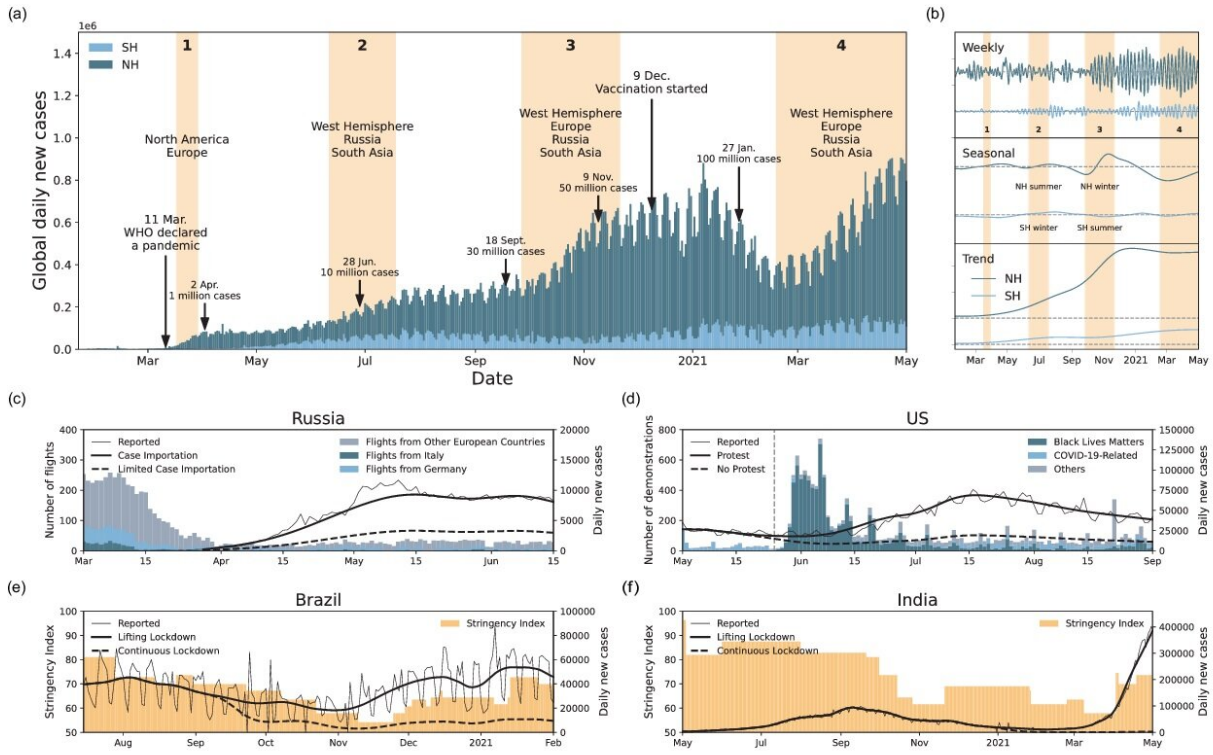

The evolution of the COVID-19 pandemic. (a) The global daily new cases, with deep (light) blue denoting the cases in the Northern (Southern) Hemisphere. (b) The weekly, seasonal and trend components decomposed by the EEMD method. (c)~(f) show the scenario simulations in Russia (c), US (d), Brazil (e) and India (f). The thin dashed black lines in (c)~(f) denote the reported daily new cases in each country, while the thick solid and dashed lines denote the simulation in two different scenarios. Credit: Science China Press

A research team led by Professor Jianping Huang from Lanzhou University has launched a Global Prediction System for the COVID-19 pandemic. Their recent work explored the periodicity and mutability in the evolutionary history of the COVID-19 pandemic and investigated the principle mechanisms behind them. They attributed the periodic oscillations of COVID-19 daily cases to seasonal modulations and reporting bias, and identified unrestricted mass gatherings as the main culprit of the COVID-19 disaster.

Their findings, entitled "The oscillation-outbreaks characteristic of the COVID-19 pandemic," were published in *National Science Review*.

In this study, the influence of human interventions and environmental influence were isolated based on statistical analysis and model simulations. They have decomposed the time series of COVID-19 daily cases into the oscillations over weekly and seasonal timescales. Weekly oscillations are mainly attributable to reporting bias, while seasonal oscillations are likely caused by variations in the meteorological and environmental factors due to seasonality. The seasonal components indicate higher infectivity and mortality in colder climates for both hemispheres.

"Though accurate quantification of the environmental influence on the COVID-19 dynamic remains a challenge, what is certain is that the seasonal oscillations with limited amplitude are not able to reverse the long-term growing trend of the cases," said Prof. Huang. The authors concluded that beneficial climate conditions (e.g. the onset of higher temperatures during the warm seasons) should not be used as a criterion to decide on relaxing control measures.

The evolution of COVID-19 cases is also strongly regulated by some rapid growth periods. Model simulations indicate that these abrupt shifts are mainly attributable to changes in the governmental response and

public adherence, as well as the unexpected natural and socio-economic crisis. The government response, public adherence, and the unexpected natural and socio-economic crisis would ultimately influence the frequency and size of gathering activities. Higher risk of mass gathering would then give rise to multiple super-spreading events and the subsequent COVID-19 disaster. Prof. Huang further pointed out that "we identify mass gatherings as the main culprit of the COVID-19 disaster. Environmental factors do influence the transmission, but their limited impact is not able to reverse the growth of cases."

Additionally, this work highlights the decisive role of Non-pharmacological interventions (NPIs). "Though vaccination has streamed into the community, we still can't let down our guard," Prof. Huang said. "Before high levels of vaccine-mediated protection can be achieved across the world, NPIs remain the most effective measure to control the epidemic in the foreseeable future."

More information: Jianping Huang et al, The oscillation-outbreaks characteristic of the COVID-19 pandemic, *National Science Review* (2021). DOI: 10.1093/nsr/nwab100

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