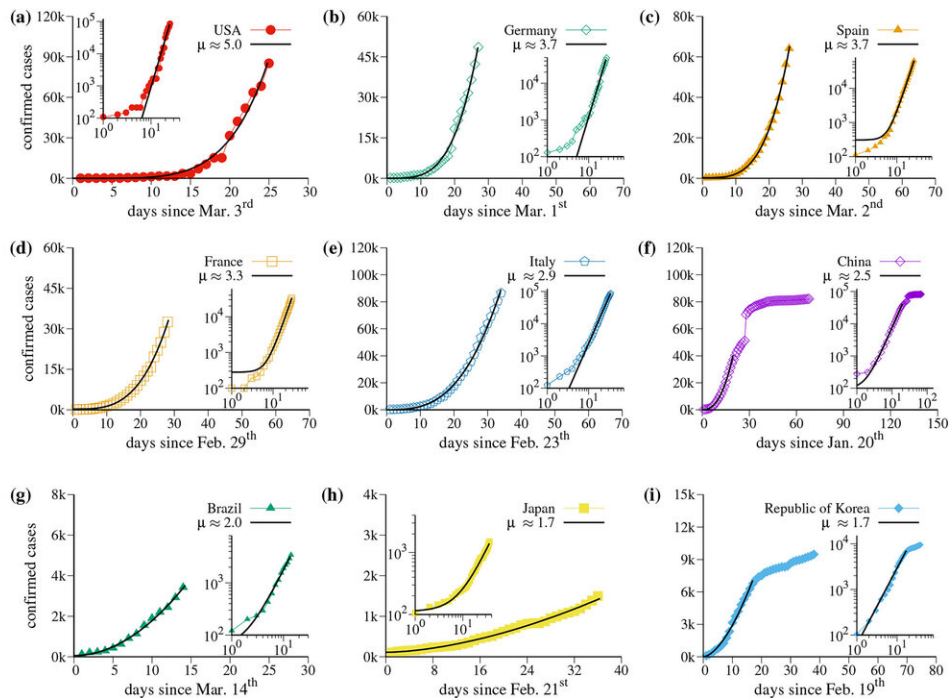# Correlations in COVID-19 growth point to universal strategies for slowing spread

April 28 2020

The cumulative number of confirmed infected cases of COVID-19 as a function of time for nine countries, excluding days with fewer than 100 infected. The black continuous curves represent a power law regression and the inset shows the same quantity is plotted in logarithm scale. Credit: Cesar Manchein

Many months since the first COVID-19 outbreak in Wuhan, China, countries continue to explore solutions that are effective at managing the spread of the virus and culturally feasible to implement. Chaos theory

analysis has provided insight on how well infection prevention strategies can be adopted by multiple countries.

Researchers in Brazil analyzed the growth of confirmed infected COVID-19 cases across four continents to better characterize the spread of the virus and examine which strategies are effective in reducing its spread.

Their results, published in *Chaos*, found the virus commonly grows along a power law curve, in which the social, economic and geographical features of a particular area affect the exponent to which the infection spreads rather than affecting traits of the infection itself.

"We decided to use our expertise to perform extensive numerical analysis using the real-time series of the cumulative confirmed cases of COVID-19 in order to search for answers about the spreading of this pathogen," said author Cesar Manchein.

The study draws on data current through March 27 from Brazil, China, France, Germany, Italy, Japan, South Korea, Spain and the United States.

The group's approach draws from a technique called numerical modeling, which leverages computing power to solve a set of differential equations in drawing comparisons between groups.

The high correlation in power law curves between each of the countries has allowed the group to single out generic effective strategies. Softer quarantine measures, they write, are inefficient at flattening curves compared to stricter isolation guidelines.

"Our results essentially show that an efficient strategy to avoid the increase of the number of infected individuals by coronavirus combines

two actions: Keep to a high level of social distance and implement a significant number of tests to identify and isolate asymptomatic individuals," said author Rafael M. da Silva.

They mention that the combination of the two actions, stay-at-home measures and more aggressive disease testing, are essentially the strategies used in South Korea.

The researchers plan on continuing to apply real-world data to further improve their model. Da Silva said the group hopes to use their models to test distinct strategies that could avoid the use of long quarantines.

"Physics and chaos theory researchers can have a fundamental role in the battle against the coronavirus," said author Cesar Manchein. "From the theoretical point of view, researchers can use their knowledge and experience to study the time and territorial evolution of the disease."

  More information: "Strong correlations between power-law growth of COVID-19 in four continents and the inefficiency of soft quarantine strategies," *Chaos* (2020). aip.scitation.org/doi/10.1063/5.0009454

Provided by American Institute of Physics