COVID-19 risk model uses hospital data to guide decisions on social distancing

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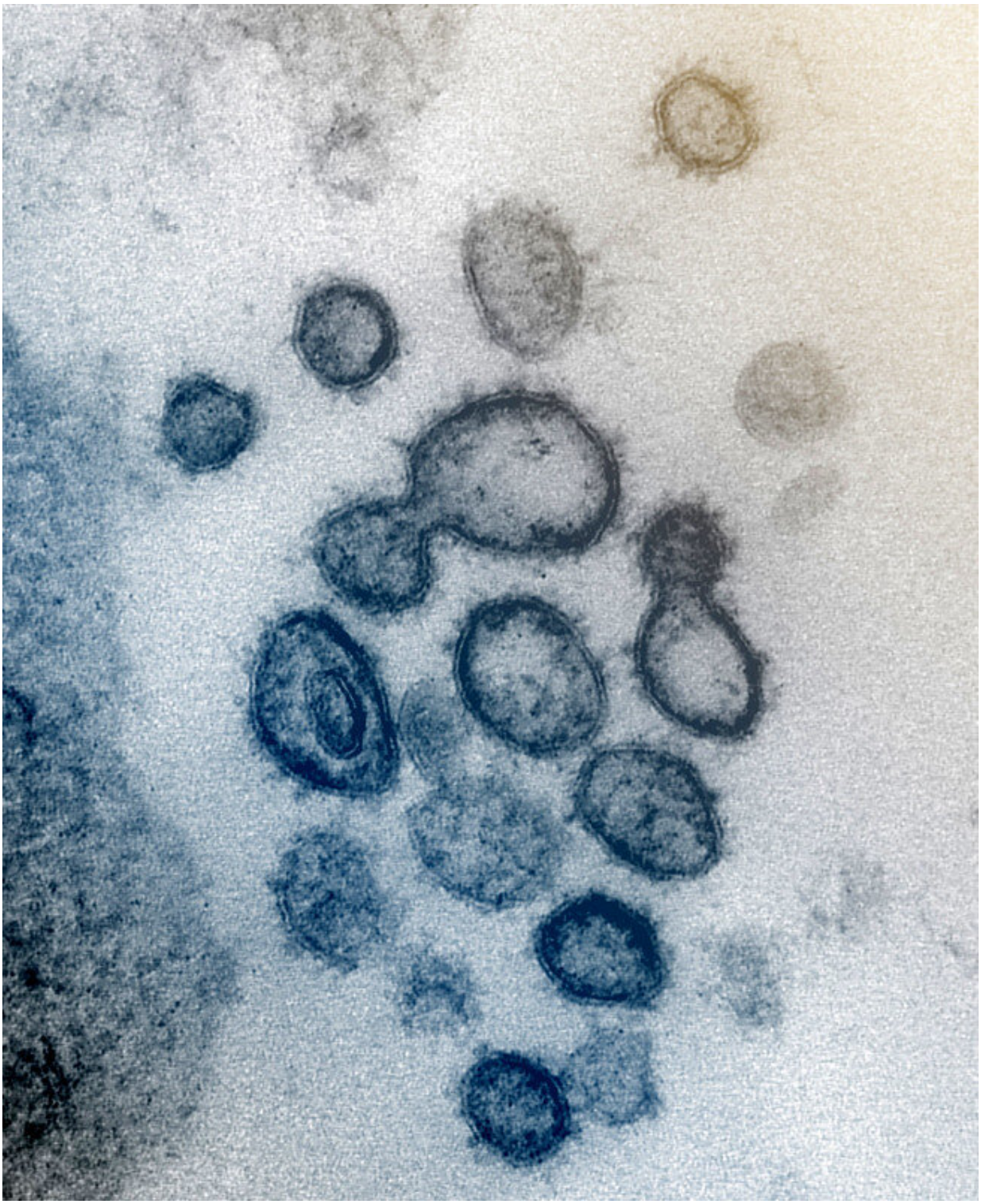

This transmission electron microscope image shows SARS-CoV-2 -- also known as 2019-nCoV, the virus that causes COVID-19 -- isolated from a patient in the US. Virus particles are shown emerging from the surface of cells cultured in the

lab. The spikes on the outer edge of the virus particles give coronaviruses their name, crown-like. Credit: NIAID-RML

With communities throughout the United States combating surges in COVID-19 cases and hospitalizations, researchers at The University of Texas at Austin and Northwestern University have created a framework that helps policymakers determine which data to track and when to take action to protect their communities. The model specifies a series of trigger points to help local entities know when to tighten social distancing measures to prevent hospitals from being overrun by virus patients. The method also aims to minimize the economic impact to communities by suggesting the earliest times for safely relaxing restrictions.

The framework is described in a new paper out today in the *Proceedings of the National Academy of Sciences.* The United States' continued high rate of infection means lawmakers around the country need to continue to make decisions about reinstating and relaxing social-distancing measures. Using hospital data, the new model lets local leaders know when it is time to tap the brakes on reopening versus easing restrictions.

For example, in Austin, Texas, the modelers applied this framework to help city leaders decide when to toggle between five different COVID-19 alert levels. The city is now tracking the daily number of new hospital admissions, and it recently tightened measures when the data surpassed the prescribed threshold.

"We developed this framework to ensure that COVID-19 never overwhelms local health care capacity while minimizing the economic and societal costs of strict social-distancing measures," said Lauren Ancel Meyers, a co-author of the paper and the director of The

University of Texas COVID-19 Modeling Consortium.

Northwestern's Daniel Duque, the first author, said that "the approach provides clear indications of when measures should be enacted and relaxed to manage risk."

There are two key components to successfully implementing the strategy—closely monitoring data about hospitalizations for COVID-19 and ensuring communities protect those most vulnerable to the disease.

"While many cities have implemented alert levels and new policies, our research may be the first to provide clear guidance for exactly what to track (hospital admissions data) and exactly when to act (strict thresholds)," said David Morton, chair and professor of industrial engineering and management sciences at Northwestern and a co-author of the paper. "Communities need to act long before hospital surges become dangerous. Hospital admissions data give an early indication of rapid pandemic growth, and tracking that data will ensure that hospitals maintain sufficient capacity." In recent weeks, public health officials have expressed concerns that hospitalization data has been inconsistent, as the federal government moved the data to a new portal housed within the Department of Health and Human Services.

"COVID-19 hospitalization data is vital to tracking the changing pace of the pandemic and informing good decision-making," Meyers said.

The team also determined that preventing an unmanageable surge in hospitalizations requires adherence to strict social distancing for high-risk populations, known as cocooning. For example, the researchers estimated that failing to protect vulnerable populations more than doubles resulting deaths while also doubling the number of days in lockdown to prevent overrunning hospitals.

The framework combines two mathematical models: an underlying model that predicts how the pandemic will likely spread and an optimization model that uses admissions data from Austin hospital systems. It attempts to walk a fine line of preventing economic disaster and keeping hospital systems from becoming overwhelmed. Though the researchers used Austin data, the framework can easily be used by other communities with publicly available hospital admissions data.

"This is a general framework that can be used to design multistage triggers—not just for lockdowns but for moving between phases—exactly like we have done for Austin," Morton said. "Our framework has already guided policy changes in Austin."

More information: Daniel Duque et al, Timing social distancing to avert unmanageable COVID-19 hospital surges, *Proceedings of the National Academy of Sciences* (2020). DOI: 10.1073/pnas.2009033117

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