Tulane math professor leads effort to map spread of coronavirus

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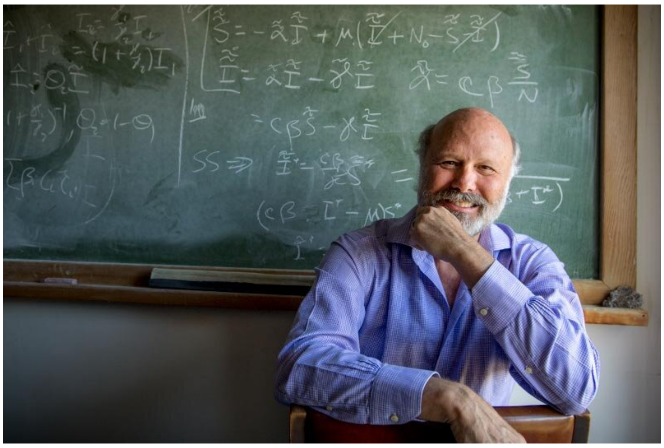

James 'Mac' Hyman, a professor at the Tulane University School of Science and Engineering, hopes his mathematical modeling will help the public health community with efforts to bring the COVID-19 outbreak under control. Credit: Paula Burch-Celentano

James "Mac" Hyman, the Evelyn and John G. Phillips Distinguished Professor in Mathematics at Tulane University, is using mathematical models to better understand and predict the spread of COVID-19 and to quantify the effectiveness of various efforts to stop it.

The goal of Hyman's work in "mathematical epidemiology" at the Tulane School of Science and Engineering, is to help the public health community understand and anticipate the spread of the infection and evaluate the potential effectiveness of different approaches for bringing it under control.

Hyman and colleagues at Georgia State University and the Public Health Agency of Canada recently had a paper on COVID-19 accepted by the journal *Infectious Disease Modeling* and the *Journal of Clinical Medicine*.

The paper is based on daily reported cases of the virus for each Chinese province from the National Health Commission of China. The paper provides a methodology to predict the number of new infections five, 10, and 15 days in the future for the current epidemic in China.

In the paper, the authors say the predictions can help public health officials prepare the medical care and allocate resources needed to confront the epidemic, as well as to predict the intensity and type of interventions needed to mitigate an epidemic. In the absence of vaccines or antiviral drugs for the virus, the effective implementation of non-drug interventions, such as personal protection and social distancing, will be critical to bringing the epidemic under control.

COVID-19 is a disease caused by a virus named SARS-CoV-2. It is a member of the coronavirus family that's a close cousin to the SARS and MERS viruses that have caused outbreaks in the past.

Last week, Hyman led a workshop titled "Modeling Emerging Infection Diseases," and the coronavirus was a major topic of discussion along with Chagas disease, Dengue fever, and Zika. Among those in attendance were researchers from Tulane, the University of Michigan, the California Academy of Sciences, and the University of Louisiana at Lafayette.

The workshop focused on improving the quality of mathematical models to help guide public health workers to mitigate emerging infections. The goals include identifying the essential problems where modeling can be useful and forming collaborations to address these problems.

"We're trying to create models that can be more effective in guiding public health efforts to mitigate an epidemic," Hyman said. "It's about figuring out what needs to be in a model to estimate the risk of someone being infected and predict the risk that an infected person will be to someone else.

"In the coronavirus, we must account for the way that an infected person can infect the environment, such as a table or door handle, and others can be infected, even if they don't have direct contact with an infected person."

In a note submitted to Science Translational Medicine, Hyman and colleagues said several groups are working independently to predict the spread of COVID-19 and that coordination among the groups is essential and should be supported by government agencies.

He thinks the World Health Organization needs to take the lead by organizing an international effort that focuses on three specific aims—predicting further spread of the virus in China, predicting its potential to spread elsewhere or under various conditions, and predicting the effectiveness of mitigation strategies, such as quarantine, contact reduction, hand hygiene and face masks.

"In the complex 'fog of an outbreak,' the world needs actions guided by expert consensus and, as emphasized in this editorial, further guided by data-driven models that explore response scenarios," he wrote.

Provided by Tulane University
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