

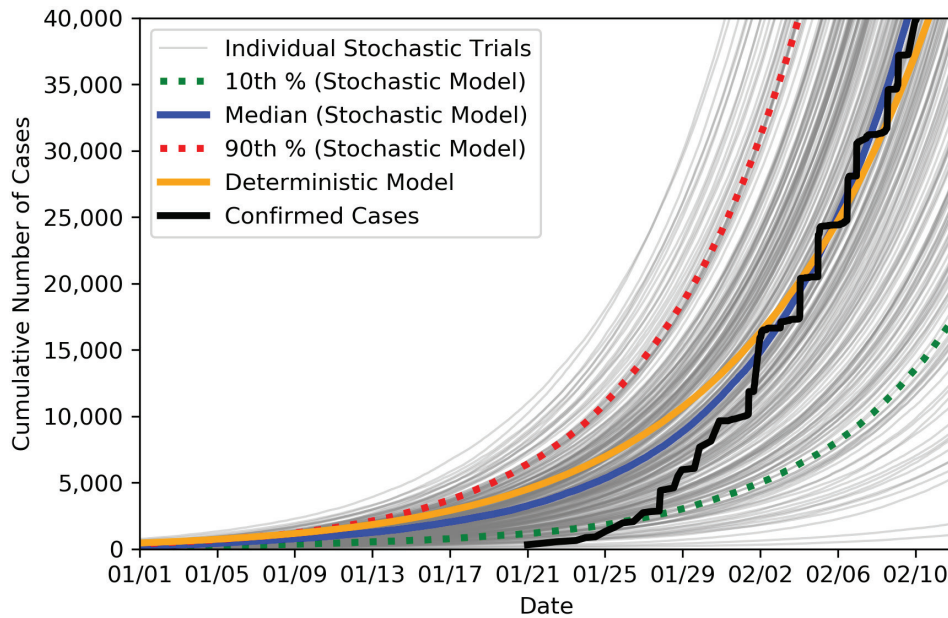
New Models for a New Disease: Simulating the 2019 Novel Coronavirus

IDA researchers updated existing contagious disease modeling capabilities with early data from the novel coronavirus disease (COVID-19) outbreak to produce preliminary models of this emerging infectious disease.

On January 30, 2020, the World Health Organization declared COVID-19 a Public Health Emergency of International Concern, which is defined in the 2005 International Health Regulations as “an extraordinary event” whose potential for international spread requires a coordinated international response. China, where the disease originated, has quarantined tens of millions of its citizens in a bid to mitigate the overwhelming spread of the disease, and countries around the world have instituted screening procedures for travelers from China in an attempt to limit the importation of the disease. As the epidemic progresses, U.S. decision-makers require analytic tools that can be rapidly updated to reflect the continuous influx of new disease knowledge to help plan, evaluate, and respond to the emerging situation.

IDA has applied its rapid contagious disease modeling capabilities to understand and analyze early data from the COVID-19 outbreak. IDA employs both stochastic and deterministic models based on the susceptible, exposed, infectious, and removed (SEIR) construct, in which members of a population at risk are categorized into cohorts based on their disease status. IDA modified these tools—previously used during the 2014 outbreak of Ebola virus disease in West Africa—to simulate the transmission of the virus causing the COVID-19 outbreak. IDA updated both the stochastic and deterministic models using early data from the ongoing outbreak to create two COVID-19 models.

(continued)



The figure above shows how IDA’s models can be used to simulate the beginning of the outbreak and compare it to the number of confirmed cases reported by China. As the outbreak progresses and case information becomes more plentiful, IDA researchers will continue to refine the COVID-19 models.

IDA’s COVID-19 models enable researchers to provide analysis that supports guidance development and decision-making. The impact of various outbreak intervention and response measures—such as patient isolation, quarantine, restriction of movement, and potential future medical countermeasures—can be assessed to evaluate and prioritize different courses of action. Additionally, the models allow IDA researchers to investigate potential disease characteristics that may play a critical role in the transmission dynamics of COVID-19, providing a better understanding of the unique challenges posed by this novel disease.



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