

## Operations Research for COVID-19

### *Operations Research Models for Local COVID-19 Outbreaks*

February 25, 2021 | 10AM PT/ 1PM ET | [EVENT LINK](#)

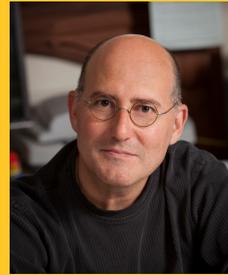
#### About the Series

COVID-19 has posed unprecedented challenges to modern society, and the extent of the virus spread has become a great threat to the U.S., calling for timely decisions to prevent and mitigate further negative consequences. Many challenges have emerged related to vaccine rollout logistics, healthcare capacity planning, and personal protective equipment distribution, among others. This seminar series is designed to provide a sample of ongoing works on operations research decision-making models related to multiple aspects of COVID-19.

#### About the Seminar

This talk presents an overview of methods developed for the modeling and control of local COVID-19 outbreaks. We start with simple models for capping the size of gatherings, and then consider applications of simple queueing models for assessing hospital ICU capacity. Next we address early transmission dynamics featuring exponential growth in infections, and link this to a renewal epidemic model where the current incidence of infection depends upon the expected value of incidence randomly lagged into the past. This leads directly to simple formulas for the fraction of the population infected in an unmitigated outbreak, and reveals herd immunity as the solution to an optimization problem.

The model also leads to direct and easy-to-understand formulas for aligning observable epidemic indicators such as cases, hospitalizations, deaths, and even the concentration of viral RNA in sewage sludge with the unobservable incidence of infection. This modeling leads to a first-order approach for estimating the effective reproduction number and to the direct assessments of the effectiveness of testing and isolation in preventing the spread of infection.



#### Edward H Kaplan

William N. and Marie A. Beach Professor of Operations Research  
Professor of Public Health and Engineering  
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An expert in operations research, mathematical modeling and statistics, Kaplan has co-authored more than 150 academic papers. He was elected to the National Academy of Engineering and the Institute of Medicine (now the National Academy of Medicine), and is an Institute of Operations Research and the Management Sciences (INFORMS) Fellow. His research in HIV prevention and counterterrorism has been recognized with the Edelman Award, Lanchester Prize, Centers for Disease Control's Charles C. Shepard Science Award, INFORMS President's Award, the Philip McCord Morse Lectureship, three Koopman Prizes, and numerous other awards. Kaplan was the Lady Davis Visiting Professor of medicine and of statistics at the Hebrew University of Jerusalem, and also served as a visiting professor to the Faculty of Industrial Engineering and Management at the Technion-Israel Institute of Technology, the Survey Research Center at UC Berkeley, Columbia's Graduate School of Business, MIT's Sloan School of Management, and Stanford's Graduate School of Business. In 2014, he was elected to the presidency of the Institute for Operations Research and the Management Sciences (INFORMS) and served as President-Elect in 2015, President in 2016, and Past-President in 2017. He received his Bachelor's Degree from McGill University in 1977 with First Class Honors, three Masters degrees from MIT (1979 in operations research, 1979 in city planning, and 1982 in mathematics), in addition to his MIT PhD in 1984.

For more information about Kaplan and his research, visit <http://faculty.som.yale.edu/EdKaplan/>.