



ASTMH Committee on Global Health Pre-Meeting Course:

Modeling for Disease Outbreaks

Practical Approaches to Understanding and Using Models

Wednesday, November 11, 2020; 9 a.m. – 4:30 p.m. EST

Virtual

(All times Eastern Standard Time)

Course Description

The COVID-19 outbreak has demonstrated to the world again how rapidly a disease can move through populations, spread exponentially in numbers and locations, and impact human health, transportation, economies, and other important and significant aspects of life. The ability to plan and implement an effective response depends on predicting as accurately as possible who, where, how many and when cases will occur, with limited information and under a range of assumptions. With this knowledge, responders can allocate resources to maximum benefit, and enact the best preventive, containment and mitigation measures. This prediction requires accurate data, an understanding of pathogen transmission dynamics, the context in which the disease is transmitted, and a range of mathematical modeling methods. Modeling is an essential tool in the study of infectious disease epidemiology which allows informed policymaking, nowcasting and forecasting of epidemics, and real-time risk assessments. COVID-19 has clearly demonstrated how model implementation is a multi-disciplinary effort best grounded in a thorough understanding of the principles and limits of communicable disease models. This Pre-Meeting Course will provide instruction to first-time or introductory modelers in 1) key concepts of infectious disease modeling; 2) understanding the strengths and limitations of modeling in order to critically review modeling results; 3) provide a list of resources including modelers and open source modeling programs; and 4) a practical session to provide hands-on experience implementing, running and using models.

At the end of the activity, participants will be able to:

- Understand the principles underlying infectious disease modeling;
- Describe dynamics in pathogen transmission;
- Identify necessary data elements for accurate disease modeling;
- Analyze different models and their outputs and understand limitations;
- Consider different resources and programs when determining the most appropriate modeling approach; and
- Develop and demonstrate mastery of basic modeling using a simulated example.

Course Co-Chairs

Julie Pavlin, MD, PhD, MPH, Director, Board on Global Health, National Academies of Sciences, Engineering, and Medicine, Washington, DC, United States

Kathryn Anderson, MD, PhD, Assistant Professor of Medicine, and Microbiology and Immunology, SUNY Upstate Medical University, Syracuse, New York, United States

9 a.m. **Welcome, Introduction of Topics and Logistics**

9:15 a.m. **Keynote Address:**

Methods and Motives for Infectious Disease Models – The Tale of COVID-19

Nicholas Reich, PhD, Associate Professor, University of Massachusetts Amherst School of Public Health and Health Sciences, Amherst, Massachusetts, United States

9:45 a.m. **Q&A**

10 a.m. **Understanding Infectious Disease Dynamics to Combat Public Health Threats**

Caroline Buckee, DPhil, Associate Director, Center for Communicable Disease Dynamics, Harvard T.H. Chan School of Public Health, Boston, Massachusetts, United States

10:15 a.m. **Data-Driven Inference for Real-Time Estimates of R_0**

Michael Johannson, PhD, Centers for Disease Control and Prevention Dengue Branch, Atlanta, Georgia, United States

10:30 a.m. **The Intersection Between Modeling and Clinical Trial Design During an Epidemic**

Natalie Dean, PhD, Assistant Professor, Department of Biostatistics, University of Florida, Gainesville, Florida, United States

10:45 a.m. **Q&A**

11 a.m. Break

11:15 a.m. **Panel Discussion – Critical Evaluation of Epidemic Models for Real-World Use: A Pragmatic Approach**

Moderator: Caitlin Rivers, PhD, Senior Scholar, Johns Hopkins Center for Health Security, Baltimore, Maryland, United States

Simon Pollett, PhD, Associate Science Director, Infectious Disease Clinical Research Program, Uniformed Services University, Bethesda, Maryland, United States

Sara Del Valle, PhD, Deputy Group Leader, Analytics, Intelligence, & Technology Division, Los Alamos National Laboratory, Los Alamos, New Mexico, United States

11:45 a.m. **Discussion Session with Panel to Include Additional Panelists:**

Sheetal Silal, PhD, Senior Lecturer and Director, Modelling and Simulation Hub, Africa (MASHA), University of Cape Town, South Africa

Michael Johannson, PhD, Centers for Disease Control and Prevention Dengue Branch, Atlanta, Georgia, United States

12:30 p.m. Lunch Break

- 1 p.m. **Practical Example of Epidemic Model Interpretations**
- Ensemble Forecasting and Review of COVID-19 ForecastHub**
Estee Cramer, PhD Student, Epidemiology, University of Massachusetts Amherst School of Public Health and Health Sciences, Amherst, Massachusetts, United States
- Modeling of Vector-Borne Diseases in Tropical Settings**
Benjamin Althouse, PhD, ScM, Research Scientist, Institute for Disease Modeling, Bellevue, Washington
- 2 p.m. Break
- 2:15 p.m. **Tales from the Field – Modeling to Support Malaria Elimination**
Sheetal Silal, PhD, Senior Lecturer and Director, Modelling and Simulation Hub, Africa (MASHA), University of Cape Town, South Africa
- 2:30 p.m. **Tales from the Field – Models Borne of Necessity: Preparing our Community and Hospitals for COVID-19 in Central New York**
Kathryn Anderson, MD, PhD, Assisant Professor of Medicine, and Microbiology and Immunology, SUNY Upstate Medical University, Syracuse, New York, United States
- 2:45 p.m. **Disease Outbreak Scenarios**
- 3 p.m. **Time for Experimentation on Own and Submit Results/Questions**
- 4 p.m. **Reconvene and Review of Modeling Results and Discussion – Faculty**
- 4:30 p.m. Course Adjourns