Department of Epidemiology, Harvard T.H. Chan School of Public Health, Boston, MA, USA); Leah LeJeune (Virginia Tech); Lauren Childs (Virginia Tech); Navid Ghaffarzadegan (Virginia Tech)

SCHEDULE Monday, 13 July 2026; 15:40-16:00; 15.02 - HS
TRACK Mathematical Epidemiology

Abstract

During the COVID-19 pandemic, individuals initially responded to epidemic risk through high-cost interventions such as mobility reduction. However, empirical data reveal that mobility reductions became less pronounced in later waves despite persistent death rates. This declining responsiveness likely reflects economic constraints, psychological fatigue, and learning about disease risk that shift individuals toward alternative cost-effective protective measures (e.g., mask wearing). Existing aggregate behavioral feedback models fail to capture this reallocation of protective behavior across interventions. In this study, we formalize this micro-level behavioral adaptation by incorporating an explicit learning mechanism, driven by accumulated pandemic experience, that shifts individuals from high-cost interventions (such as mobility reduction) toward lower-cost measures (such as mask wearing) within a risk-responsive epidemic model.

MS173-04 — SIR model with the distribution of preventive behaviors in a community

SPEAKERS Zhiqiong Fu (Tohoku University)
AUTHORS Hiromi Seno (Tohoku University); Zhiqiong Fu (Tohoku University)
SCHEDULE Monday, 13 July 2026; 16:00-16:20; 15.02 - HS
TRACK Mathematical Epidemiology

Abstract

We consider a mathematical model of differential equations for the epidemic dynamics with heterogeneity in preventive behaviors among individuals. Our focus is on how the distribution of preventive behaviors influences the epidemic consequence in a community. The preventive behavior determines the level of caution to the disease transmission. We assume that the community could be categorized into n classes according to their caution level about a spreading disease. The caution level affects both the susceptibility of susceptible individuals and the transmissibility of infected individuals. Susceptible individuals of low caution level are more likely to be infected than those of high caution level. Infected individuals of low caution level contribute more to the disease transmission. Based on this social structure, we present an SIR-type model with n classes of different caution levels. We investigate how the distribution of classes could affect the final epidemic size, which is defined as the total number of individuals who experienced the disease transmission, and discuss how the severity of the disease outbreak depends on the nature of the distribution.

MS173-05 — Extending an SEIR behavioural model with structures for supply chain efficiency and vaccine allocation

SPEAKERS Jim Duggan (University of Galway)
AUTHORS Jim Duggan (University of Galway)
SCHEDULE Monday, 13 July 2026; 17:00-17:20; 15.02 - HS
TRACK Mathematical Epidemiology

Abstract

A key challenge in infectious disease modelling is to extend beyond classical epidemiological structures to model the interplay between the spread of a disease and how people respond to an outbreak [LeJ+25]. Recent research highlights the potential of incorporating a human behaviour feedback loop into existing model structures as a promising way to advance disease forecasting, and provide better methods for decreasing the negative impact of disease countermeasures on society [GPV25; RXG22]. This talk presents an age-cohort infectious disease spread model, and builds upon recent contributions for exploring pandemic response strategies in the context of limited resources [And+24] in three ways. First, the it incorporates a negative feedback structure to capture human behaviour which moderates disease spread; second, it adds