

Yale SCHOOL OF PUBLIC HEALTH

Biostatistics

Learning from COVID-19 Data on Transmission, Health Outcomes, Interventions and Vaccination

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ABSTRACT

COVID-19 is an emerging respiratory infectious disease that has become a pandemic. In this talk, I will first provide a historical overview of the epidemic in Wuhan. I will then provide the analysis results of 32,000 lab-confirmed COVID-19 cases in Wuhan to estimate the transmission rates using Poisson Partial Differential Equation based transmission dynamic models. This model is also used to evaluate the effects of different public health interventions on controlling the COVID-19 outbreak, such as social distancing, isolation and quarantine. I will present the results on the epidemiological characteristics of the cases. The results show that multi-faceted intervention measures successfully controlled the outbreak in Wuhan. I will next present transmission regression models for estimating transmission rates in USA and other countries, as well as factors including intervention effects using social distancing, test-trace-isolate strategies that affect transmission rates. I will discuss estimation of the proportion of undetected cases, including asymptomatic, pre-symptomatic cases and mildly symptomatic cases, the chances of resurgence in different scenarios, and the factors that affect transmissions. I will also present the US county-level analysis to study the demographic, social-economic, and comorbidity factors that are associated with COVID-19 case and death rates. I will also present the analysis results of >500,000 participants of the HowWeFeel project on symptoms and health conditions in US, and discuss the factors associated with infection, behavior, and vaccine hesitancy. I will provide several takeaways and discuss priorities.