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Statistical Methods for Causal Inference In HIV Research

In this talk I will review some of the statistical challenges we encountered in our collaborations in HIV research. One collaboration was concerned with the assessment of the effects of mutations in the HIV virus on drug-resistance, involving interval censored time to event outcomes, confounding by the patient history and other mutations. In another collaboration we are concerned with estimation of subgroup-specific causal effects of treatment on time to death and viral failure based on a randomized controlled trial in which subjects are lost to follow up in response to time-dependent markers. We have also worked on estimation of individualized rules for when to switch a drug regimen and when to start treatment for HIV infected patients based on a variety of observational studies. Currently, we are involved in designing a RCT for comparing a "treat early" intervention with the current standard w.r.t. HIV prevention at the community level, and in determining optimal rules for triggering HIV testing based on observing the history of subjects including their adherence profile. We will demonstrate that we employed a general roadmap for targeted learning of causal effects, involving the most recent advances in modeling, estimation, and inference.