Predicting on-demand PrEP strategies that effectively reduce HIV risk

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Pre-exposure prophylaxis (PrEP) is an HIV prevention strategy intended to reduce the risk of infection. Briefly, PrEP refers to the practice of taking antiretroviral drugs therapy (ART), known to effectively control infection, in advance of exposure to HIV. The CDC currently recommends continuous, daily dosing of Truvada, a combination of two ART drugs, with the first dose administered a full month before the initial high-risk incident; such continuous dosing was shown to effectively reduce risk of HIV infection most famously in the 2010 iPrEX study. However, the 2015 IPERGAY demonstrated that taking only a few doses before and after exposure - termed "on-demand PrEP" - may be roughly as effective in preventing infection as continuous exposure. On-demand PrEP strategies, i.e., dosing and timing relative to exposure, that may most effectively reduce risk of infection, remain unclear. We investigate strategies via an inhomogeneous branching process model created by integrating via a model of the pharmacokinetics and pharmacodynamics of Truvada in relevant tissues (Cottrell et al. 2016) into a stochastic mathematical model of HIV infection risk following exposure (Conway et al. 2013). We will discuss our model and present preliminary results predicting effective relative HIV risk reduction via on-demand PrEP.

⋆Mini-Symposium: Modeling virus infection