Intelligent Network-Based HIV PrEP Distribution

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Motivation and Objective

We do not have enough HIV PrEP to distribute it to everyone who is at risk

Question: Who gets priority?

Objective: Distribute PrEP in a way that *minimizes* the total number of new HIV cases in a network.

High-Level Problem Formulation

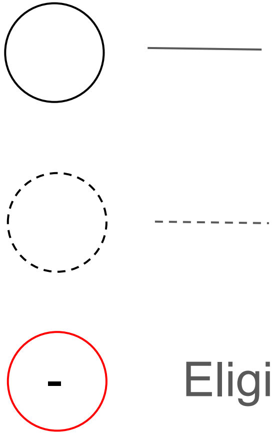
Given:

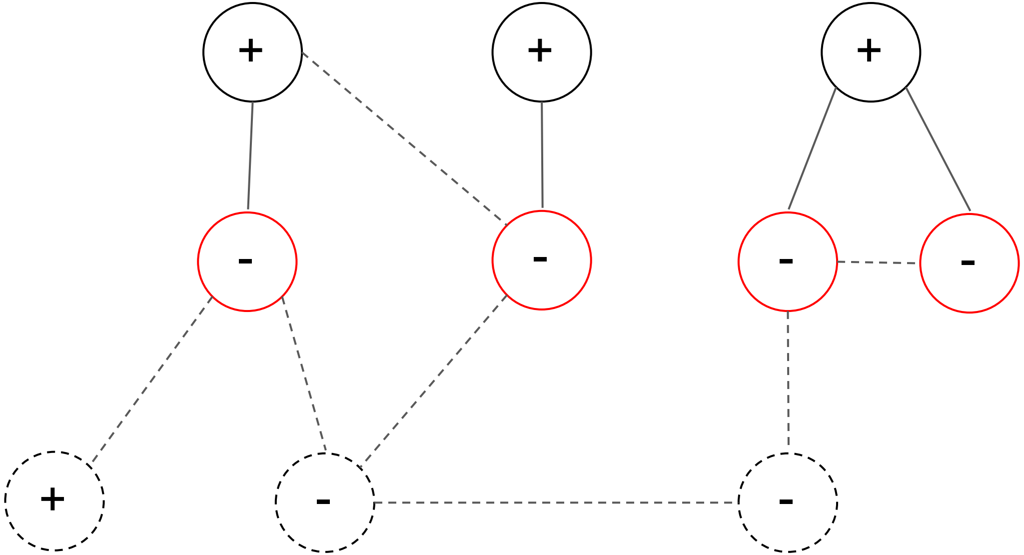
1. n HIV- people that are connected to an HIV+ person, as well as their covariates and node degrees
2. PrEP budget $B \leq n$

How do we select B people to give PrEP to in order to minimize the total number of infections in the underlying transmission network?

HIV spread model: independent cascades

Visual Example





How do we distribute B = 2 PrEP as to minimize new HIV cases despite limited observability of the transmission network?

Additional Modeling Choices

Adherence: if person A receives PrEP, their transmission probability should decrease but may not reach 0

Heterogeneous interventions: we may have different budgets for different types of PrEP-based interventions that result in varying decreases in transmission probability

Sequential modeling: the edges in the network may change over time, and people may flow in and out