Background

PrEP and STI Incidence among MSM

- PrEP reduces HIV risk by over 90% among MSM with high adherence.
- Public health concern about higher incidence of bacterial STIs among PrEP users compared to non-PrEP cohorts (Kojima, AIDS, 2016):
  - Neisseria gonorrhoeae (NG) rates 25 times as high (37.2 versus 1.5 per 100 PYAR).
  - Chlamydia trachomatis (CT) rates 11 times as high (38.0 versus 6.6 per 100 PYAR).
- Higher rates may be causal due to effects of PrEP or non-causal due to biases in comparing the two cohort groups.
- A primary causal hypothesis is behavioral risk compensation (RC), where MSM may reduce condom use after starting PrEP.
- PrEP confers no biological protection against bacterial STIs.

STI Screening within PrEP Guidelines

- CDC's PrEP clinical practice guidelines recommend biannual screening and treatment for bacterial STIs.
- Biannual screening may miss 40% of infections compared to quarterly intervals (Cohen, CROI, 2016).
- Optimizing STI screening recommended within the guidelines may result in lower STI incidence, which would reduce HIV among non-PrEP users.

Study Aims

- To estimate how the two potentially counteracting phenomena surrounding PrEP use — behavioral RC and ongoing STI screening — could interact to either increase or decrease the incidence of rectal and urogenital NG and CT.

Methods

Network-Based Mathematical Model

- Extended our robust HIV transmission model for MSM in the United States.
- Network model for dynamics of complex predictors for main, casual, and one-off sexual partnerships using exponential random graph models (ERGMs).
- Modeled three co-circulating infections: HIV, NG, and CT.
- HIV model incorporated interacting transmission and progression dynamics by HIV viral load, condom and PrEP use, sexual position, biological/genetic factors.
- NG/CT transmission site-specific (urethral vs rectal) with varied symptomatology.
- NG/CT recovery dependent on treatment status, influenced by PrEP use and symptoms.

Results

- At 40% PrEP coverage and 40% risk compensation, 42% of GC infections and 40% of CT infections would be averted over the next 10 years.
- A doubling of RC would still result in net STI prevention benefits relative to no PrEP.
- Percent of NG Infections Averted
- Percent of CT Infections Averted

Discussion

PrEP Could Reduce STI Incidence

- Increasing uptake of PrEP along with successful completion of STI treatment after routine screening could lead to strong and sustained declines in NG/CT incidence and prevalence among MSM.
- PrEP-related screening would result in early detection of many more asymptomatic rectal cases, which often remain untreated.

No Support for the Causal Hypothesis

- Our models, calibrated to the non-PrEP cohorts, were unable to reproduce incidence rates close to the PrEP cohorts even under extreme levels of RC.
- Suggest higher incidence observed in PrEP cohorts more likely resulting from biased comparisons between the cohorts (e.g., selection bias) than causal from RC.

Optimizing PrEP-Related STI Screening

- Screening interval was strongly associated with STI incidence reductions, but even yearly screening and treatment would reduce STI incidence.
- Clinicians have a critical role to perform the recommended STI screening and treatment, as incidence could increase if PrEP delivery was delayed.

PrEP as Combination Prevention

- MSM who are at substantial risk for HIV, and therefore indicated for PrEP, are also at risk for STIs through the same sexual partnership networks and behaviors.
- Our study highlights the design of PrEP not only as daily antiretroviral medication, but as a combination HIV/STI prevention package incorporating STI screening and treatment.

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