STI Incidence among MSM Following HIV Preexposure Prophylaxis: A Modeling Study

Samuel M. Jenness,1 Kevin Weiss,1 Steven M. Goodreau,2 Thomas Gift,3 Harrell Chesson,3 Karen W. Hoover,3 Dawn K. Smith,3 Patrick Sullivan,1 Eli Rosenberg1

1 Emory University; 2 University of Washington; 3 US Centers for Disease Control and Prevention

Abstract #1034

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 NG Infections Averted
  - Percent of CT Infections Averted

- **STI Incidence by PrEP STI Screening Interval**
- Under 40% RC, STI incidence would decline only if >50% of PrEP users were adequately screened and treated for infection, consistent with the guidelines.

- **STI Incidence by Proportion Treated**
- For a combined STI incidence outcome, performing STI screening at quarterly versus biannual intervals would result in a further 50% reduction in incidence.

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 delivered without those services.

**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.

Conference on Retroviruses and Opportunistic Infections (CROI) February 2017 // Seattle

Funding CDC U38 PS004646 NIH R21 HD075662 NIH P30 AI050409

Contact sjenness@emory.edu http://epimodel.org http://samueljenness.org