# 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 Rosenberg[1]

*[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 4.2 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.

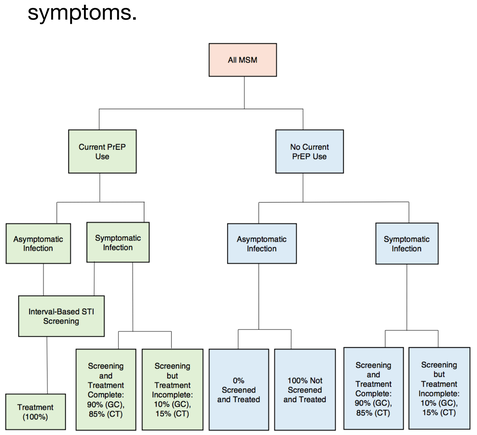
### Study Aims

- 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

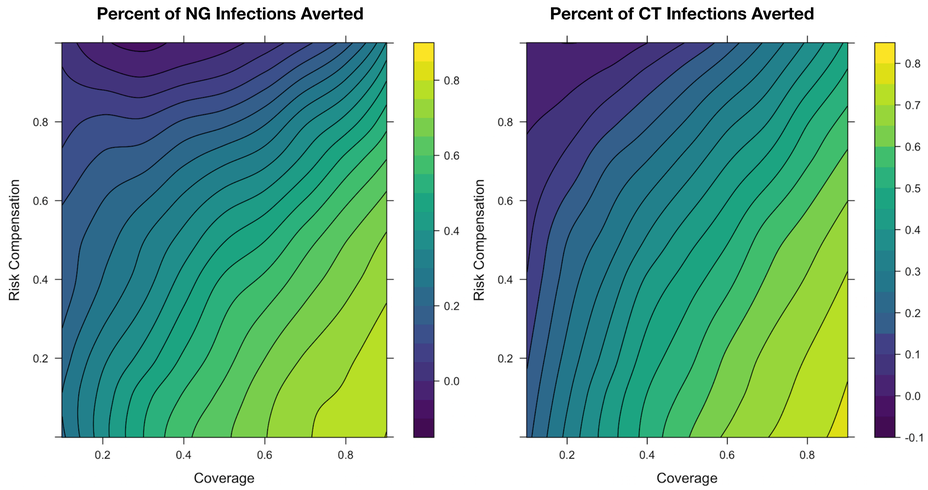
- Extended our robust **HIV transmission model** for MSM in the United States.
- Network model for dynamics of complex predictors for main, casual, and one-off sexual partnerships using **exponential random graph models** (ERGMs).
- Modeled **three co-circulating infections**: HIV, NG, and CT.
- **HIV 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.



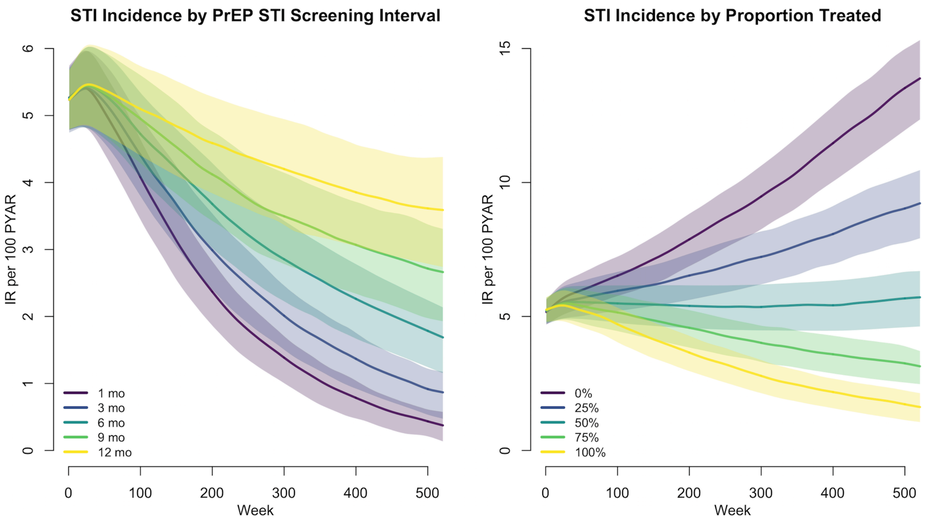

- **PrEP indications** modeled based on CDC guidelines, adherence based on the PrEP Demo Project, efficacy based on iPrEx.
- **Risk compensation** modeled as a per-act proportional reduction in condom use while on PrEP (Volk, CID, 2015).
- Model **calibrated** to STI incidence in non-PrEP cohorts in Kojima meta-analysis.

## 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.




- STI incidence declined because PrEP-related STI screening resulted in a **17% and 24% increase in detection of asymptomatic and rectal cases**, respectively.




- For a combined STI incidence outcome, performing STI screening at **quarterly versus biannual intervals** would result in **a further 50% reduction in incidence**.
- Under 40% RC, **STI incidence would decline** only if **>50% of PrEP users were adequately screened and treated** for infection, consistent with the guidelines.

## 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**.

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**Contact**
sjennes@emory.edu
http://epimodel.org
http://samueljenness.org

EpiModel Research Lab

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