# Projected Impact of Doxycycline-PEP on Syphilis Incidence: Modeling Study in 4 US Cities

1020

**Ryan Forster**[1], Melissa Schnure[2], David Dowdy[1], Maunank Shah[2], Anne Rompalo[2], Khalil G Ghanem[2], Anthony T. Fojo[2], Parastu Kasaie[1]
[1]Johns Hopkins Bloomberg School of Public Health, Baltimore, MD, US, [2] Johns Hopkins University School of Medicine, Baltimore, MD, US

## BACKGROUND

**Rising Burden:** Syphilis cases surged by ~80% between 2018 and 2022. MSM accounted for 45% of all male primary and secondary syphilis diagnoses in 2022.

**Objective:** Clinical use of doxy-PEP began in 2022, with national guidelines released in 2024; however, rollout data remain limited. We therefore calibrated models to data through 2022 (pre–doxy-PEP) and simulated hypothetical scenarios to **estimate population-level impact.**

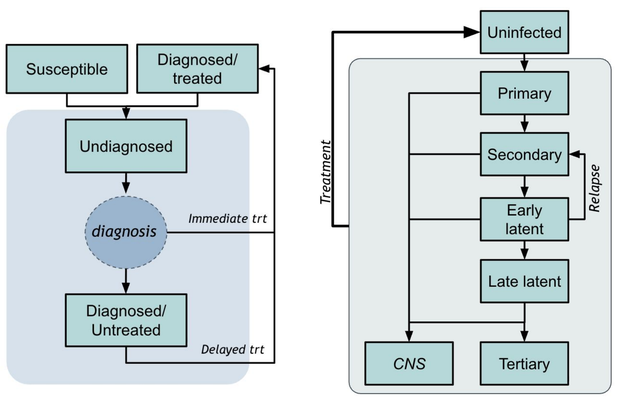
## METHODS

**Model Design:** **SHIELD** is a dynamic compartmental model calibrated to local data (1993–2022) across four major US urban populations.

**Intervention Scenarios:** Doxy-PEP rollout begins in 2022, scaling to reach 10% or 25% coverage of MSM by 2027. Doxy-PEP is assumed to reduce the risk of syphilis acquisition on average by 80%.

**Outcomes:** The primary outcomes are the total number and percentage of new syphilis infections prevented among MSM between 2022 and 2030.

### Model Structure



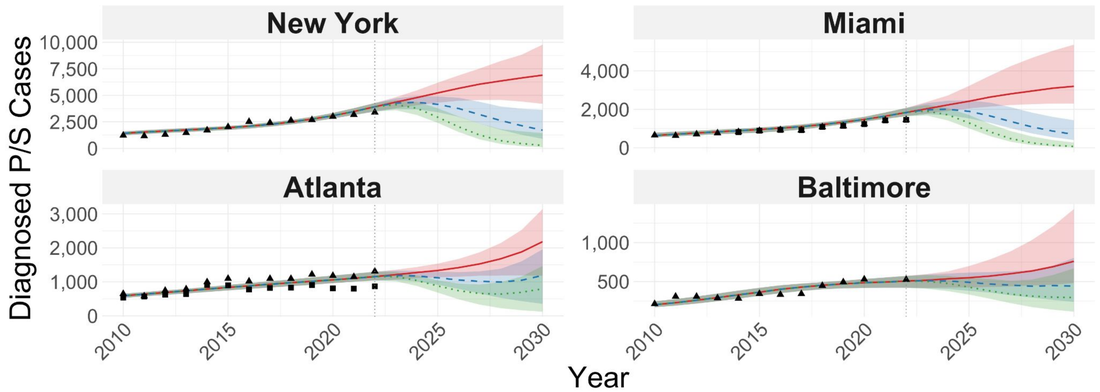

Without new prevention, syphilis cases are projected to rise by 2030. Doxy-PEP could reverse this trend, with 10% MSM coverage preventing nearly half of new infections.

- **Projected Surge:** Without Doxy-PEP, syphilis cases could increase on average by 48% in Baltimore to 92% in New York City by 2030.
- **Prevention Goal:** Covering 10% of MSM by 2027 could prevent nearly half of new syphilis infections among MSM.

## RESULTS

### Calibrated Fit and Projected Trends in Diagnosed Primary & Secondary Syphilis Cases

Median (solid line) and 95% uncertainty range (shaded) among 100 simulations

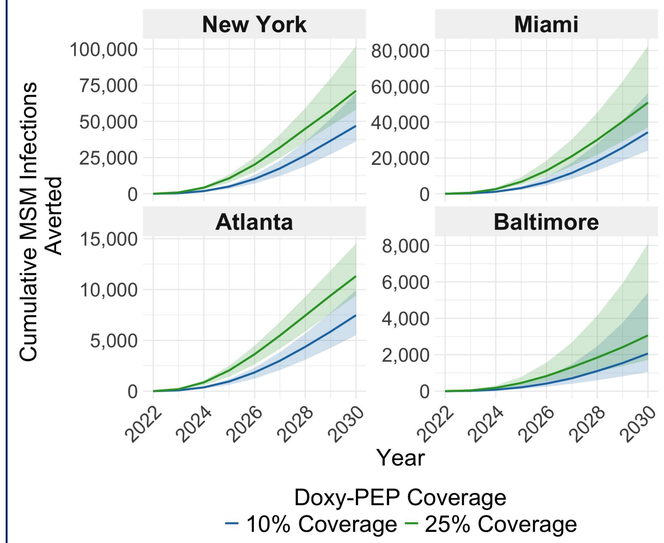



### Projected Impact of Doxy-PEP Implementation Among MSM from 2022-2030

| | 10% Doxy-PEP Coverage | | | | 25% Doxy-PEP Coverage | | | |
|---|---|---|---|---|---|---|---|---|
| City | Person-Years Doxy-PEP | Averted Infection | Number Needed to Treat | % Averted Infection | Person-Yrs Doxy-PEP | Averted Infection | Number Needed to Treat | % Averted Infection |
| **New York** | 349.3k | 46.9k | 7.4 | 42.6% | 873.2k | 71.1k | 12.2 | 63.8% |
| **Miami** | 142.9k | 34.4k | 4.1 | 46.3% | 357.3k | 50.9k | 7.0 | 68.1% |
| **Atlanta** | 93.3k | 7.5k | 12.5 | 37.4% | 233.4k | 11.3k | 20.4 | 56.9% |
| **Baltimore** | 37.9k | 2.1k | 19.6 | 39% | 94.8k | 3.1k | 32.6 | 59.6% |

## RESULTS

### Cumulative Impact of Doxy-PEP on Averted MSM Infections




## DISCUSSION & CONCLUSION

**Projected Impact:** Syphilis infections among MSM are projected to rise **1.71-fold** across locations by 2030. Doxy-PEP could avert **37%** of infections in Atlanta and **46%** in Miami at **10% coverage**, increasing to **57%** and **68%** respectively at **25% coverage.**

**Location Heterogeneity:** Absolute impact does not equate to clinical efficiency or population-level reduction. While **NYC** prevented the most total infections, it required more treatments to prevent a single infection (**12.2 NNT**) and yielded a lower percentage averted (**63.8%**) than **Miami**, which saw the greatest relative impact (**68.1%**) with the highest clinical efficiency (**7.0 NNT**).

**Study Limitations:** Projections are limited by lack of data on current Doxy-PEP rollout and exclusion of HIV co-infection (work in progress).

**FUNDING:** This research was funded by the National Institute of Allergy and Infectious Diseases (Translating Evidence into Action: Novel modeling approaches to end the syphilis epidemic in the U.S.: 1R01AI179776-01). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.