

No increased incidence of bacterial sexually transmitted infections with PrEP use among men who have sex with men in a clinic cohort

Benson Koon Wee Yeo¹ FAMS (Dermatology), Faith Tan¹ BSc (Statistics), Linus Cheng¹ BSc (Information Systems)

Dear Editor,

Pre-exposure prophylaxis (PrEP) is a highly effective biomedical intervention to prevent human immunodeficiency virus (HIV) acquisition in at-risk populations, particularly in men who have sex with men (MSM).¹ However, concerns about risk compensation, such as reduced condom use or increased partner numbers, have raised the possibility of rising bacterial sexually transmitted infection (STI) incidence among PrEP users.^{2,3} While some studies report higher STI rates among PrEP users,^{4,5} others suggest that structured PrEP programmes with routine screening may mitigate these risks.⁶ Singapore's Department of STI Control (DSC) Clinic introduced PrEP services in 2018, offering regular reviews, testing and counselling. This study evaluated whether PrEP use was associated with different STI outcomes compared to non-PrEP users within this structured framework.

A retrospective cohort analysis of electronic medical records from the DSC Clinic in Singapore was conducted between January 2018 and December 2023. Eligible participants were MSM aged ≥ 21 years who had at least 1 negative baseline chlamydia or gonorrhoea test and at least 1 subsequent follow-up test. All PrEP users were included. The comparison group comprised MSM not using PrEP. Non-MSM patients were excluded due to small sample size.

For each visit, results across all anatomical (pharyngeal swabs, rectal swabs and urine samples) sites were consolidated, and a visit was considered positive if at least 1 chlamydia or gonorrhoea test was positive. Incident positivity was defined as a positive result following the earliest negative test. To account for differences in testing behaviour, the authors adjusted for the number of tests performed at each visit, the cumulative number of tests a patient had previously undergone, any prior positive results and the interval since the last test. Each variable was categorised for analysis due to data skewness. Analyses focused on chlamydia and gonorrhoea, which were routinely tested. Syphilis serologies were excluded, as interpretation required reference to clinical notes that were not extracted for analysis.

Associations between PrEP use and STI outcomes were evaluated using unadjusted and covariate-adjusted multivariable logistic mixed-effects models. A random effect for patient identifier accounted for repeated visits from the same individual. Fixed effects included for covariate adjustment were demographic factors (age, ethnicity and sexual preference), STI type and the 4 testing-related covariates. Results are reported as odds ratios (ORs) with 95% confidence intervals (CIs). Separate models were fitted for overall bacterial STI, chlamydia alone and gonorrhoea alone. A significance level of 0.05 was selected as the threshold for statistical significance. Statistical analyses were performed using R version 4.5.1 (R Core Team) (R Foundation for Statistical Computing, Vienna, Austria) and RStudio version 2025.05.1+513 (Posit Team) (RStudio Corporation, Massachusetts, US).

This study was approved by the National Healthcare Group Domain Specific Review Board (2023/01000).

A total of 2711 subjects (588 PrEP users, 2364 non-PrEP users) contributed 15,287 non-baseline observations. PrEP users were older (43.0% aged 31–40 versus [vs] 34.3% of non-users), while non-PrEP users were more likely aged 21–30 years (45.3% vs 33.1%). Ethnic distribution was similar. Chinese participants comprised three-quarters of both groups. Nearly all participants reported sex exclusively with men (95.4% of PrEP users vs 91.7% of non-PrEP users), while 8.3% of non-PrEP users and 4.6% of PrEP users reported sex with both men and women.

PrEP users had more frequent follow-ups, contributing a median of 3 visits (interquartile range [IQR] 4) compared with 2 visits (IQR 2) in non-PrEP users, and were more likely to undergo multiple-site testing per visit (65.8% vs 49.4%). They also accumulated more prior testing, with 53.9% having 6–20 previous tests and 21.1% having more than 20, compared with 37.1% and 4.6% of non-PrEP users, respectively. Prior positive results were also more common among PrEP users (24.1% vs 10.0%).

Overall, incident positivity was similar: 10.93% in PrEP users vs 10.71% in non-PrEP users. In the unadjusted mixed-effects model, PrEP use was not significantly

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¹ Department of STI Control, National Skin Centre, Singapore

Correspondence: Dr Benson Koon Wee Yeo, Department of STI Control, National Skin Centre, 31 Kelantan Lane, Singapore 200031.

Email: bensonyeo@nhghealth.com.sg

Accepted: 31 October 2025

Published Online First: 21 November 2025

Table 1. Incident STI outcomes and association with PrEP use.

Outcome	PrEP users, n/N (%)	Non-PrEP users, n/N (%)	OR (95% CI), P value	Adjusted OR (95% CI), ^a P value
Either chlamydia or gonorrhoea	476/4354 (10.9)	1171/10,933 (10.7)	OR 1.05 (0.90–1.23), P=0.53	^a OR 1.07 (0.90–1.27), P=0.45
Chlamydia	237/2162 (11.0)	594/5411 (11.0)	OR 1.02 (0.85–1.23), P=0.81	^a OR 1.03 (0.84–1.27), P=0.76
Gonorrhoea	239/2192 (10.9)	577/5522 (10.4)	OR 1.09 (0.87–1.38), P=0.46	^a OR 1.09 (0.84–1.42), P=0.51

CI: confidence interval; n/N: number of positive incident tests over total number of tests conducted; OR: odds ratio; PrEP: pre-exposure prophylaxis; STI: sexually transmitted infection

^a Adjusted for age, ethnicity, sexual preference, no. of tests per visit, cumulative number of prior tests, prior positive results and interval since last test.

associated with overall STI positivity (OR 1.05, 95% CI 0.90–1.23, $P=0.53$) (Table 1). Sub-analyses by infection type also showed no significant association with PrEP use: chlamydia (OR 1.02, 95% CI 0.85–1.23, $P=0.81$) and gonorrhoea (OR 1.09, 95% CI 0.87–1.38, $P=0.46$). Similar results were seen in the adjusted mixed-effects model, where PrEP use was not significantly associated with overall STI positivity (OR 1.07, 95% CI 0.90–1.27, $P=0.45$), chlamydia positivity (OR 1.03, 95% CI 0.84–1.27, $P=0.76$) and gonorrhoea positivity (OR 1.09, 95% CI 0.84–1.42, $P=0.51$).

This retrospective longitudinal cohort study found no significant association between PrEP use and chlamydia or gonorrhoea incidence among MSM attending a specialist sexual health clinic. Although there were slightly higher odds of positivity among PrEP users, differences were small and not statistically significant.

These findings indicate that structured PrEP services, which include regular STI testing, counselling and prompt treatment, do not contribute to higher STI burden. PrEP users in this study's cohort underwent more frequent and comprehensive testing, which likely enabled earlier detection and treatment. This aligns with other studies showing that increased STI diagnoses among PrEP users largely reflect intensified screening, rather than PrEP itself increasing transmission.^{7,8}

Several limitations should be considered. First, sexual behavioural data such as condom use, number of partners and network factors were not available, limiting the ability to adjust for key risk factors.⁹ Second, tests performed for symptoms and those conducted as routine screening could not be differentiated, as presenting complaints were recorded only in free-text notes and were not extractable for analysis, which may bias comparisons since PrEP users are systematically tested while non-users are more often tested when symptomatic.¹⁰ Third, continuous testing-related variables, such as cumulative test

counts and intervals between tests, were categorised for analysis due to skewed distributions, which may have reduced sensitivity to extreme patterns of very frequent or infrequent testing. Finally, as this study was conducted in a single specialist clinic, findings may not be generalisable to primary care, community-based settings or to other countries where PrEP delivery models may differ.

PrEP use was not associated with significantly different odds of testing positive for chlamydia or gonorrhoea in a structured clinic setting. Comprehensive PrEP services remain essential for HIV prevention and sexual health, without increasing bacterial STI incidences.

Ethics statement

This study was approved by the National Healthcare Group Domain Specific Review Board (2023/01000).

Declaration

The authors declare there are no affiliations with or involvement in any organisation or entity with any financial interest in the subject matter or materials discussed in this manuscript.

Keywords: *chlamydia, gonorrhoea, HIV, men who have sex with men, pre-exposure prophylaxis, sexually transmitted infections*

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