Impact of Rapid HIV Testing on Lenacapavir Effectiveness and Resistance in Thailand

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BACKGROUND

- WHO recommends rapid diagnostic HIV, including self-tests, before lenacapavir administration.
- Rapid tests have reduced sensitivity, especially during the acute HIV infection.
- Starting lenacapavir during undiagnosed infection may facilitate ongoing transmission and emergence of drug resistance.
- This study evaluates the impact of HIV testing strategies on lenacapavir's preventative effectiveness and drug resistance transmission dynamics in MSM in Thailand.

METHODS

Mathematical model

- Figure 1: schematic representation of the model.
- Table 1: parameters used in calibration

PrEP use

- From 50-80,000 users to 100,000 in the next decade
- 20-100% of PrEP users received lenacapavir

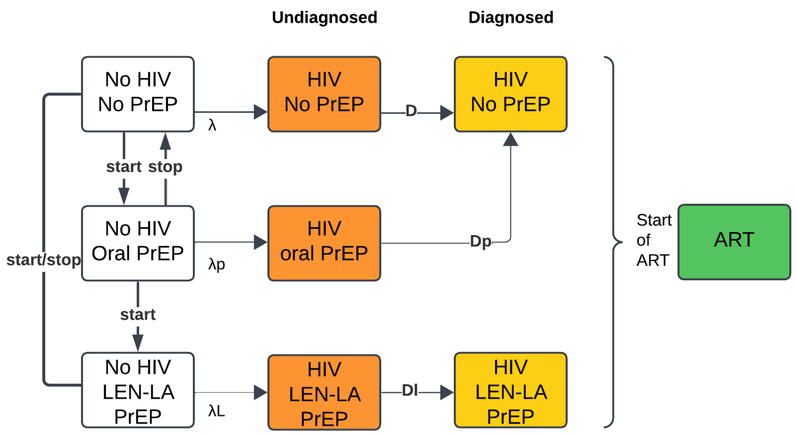
PrEP related parameters (including resistance): See Table 2

Testing strategies

- Compared to a perfectly accurate HIV test: 1) rapid tests fail to identify acute infections, 2) individuals are tested annually

Figure 1: Mathematical model among MSM in Thailand

Based on model for oral PrEP in Thailand (Versteegh et al. Lancet Reg Health SE Asia 2022). HIV acquisition rate (λ) is reduced by PrEP (see methods). Diagnosis rate (D) increases with PrEP use. Individuals progress through acute, chronic, AIDS stages each with distinct infectivity (Sood et al. Clin Infect Dis 2013).



Rapid HIV testing yields small increases in incident infections and drug resistance transmission, supporting for its use in scaling up lenacapavir-based long-acting PrEP.

RESULTS

- Table 3: Infections averted after introduction of lenacapavir
- Table 4: Transmitted resistance after introduction of lenacapavir

Table 3: Epidemiological impact of testing strategy after lenacapavir in the next 20 years

Projected infections averted by lenacapavir-based PrEP expansion (N=100,000; 20-100% lenacapavir uptake) under different HIV screening approaches: perfect sensitivity test, rapid diagnostic test (no detection during acute stage), and annual testing. Counterfactual: 57,000 infections (no lenacapavir).

PrEP w/ LEN	Perfect test	Rapid test	Rapid test – annual testing
20%	5460	+237 (+4%)	+254 (+5%)
40%	9625	+407 (+4%)	+430 (+4%)
60%	13179	+517 (+4%)	+532 (+4%)
80%	15884	+603 (+4%)	+616 (+4%)
100%	17814	+650 (+4%)	+668 (+4%)

Table 4: Testing strategy and transmitted lenacapavir resistance in the next 20 years

Projected number of individuals with transmitted lenacapavir resistance (N=100,000; 20-100% lenacapavir uptake) under different HIV screening approaches: perfect sensitivity test, rapid diagnostic test (no detection during acute stage), and annual testing.

PrEP w/ LEN	Perfect test	Rapid test	Rapid test – annual testing
20%	12	+6 (+50%)	+12 (+100%)
40%	18	+9 (+50%)	+18 (+100%)
60%	20	+12 (+60%)	+21 (+105%)
80%	23	+12 (+52%)	+23 (+100%)
100%	24	+12 (+50%)	+23 (+96%)

Table 1: Parameters used in calibration

Parameter	Range	Source
MSM	375-840 x1,000	National report on PrEP
CD4 at diagnosis		Local data
<200	40-70%	
200-350	10-30%	
Living with HIV	65-85 x1,000	Brown et al. JAIDS 2024
New acquisitions	5-7 x1,000	Brown et al. JAIDS 2024

Table 2: PrEP related parameters (including resistance)

Parameter	Range	Source
Efficacy LEN	96% (82-99%)	Kelly et al NEJM 2024
Real-World PrEP effectiveness	60% (46-71%)	Jourdain et al Lancet Publ Health 2022
Risk of LEN resistance	50-100%	Kelley et al NEJM 2024
Transmissibility LEN resistant HIV	30-50% lower	Demirdjian et al J Med Virol 2025

CONCLUSIONS

- Rapid HIV testing and less frequent testing are associated with a modest increase in new infections and drug-resistant HIV transmission.
- These findings support the use of rapid tests, including self-testing to expand access to lenacapavir as a long-acting PrEP option.

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PLAIN LANGUAGE SUMMARY

Lenacapavir is a highly effective HIV prevention injection given twice yearly, but requires HIV testing before each dose. Our study found that using less accurate but easy to administer rapid HIV tests causes only a small increase in new infections and drug resistance, meaning it could simplify providing access to lenacapavir.