Estimating Return on Investment (ROI) With Increased Utilisation of HIV Pre-Exposure Prophylaxis (PrEP) Among Key Populations in France

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Conclusions

- This modelling study explored whether increased uptake and adherence to oral pre-exposure prophylaxis (PrEP) in subpopulations in France, compared with current real-world estimates, would result in overall cost savings by reducing HIV-1 cases
  - Net economic savings were measured as a return on investment (ROI) >1
- The model results showed an ROI >1 for increased oral PrEP use in populations with high HIV-1 incidence, including men who have sex with men (MSM), transgender women (TGW), female sex workers, and heterosexual men (HSM) and women (HSW) born in Sub-Saharan Africa
- In populations with lower HIV-1 incidences, the ROI was observed to be lower; however, increased PrEP utilisation would still lead to reduced HIV-1 cases
  - The impact of increasing PrEP in these populations should be explored as they may contain subgroups with higher HIV-1 incidence not captured in this study
- The model highlights the importance of oral PrEP; however, these net economic savings are not currently being realised, as challenges to achieving higher oral PrEP uptake and adherence remain
  - Investing in future PrEP modalities with higher acceptability among individuals not well-served by oral PrEP could further improve real-world outcomes

Plain Language Summary

- HIV prevention medications called "PrEP" lower the chance of getting HIV, and have been available in France since 2016 and are fully covered by health insurance
  - The PrEP medication currently available in France is taken as a daily oral (by mouth) pill
- Even though PrEP is available in France, the number of people getting new HIV infections remains high in some groups of people
- This study asked the question "if more money had been spent in France because more people were using oral PrEP, would there have been an overall savings as less money would be spent on costs related to HIV treatment?"
- The study found that money would have been saved in France if more money had been spent on daily oral PrEP use in groups of people with a higher risk of getting HIV, including men who have sex with men and people born in Sub-Saharan Africa
- However, more money would need to be spent on outreach to encourage more people to use oral PrEP in France, and not all people who need or want PrEP are able to take a once-a-day pill
- Investing in new PrEP choices that are acceptable to more people who need or want PrEP may help to further reduce new HIV infections

Background

- PrEP can help significantly reduce HIV incidence and national spending on lifelong HIV treatment[1]; a prior study estimated HIV management costs in France to total €1.37 million in 2013 alone[2]
- In France, the daily oral PrEP medication tenofovir disoproxil fumarate/emtricitabine (F/TDF) is approved and fully reimbursed as of 2016[3]
  - F/TDF is highly effective at preventing HIV-1 infection when ≥4 doses are taken per week[4]
- While PrEP uptake increased in France between 2017 and 2023, uptake was primarily among socioeconomically advantaged men[3]
- HIV incidence remains high in a number of subpopulations in France, including MSM, individuals born abroad, transgender individuals, and people who inject drugs[5]
- Expanding PrEP use in priority populations would not only significantly reduce HIV incidence, but also decrease the future HIV treatment costs incurred by payors
  - Increasing PrEP uptake is challenging and requires expanded outreach efforts, additionally, current PrEP options may not meet the needs of all individuals[6]

Objective

- To estimate the ROI associated with improved oral PrEP use for several subpopulations in France, quantified as the future HIV-related costs averted per additional Euro invested in PrEP

Methods

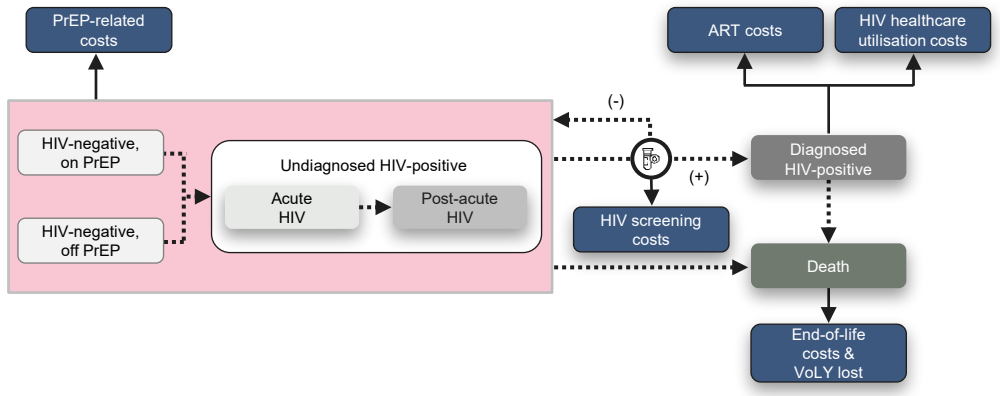
- An individual-level HIV microsimulation model was developed to capture the clinical and net economic impact of increased oral PrEP utilisation in France (**Figure 1**)
- Monthly probabilities, based on published real-world data, were used to simulate progression through various health events, including HIV screening, PrEP discontinuation, HIV acquisition, opportunistic infections, and death
- Direct costs captured in the model included the costs of oral PrEP, HIV screening, antiretroviral therapies (ART), HIV-related healthcare utilisation, and end-of-life costs
  - PrEP-related costs included the cost of F/TDF, scaled by adherence level (<50%, 50–74%, and ≥75%)
  - The monetary value of statistical life years (VoLY) was considered to better account for the toll of HIV-related deaths from a societal perspective[7]
- Assessed scenarios included increased oral PrEP uptake and adherence among subpopulations with varied HIV incidence (MSM, TGW, HSM, HSW, sex workers, born abroad), as compared with current PrEP usage estimates

- ROI was calculated by dividing the total savings on future HIV treatment costs by the total additional investment made on PrEP:
  - A ROI >1 implies a net economic saving with a reduction in HIV-1 cases
  - A ROI=1 implies net neutral economic spending with a reduction in HIV-1 cases
  - A ROI <1 implies additional overall funds spent to achieve a reduction in HIV-1 cases

Sensitivity analyses

- Sensitivity analyses assessed ROI at PrEP uptake increases of 5% and 15% above current levels
- One-way sensitivity analysis were conducted to assess model robustness and to identify individual parameters that significantly impacted overall outcomes

Figure 1. Simplified Model Schematic

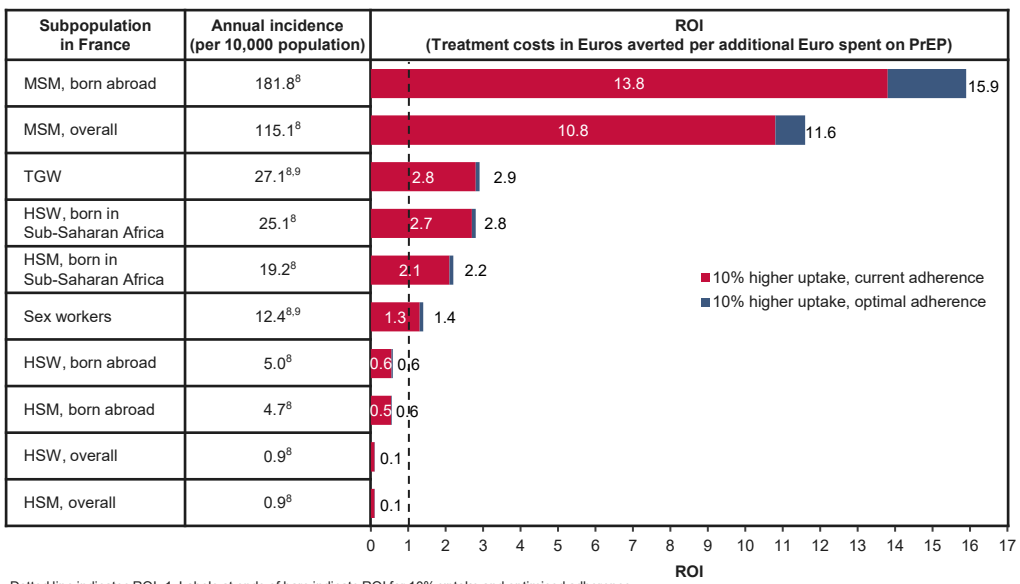


PrEP uptake and adherence were varied and associated costs were assessed relative to base-case levels; adherence was defined as % of days covered, with a distribution of use categorised as low (<50% use), medium (50–74% use), and high (≥75% use). HIV incidence data pulled for the model were for the full subpopulations and were not restricted to only those who need or want PrEP.
ART, antiretroviral therapy; PrEP, pre-exposure prophylaxis; ROI, return on investment; VoLY, value of life-year.

Results

- With a 10% increase in PrEP uptake above current real-world estimates, net economic savings were observed for MSM, TGW, sex workers, and for HSM and HSW born in Sub-Saharan Africa (**Figure 2**)
  - Savings were higher in subpopulations with higher annual incidence of HIV-1
- Additional savings were seen when PrEP adherence for all was optimised (≥75% use), particularly for MSM and MSM born abroad (**Figure 2**)
- While ROI was <1 for HSW overall, a net economic savings was estimated for populations within this group, including female subpopulations, including sex workers and HSW born in Sub-Saharan Africa (**Figure 2**)

Figure 2. HIV-1 Incidence and Oral PrEP ROI for Subpopulations in France

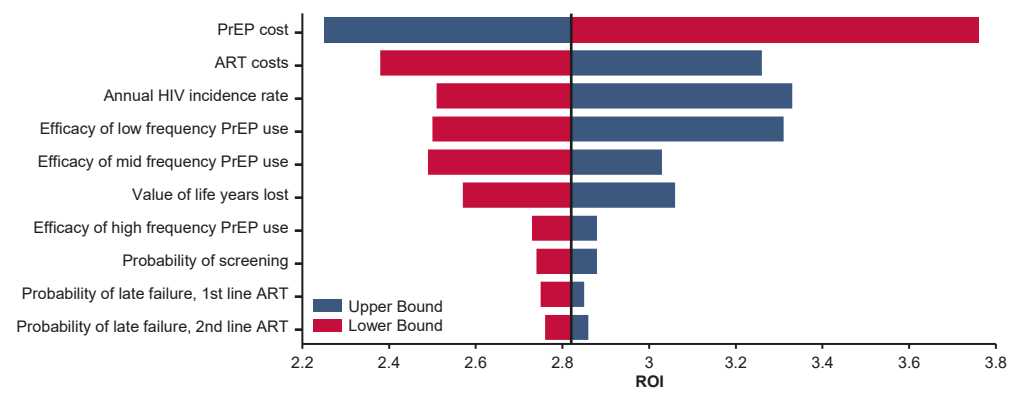


Dotted line indicates ROI=1. Labels at ends of bars indicate ROI for 10% uptake and optimised adherence.
HSM, heterosexual men; HSW, heterosexual women; MSM, men who have sex with men; PrEP, pre-exposure prophylaxis; ROI, return on investment; TGW, transgender women.

Sensitivity analysis

- For all subpopulations, increasing PrEP uptake by 5% or 15% produced similar ROIs to a 10% increase in uptake
  - In MSM, ROI was 10.8 and 10.1 with a 5% and 15% increase in PrEP uptake, respectively
- In one-way sensitivity analyses, ROI estimates were robust to parameter variations across populations (**Figure 3**)
  - In TGW, PrEP costs were the most influential factor affecting ROI outcomes, with a 25% reduction in PrEP costs leading to a 33.3% increase in ROI
  - ROI increased by 18.1% and 15.6% when incidence and ART costs increased by 19% and 25%, respectively
  - Findings of one-way sensitivity analyses for the other subpopulations and interventions were similar

Figure 3. One-Way Sensitivity Analysis Results for TGW at 10% Higher PrEP Uptake



Baseline (lower bound, upper bound) values used in the sensitivity analysis were: PrEP efficacy, 93% (84–97%) for high, 69% (41–84%) for mid, and 18% (0–43%) for low frequency use; monthly probability of ART failure, 0.6% (0.4%–0.7%) for 1st line and 1.5% (1.1–1.9%) for 2nd line treatment; monthly probability of HIV screening, 1.1% (0.8–1.3%); annual HIV incidence per 10,000 population, 27.2 (24.1–32.4). All costs, including monetised VoLY, were varied by 25%.
ART, antiretroviral therapy; PrEP, pre-exposure prophylaxis; TGW, transgender women; VoLY, value of life-year.

Limitations

- Incidence estimates used in the model were published in 2018 and may not reflect current incidence rates
  - However, assuming no drastic changes in subpopulation incidence rates, ROI outcomes should be similar
- The model was static, utilising constant incidence rates, and did not capture the averted secondary transmissions; additionally, age-specific incidence rates were not incorporated, which would have increased the number of averted cases, as younger populations have a higher incidence rate and greater life expectancy
  - Including secondary transmissions and age-specific incidence rates would have resulted in a greater ROI
- ROI estimates produced by this model were conservative because included populations were not restricted to individuals who need or want PrEP due to data limitations
  - Estimates on subgroups with higher reported HIV-1 incidence (e.g., sex workers among HSW) provide insight into the need for an acceptable PrEP option among broader populations
- Due to data limitations, the model did not include all populations who may benefit from higher PrEP utilisation

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Conflicts of Interest: **Mert Edali** and **Emir Gursel** are employees and **Turgay Ayer** is a shareholder of Value Analytics Labs, who conducted the analysis funded by Gilead Sciences, Inc. **Claire Idelovici-Marchal, Elias Benabadji, James Jarrett**, and **Dylan Mezzio** are employees and shareholders of Gilead Sciences, Inc. This study was funded by Gilead Sciences, Inc.

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