P - 909

Modelling the Future Epidemiological and Economic Burden of HIV in the United States: Substantial New Diagnoses and Additional Costs Projected Under Current Care Patterns

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Key Takeaways

- **Projection period costs and lifetime costs of HIV for ongoing new acquisitions between 2025 and 2034 will be considerable, estimated at $36.9 billion and $818 billion, respectively.**
- **Under continuation of the current HIV care and prevention provision in the US, significant ongoing transmission is projected with considerable economic burden.**
- **Prompt action across Ending the HIV Epidemic (EHE) initiative priorities will be critical to achieving the national target of reducing new HIV diagnoses.**

Plain Language Summary

- We used a mathematical model, based on recent US HIV data, to estimate how the epidemic and its costs may change over the next 10 years if current prevention and care continue as they are today.
- The results suggest that many new HIV infections will continue to occur unless further action is taken. Investing in prevention, testing, and treatment will be important to meet national goals for ending the HIV epidemic.
- New HIV infections occurring between 2025 and 2034 are expected to result in a substantial cost to the healthcare system, with an estimated $36.9 billion in costs over modelled period and $818 billion in lifetime healthcare costs associated with these new acquisitions.

Introduction

- The US has made ending the HIV epidemic a national priority through the National HIV/AIDS Strategy (NHAS) and the federal Ending the HIV Epidemic in the U.S. (EHE) initiative.[1] These initiatives aim to reduce new HIV acquisitions by 75% by 2025 and 90% by 2030, alongside corresponding targets for reductions in annual HIV diagnoses. From a 2017 baseline of 38,351 diagnoses, this would make the targets <9,588 diagnoses by 2025 and <3,835 by 2030.[2]
- The UNAIDS 95–95–95 targets support the global goal of ending AIDS as a public health threat by 2030. They call for 95% of people living with HIV to know their HIV status, 95% of those diagnosed to receive antiretroviral therapy (ART), and 95% of those receiving ART to achieve viral suppression.[3]
- Contemporary projections under current care provision are needed to assess progress towards these goals and the scale of additional intervention that may be required. Quantifying the costs associated with ongoing HIV transmission also provides a benchmark against which the economic value of changes in the epidemic trajectory can be assessed.
- Cohen et al. (2025) estimated incremental lifetime healthcare costs of $2.41 million undiscounted, or $1.12 million discounted (2022 USD), compared with matched individuals without HIV.[4] The estimate reflects the inclusion of all-cause healthcare costs and comorbidity burden.
- Using established HIV transmission modelling methods, this study aimed to project epidemiological outcomes and estimate the economic burden associated with continued HIV transmission under current care provision in the US.

Methods

- We developed a compartmental dynamic HIV transmission model calibrated to US Centers for Disease Control and Prevention (CDC) surveillance data.

Model Overview

- The model was informed by established HIV transmission modelling approaches, including the US CDC HIV Optimization and Prevention Economics (HOPE) model.[5-7] The US population (aged ≥15 years) was stratified by HIV acquisition risk, with people living with HIV represented across acute and chronic disease stages, continuum-of-care states, and CD4 strata to capture disease progression, probability of transmission and associated risks and costs (**Figure 1**).
- Daily oral pre-exposure prophylaxis (PrEP) was modelled by adherence level (0–3 vs ≥4 pills/week), with adherence-specific protection and medication costs reflecting pill use (**Table 1**). Adherence distributions and protection were informed by the iPrEx open-label extension study,[8] corresponding to an overall effective protection of 59.5% among oral PrEP users.
- The model projected HIV incidence, prevalence, and diagnoses from 2025–2034. Migration of people previously diagnosed with HIV outside the US was excluded to focus projections on locally acquired infections and because of uncertainty in future migration trends.

Epidemiological Data Calibration

- The model was calibrated to CDC surveillance data available over the 2017–2024 period[9] using stochastic parameter sampling, consistent with established epidemiological modelling approaches.[10] Inputs for calibration included HIV prevalence (overall, diagnosed, and undiagnosed), annual new diagnoses, UNAIDS diagnosis/treatment/viral-suppression indicators, and all-cause mortality among people living with HIV. Historical PrEP use was informed by published AIDSVu data.[11] PrEP use during the projection period was held constant at the coverage level from the last available time point (2024).

Cost Outcome Estimation & Inputs

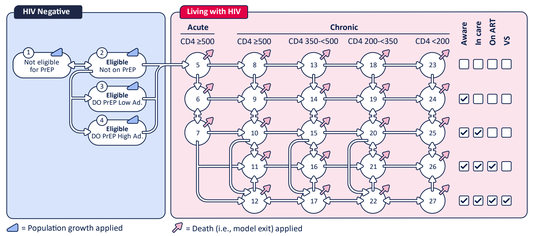
- HIV-related costs were estimated using two approaches. For 2025–2034, annual healthcare system costs, including antiretroviral therapy, hospitalizations, outpatient care, and monitoring, were assigned to model compartments according to projected occupancy. For the lifetime cost analysis, estimated lifetime HIV management costs were applied to each new acquisition occurring during the projection period, assuming eventual diagnosis.
- Cost inputs are summarized in **Table 1**. Annual costs were expressed in 2025 prices, with healthcare inflation applied where required. No discounting was applied to future costs, including lifetime cost estimates.

Table 1. Modelled Annual Cost Inputs[4,12-18].

Cost Group	Parameter	Cost
Annual Cost Inputs (Projection Period)		
Daily Oral PrEP	Medication – Low adherence group (0-3 pills/week)	$3,180
	Medication – High adherence group (≥4 pills/week)	$11,660
	Monitoring	$1,268
Treatment	ART Medication	$49,190
Background Disease Management	CD4 ≥200 - Undiagnosed	$6,891
	CD4 ≥200 - Diagnosed, Not on ART	$7,811
	CD4 ≥200 - Diagnosed, on ART	$12,216
	CD4 <200 - Undiagnosed	$27,825
	CD4 <200 - Diagnosed, Not on ART	$29,967
	CD4 <200 - Diagnosed, on ART	$31,866
End of Life Care	Excess Costs in Final Months of Life (one-off)	$43,142
Lifetime Cost Inputs (Undiscounted)		
Annual healthcare system (ART & other resource use)		$47,184

Abbreviations: ART, antiretroviral therapy; CD4, cluster of differentiation 4; PrEP, pre-exposure prophylaxis.

Figure 1. Model Compartment and Transition Flow Diagram.



Abbreviations: Ad, adherence; ART, antiretroviral therapy; CD4, cluster of differentiation 4; DO, daily oral; PrEP, pre-exposure prophylaxis; VS, virally suppressed.

Numbers represent the compartment indexes in the model.

Results

- The results show a considerable economic burden if current HIV care trends persist over the 10-year projection period.
  - Modelled UNAIDS 95-95-95 targets were not met. (**Figure 2**).
  - Model predictions based on the calibrated transition rates closely replicated the target data for key endpoints, including the annual number of new diagnoses (**Figure 3**).
- Annual new diagnoses were predicted to remain relatively stable at approximately 39,000 through 2034 (**Figure 3**), well above the EHE 2025 target of <9,588; from 2025 through 2034, 426,194 new diagnoses were predicted in total.
- HIV diagnosis is defined as the point at which a person becomes aware of their infection. Because of the delay between acquisition and diagnosis, diagnosis counts may not reflect HIV incidence in the same period. Lifetime costs are therefore calculated using modelled new HIV acquisitions rather than diagnoses.
- Total healthcare system costs incurred by 2034 for all new HIV acquisitions in the period (n=463,929) were estimated to be $36.9 billion (**Figure 4**).
  - 3-year period (2025-2027): $2.0 billion
  - 5-year period (2025-2029): $6.3 billion
- When applying lifetime costs to the new HIV acquisitions over the projection period, overall HIV costs were estimated to be $818 billion.

Figure 2. Modelled UNAIDS 95-95-95 Target Values for 2024 (Final Calibration Year) and 2030 and 2034 (Projection Years).

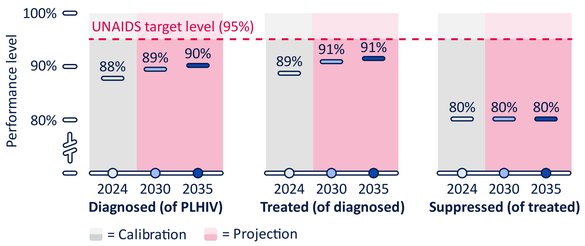


Figure 3. Number of New Diagnoses Across the Calibration (2017-2024) and Projection (2025-2034) Periods.

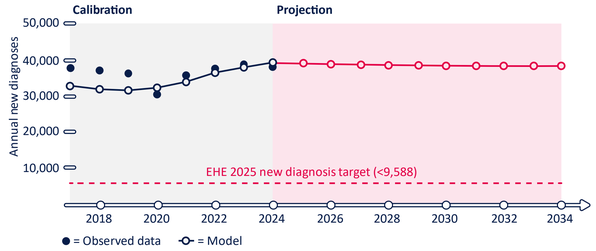
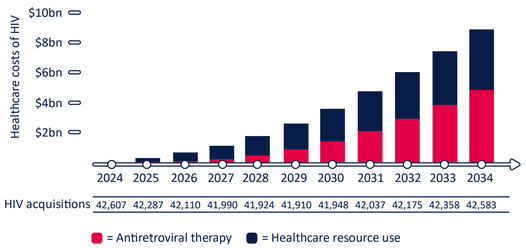


Figure 4. Estimated Annual HIV Costs Incurred in 2025 to 2034 for New Acquisitions in the Period.



Limitations

- The lifetime cost estimation assumes all new acquisitions are diagnosed and receive treatment, which will result in a degree of overestimation. However, as most PLHIV will receive a diagnosis in their lifetime, this is not expected to be significant; lifetime cost inputs reflect mean treatment durations for diagnosed people with HIV.[18]
- The model evaluates the overall setting population and implicitly assumes behaviors that may result in transmission remain constant in the future. Changes in behavior over time may result in alternative outcome projections but a large shift in behaviors would be necessary for diagnoses targets to be met.
- Due to the inherent uncertainty with forecasting, the model also assumes constant PrEP coverage at 2024 levels. LAI PrEP and LAI ART were assumed not to have any uptake during the calibration period.

Conclusion

- With continuation of the current provision of HIV care in the US, the EHE targets for reducing new HIV diagnoses are not projected to be met, and the economic burden of ongoing new acquisitions is expected to be considerable.
- Improving access and engagement across testing, prevention, and treatment are strategic priorities of the EHE initiative, and prompt action in these areas is critical to closing the gap between projected HIV diagnoses and the national 2030 target.

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