EPC145

Supporting Achievement of the State of Georgia's 25% HIV Incidence Reduction Target Among MSM: A Mathematical Model to Evaluate the Potential Impact of Long-acting Pre-exposure Prophylaxis in Atlanta

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Key Takeaways

- **A previously developed dynamic network model of HIV transmission (EpiModelHIV) was updated to evaluate the potential impact of long-acting PrEP to support the State of Georgia's HIV incidence reduction goals in the MSM population.**
- **An increase in overall PrEP use in indicated MSM with a new highly efficacious long-acting PrEP modality can help the State of Georgia achieve its HIV incidence reduction goal in MSM (-25%) at an overall PrEP coverage level lower than the State's target (43% vs 50%), with the greatest benefit in averted HIV infections captured by communities disproportionally impacted by HIV.**

Introduction

- Despite ambitious US HIV incidence reduction goals at national and regional levels, new infections remain high in numerous communities and demographics, including among men who have sex with men (MSM) in the US Southeast.[1]
- A key objective of the White House National HIV/AIDS strategy is to increase pre-exposure prophylaxis (PrEP) uptake in populations disproportionately affected by HIV, including among young adults and Black and Latino MSM.[2]
- **The Georgia Department of Public Health has targeted a 25% HIV incidence reduction among all MSM, with specific focus on increasing use of PrEP to 50% of MSM indicated.**[3]
- However, attributes associated with daily-oral PrEP, such as daily pill burden, lack of discretion leading to stigmatization, and concerns about potential side-effects, may limit its use in key populations.[4,5]
- Cabotegravir long-acting (CAB-LA) demonstrated a superior reduction in HIV-1 acquisition compared with daily oral FTC/TDF in MSM and TGW in the HPTN083 trial with high efficacy in key populations that have reported low rates of adherence to daily-oral PrEP, including young adults and Black and Latino MSM.[6]
- **AIM:** We used a mathematical model to estimate the impact of the introduction of CAB-LA on incidence in the MSM population in Atlanta, Georgia and the minimum CAB-LA coverage needed towards achieving the 25% incidence reduction target.

Methods

Model Outline

- We expanded a previously developed dynamic network model of HIV transmission (EpiModelHIV) calibrated to the HIV epidemic among MSM in Atlanta by demographics.[7]
- The published model was updated by incorporating the HPTN083 results and to reflect real-world data on the association between demographic characteristics and daily-oral PrEP uptake, adherence, and persistence based on real-world US PrEP studies.[8-10]
- We calibrated the overall daily-oral PrEP coverage among the indicated MSM population to that provided in the CDC ATLAS dataset for Georgia for 2018 (20%).
- 2018 was used as the reference point in order to match the latest rigorous HIV incidence and prevalence data available for validation purposes.

Modelled PrEP Scenarios

- We investigated the impact of the introduction of CAB-LA on HIV incidence over ten years associated with overall increased engagement with biomedical HIV Prevention compared to a base-case scenario with oral PrEP uptake maintained at current levels (20% coverage in the indicated MSM population).
- Results were disaggregated by race/ethnicity and age sub-groups, and between PrEP users and non-users.

CAB-LA PrEP Characteristics

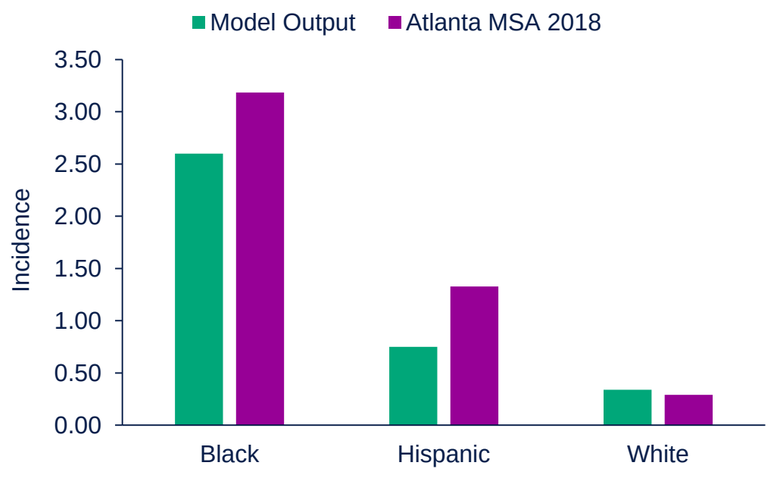
- Modelled CAB-LA PrEP effectiveness reflects data from the HPTN083 trial.
- Due to reduced user-dependency of injectable versus oral PrEP, we assume 100% adherence to the dosing schedule.
- In the absence of real-world data, it was assumed that CAB-LA persistence (i.e., period of use of the intervention) matched that of daily-oral PrEP.
- A range of feasible coverage levels for CAB-LA were examined (5% to 30% of indicated MSM), whilst maintaining daily-oral PrEP use at current levels (20% of indicated MSM).
- Such an increase in PrEP usage is based upon an analogy with contraception (where greater number of modalities significantly increased overall engagement[11]) and survey data reflecting MSM preference for long-acting over daily-oral PrEP.[12]
- CAB-LA PrEP uptake across demographic groups was distributed proportional to existing uptake patterns of daily-oral PrEP.

Model Validation

HIV Incidence in MSM in Atlanta MSA

- The model was validated against real-world evidence of HIV incidence (**Figure 1**), prevalence, and PrEP use in the year 2018.[13-16] Good agreement was observed between predicted outcomes and real-world estimates.
- The burden of new HIV infections is differentiated by race/ethnicity and is highest in the Black MSM population in the Atlanta Metropolitan Statistical Area (MSA).

Figure 1. Comparison of Model Output to Atlanta MSA HIV Incidence in All MSM in 2018 (per 100 Person-Years)



Adherence to Daily-Oral PrEP by Age and Race/Ethnicity

- As PrEP efficacy is a function of adherence, less than half of Black and Hispanic MSM and less than 45% of MSM 34 years of age and younger achieved the highest levels of protection under current daily-oral usage patterns (**Table 1**).

Table 1. Proportion of Population in Each Race/Ethnicity and Age Group by Adherence Level

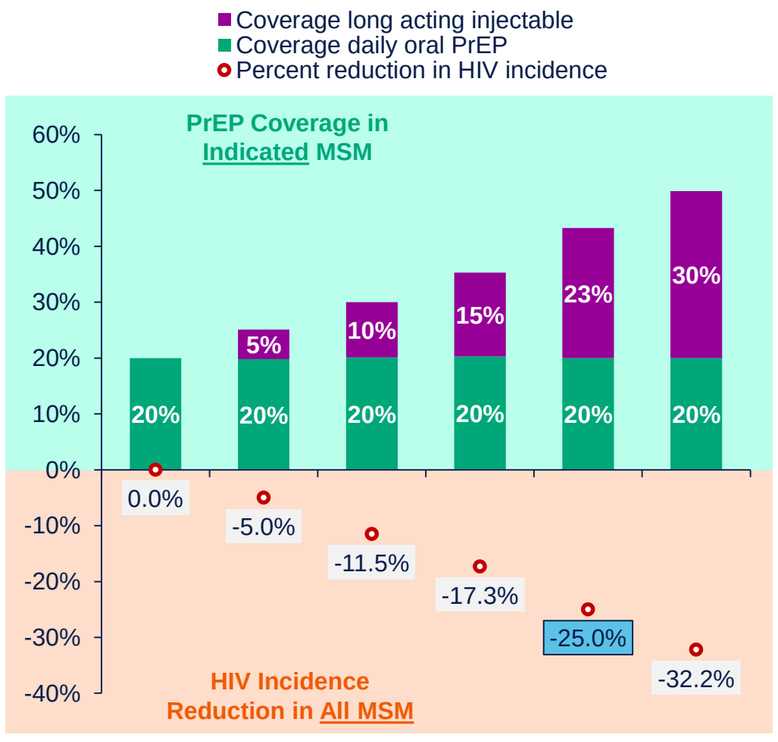
Age Group	Black	Hispanic	White	Total
High adherence (≥ 4 pills per week)				
Total	**42.4%**	**47.0%**	**52.8%**	**49.7%**
15 to 24	30.9%	31.8%	38.8%	**35.5%**
25 to 34	41.0%	44.4%	48.1%	**43.2%**
35 to 44	46.5%	49.2%	54.6%	**44.8%**
45 to 54	49.1%	52.2%	57.8%	**51.3%**
55 plus	49.4%	49.6%	57.8%	**53.1%**
Medium adherence (2 – 3 pills per week)				
Total	**38.3%**	**36.9%**	**35.0%**	**36.0%**
15 to 24	41.0%	41.0%	39.4%	**40.1%**
25 to 34	39.0%	38.1%	37.0%	**38.4%**
35 to 44	37.2%	36.3%	34.5%	**39.7%**
45 to 54	36.2%	35.3%	33.0%	**35.7%**
55 plus	36.3%	36.0%	33.0%	**35.0%**
Low adherence (< 2 pills per week)				
Total	**19.4%**	**16.0%**	**12.3%**	**14.4%**
15 to 24	28.1%	27.2%	21.8%	**24.5%**
25 to 34	20.0%	17.5%	14.9%	**18.3%**
35 to 44	16.3%	14.4%	10.9%	**19.0%**
45 to 54	14.7%	12.5%	9.1%	**13.0%**
55 plus	14.3%	14.4%	9.1%	**11.9%**

Results

Effect of Increasing Long-acting Injectable PrEP Coverage

- Increasing coverage with long-acting PrEP resulted in greater reductions in HIV incidence in the MSM population relative to baseline (**Figure 2**). To reach the Georgia Department of Public Health's goal of 25% reduction in HIV incidence, long-acting coverage of 23% is required, while maintaining the 2018 rate of daily oral coverage of 20%.
- With high efficacy in preventing new HIV infections, CAB-LA resulted in the 25% incidence reduction target achieved at a lower overall coverage level than that targeted by the Georgia Department of Public Health (43% vs 50%).

Figure 2. 10-Year HIV Incidence Reduction as a Function of Long-acting Injectable PrEP Coverage Increases



PrEP Coverage by Modality to Achieve Target

- PrEP coverage differed by age and race/ethnicity based on real-world PrEP studies. The White population had the highest uptake followed by the Hispanic and then the Black populations. Coverage increased with age in all population groups (**Table 2**).

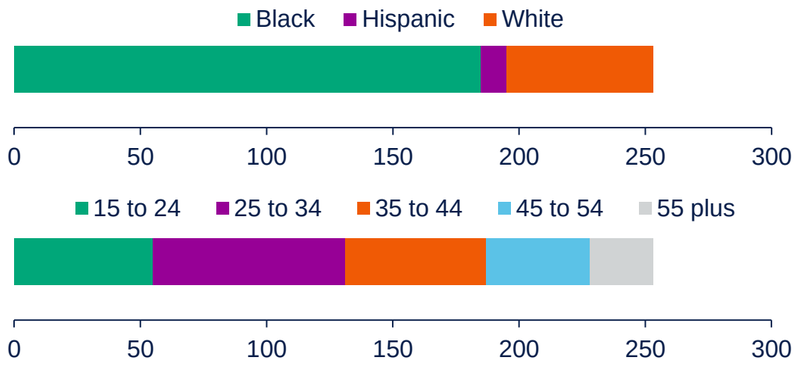
Table 2. PrEP Coverage in Indicated MSM Population to Achieve 25% Incidence Reduction

PrEP Coverage by Race/Ethnicity and Age					
	Black		**Hispanic**		**White**
Daily-oral PrEP coverage	**15.3%**		**18.7%**		**13.2%**
CAB-LA coverage	**19.2%**		**22.2%**		**25.9%**
	15-24	**25-34**	**35-44**	**45-54**	**55+**
Daily-oral PrEP coverage	**12.6%**	**18.3%**	**21.9%**	**25.3%**	**27.8%**
CAB-LA coverage	**16.5%**	**22.0%**	**24.9%**	**27.5%**	**29.6%**

HIV Infections Averted by Race/Ethnicity and Age Over 10 Years at the 25% Incidence Reduction Target

- When stratifying the results by age and race/ethnicity, the greatest proportion of infections averted was in the Black MSM community (73% of all infections averted). Slightly more than half of all infections averted were in those aged 34 and younger (**Figure 3**).

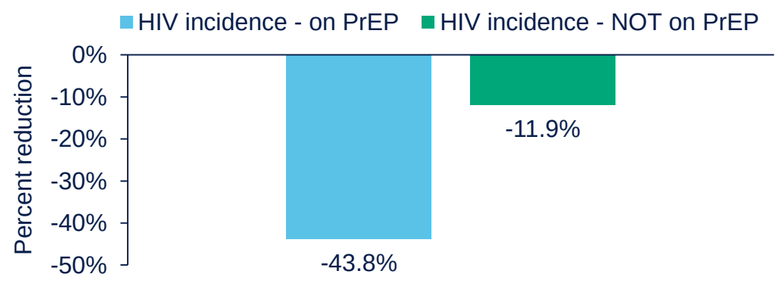
Figure 3. Number of Infections Averted by Race and Age Group (of 12,000 MSM in Model Population)



HIV Incidence Reductions Among PrEP Users vs. Non-Users

- The HIV incidence reduction that results from increasing the coverage of CAB-LA is evident not only in those on PrEP, but also those not on PrEP, which highlights the benefit to the overall MSM community from those individuals using PrEP (**Figure 4**).
- Specifically, non-PrEP users in the overall Atlanta MSM community experienced a 12% decline in HIV incidence with achievement of the overall MSM 25% reduction target.
- Increasing the overall coverage of PrEP and the increased efficacy of CAB-LA results in a secondary transmission blocking effect, which results in an overall network protection. A transmission event averted between one HIV discordant pair due to PrEP use may prevent further transmission events occurring between the individual that would otherwise have been infected and new partner(s).

Figure 4. HIV Incidence Reduction in PrEP Users vs Non-Users[a]



[a]Comparison between 20% daily oral coverage and scenario to achieve 25% overall incidence reduction in all MSM.

Conclusions

- Long-acting PrEP has the potential to contribute to substantial reductions in HIV incidence among MSM. With high efficacy in preventing new HIV infections across demographics, long-acting PrEP can support achievement of regional HIV incidence reduction targets at feasible usage levels.
- With a 25% incidence reduction in the overall Atlanta MSM community, the greatest benefit in averted HIV infections was captured by communities disproportionally impacted by HIV and achieving less benefit from daily-oral PrEP, such as young MSM and the Black MSM community.
- The benefits of increased PrEP use with a long-acting option were captured by the entire Atlanta MSM community, with a substantial decrease in HIV incidence in individuals not engaged with biomedical HIV prevention (-12%).

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