Estimating the impact of PrEP regimens containing long-acting injectable cabotegravir or daily oral TDF/FTC among men who have sex with men in the United States: mathematical modelling for HPTN 083

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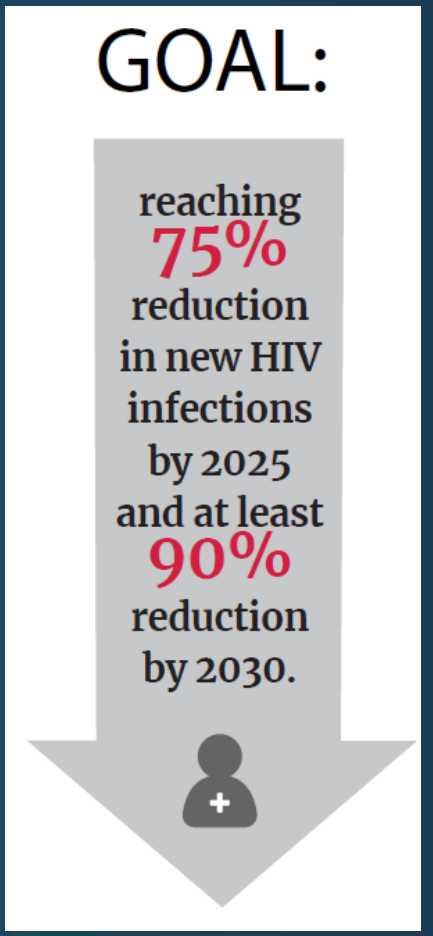
Background

HIV in the United States

- High HIV incidence among men who have sex with men (MSM)
- Higher HIV incidence among younger MSM, Black and Hispanic MSM, in the Southern US
- Ending the HIV Epidemic (EHE) initiative aims to reduce the number of new HIV infections by improving:
  - HIV diagnosis
  - antiretroviral therapy usage and viral suppression
  - prevention including **pre-exposure prophylaxis (PrEP)**



U.S. Department of Health and Human Services (HHS) 2020

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HPTN 083 PrEP trial

Demonstrated **superiority** of a regimen containing **long-acting injectable cabotegravir (CAB)** over **daily oral tenofovir disoproxil fumarate/emtricitabine (TDF/FTC)** for **HIV PrEP** among **MSM and transgender women**

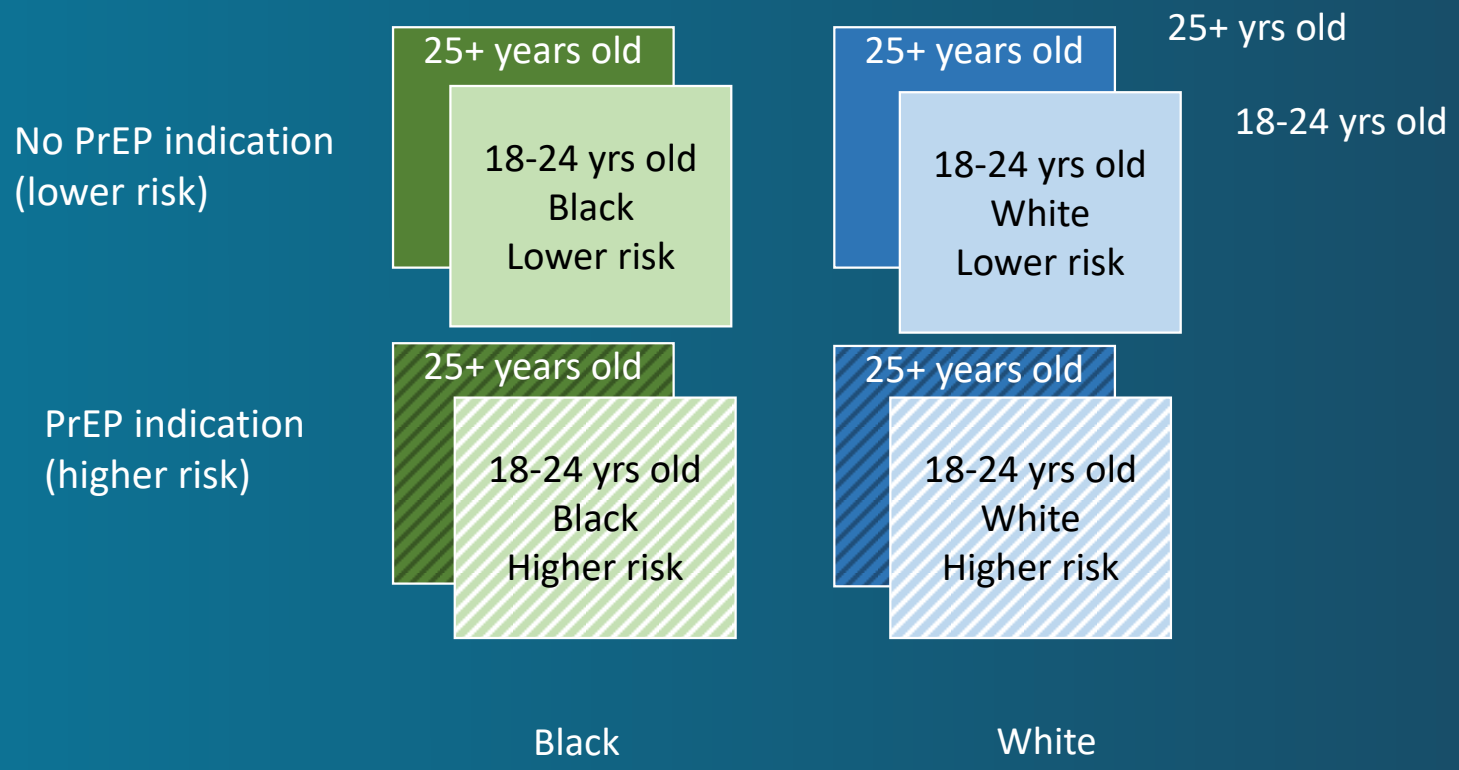
AIMS

1. Assess the potential **population-level impact** on new HIV infections of daily oral TDF/FTC and long-acting injectable CAB use among MSM in Atlanta, Georgia, US
2. Assess their potential **role in achieving the EHE goals**

Methods

Mathematical model

- Deterministic, compartmental model of HIV transmission, treatment and PrEP use among MSM in the United States
- Population stratified by age, race and PrEP indication[1]



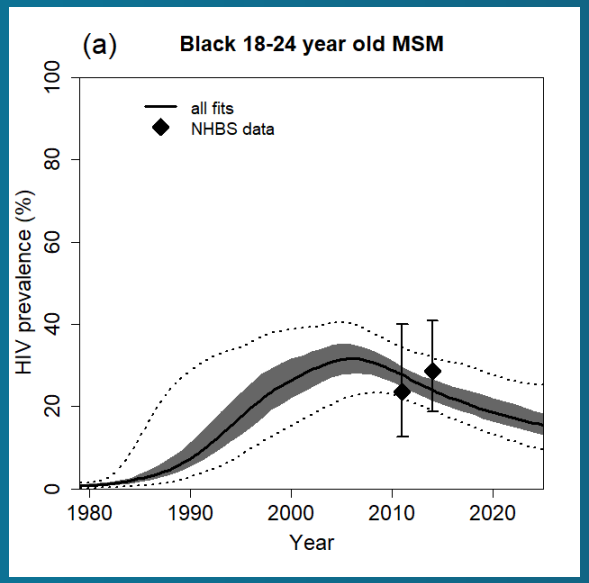
[1]indication for PrEP:
≥2 male partners AND condomless anal sex OR bacterial STD
OR
main HIV-infected male partner

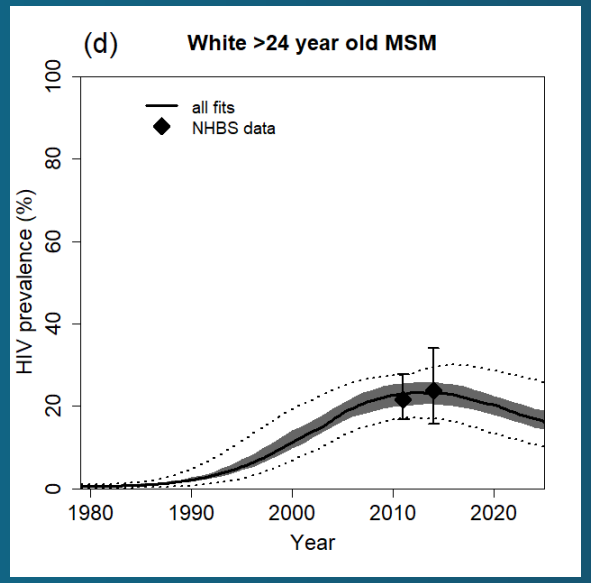
in past 12 months

Model calibration

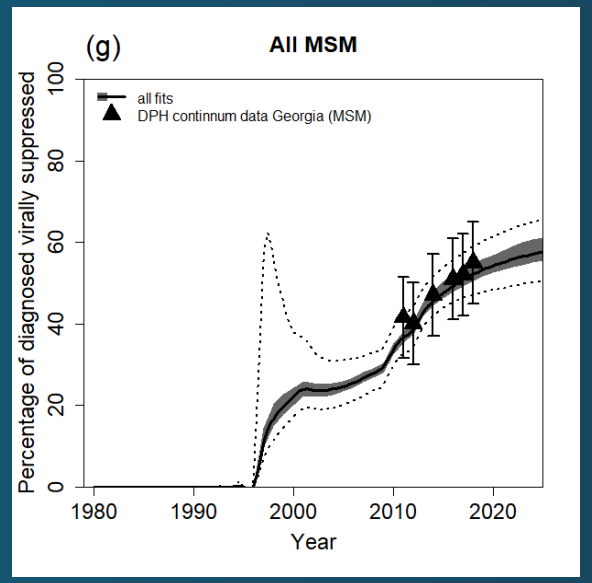
- Model parameterised and calibrated with behavioural and HIV prevalence data from NHBS[1] for MSM in Atlanta
- Also calibrated to viral suppression data[2] for MSM in Georgia and PrEP use data[3] for MSM in Atlanta

HIV prevalence

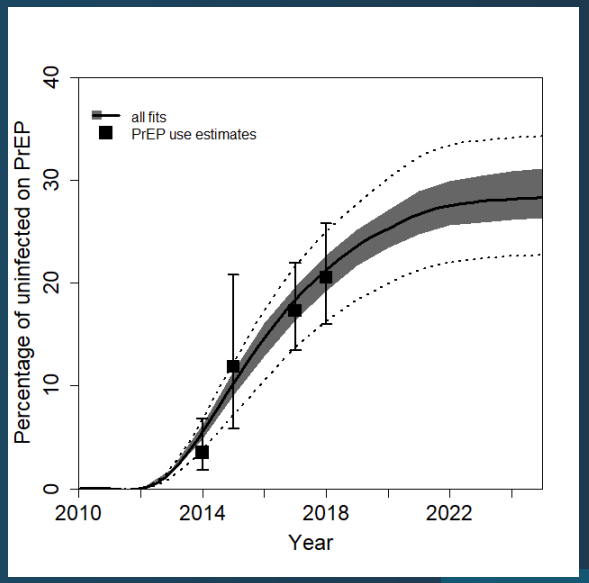




% virally suppressed



% using PrEP



1. CDC National HIV Behavioral Surveillance; 2. Georgia Department of Public Health surveillance data; 3. multiple sources, incl NHBS

PrEP assumptions

Oral TDF/FTC

- Efficacy (≥4 doses/wk): 90-100%
  (Anderson et al 2012 Sci Transl Med)
- Adherence (% taking ≥4 doses/wk): 79-92%
  (US PrEP Demo project)
- Effectiveness (efficacy × adherence): 72-89%
- Dropout: 17-44%/yr
  (US PrEP Demo project)

Long-acting injectable CAB

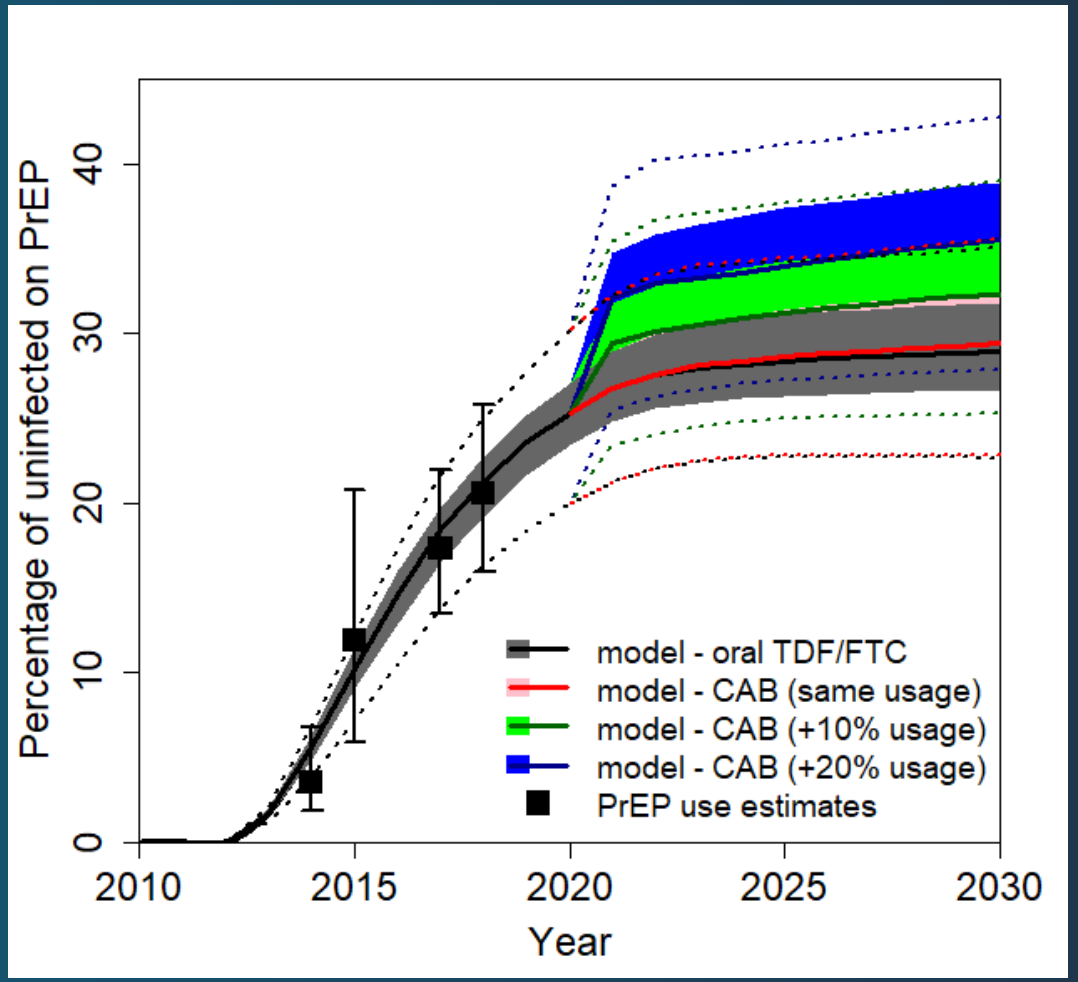
- Effectiveness (efficacy × adherence): 82-96%
  (HPTN 083 statistics team)
- Dropout: as for oral TDF/FTC

Main analysis: PrEP only used by MSM with a PrEP indication (~45%)

PrEP scenarios

1. TDF/FTC use maintained
2. All TDF/FTC users switched to CAB in Jan 2021
3. All TDF/FTC users switched to CAB in Jan 2021 + CAB users increased by 10%
4. All TDF/FTC users switched to CAB in Jan 2021 + CAB users increased by 20%

PrEP expansion among MSM with a PrEP indication



Outcomes:

- % **cumulative infections averted** over 5 or 10 years from Jan 2021 vs no PrEP
- % **reduction in annual infections** during 2025 and 2030 vs 2017

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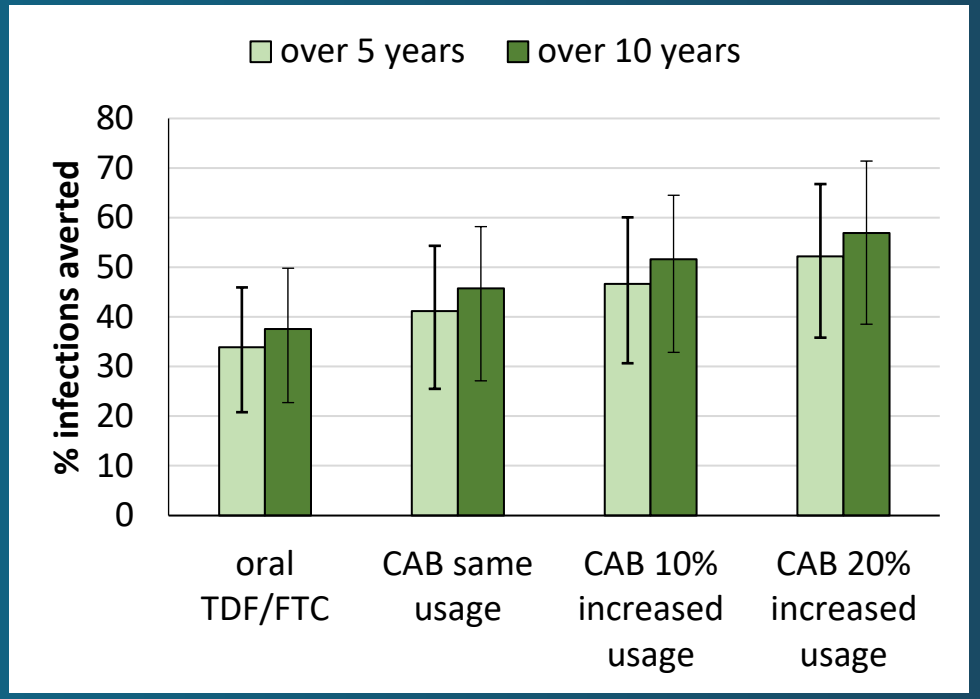
RESULTS

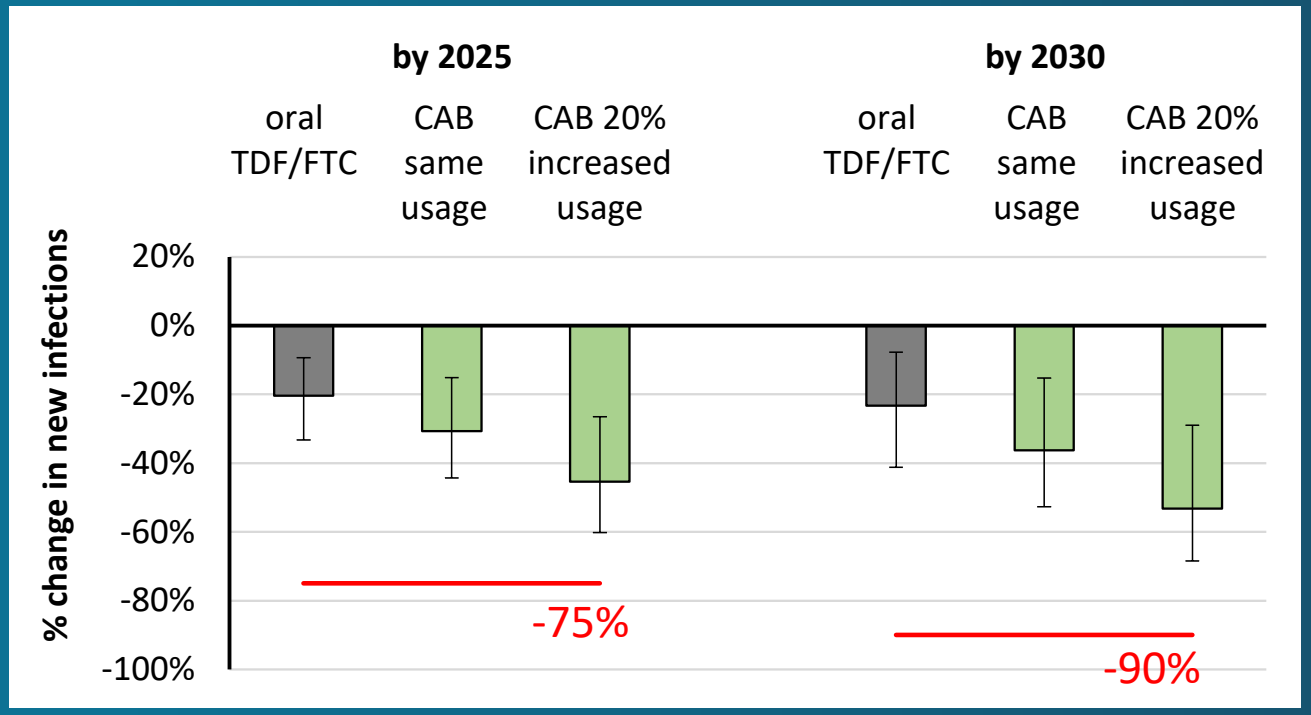
Population level impact: HIV infections averted

vs. no PrEP

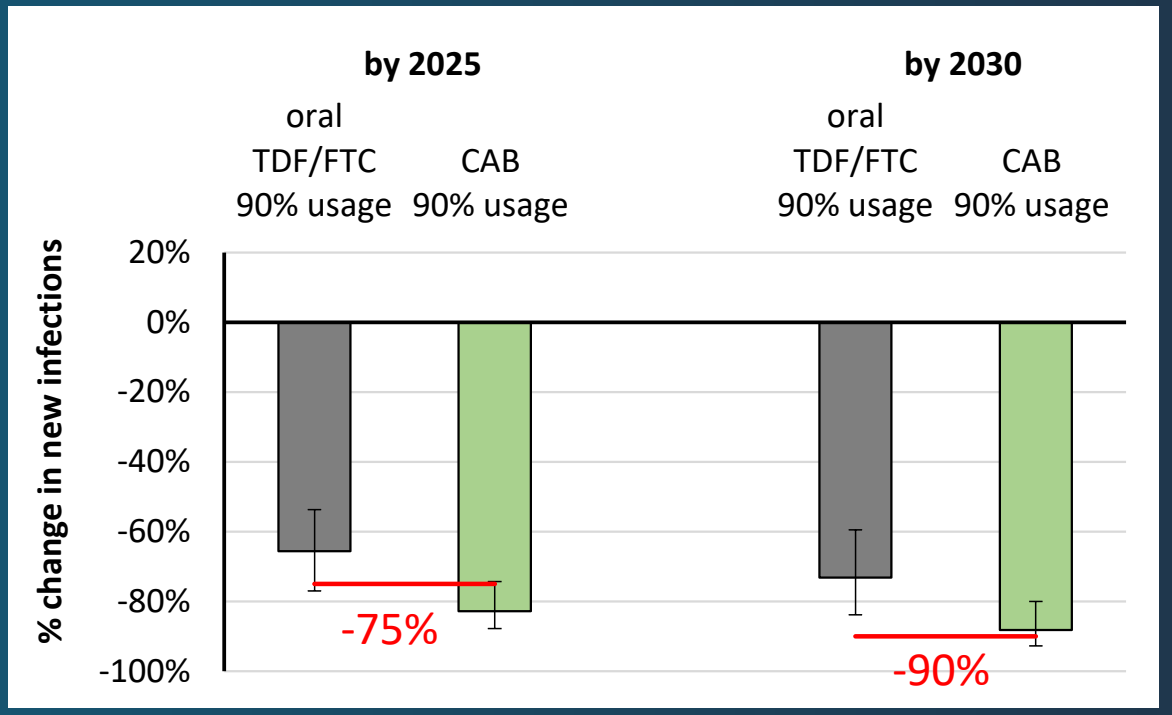


Achieving the EHE goals

PrEP expansion among MSM with a PrEP indication



PrEP expansion among all MSM with or without a PrEP indication



% all uninfected MSM using PrEP 2025:	28%	28%	34%	28%	28%	34%	90%	90%	90%	90%

Conclusions

- While continuing TDF/FTC use by Atlanta MSM could prevent 1/3rd of new HIV infections over the next 5 years…
- CAB estimated to prevent ~20% more infections than TDF/FTC with similar numbers of users, if CAB adherence is the same as in HPTN 083
- With 1/3rd of uninfected MSM using CAB could get ~60% of the way towards the EHE goals
- To meet EHE goals expanding PrEP alone, need 90% using CAB
- Other measures, e.g. improvements in diagnosis and viral suppression, also likely needed to meet the EHE goals

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HPTN 083 an HIV prevention clinical trial

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