
# Decreasing Population-Level HIV Incidence: The Role of Multifaceted HIV Prevention

Kenneth Mayer, M.D.
Fenway Health/Harvard Medical School

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## Disclosures

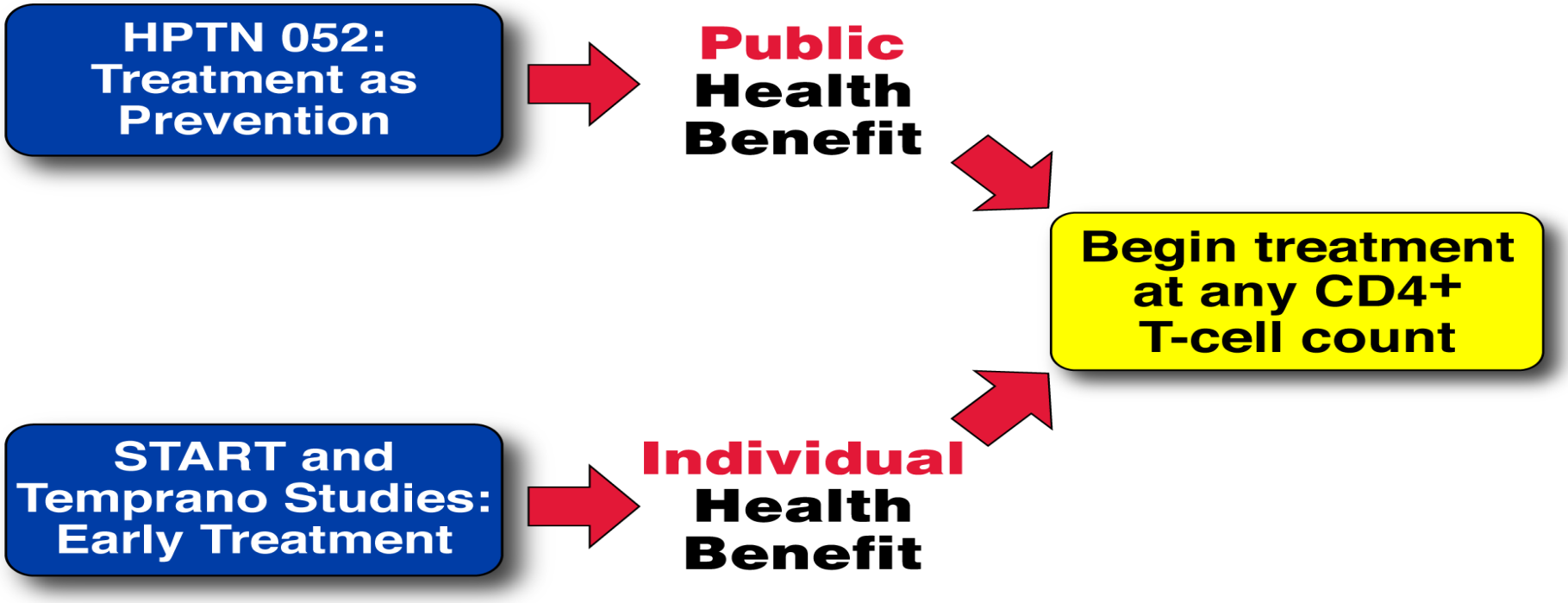
-Unrestricted research grants from Gilead Sciences and ViiV Health Care

-Scientific Advisory Boards focused on HIV Prevention: Gilead Sciences and Merck Pharmaceuticals

# Where are we in mid-2018?

- Proof of concept for TasP and PrEP in RCTs
- Demo Projects have shown promise
- Population-level impact seen in some jurisdictions
- Roll-out has highlighted disparities
- Roll-out has highlighted needs address behavioral and comprehensive sexual health to achieve global impact

# The Key Paradigm: Test and Treat (when ready)



# Why PrEP? In the TasP Era, Reductions in New HIV Infections are Off Target

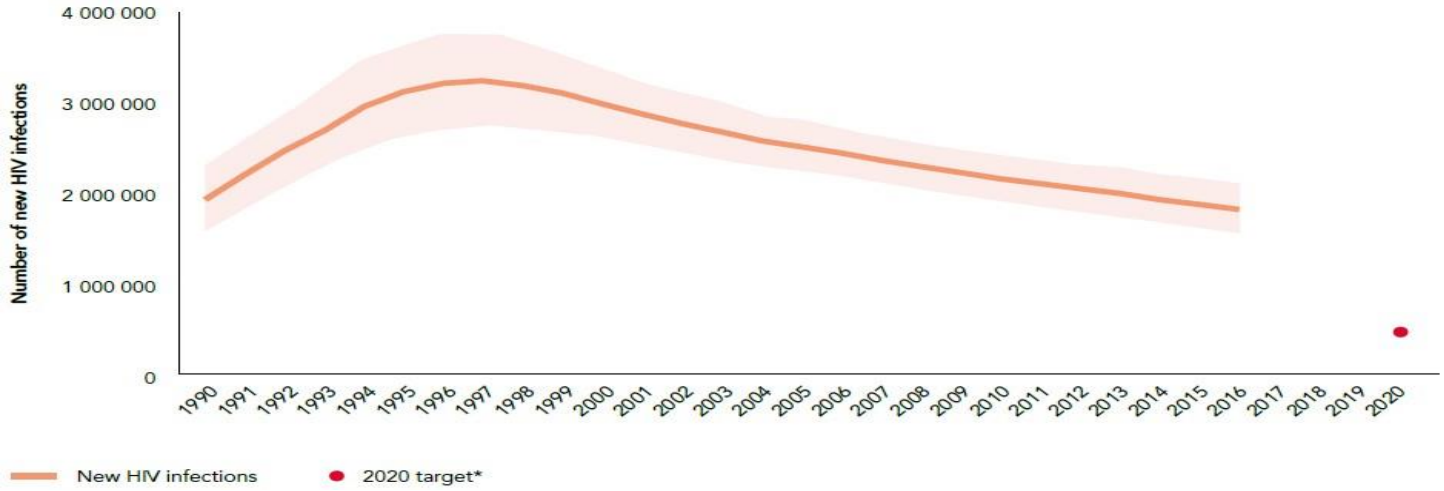
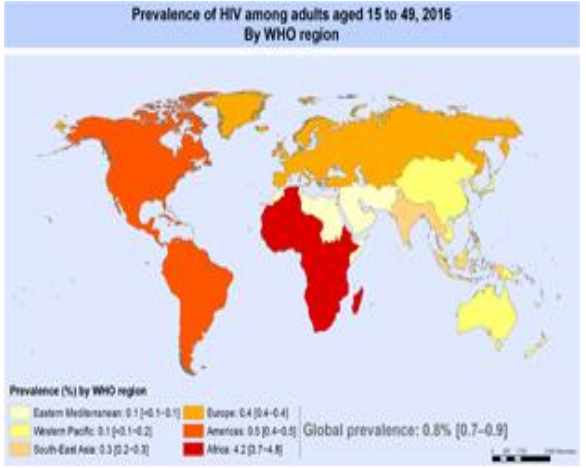



FIGURE 2.4. NEW HIV INFECTIONS, ALL AGES, GLOBAL, 1990–2016 AND 2020 TARGET

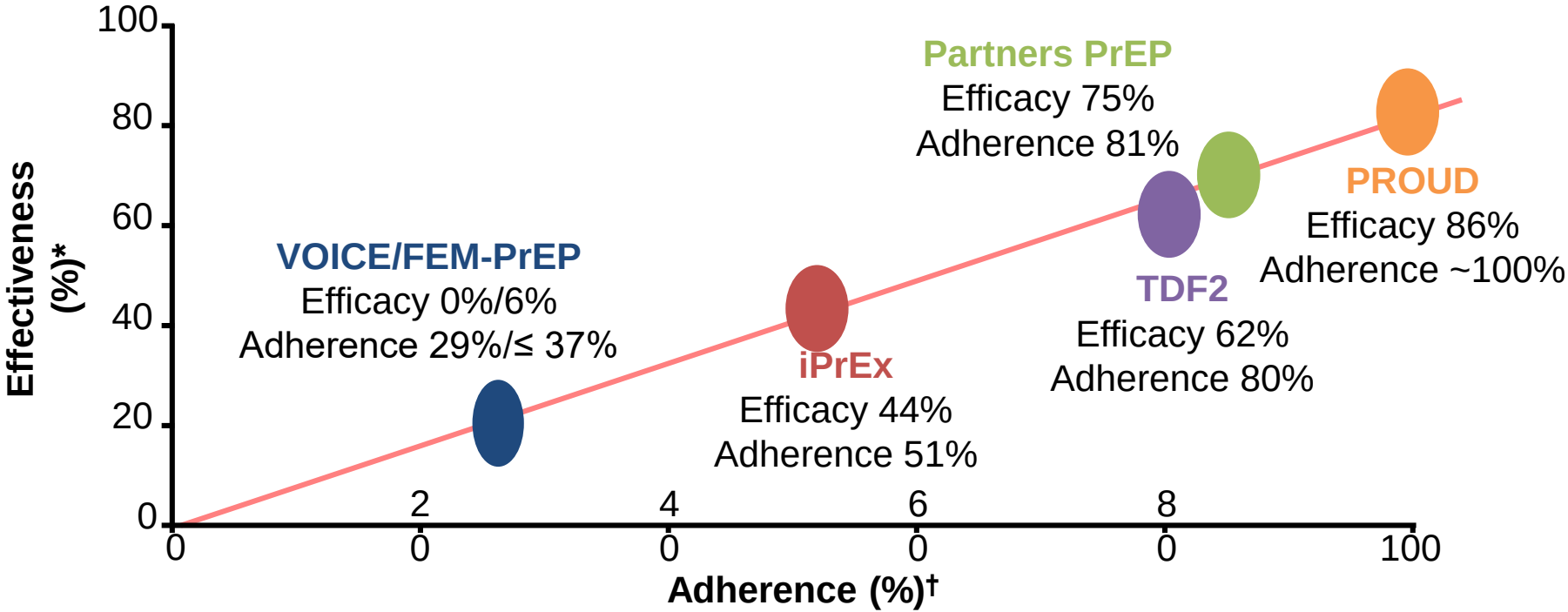
*The 2020 target is fewer than 500 000 new HIV infections, equivalent to a 75% reduction since 2010.
Source: UNAIDS 2017 estimates.

# GLOBAL HIV TRENDS




- 1995: 3 million new infections/year
  18 million PLHIV; 2 million deaths/year
- 2018:< 2 million new infections/year;
  39 million PLHIV; < 1 million deaths/year
- About half on HAART, but viral suppression variable
- 2.3 % ↓ in new infections 2005-2015
- 47% ↓ in death 2005-2015
- Since 2012, global HIV spending ↓ by 5.4%

# Select Daily Oral TDF/FTC PrEP Trials: Effectiveness Improves With Adherence



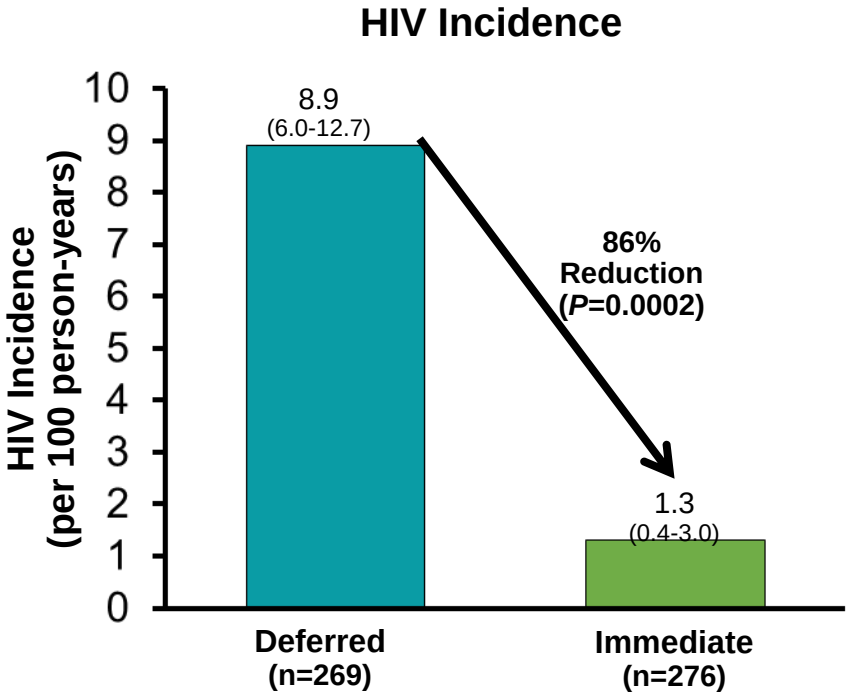

*Reduction in HIV incidence vs control.

†Based on pill counts or the detection of study drug in plasma.

Fonner VA, et al. AIDS. 2016

# PROUD Study: High PrEP Efficacy in a Real-World Setting

- Significantly ↓ HIV infections with immediate vs deferred PrEP (3 versus 20 cases)
  - HIV infection predated PrEP start (n=1)
  - No drug/not adherent (n=2)
- Number needed to treat to prevent 1 HIV infection: 13
- PrEP was generally well tolerated




McCormack S, et al. *Lancet*. 2016;387:53-60.

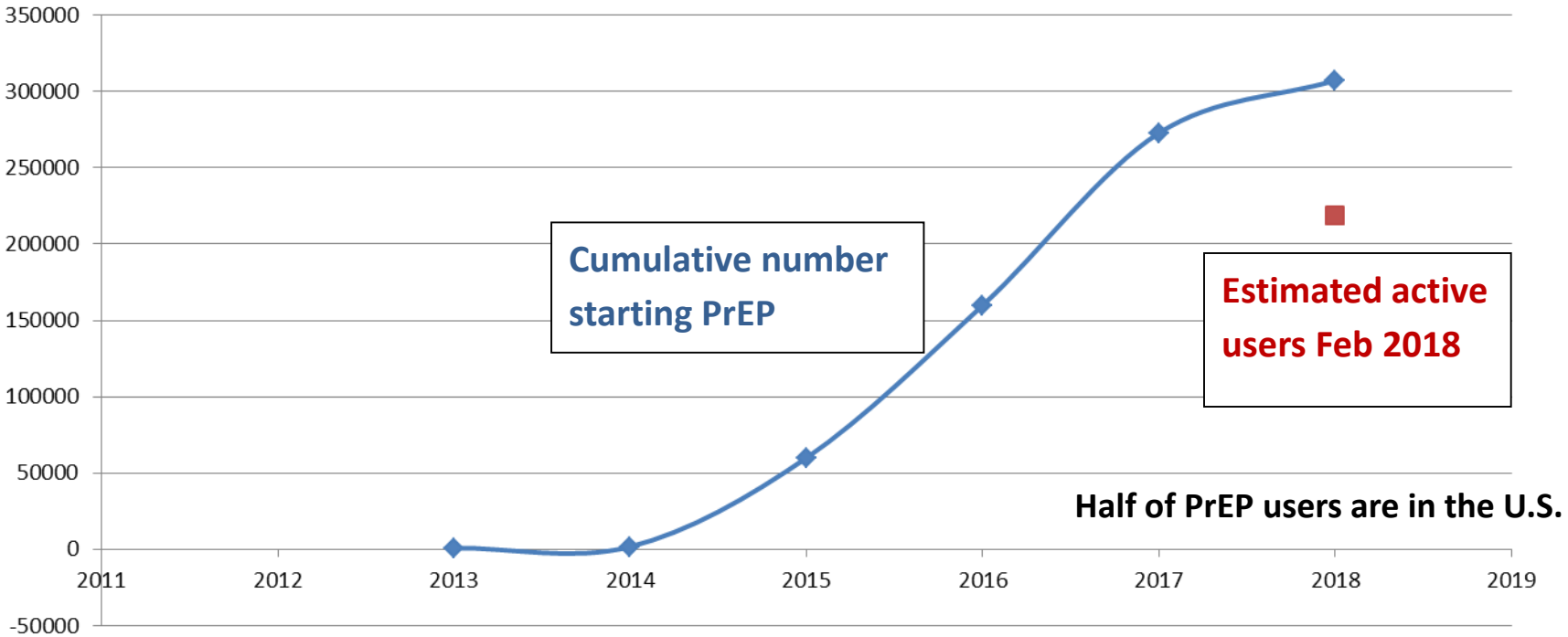
# Oral PrEP global roll-out, 2018

**National roll-out**- Australia, Belgium, Brazil, Canada, Kenya, New Zealand, Norway, Scotland NHS, South Africa (?US)

**Other implementation** (e.g. demonstration projects, pharmacy access, DREAMS)


World Health Organization

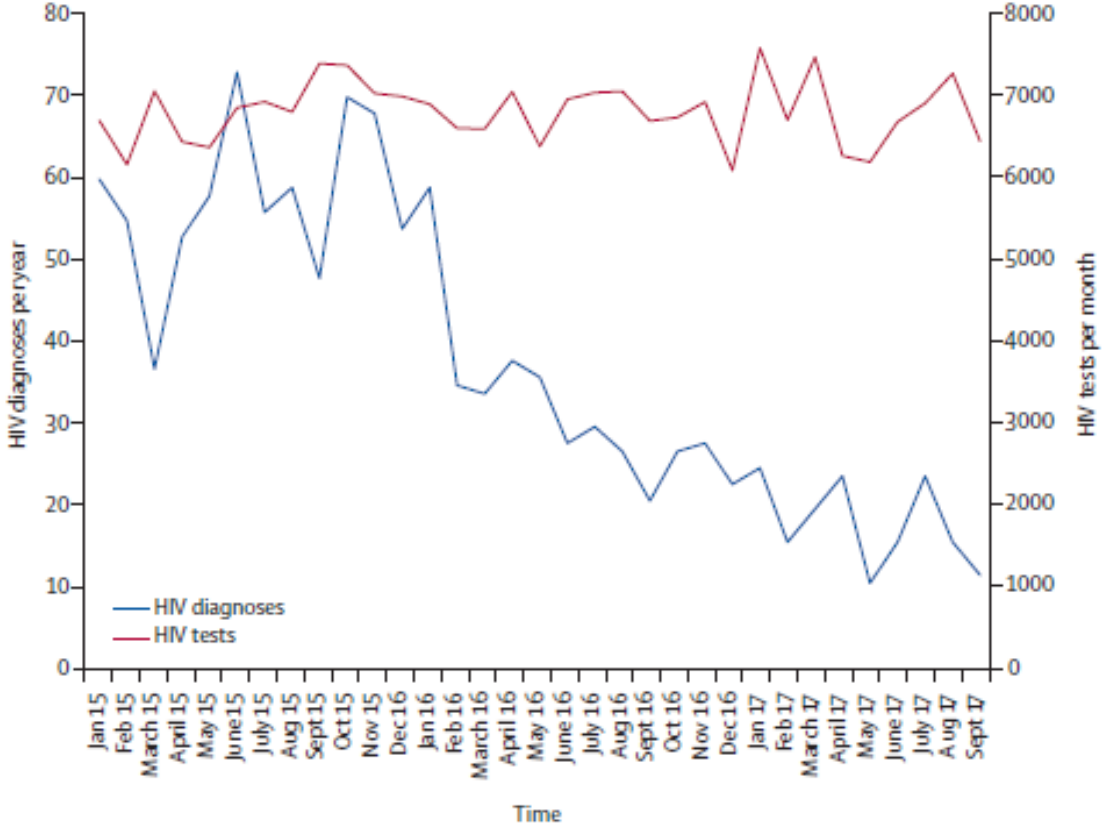
# Number of people taking PrEP globally




World Health Organization

# HIV Decline at Dean Street -UK

*Lancet HIV* 2017
Published Online
October 20, 2017
http://dx.doi.org/10.1016/
S2352-3018(17)30181-9




80% decline in HIV cases since 2015

56 DEAN STREET

DEAN STREET express

# EPIC-NSW Cohort (N=3700): Targeted PrEP Decreasing HIV Incidence

- Medication possession ratio over 12 months (having enough medication to take PrEP over 12 months)
  - Mean: 83% (95% CI 82%-84%)
- Within cohort HIV infection rate: 0.5/100 person-years
  - 2 infections over 3927 person-years
    - 1 never commenced PrEP
    - 1 took no PrEP for months prior to infection
- Population change in HIV diagnoses over the past 12 months: 32% decline (from 149 to 102 persons)
  - Least reductions
    - Young MSM
    - MSM living outside the central Sydney "gay" suburbs
    - Non-English speaking overseas-born gay men

**Reduction in HIV Diagnoses (12-month before-after recruitment)**

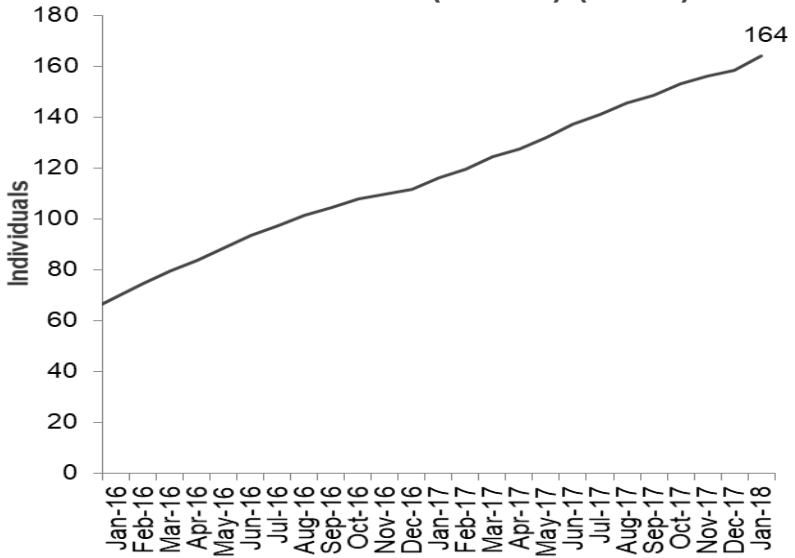
| | Decline (%) |
|---|---|
| Overall | 32 |
| Years of age | |
| 18-24 | 10 |
| 25-34 | 22 |
| 35-44 | 44 |
| >44 | 48 |
| Country/region of birth | |
| Australia | 49 |
| High-income, English speaking | 33 |
| Asia | 21 |
| Other countries | +24 |
| Area of residence | |
| Gay Sydney suburbs | 52 |
| Other Sydney | 7 |
| Outside of Sydney | 54 |

Grulich A, et al. 25th CROI. Boston, 2018. Abstract 88.

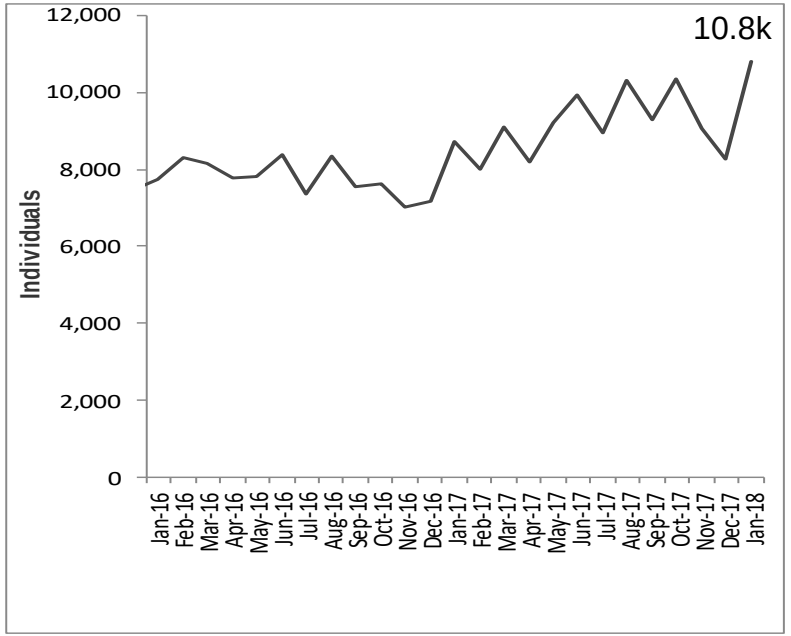
# ~164,000 patients are taking Truvada for PrEP®

**Truvada for PrEP Monthly Trends**

**Individuals Taking Truvada for PrEP (Active) (000's)**

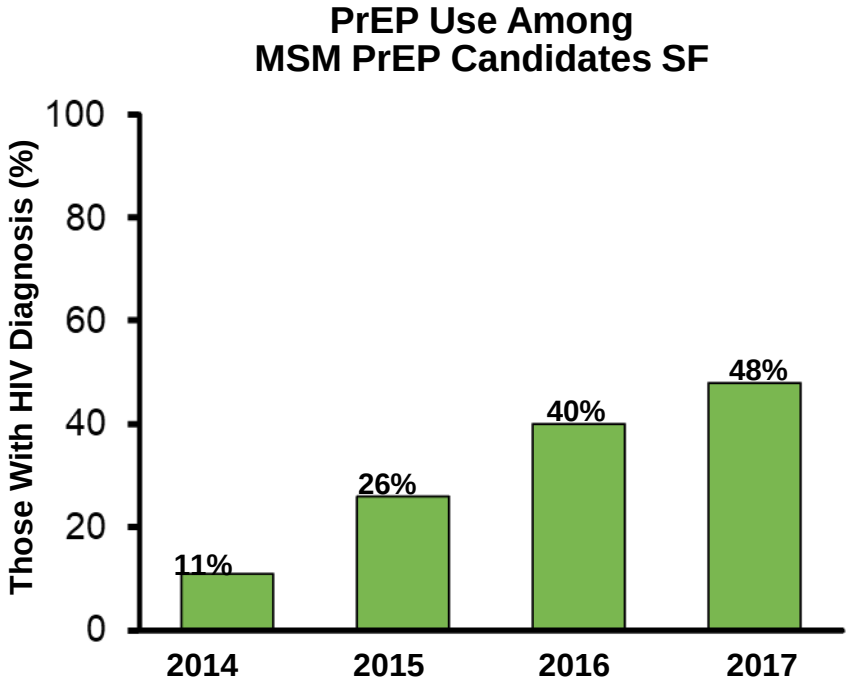



**Individuals Initiating Truvada for PrEP**



# Impact of Targeted PrEP Implementation on HIV Diagnoses in San Francisco (2016)

- City-wide getting to zero consortium
  - Coordinated PrEP program
  - Rapid ART program
  - Linkage-engagement in care
- New HIV diagnoses in SF decreased 51% between 2012 (n=453) to 2016 (n=223)
  - Decreases seen among all race/ethnicity groups




PrEP candidates: HIV negative and condomless anal sex OR STI OR HIV-positive partner.

Buchbinder SP, et al. 25th CROI. Boston, 2018. Abstract 87.

# Adherence in clinical practice

- Refill-based PrEP adherence at Kaiser: **92%**! with >900 pts f/u
- <5% with <60% adherence (<4/week)
- 2 seroconversions b/c insurance lapses; none among those still on PrEP

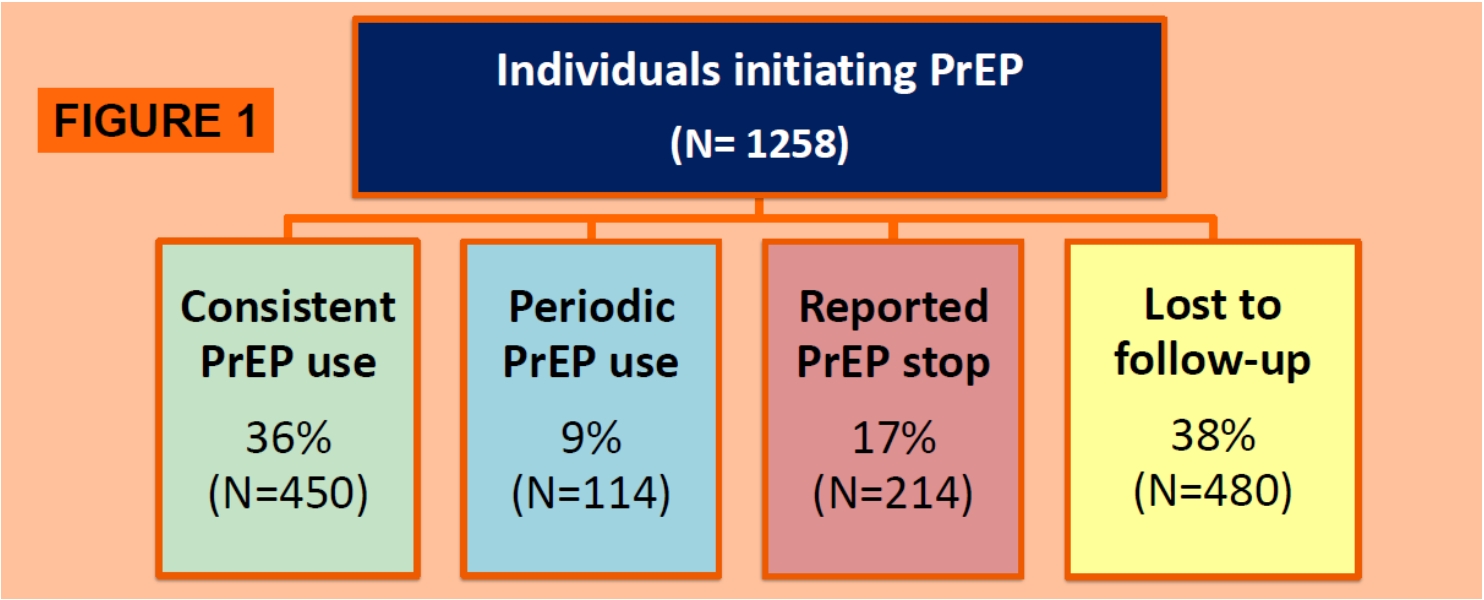
| Factors associated with <80% adherence (N=915) | | | |
|---|---|---|---|
| | Risk ratio* | (95% CI) | P |
| Non-Hispanic Black | 3.0 | (1.7-5.1) | <0.001 |
| PrEP copay >$50 per month | 2.0 | (1.2-3.3) | 0.005 |
| Smoking | 1.6 | (1.1-2.3) | 0.025 |

* Risk ratios obtained from Poisson regression with robust variance and adjusted for age, sex, race/ethnicity, socioeconomic status, copay, smoking, drug/alcohol abuse, baseline STI, baseline renal function, hypertension, and diabetes

Marcus et al., *JAIDS*, July 2016

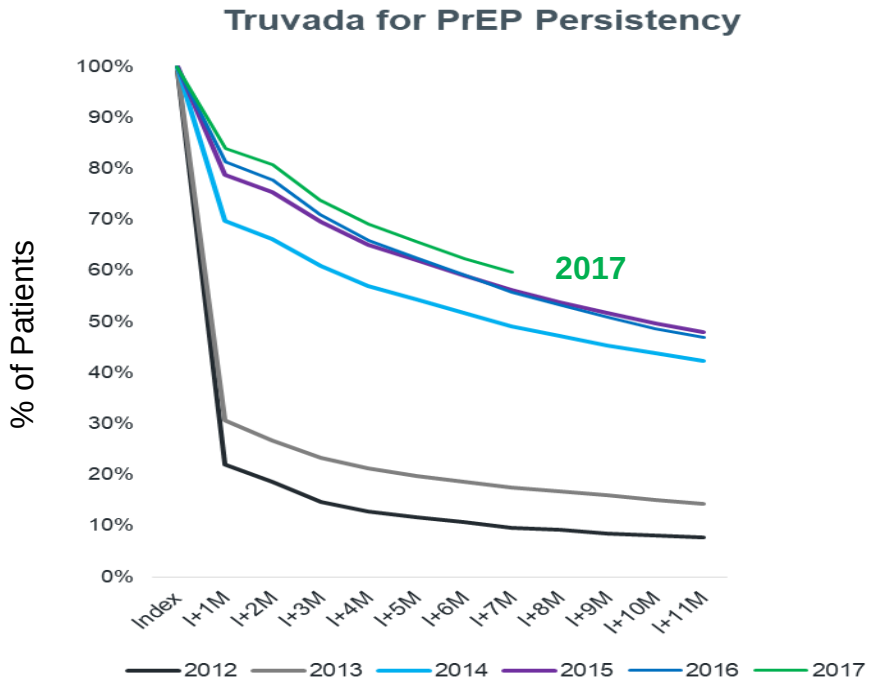
# HIV Acquisition after PrEP Discontinuation (Montreal)

- Retrospective cohort study in MSM who initiated PrEP and returned for at least 1 follow-up visit




Greenwald et al, CROI 2018, abstract 1038

# Persistency has dramatically improved over time – roughly half of patients still on Truvada for PrEP® after 1 year




Average number of Truvada for PrEP refills/year = 7.5

# Blacks Have Highest Number Needing PrEP in US

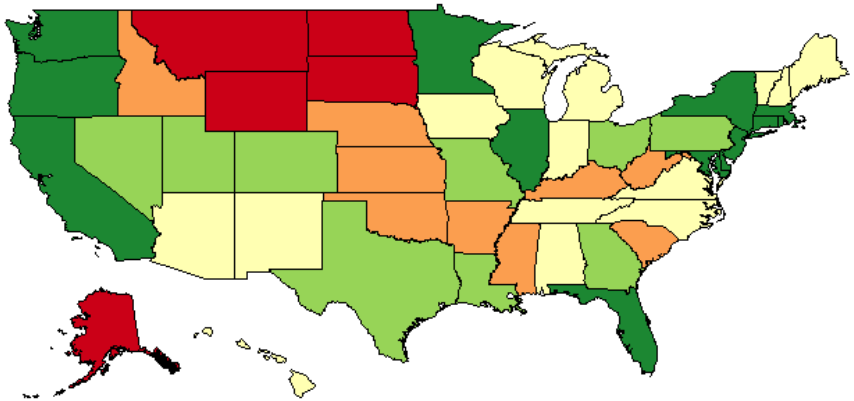
## ESTIMATED NUMBER OF ADULTS WHO COULD POTENTIALLY BENEFIT FROM PREP, UNITED STATES, 2015

| | Gay, bisexual, or other men who have sex with men | Heterosexually active adults | Persons who inject drugs | Total by race/ethnicity |
|---|---|---|---|---|
| Black/African American, non-Hispanic | 309,190 | 164,660 | 26,490 | 500,340 |
| Hispanic/Latino | 220,760 | 46,580 | 14,920 | 282,260 |
| White, non-Hispanic | 238,670 | 36,540 | 28,020 | 303,230 |
| Total who could potentially benefit from PrEP | **813,970** | **258,080** | **72,510** | **1,144,550** |

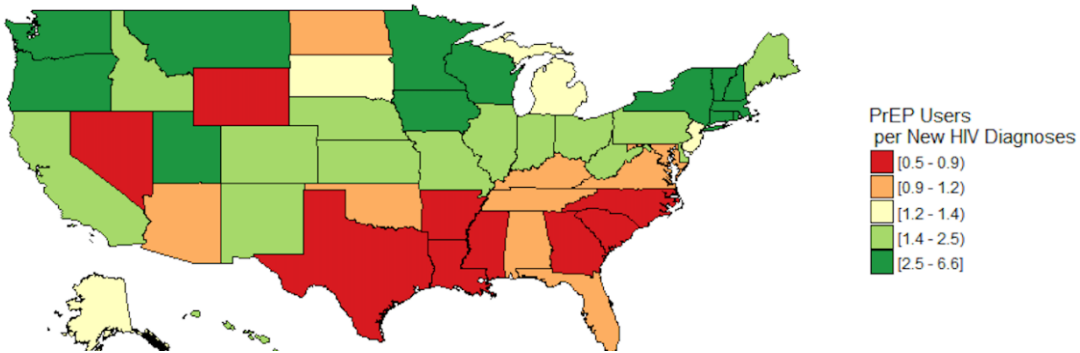
Smith D et al, CROI 2018, Abstract 86

# PrEPVu: Matching PrEP Uptake to PrEP Need

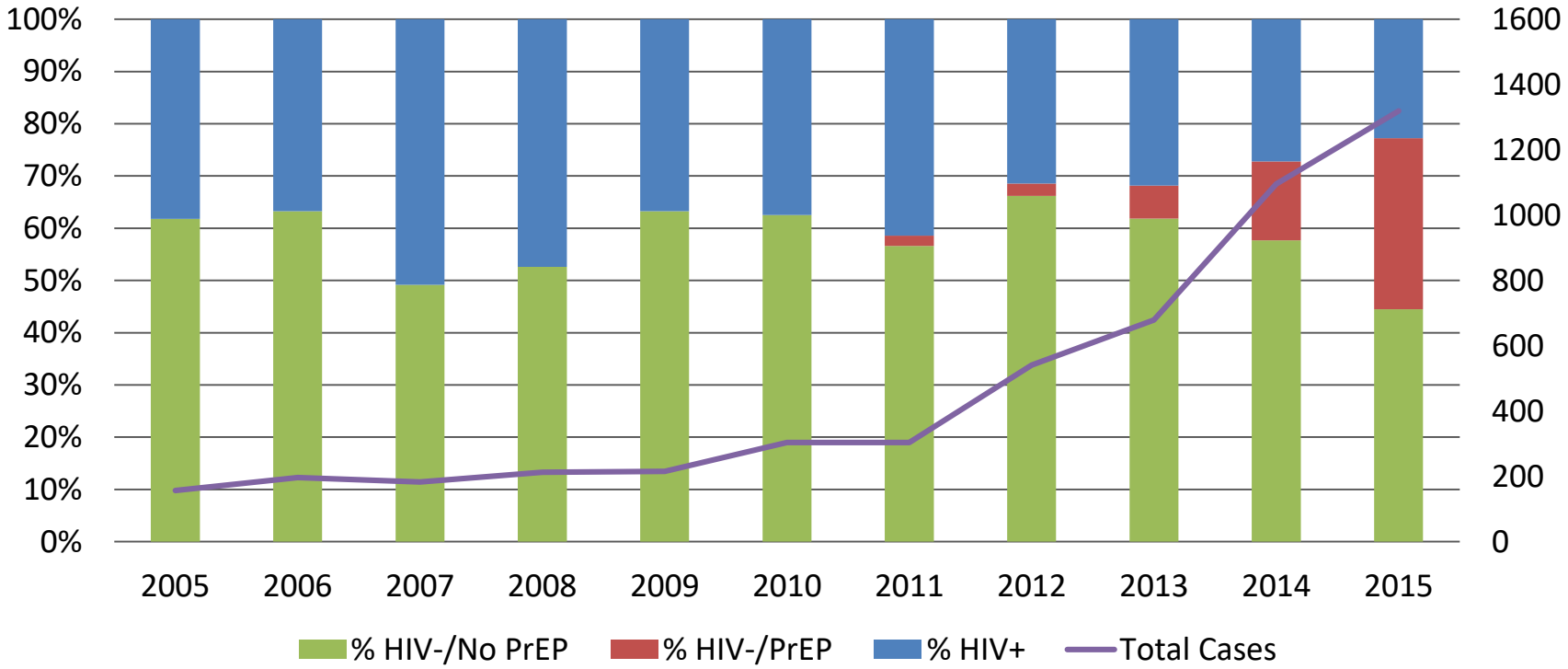
**Prevalence of PrEP Users per 100,000 Population**
**Q2 2017**




**PrEP-to-Need Ratio (PnR)**
**Q2 2017**



# Frequency of any bacterial STI infection, by HIV status and PrEP Use, among Male Patients, Fenway Health




Mayer, OFID, 2017

# PrEP as a gateway to care: Fenway Health

| Adjusted prevalence ratios (95% CI) comparing receipt of primary care between PrEP users and individuals not prescribed PrEP – Fenway, 2012-2016 (N=5,857) | |
|---|---|
| Flu vaccination | **1.57 (1.47-1.67)** |
| Tobacco screening | **1.13 (1.09-1.16)** |
| Depression screening | **1.18 (1.15-1.22)** |
| Hemoglobin A1c or glucose testing | **1.83 (1.75-1.92)** |
| Hemoglobin A1c testing | 0.89 (0.79-1.01) |
| Glucose testing | **2.03 (1.93-2.14)** |
| Prevalence ratios obtained from Poisson models with generalized estimating equations. Adjusted models included age, gender, race/ethnicity, insurance type, and year, with diabetes, hypertension, and overweight/obesity additionally included in models for hemoglobin A1c and glucose testing. | |

Marcus et al., CROI, 2018; AJPH, in press

# Purview paradox

**HIV providers:**

$1^0$ care providers should prescribe

PrEP

**Primary care providers:**

PrEP is for specialists

Krakower, AIDS and Behavior, 2014

# Using EHR data to identify PrEP candidates: patients with incident HIV (cases) and patients without HIV (controls)

Demographics

Laboratory Results

Diagnoses

Prescriptions

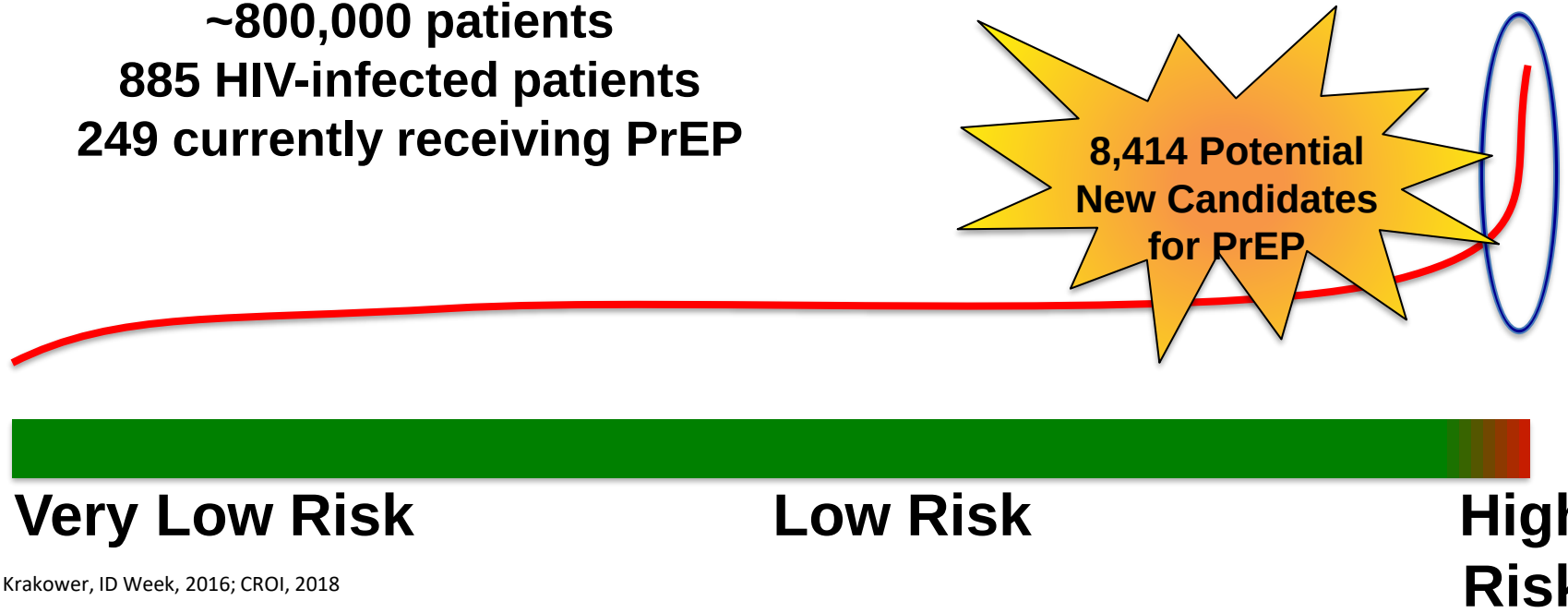
# 8,414 (1.1%) of patients in the HMO population had HIV prediction scores above an inflection point in the distribution of scores

**Atrius Health**

**~800,000 patients**

**885 HIV-infected patients**

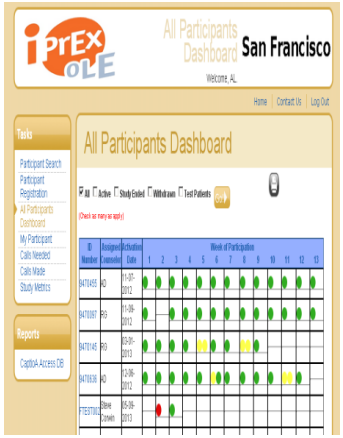
**249 currently receiving PrEP**

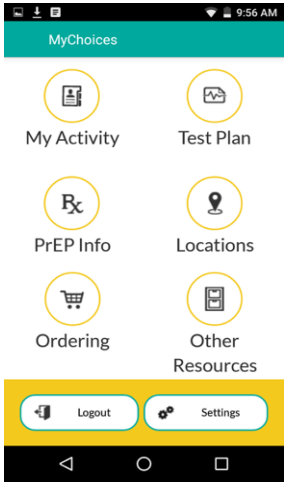



D Krakower, ID Week, 2016; CROI, 2018

# New technologies and TasP/PrEP engagement

- ↑ treatment adherence with text messaging (Lester, Lancet, 2010)
- Daily SMS texting was used to supplement a nurse-delivered PrEP intervention (Safren/Mayer)
- Counseling augmented by electronic diary was associated with ↑ adherence (Amico/Hosek)
- Feedback on drug levels been studied as adjunct to counseling (Landovitz)
- SexPro and MyChoices Apps



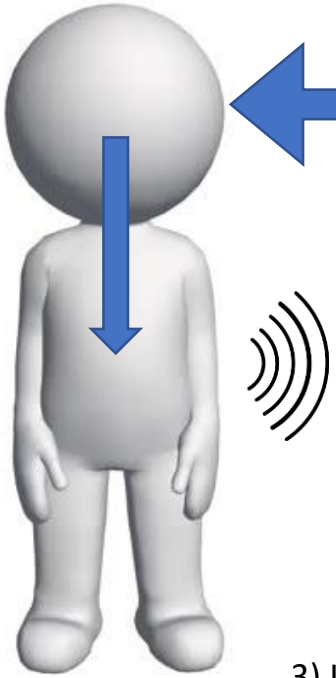




# Chai/Boyer


eTectRx

1) Overencapsulation of Truvada with a gel capsule with integrated radiofrequency emitter creates a ”digital pill” (eTectRx)

2) Digital pill is ingested, stomach contents dissolve gel capsule, chloride ion gradient in stomach activates radiofrequency emitter (6ft radius), 30min emission life




3) Ingestion event recorded by a wearable reader. Data displayed on companion smartphone app

# How to improve chemoprophylaxis effectiveness?

**New oral PrEP drugs and dosing strategies**

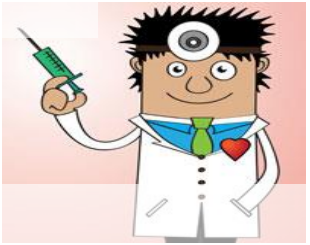


**Novel adherence strategies**

**Alternative delivery systems and formulations**

**Vaginal & Rectal Microbicides**

**Intravaginal rings**
**(Dapivirine, Tenofovir)**
**+/- Contraception)**



**Injectables:**
**ARVs and mAbs**
**(Cabotegravir, VRC01)**

# Preference for injectable PrEP (vs. daily pill)

(Biello, AIDS Behav, 2017)

| Measure | | aOR (95% CI) | p |
|---|---|---|---|
| Age | 18-21 | 1.71 (1.05, 2.79) | 0.031 |
| | 22-25 | 1.71 (1.14, 2.55) | 0.010 |
| | 26-29 | 1.97 (1.33, 2.93) | 0.001 |
| | 30-39 | 1.94 (1.41, 2.68) | <0.001 |
| | 40-49 | 1.11 (0.81, 1.51) | 0.528 |
| | 50+ | 1.0 | |
| Race/ethnicity | White | 1.0 | |
| | Black | 1.58 (1.17, 2.12) | 0.003 |
| | Hispanic | 1.45 (1.00, 2.12) | 0.053 |
| | Asian/PI | 1.18 (0.71, 1.96) | 0.513 |
| | Multiracial | 1.03 (0.67, 1.57) | 0.906 |
| | Other | 1.12 (0.46, 2.73) | 0.801 |
| Condomless anal sex acts, past 3 mos. | 0 | 1.0 | |
| | 1 | 1.11 (0.78, 1.57) | 0.559 |
| | 2+ | 1.52 (1.21, 1.91) | <0.001 |
| Oral PrEP experienced | Yes | 1.39 (1.02, 1.89) | 0.038 |

- Preference for injectable PrEP
  - 47.2% prefer injectable PrEP
  - 16.8% prefer a daily pill
  - 36.0% were unsure
- Difficulty to take injectable PrEP
  - 47.0% indicated that injectable PrEP would be easier to take as prescribed

# Focus Group Results (Biello, Arch Sex Beh

| | n (SD) |
|---|---|
| Race/e | |
| Latino | 17% |
| Black, non-Hispanic | 69% |
| White, non-Hispanic | 6% |
| Other | 8% |
| Male gender identity | 67% |
| High school diploma or less | 59% |
| Past year STI test | 81% |
| Past year HIV test | 83% |
| Ever PrEP use | 36% |

*We [Black MSM] have too many stories and reasons not to trust vaccines.* (Boston participant, PrEP experienced group)

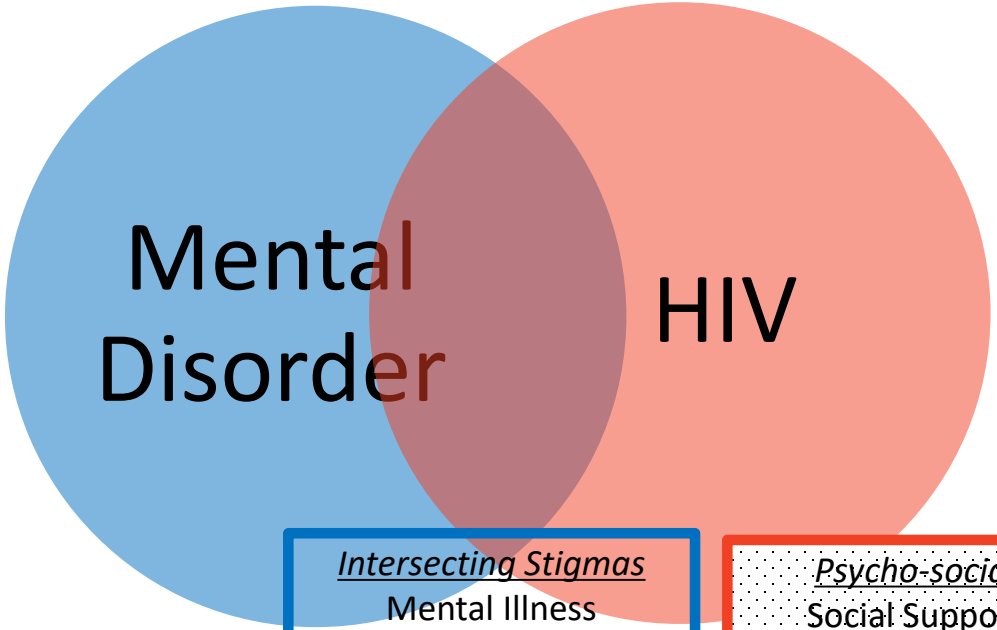
*I honestly don't want to get an injection if I don't need it but would still prefer that to the pill.* (LA participant, PrEP naïve group)

*I think it would be hard to get every 3 months…It would be better to not have a whole sit-*

*Not everyone is sexually active every single day so not everyone wants to take a pill everyday if they don't need it. It would be better if you could just take the pill around the time you know you'll be sexually active.* (LA participant, PrEP naïve group)

*side effects the whole 3 months with the injection? Or just the first few days, if any?* (LA participant, PrEP naïve group)

# Why the high burden of mental health in HIV?




*Demographic*
Age
Gender
Sexual Orientation
Ethnicity

*Biological*
Chronic immune activation and HPA dysregulation
Other Infections (e.g., HCV)

*Community*
Density
Safety / Violence

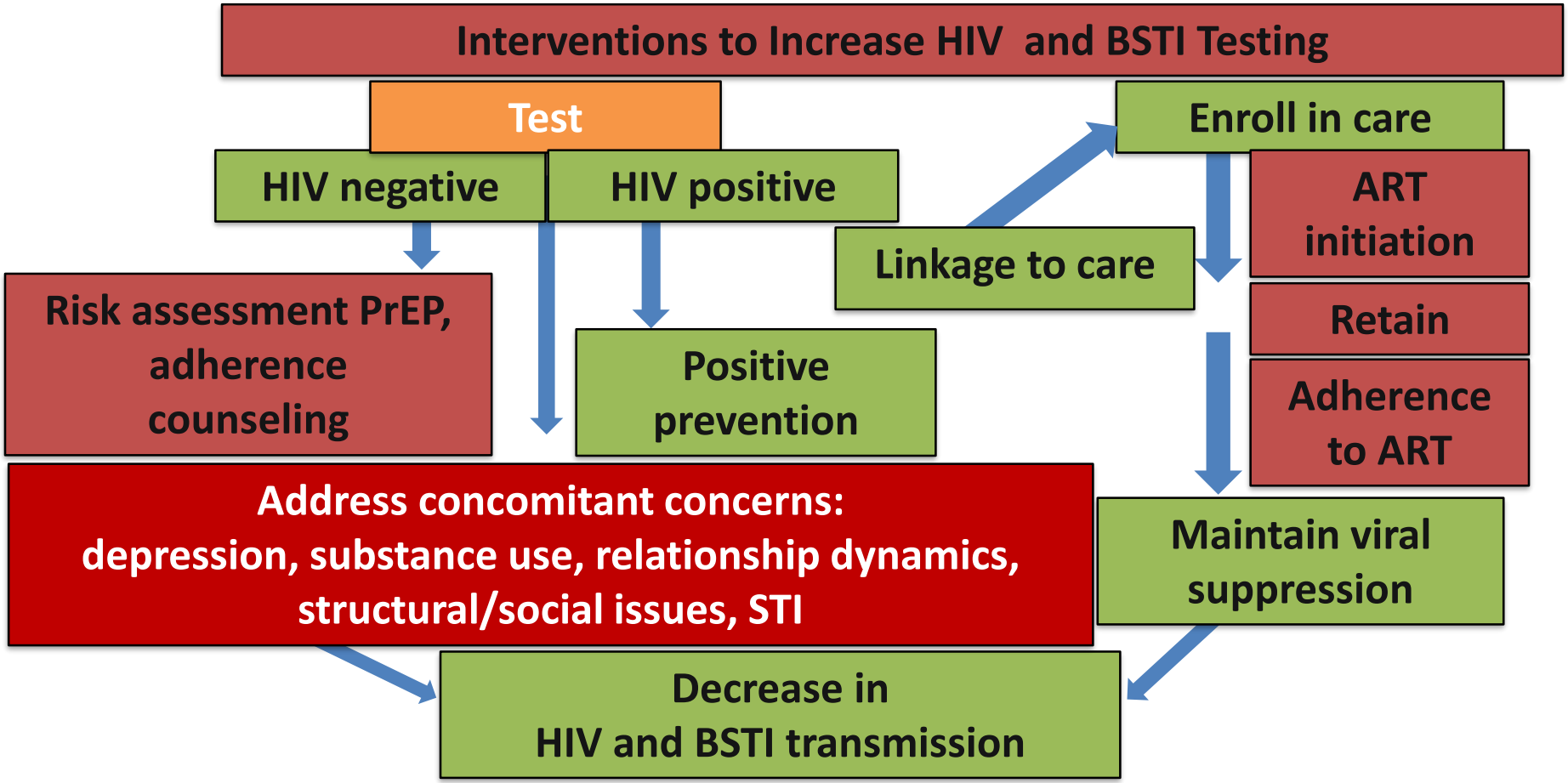
*SES*
Income
Education
Housing and Food: Security/Insecurity

*Environmental*
Natural Disasters
War/Conflict
Climate / Water
Migration

*Intersecting Stigmas*
Mental Illness
HIV
Gender / Sexual Minority
Substance Use
Sex Work

*Psycho-social*
Social Support
Loss / Bereavement
Trauma
Gender-based violence
Fear of illness

# Need to Address more than PrEP (and TasP)



# Thank You

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Robert Remien
Steve Safren
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Patrick Sullivan

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