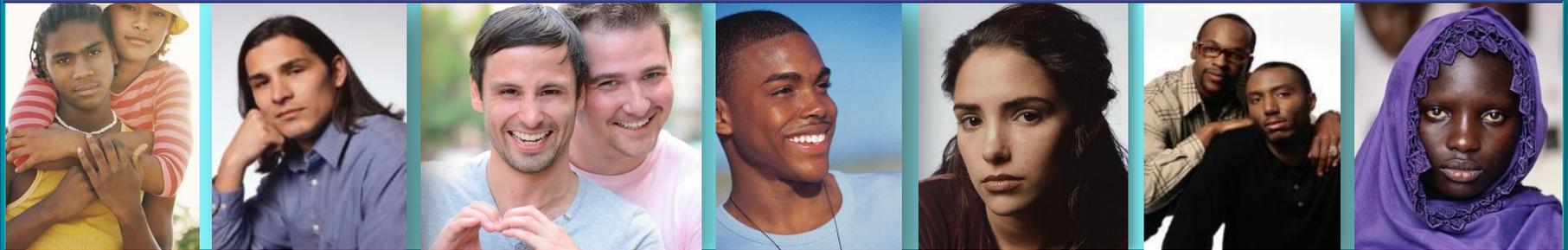


ARV treatment, PrEP, and an evolving HIV prevention paradigm



Jonathan Mermin, MD, MPH

**National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention
Centers for Disease Control and Prevention**

**IAPAC summit on controlling the HIV epidemic with ARVs
October 1, 2015**

Why are we here when these are 100% effective?



Sero-Sorting 101
[POZ] | [NEG]



Two sides of prevention



Vaccine

Ultimate prevention for negatives



Cure

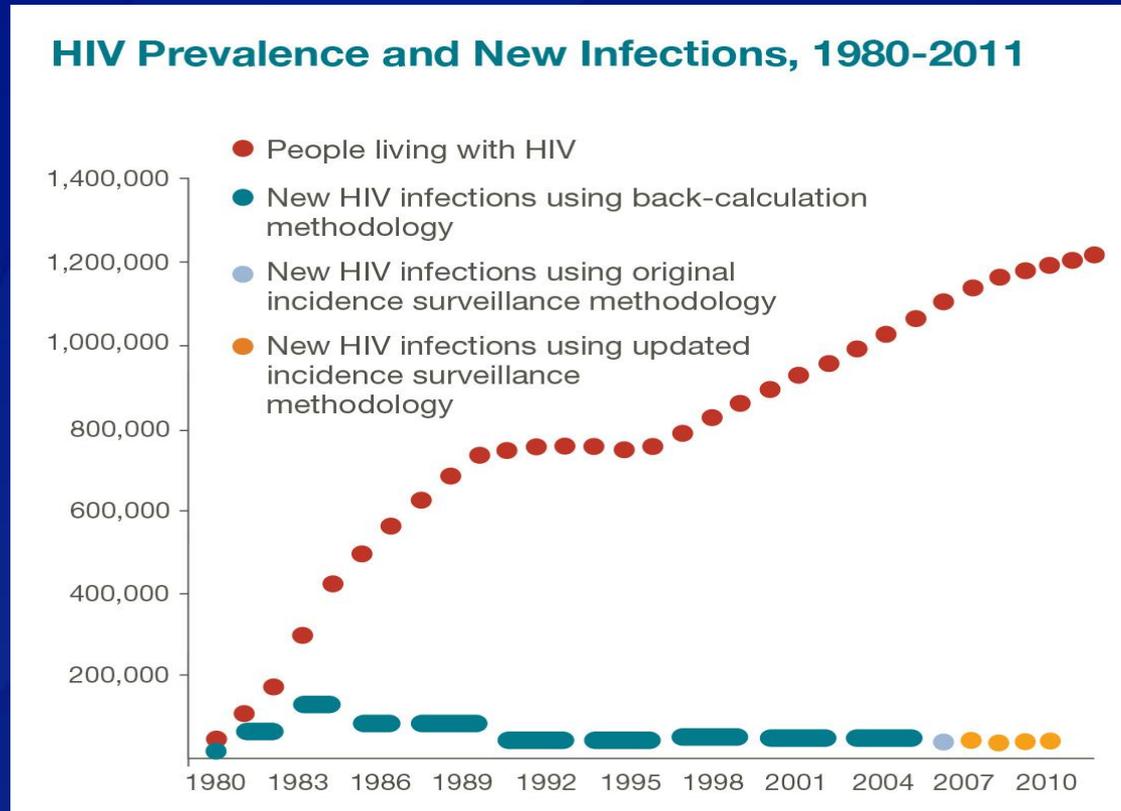
Ultimate prevention for positives

Outline

- 1. State of the HIV epidemic**
- 2. Do treatment and PrEP reduce HIV incidence on individual and population levels?**
- 3. What is best use of resources to reduce HIV?**
- 4. How can we fully implement HIV screening and the continuum of care?**
- 5. What are the scientific breakthroughs that will make the healthy choice the easy choice?**
- 6. What is new generation of sexual risk messaging?**
- 7. Health equity**

Worsening HIV epidemic

HIV trends in the United States

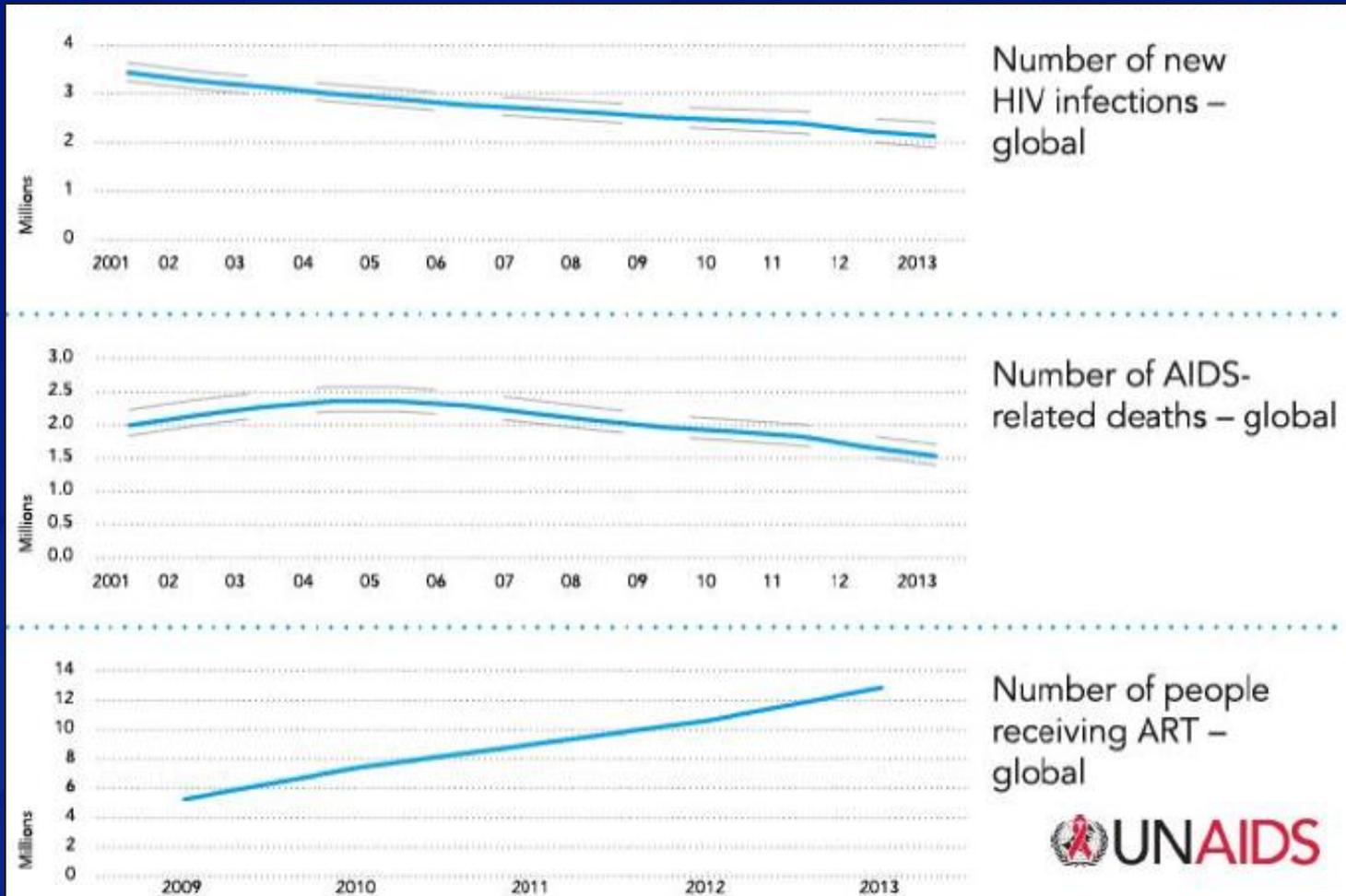


Number of people living with HIV has grown because incidence is relatively stable and survival has increased

Partial success in the United States

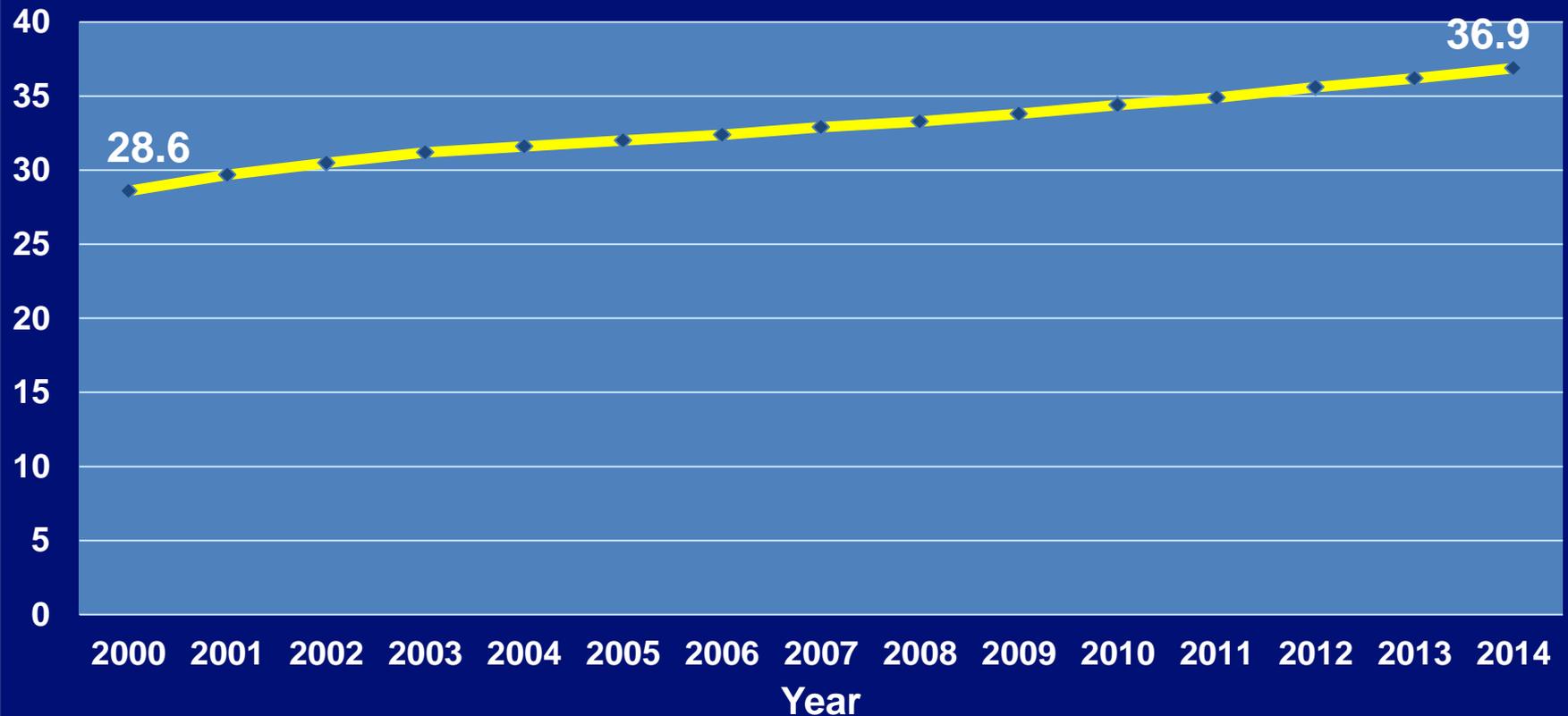
- 2002-11, annual new HIV diagnoses decreased 33%
- Proportion of person with HIV aware of status increased from 77% in 2002 to 87% 2013
- 2008-2010, estimated incidence decreased 15% among heterosexuals, 21% among African American women, 22% among IDUs
- But, 65% of new infections in U.S. are among MSM
- New HIV infections increased 12% among MSM

Partial success globally



Number of People Living with HIV, Global, 2000-2014

Millions



UNAIDS, *How AIDS Changed Everything*, July 2015

Regional HIV and AIDS statistics and features | 2014

	Adults and children living with HIV	Adults and children newly infected with HIV	Adult prevalence (15–49) [%]	Adult & child deaths due to AIDS
Sub-Saharan Africa	25.8 million [24.0 million – 28.7 million]	1.4 million [1.2 million – 1.5 million]	4.8% [4.5% – 5.1%]	790 000 [670 000 – 990 000]
Middle East and North Africa	240 000 [150 000 – 320 000]	22 000 [13 000 – 33 000]	0.1% [<0.1% – 0.1%]	12 000 [5300 – 24 000]
Asia and the Pacific	5.0 million [4.5 million – 5.6 million]	340 000 [240 000 – 480 000]	0.2% [0.2% – 0.2%]	240 000 [140 000 – 570 000]
Latin America	1.7 million [1.4 million – 2.0 million]	87 000 [70 000 – 100 000]	0.4% [0.4% – 0.5%]	41 000 [30 000 – 82 000]
Caribbean	280 000 [210 000 – 340 000]	13 000 [9600 – 17 000]	1.1% [0.9% – 1.3%]	8800 [5700 – 13 000]
Eastern Europe and Central Asia	1.5 million [1.3 million – 1.8 million]	140 000 [110 000 – 160 000]	0.9% [0.7% – 1.0%]	62 000 [34 000 – 140 000]
Western and Central Europe and North America	2.4 million [1.5 million – 3.5 million]	85 000 [48 000 – 130 000]	0.3% [0.2% – 0.5%]	26 000 [11 000 – 86 000]
TOTAL	36.9 million [34.3 million – 41.4 million]	2.0 million [1.9 million – 2.2 million]	0.8% [0.7% - 0.9%]	1.2 million [980 000 – 1.6 million]

The ranges around the estimates in this table define the boundaries within which the actual numbers lie, based on the best available information.

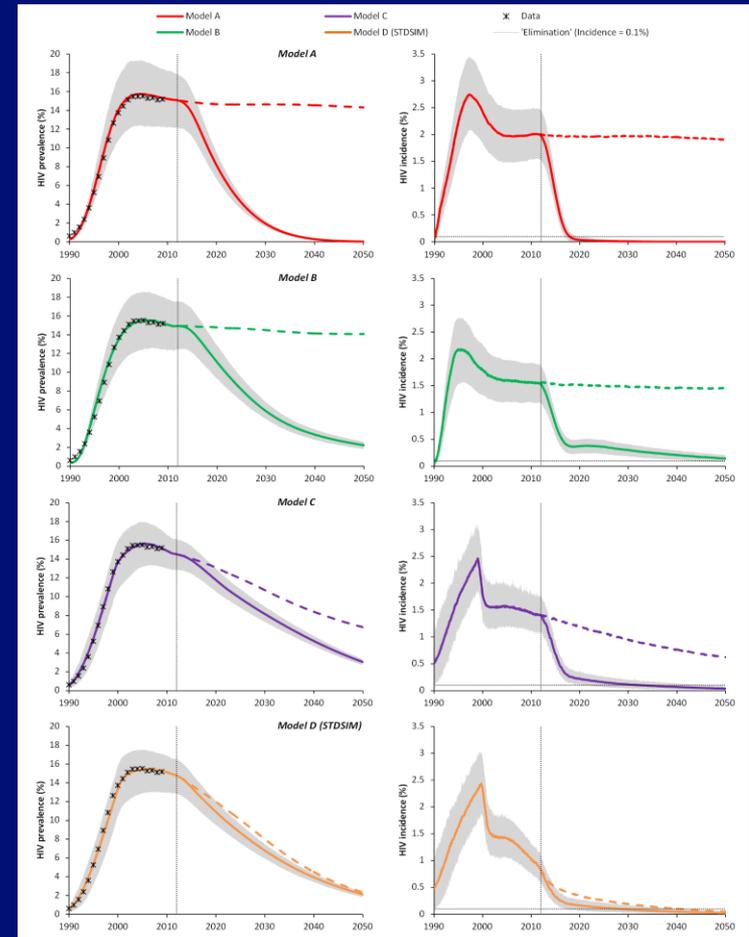
**Do treatment and PrEP decrease
HIV transmission on individual and
population levels?**

**Does ARV treatment prevent
HIV transmission?**

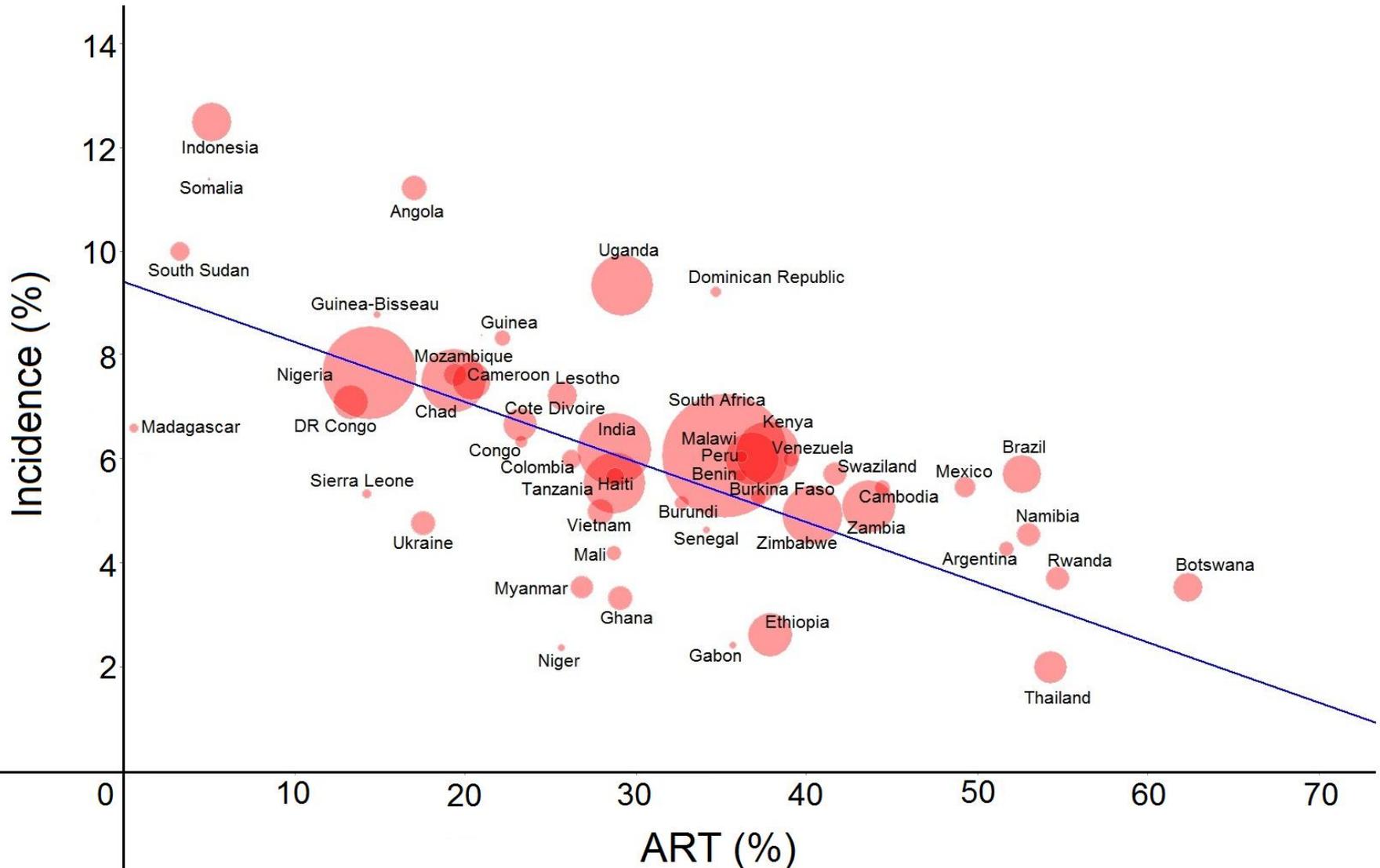
Yes

Individual and population levels

- **Elimination theoretically possible**
 - New HIV infections can be eliminated (<1 per 1,000 person-years) in South Africa with annual screening and universal or CD4-guided ART
- **And empirically possible**
 - In rural KwaZulu-Natal, a person living in a community with 30-40% ART coverage was 38% less likely to acquire HIV than person in community with <10% coverage



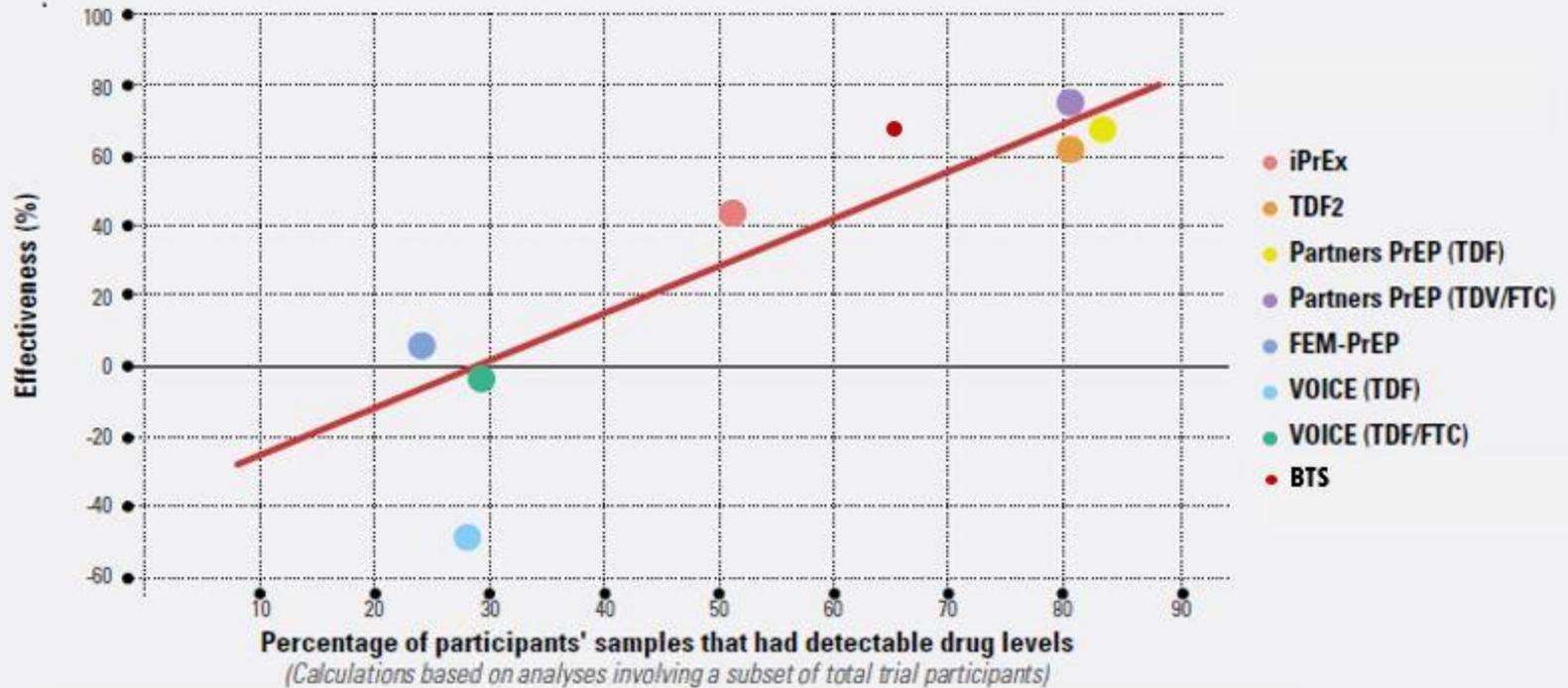
New HIV infections (percentage growth) versus ART coverage in 51 countries.



**Does pre-exposure prophylaxis
prevent HIV acquisition?**

Yes

Individual level



Adapted from:

Source: Salim S. Abdool
Karim, CAPRISA

In practice

U.S. PrEP Demonstration Project

- Moderate PrEP adherence with 63% of 557 MSM and transgender women participants at ≥ 4 doses a week
- 2 HIV infections at follow-up

TDF2 Open-Label Extension (OLE), 2013-2014

- In random sample of 120 of 229 participants, detectable tenofovir in 93% of visits
- No HIV infections among participants

PrEP Use, Kaiser Permanent Medical Center, San Francisco

- No HIV infections despite high rates of STIs, risk behavior

HIV PrEP demonstration project for YMSM in U.S.

- 56% of participants had protective drug level at first monthly visit, but adherence declined as visits decreased in frequency
- 4 HIV infections; all had undetectable drug levels

Modeling PrEP Population Impact

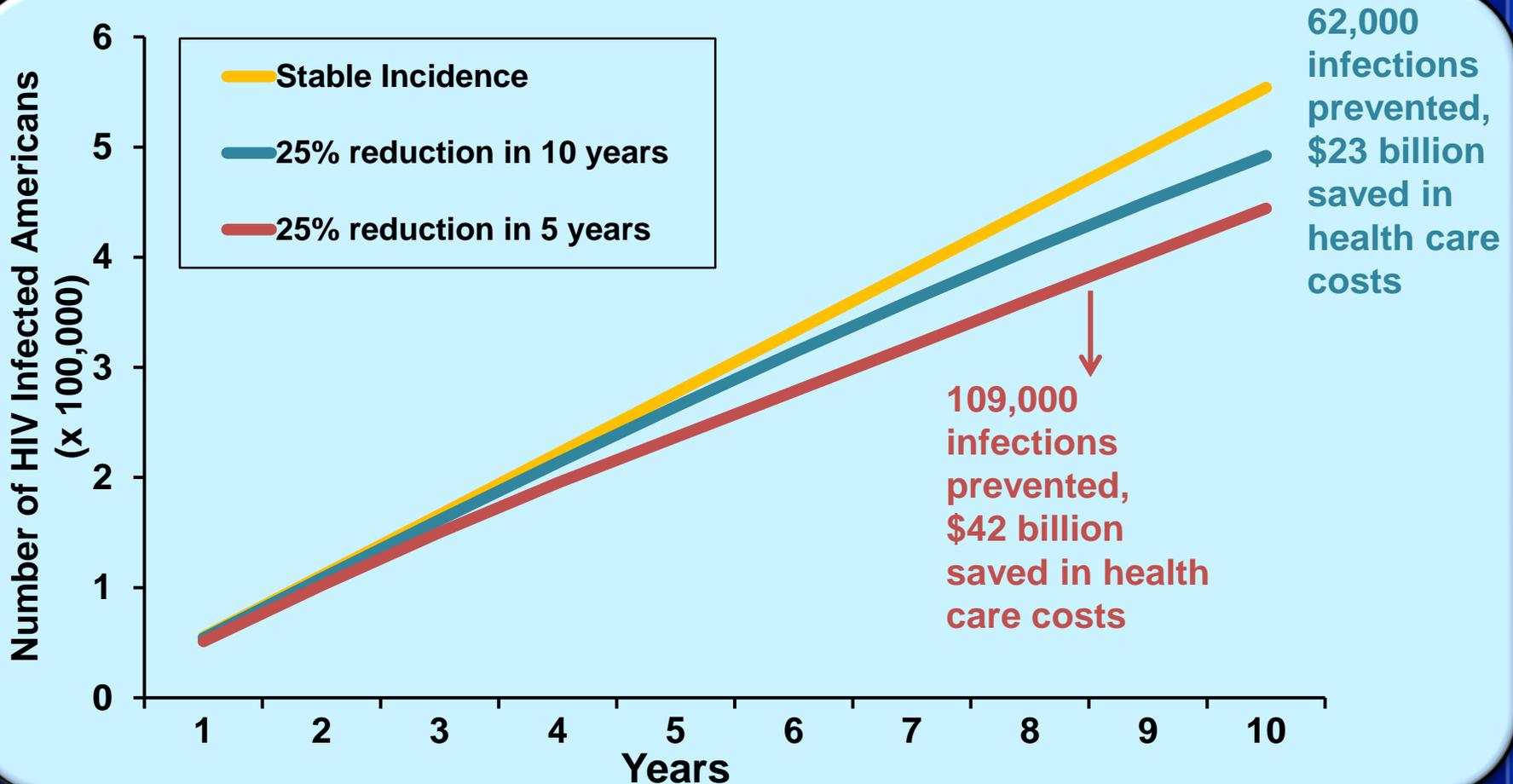
Population	% Covered	Incidence Reduction in Target Population
Heterosexuals in Kenya	NA	11% over 10 years
MSM in US and Peru	20%, 40%, 60%	<1% for low coverage and adherence, over 10 years; 30% with most efficient targeting; >50% with 60% coverage and high adherence
MSM, PWID, Heterosexuals in New York City	50%	24% over 20 years for all populations; 19% for all MSM
MSM in New South Wales	10%,20%, 30%	10% on PrEP, 9% reduction over 10 years; 20% on PrEP, 21% reduction 30% on PrEP, 30% reduction
Heterosexuals in South Africa	4.4% of 15-54 year olds	3.6% over 10 years
MSM in US	20%, 50%, 100%	20% on Prep, 13% averted over 20 years; 50% on PrEP, 29% averted; 100% on PrEP, 51% averted

Cremin, *AIDS* 2015; Carnegie, *JAIDS* 2015; Kessler, *AIDS* 2014; Schneider, *Clinical Infectious Diseases* 2014; Cremin, *AIDS* 2013; Jussola 2012, *Ann Intern Med* 2012

**What is best use of existing
or additional resources to
reduce HIV?**

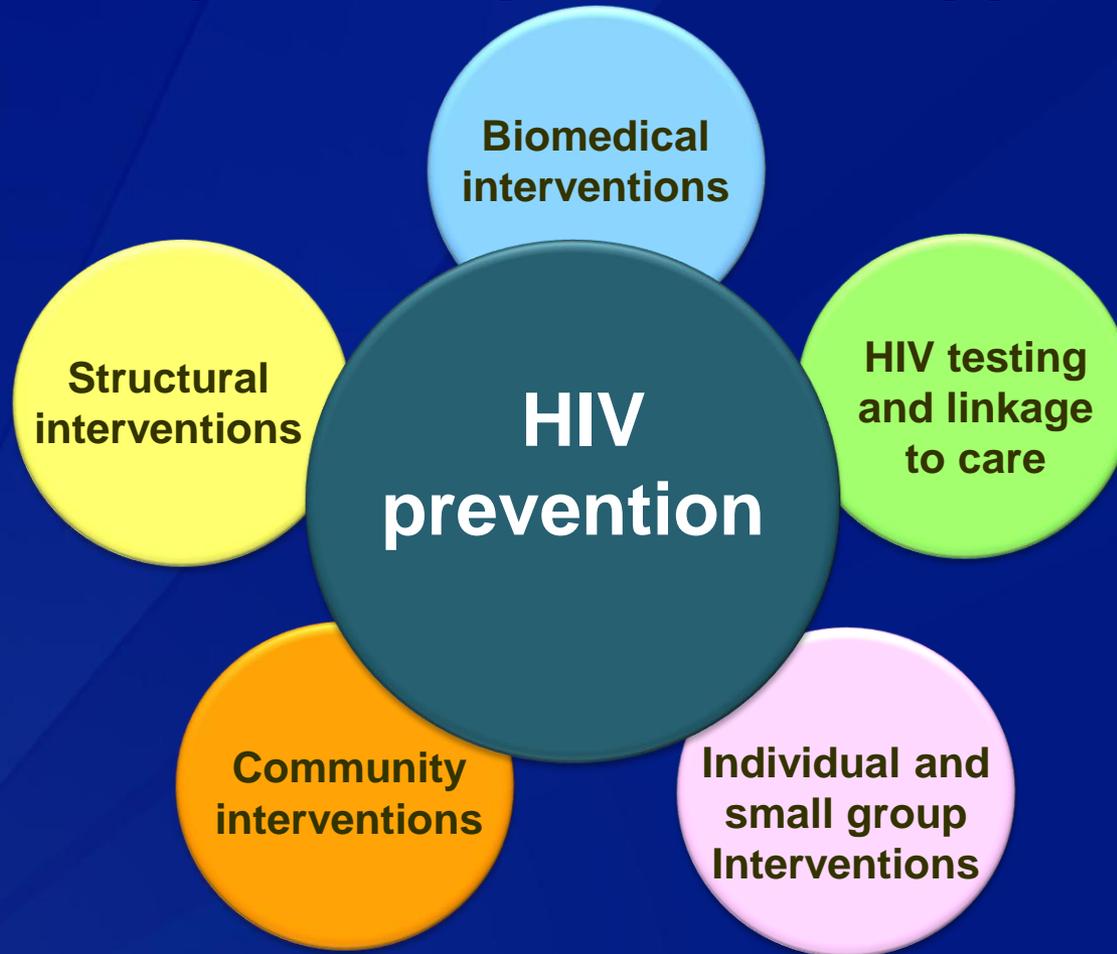
Faster we act, bigger the impact

Achieving prevention goals of National HIV/AIDS Strategy would avert tens of thousands of new infections and save billions of dollars



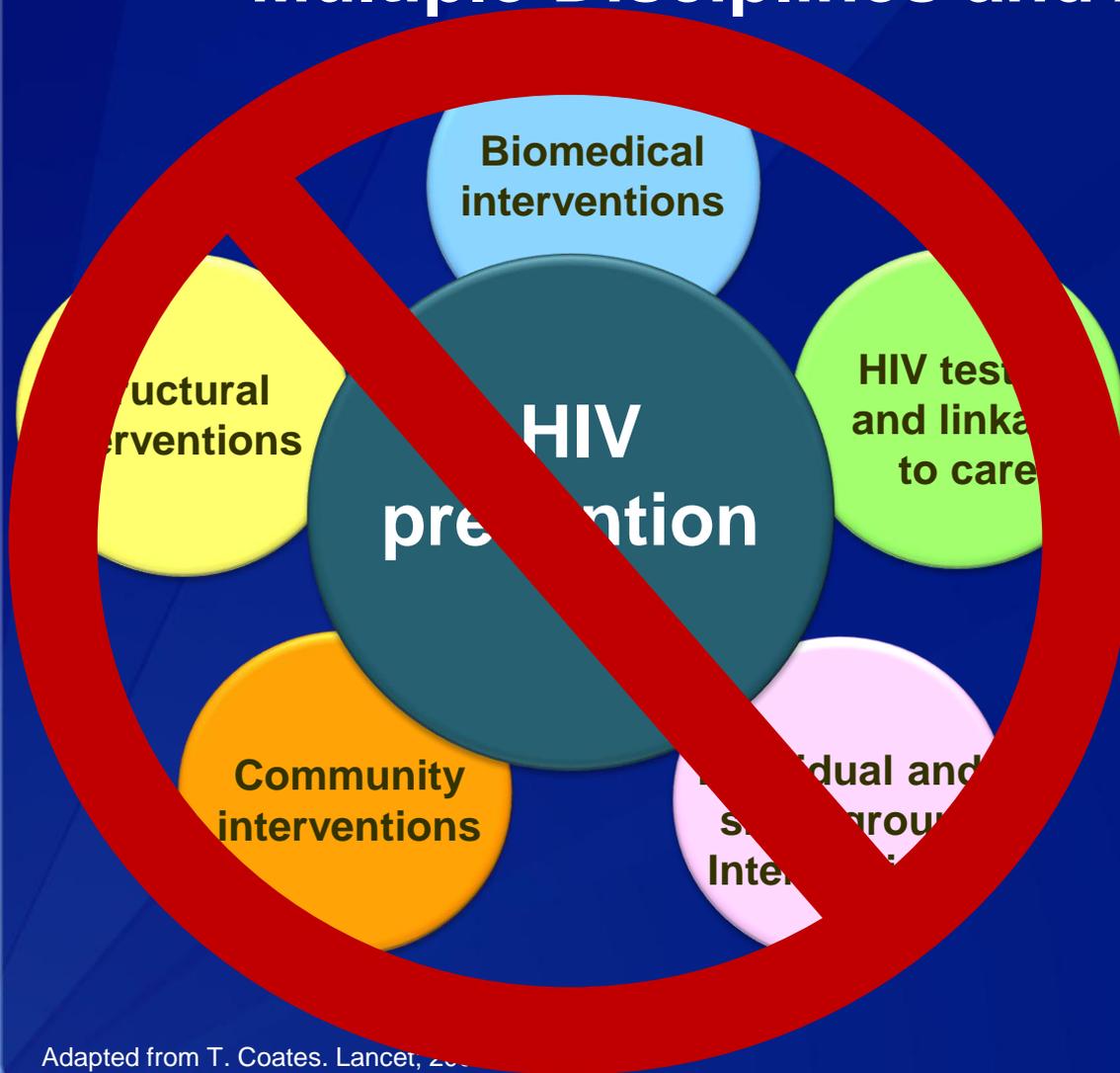
Combination Prevention

Multiple Disciplines and Approaches



Combination Prevention

Multiple Disciplines and Approaches



Combining interventions is not enough

All interventions are not effective

All effective interventions are not equal

Strategy

**HIGH-IMPACT
PREVENTION**

**Potential
interventions**



**Assess efficacy
and effectiveness**



**Establish cost and cost
effectiveness per
infections averted
and life-years saved**



**Determine
feasibility of full
scale
implementation**



**Develop epidemic
models to project
impact of
interventions**



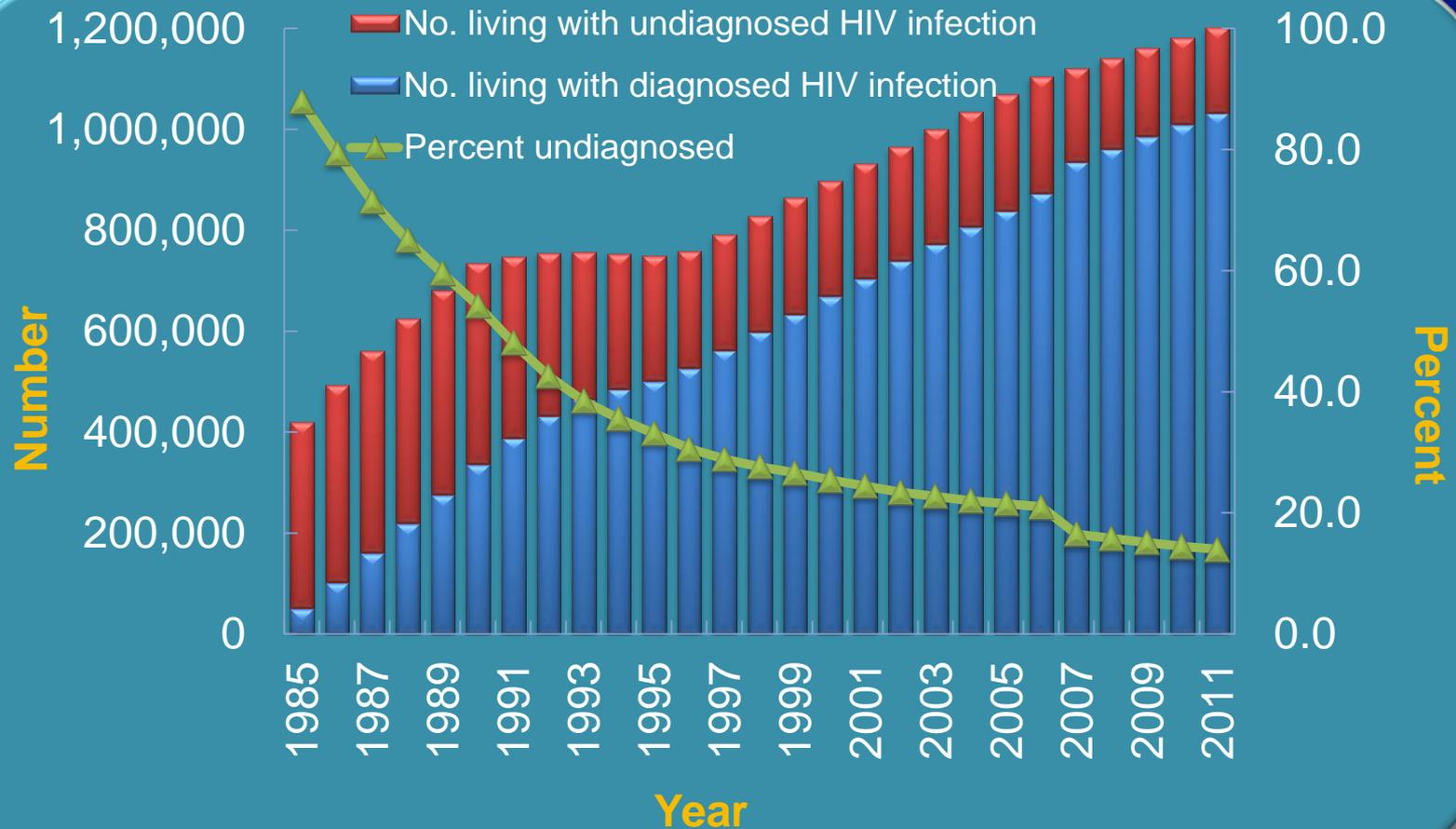
**Prioritize
interventions**



**Implement
and evaluate
programs**

How can we fully implement HIV screening and improve the continuum of care?

HIV prevalence and diagnosis



HIV Testing Examples

- **Veterans Health Administration revised national HIV policy to routinely offer HIV testing to all veterans**
 - **Eliminated required written informed consent and pre- and post-test counseling**
 - **In 2009, 9.2% of outpatients had ever been tested for HIV, by 2011, 20% had--1.2 million more veterans**
- **Very few hospitals or clinics have routine clinical decision support systems that flag blood drawn for other tests, e.g., CBC or chemistries and request HIV testing**

Testing in health care and at home

- In Kampala, Uganda, 98% of 50,000 in-patients and clinic attendees agreed to HIV testing
 - 29% never tested previously were infected
- In eastern Uganda, 99% of 2,300 family members of people taking ART accepted HIV testing
 - 37% of adults and 10% of children ≤ 5 years infected
 - 74% of HIV-infected never previously tested--of these, 39% eligible for ART
 - 43% of spouses positive and 99% not previously tested



Door-to-door and community testing

- 111,700 (98% of those present) tested in Bushenyi District, Uganda; Prevalence 5.8%
- >7,000 tested in Nairobi with 96% uptake
 - Prevalence 13%
 - 85% of people with HIV had never had HIV test
 - Median CD4 count 450 cells/ml
- 47,000 tested in 7 days in community testing program in rural Kenya
- All testing was cost-effective
 - Cost-saving if averted infections included: \$1,800-\$51,000 saved per 1,000 tested

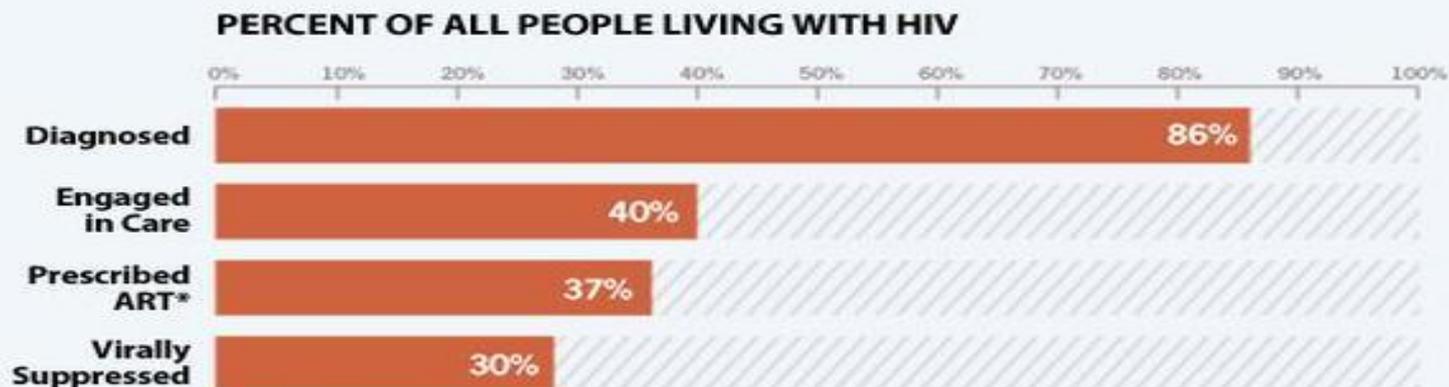


New HIV testing algorithm

- **71-84% of RNA+/ 3rd generation-negative specimens detected by 4th generation assay**
- **4 days after RNA positive**
- **Algorithm diagnoses majority of acute infections, allows for PCR confirmation rather than WB, and detects HIV-2**
- **Improved rapid test characteristics as well**

HIV Care Continuum

There is an urgent need to reach more people with testing and make sure people living with HIV receive prompt, ongoing care and treatment.



*Antiretroviral therapy

SOURCE: CDC National HIV Surveillance System and Medical Monitoring Project, 2011.

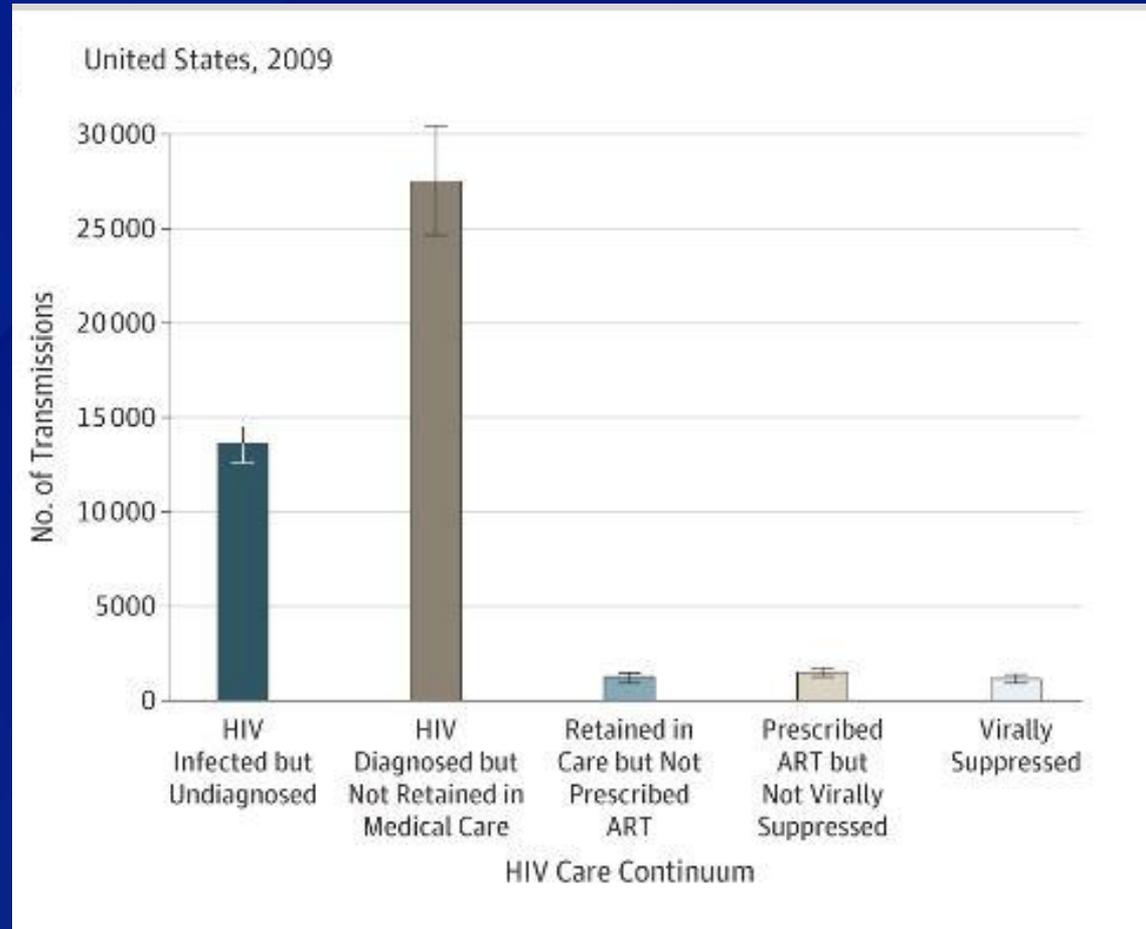


Vital^{CDC}signs™

www.cdc.gov/vitalsigns/HIV-AIDS-medical-care

HIV Transmission at Each Step of Care Continuum, United States

- 9 of 10 new U.S. HIV infections transmitted by HIV-infected people who are undiagnosed or by those diagnosed but not retained in medical care
- Those virally suppressed 94% less likely to transmit HIV than those infected but undiagnosed



JAMA Intern Med. 2015;175(4):588-596.

Data to Care Strategy

- Using surveillance data to identify people who are not engaged in care not receiving optimal care**
 - Never linked to care, dropped out of care**
 - Persistently low CD4 count or detectable viral load**
- CD4 or viral load test result as proxy for care visit**
- Data are used for public health follow up**
 - Continuum of Care uses aggregate data for monitoring**
 - Data to Care uses individual data for public health action**

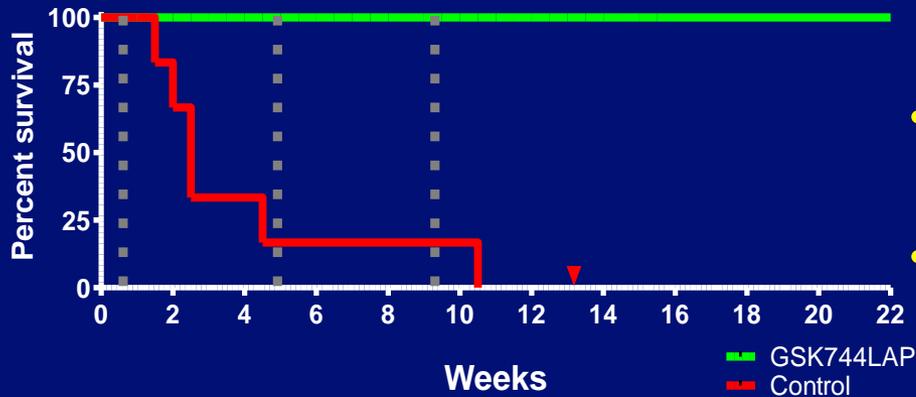
What are the scientific breakthroughs that will make the healthy choice the easy choice?

Making the default option safer

For example:

- **Effective microbicide for vaginal and anal sex inexpensive and safe enough to be in all lubricants and condoms**
- **Easy availability of non-reusable syringes**
- **Conventional and rapid HIV tests that diagnose acute and chronic infection**
- **Long-acting PrEP and ART**

Can healthy choice be easy choice?



- Oral PrEP reduced HIV acquisition among heterosexuals, MSM, IDUs
 - Some trials failed
- More effective with better adherence
- Long-acting GSK744 monthly injections protected macaques from rectal and vaginal SHIV
- TDF ring protected macaques from vaginal SHIV infection
- Raltegravir gel applied vaginally 3 hrs after SHIV challenge reduced acquisition

Can a condom feel better than alternative?

- **In national sample, >70% of adolescents reported condom use during last sex**
 - However, only 22% of women and 25% of men of all ages reported condom use
 - Use more than twice as likely with casual than “relationship” partner
- **Couples stop using condoms over time**
 - Men and women >5 times less likely to use a condom if had sex more than 10 times previously
- **Among MSM, 68% of HIV transmission was from main partner**
 - Higher number of sex acts, more frequent receptive role, and lower condom use

Need for improved technology

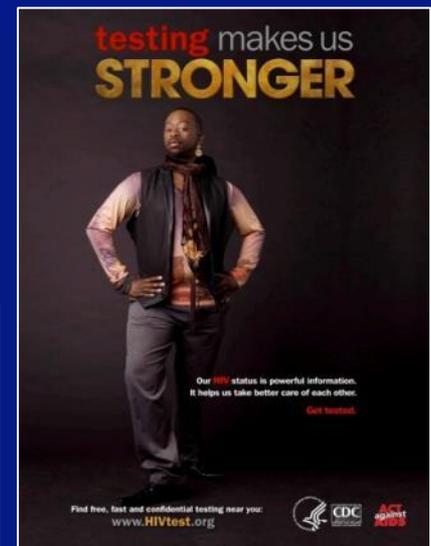
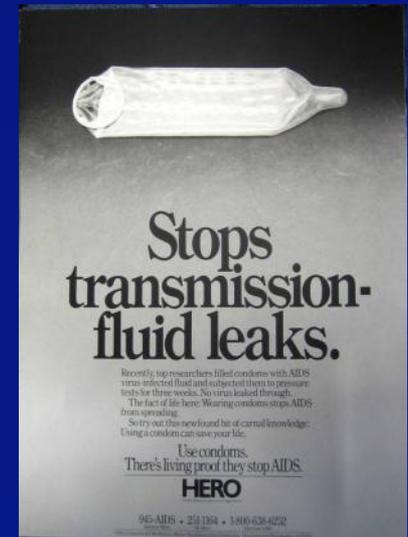


- Gates foundation awarded \$1 million in research grants to develop a condom that “significantly preserves or enhances pleasure”
 - University of Manchester exploring graphene condoms

What is new generation of sexual risk messaging, including knowledge of self and partner HIV status, PrEP and ART, in a time when STD and HIV prevention are diverging?

What is the new generation of risk messaging?

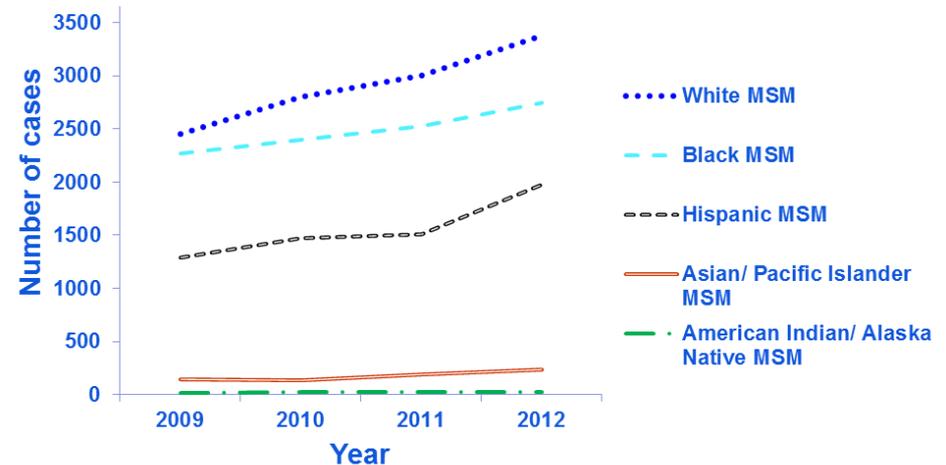
- “Protection” is no longer restricted to condoms
- No studies have assessed effectiveness of risk reduction for HIV-negative persons incorporating ART by partner, PrEP, nPEP, male circumcision, and serosorting
- Few studies have assessed new approaches for persons with HIV and their partners



Syphilis increasing among MSM

- Syphilis rates for men increased from 5.1 to 9.8 per 100,000, during 2005-2013
- Men accounted for 91% of all syphilis cases in 2013
- Proportion of male cases attributed to MSM increased from 77% in 2009 to 84% in 2012
- About half of new syphilis cases are among MSM with HIV

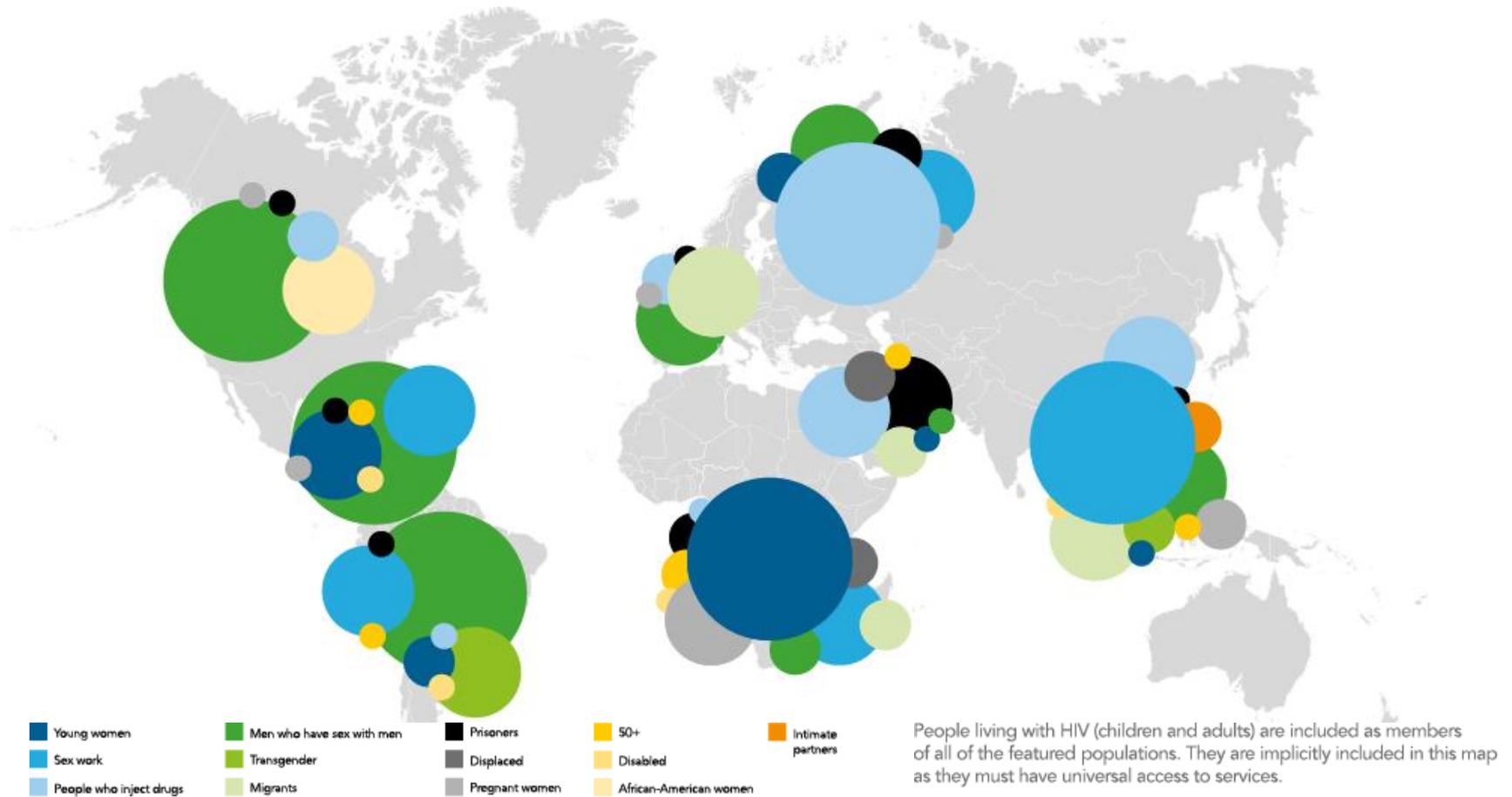
Number of primary and secondary syphilis cases among MSM, by race/ethnicity, 2009-2012



Health Equity

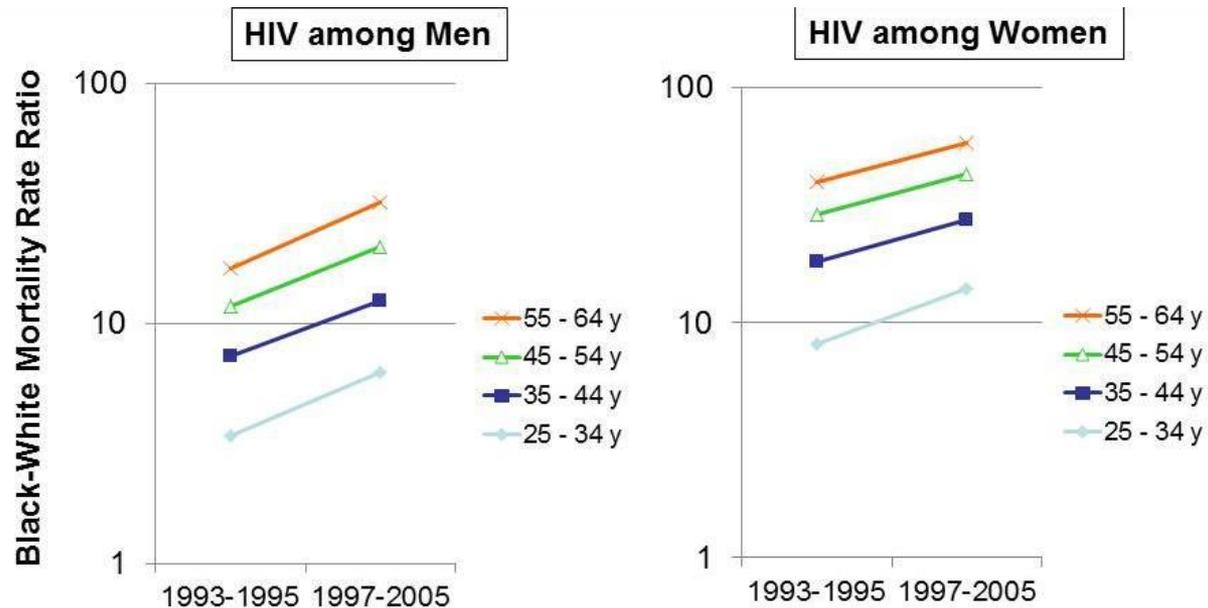
- In United States, African Americans 8 times and Latinos 3 times more likely to have HIV than whites
- Almost 70% of new HIV infections are in sub-Saharan Africa
- Young women 15-24 years old in sub-Saharan Africa twice as likely as young men to be living with HIV
- Globally, MSM are 19 times more likely to be living with HIV than the general population

The importance of location and population



Source: UNAIDS

Racial Disparities in HIV-Associated Mortality



➤ Racial disparities in mortality increased with the availability of HAART

Conclusions

- **We are not yet winning the battle against HIV**
- **Treatment and PrEP are particularly effective tools for HIV prevention**
- **New science, technology, and program innovation can make them easier, more effective choices**
- **We can greatly improve the health information we provide people**
- **Where we put resources matters**

The findings and conclusions in this presentation do not necessarily represent the official position of the Centers for Disease Control and Prevention