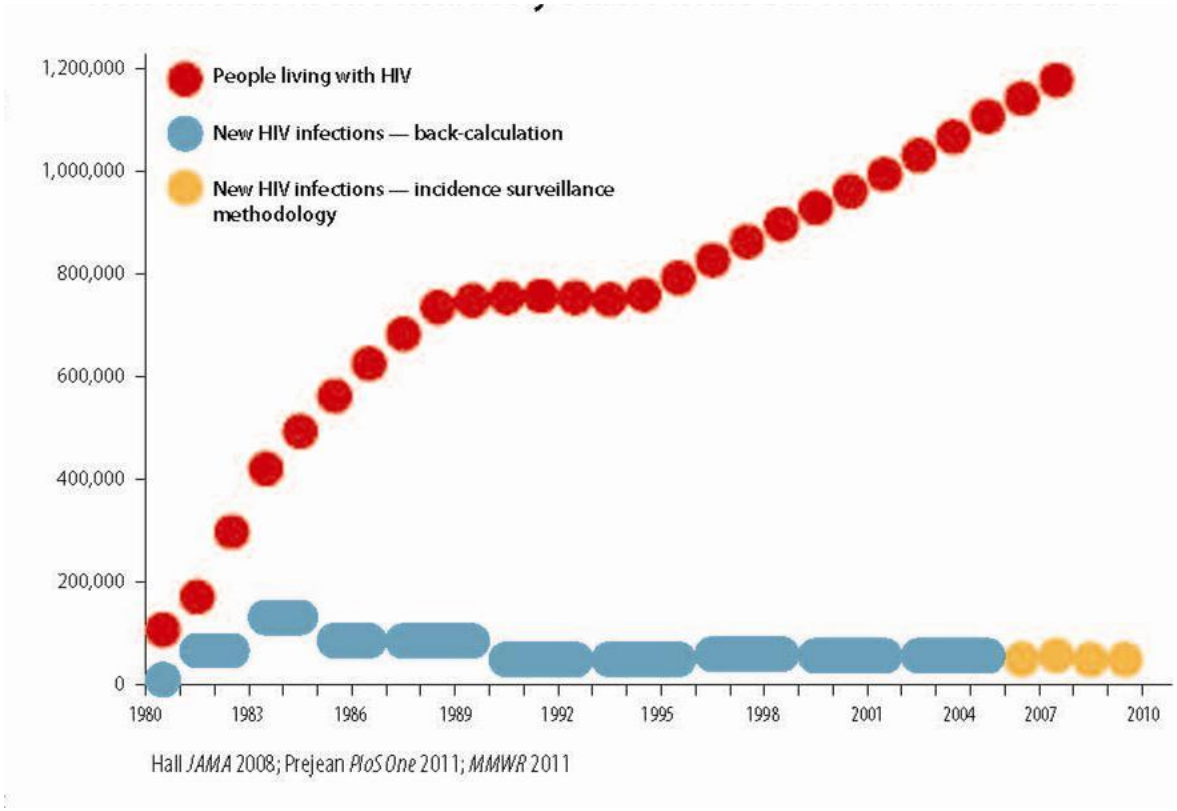
Science of Optimizing HIV Prevention

Jonathan Mermin, MD, MPH
Division of HIV/AIDS Prevention
Centers for Disease Control and Prevention

Accessible version: https://youtu.be/PxNiQdaoyi0

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

HIV Prevalence and Incidence United States, 1980 - 2010



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

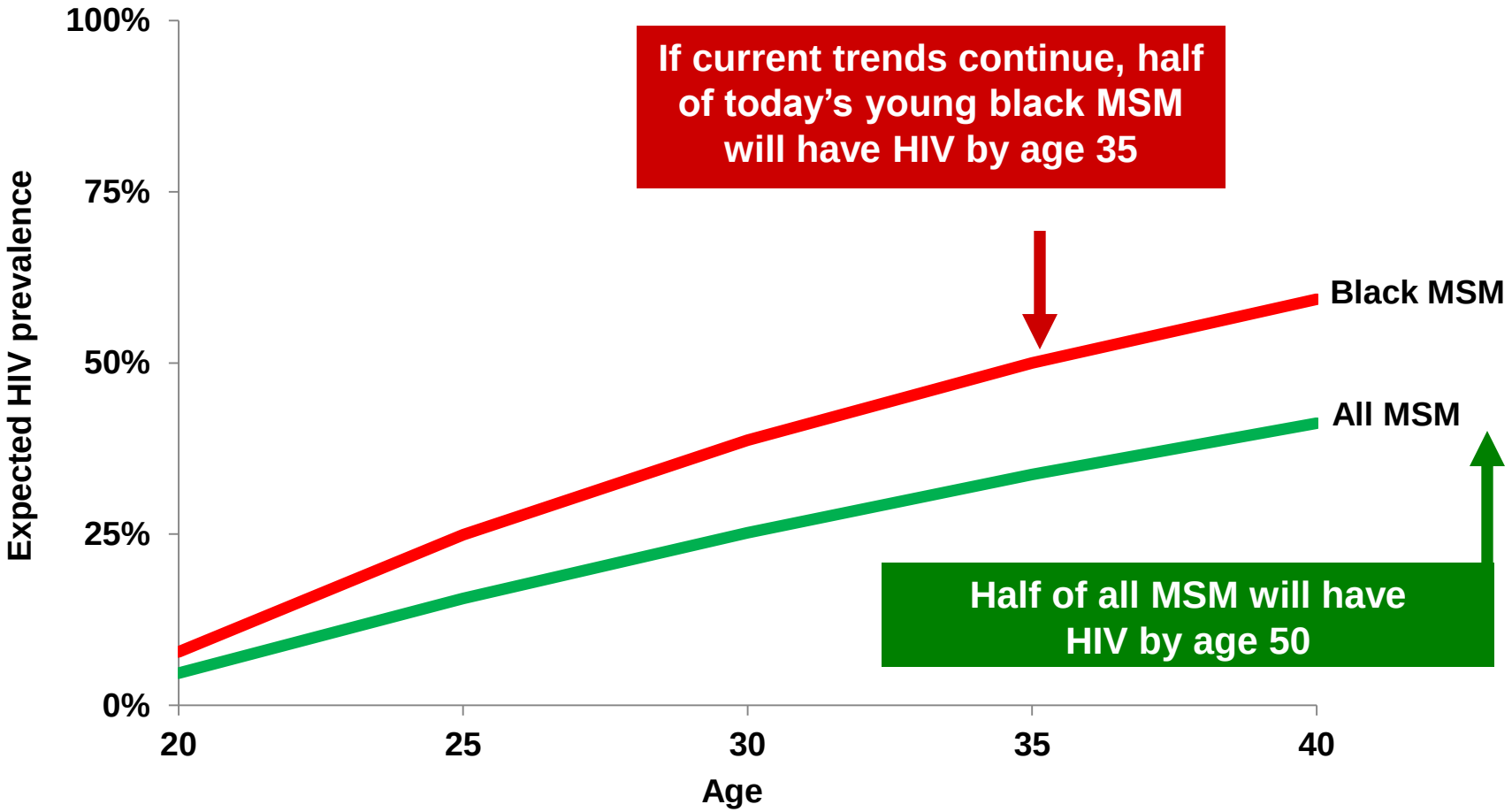
Hall HI et al. JAMA. 2008 Aug 6;300(5):520-9
Prejean J et al. PLoS One. 2011;6(8):e17502
MMWR Morb Mortal Wkly Rep. 2012 Mar 2;61(8):133-8

Health Inequity

- **African Americans are 8 times more likely and Latinos are 3 times more likely to have HIV than whites**
- **Inequities in lifetime risk for HIV diagnosis among women**
  - 1 in 139 for all women
  - 1 in 32 African American women
  - 1 in 106 Latino women
  - 1 in 182 Native Hawaiian/Pacific Islander women
  - 1 in 217 American Indian/Alaska Native women
  - 1 in 526 white or Asian women
- **HIV prevalence is associated with population density, region of residence, poverty, education, employment, and homelessness**
- **Men who have sex with men (MSM) are >40 times more likely to have HIV than other men**

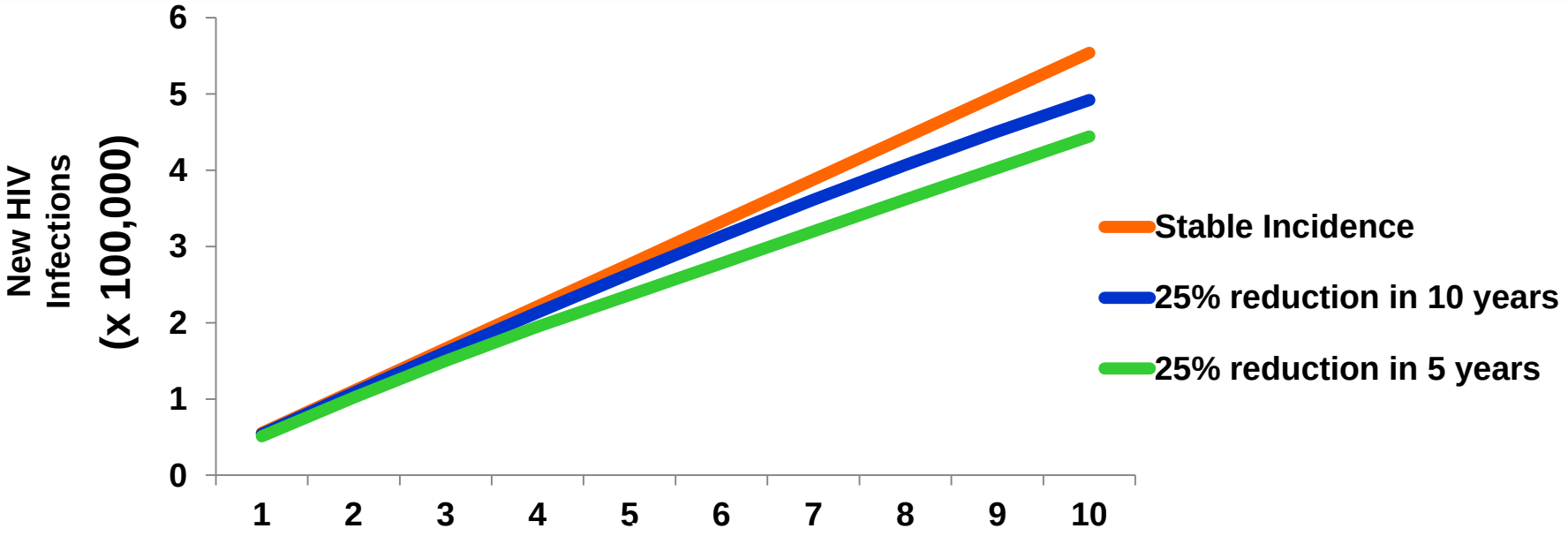
CDC, HIV Surveillance Report, 2009; ww.cdc.gov/hiv/surveillance/resources/reports
Purcell, National STD Prevention Conference, 2010
Denning, International AIDS Society, 2010

Lifetime Risk of HIV Infection among MSM



Stall R et al. AIDS Behav. 2009 Aug;13(4):615-29
MSM, Men who have sex with men

Faster Action Now
Saves Lives and Resources Later



Stable Incidence: 550,000 additional cases in 10 years

Reducing incidence by 25%

- **In 10 years would save 62,000 infections and $23 billion**
- **In 5 years would prevent 109,000 infections and $42 billion**

Adapted from :
Hall HI et al. J Acquir Immune Defic Syndr. 2010 Oct;55(2):271-6

Prevention with HIV(+) Persons

- ✓ HIV testing, linkage to care and prevention services
- ✓ Antiretroviral therapy
- ✓ Retention in care and adherence
- ✓ Partner services
- ✓ Behavioral risk reduction interventions and condoms
- ✓ STD screening and treatment
- ✓ Perinatal transmission interventions

Prevention with HIV (-) Persons

- ✓ Condom distribution
- ✓ Behavioral risk reduction interventions and condoms
- ✓ Pre-exposure prophylaxis (PrEP)
- ✓ Post-exposure prophylaxis
- ✓ Syringe services
- ✓ Male circumcision
- ✓ Microbicides
- ✓ STD screening and treatment

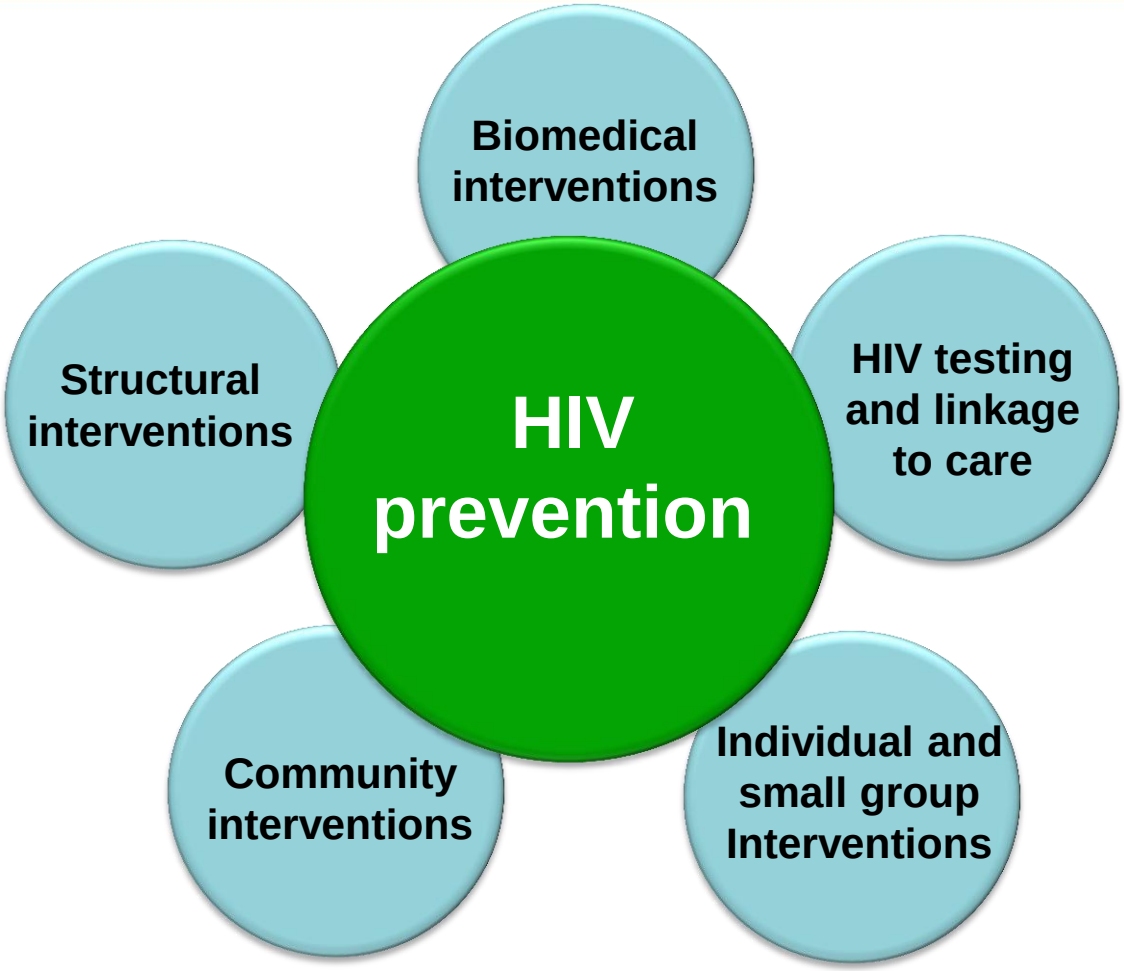
Prevention Not Focused on HIV Status

- ✓ Social mobilization
- ✓ Condom availability
- ✓ Substance use, mental health, and social support

Not all interventions are supported financially by CDC or other federal agencies

How Can We Reach Prevention Goals?

Combination Prevention
Multiple Disciplines and Approaches

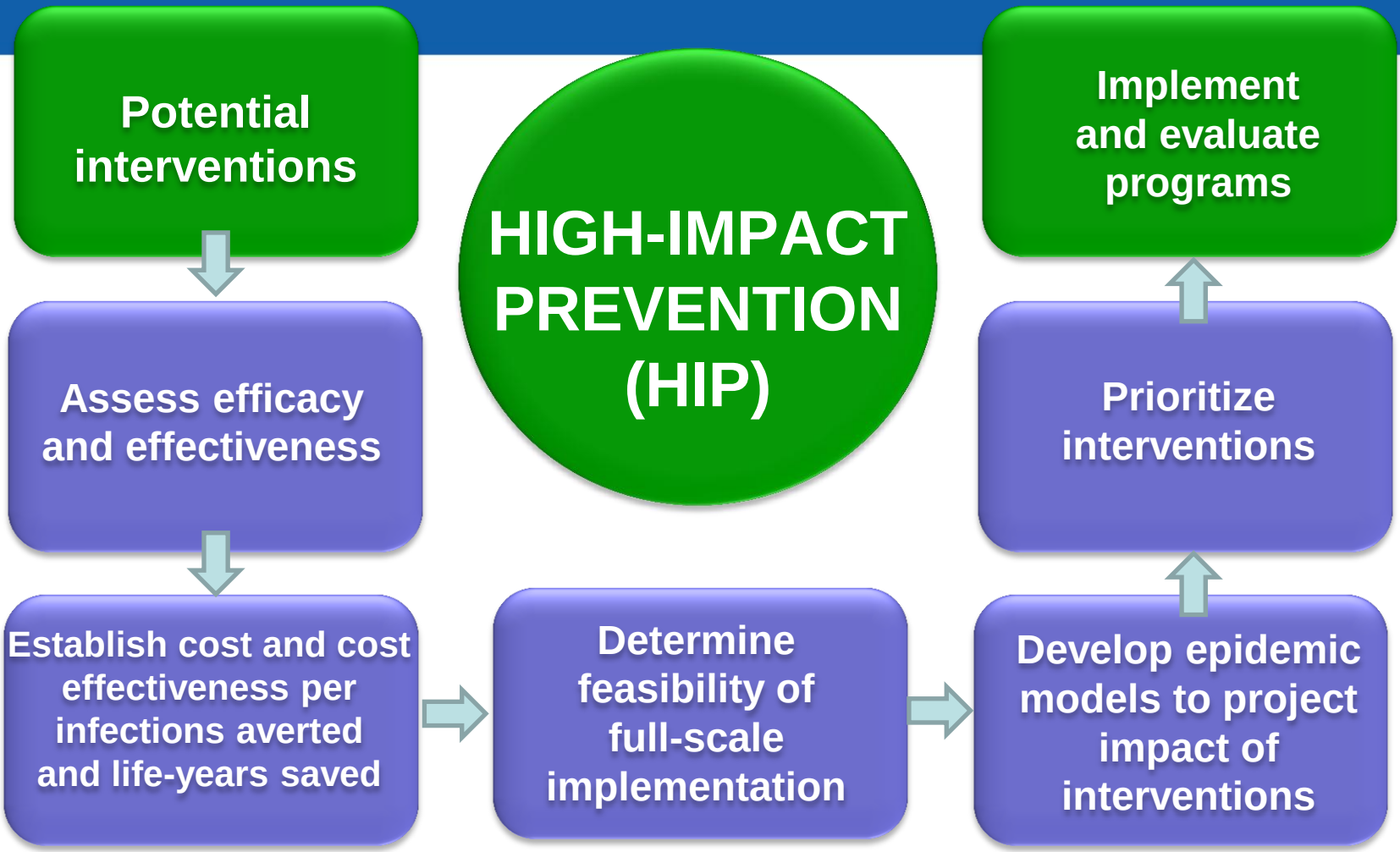


Combining interventions is not enough

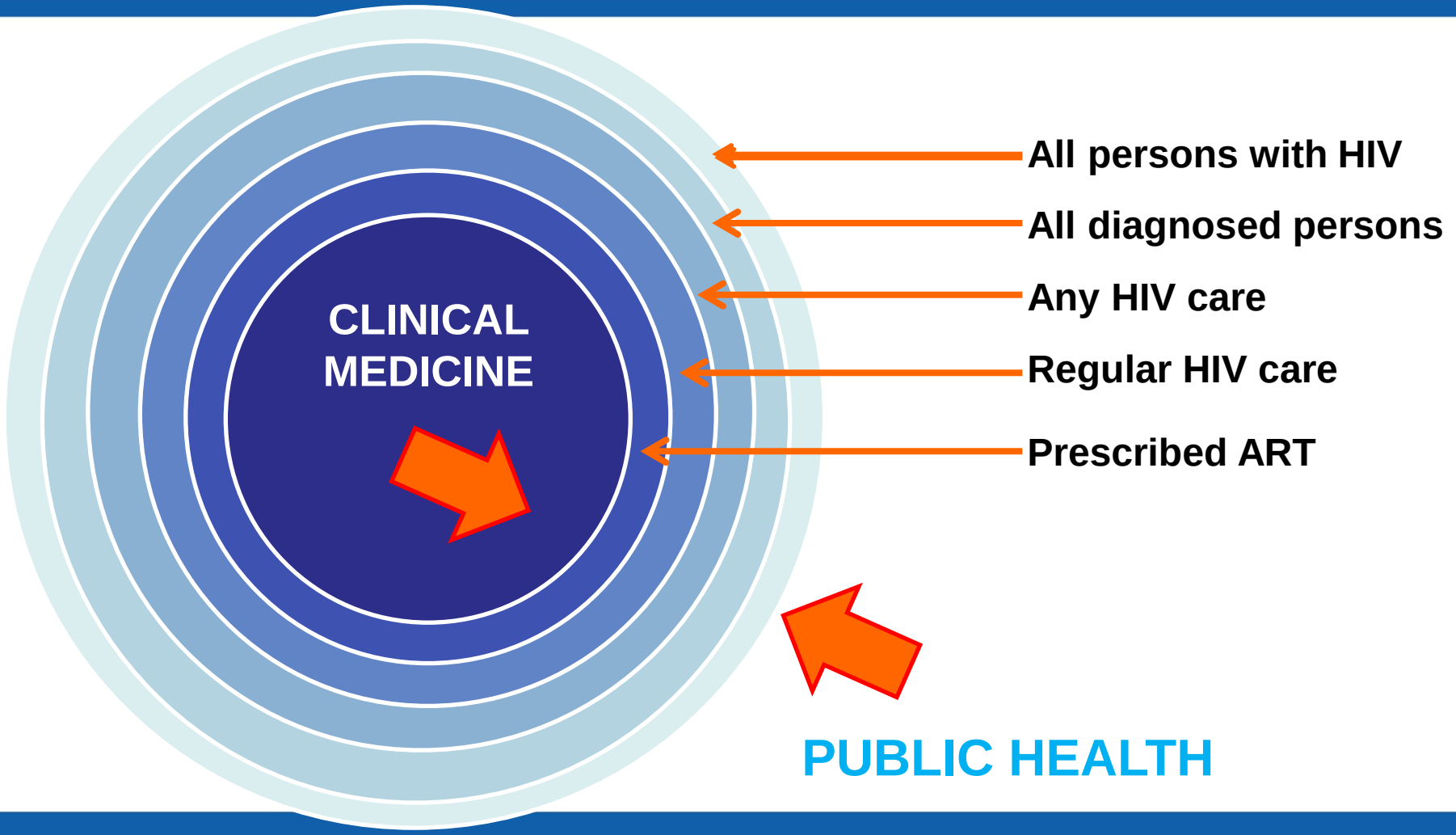
Not all interventions are effective

All effective interventions are not equal

Adapted from :
Coates TJ, Richter L, Caceres C. Lancet. 2008 Aug 23;372(9639):669-84

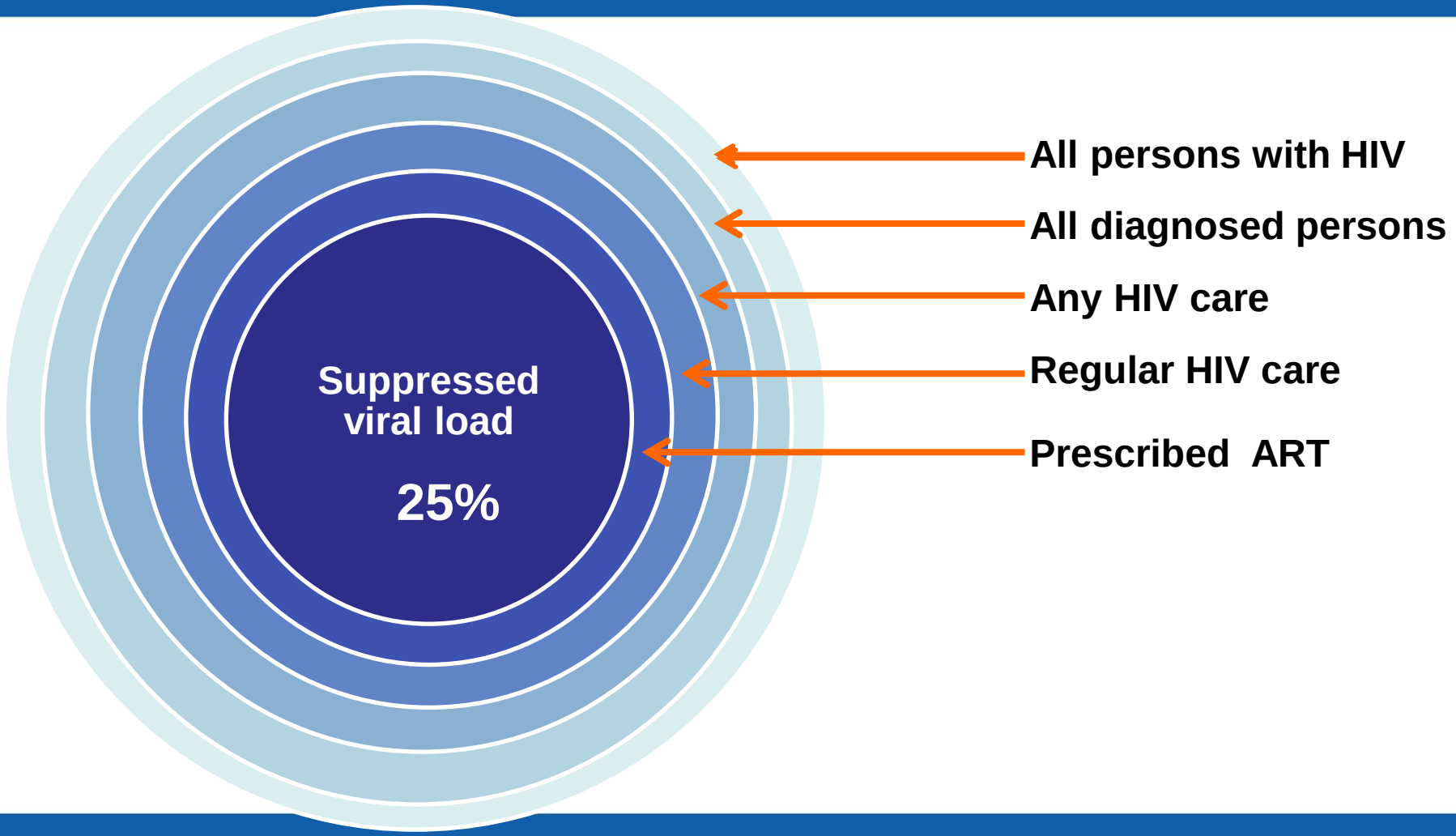

Potential interventions
Assess efficacy and effectiveness
Establish cost and cost effectiveness per infections averted and life-years saved
Determine feasibility of full-scale implementation
Develop epidemic models to project impact of interventions
Prioritize interventions
Implement and evaluate programs
HIGH-IMPACT PREVENTION (HIP)

High-Impact Prevention (HIP)
Clinical Medicine and Public Health



MMWR 2011 Dec 2;60(47):1618-23
ART, Antiretroviral therapy

Viral Load Suppression

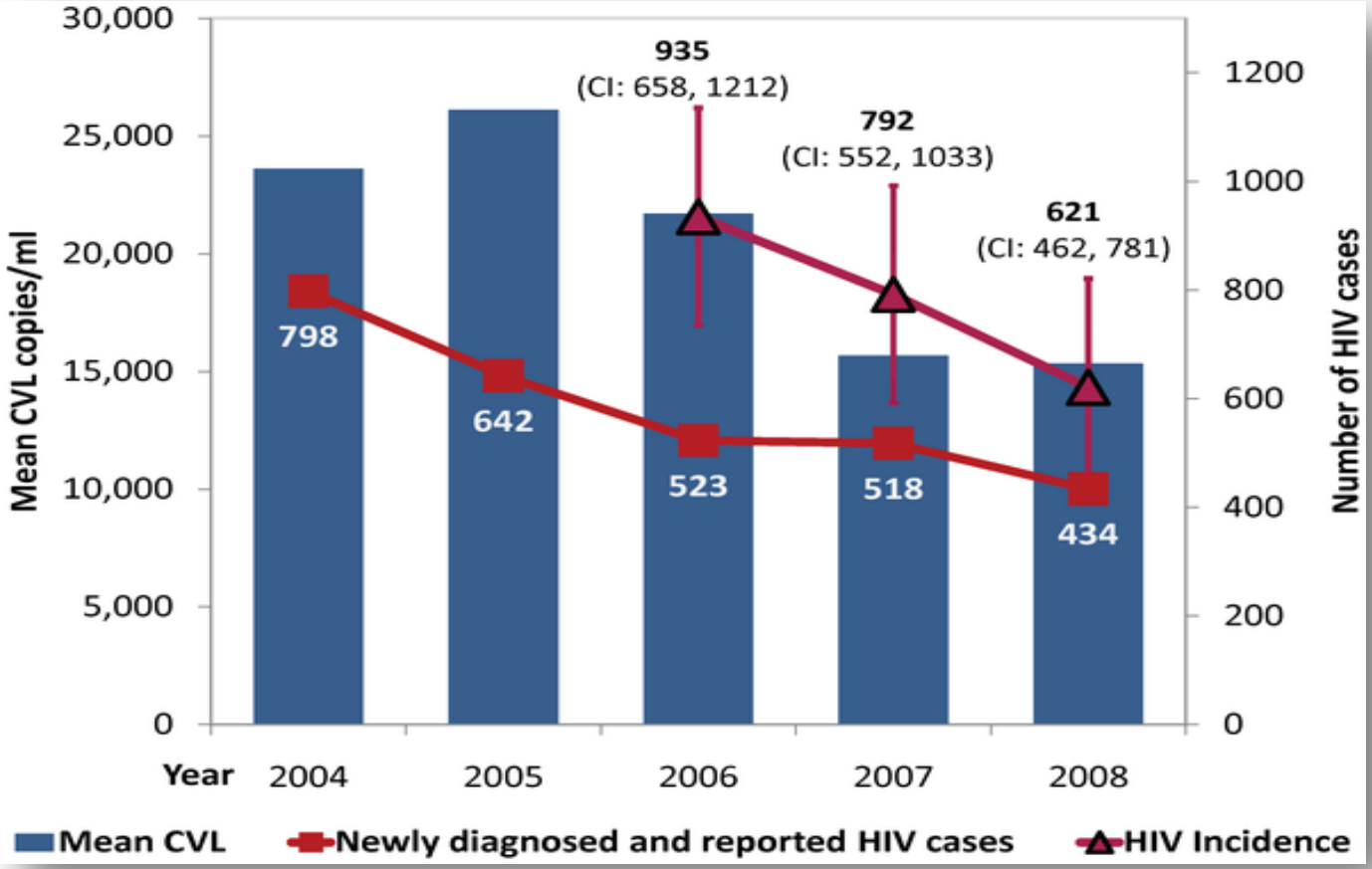


Hall I, XIX International AIDS Conference, 2012
ART, Antiretroviral therapy

Strengthening the Public Health Approach to HIV

- **Public health responsibility to close gaps in HIV care and prevention services**
  - At individual level, lower viral load reduces morbidity and mortality, and reduces chance of spreading HIV
  - Population level, viral load leads to fewer new infections
- **Emulate successful programs in other disease areas**
  - Example: Hemoglobin A1C registry and diabetes monitoring in New York City

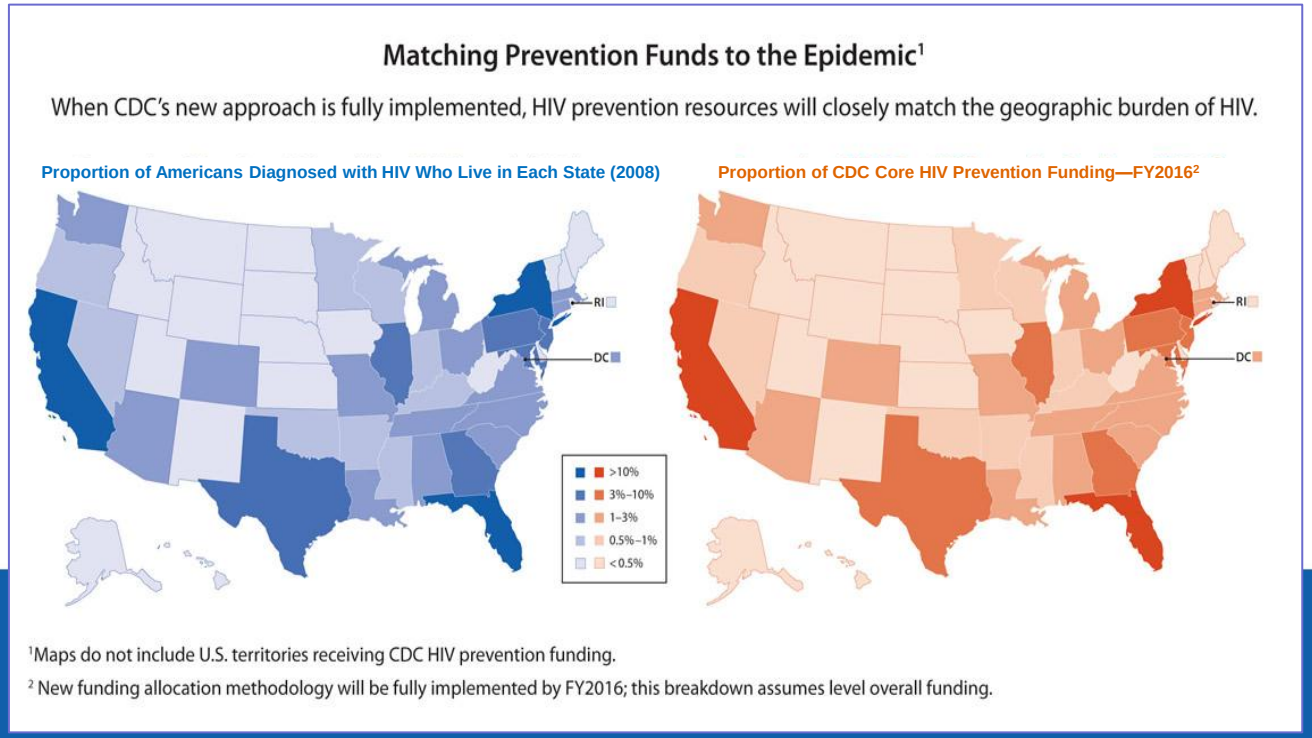
Success in San Francisco
Community Viral Load and HIV Incidence



Das M et al. PLoS One. 2010 Jun 10;5(6):e11068
CVL, Community viral load

Aligning Resources with the Epidemic
CDC Funding of State and Local Health Departments

- $339 million annually, allocated based on HIV prevalence
- Allows flexibility based on local epidemic modeling and needs
- Focuses on interventions that will have greatest impact on epidemic with 75% of budget focused on 4 key strategies: HIV testing, prevention with positives including ART, policy, and condom distribution



www.cdc.gov/hiv/strategy/hihp/healthDepartments/

CDC is Implementing the Principles of High-Impact Prevention

- **Expanded Testing Initiative**
  - 2.8 million tests conducted in first 3 years
  - 18,000 people newly diagnosed with HIV
    - ✓ 70% African American and 12% Latino
  - Averted an estimated 3,400 HIV infections
  - Achieved a return of $1.97 for every dollar invested
- **Care and Prevention demonstration projects**
  - $14.5 million annually over 3 years for 6 - 9 states
  - Monitor and improve diagnosis, linkage, retention, ART provision, viral suppression, and behavioral prevention by using individual and community-level surveillance data
  - Provide information to patients and clinicians to improve outcomes

Conclusions

- Growing number of people with HIV and restricted budget require higher impact strategies
- Window for success may be closing, requiring swift action
- Large disparities require conscious application of health equity approaches
- Public health prevention, care, and surveillance programs must be integrated

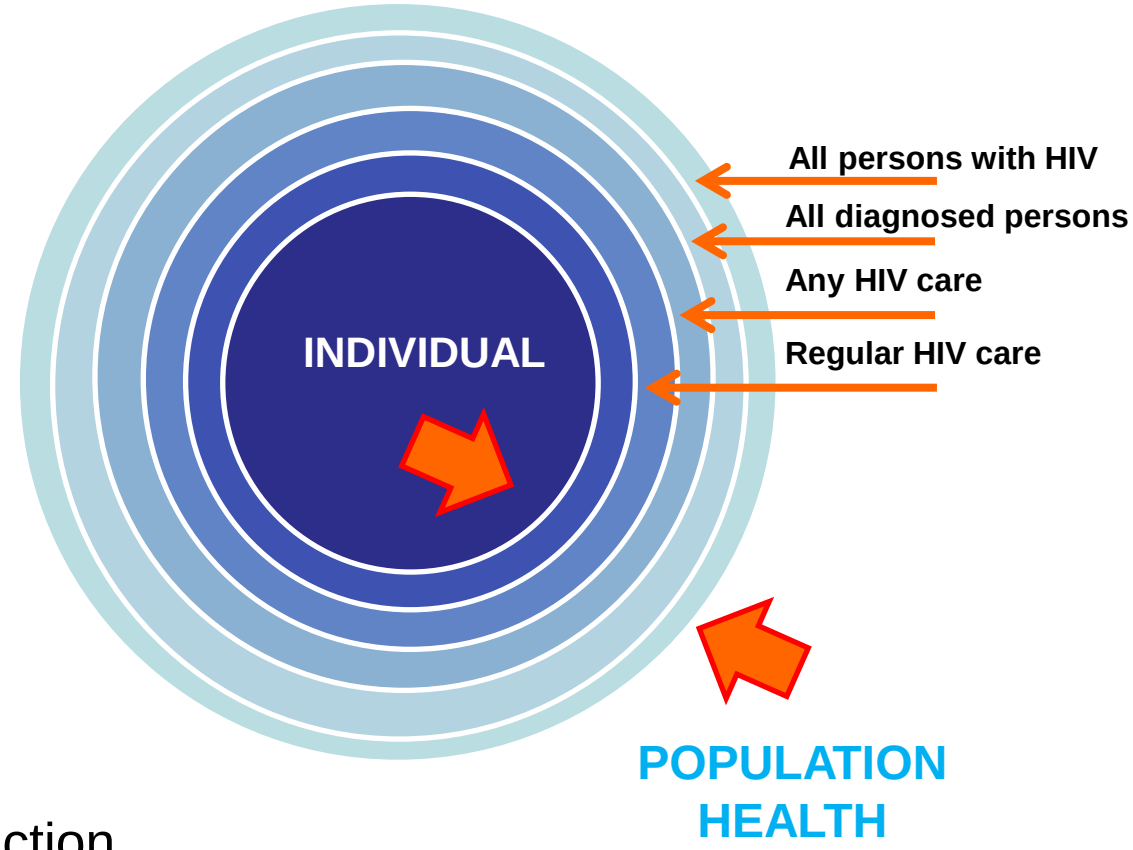
HIV Surveillance In Action

Irene Hall, PhD, MPH, FACE
Division of HIV/AIDS Prevention
Centers for Disease Control and Prevention

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

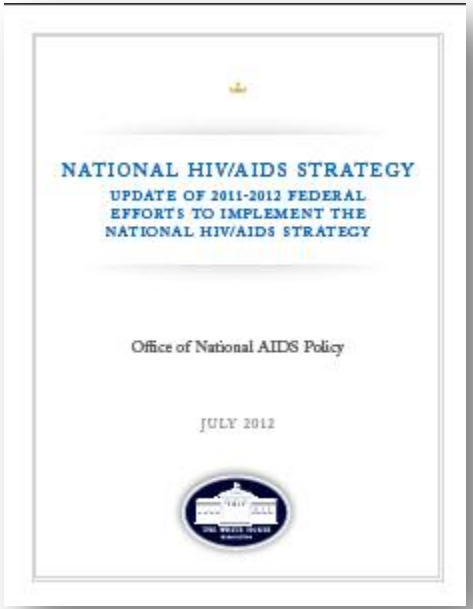
HIV Case Surveillance Data for Prevention

- **Sources of reports**
  - Hospital practitioners
  - Private practitioners
  - Public clinics
  - Laboratories
- **Surveillance then**
  - Few sentinel events
- **Surveillance now**
  - Continuous data collection



National HIV/AIDS Strategy Primary Goals

- Reduce the number of people who become infected with HIV
- Increase access to care and optimize health outcomes for people living with HIV
- Reduce HIV-related health disparities



The White House Office of National AIDS Policy. Washington D.C.: White House, July 13, 2010
www.whitehouse.gov/sites/default/files/uploads/NHAS.pdf

National HIV/AIDS Strategy
Indicators of Need and Outcome for Prevention Efforts

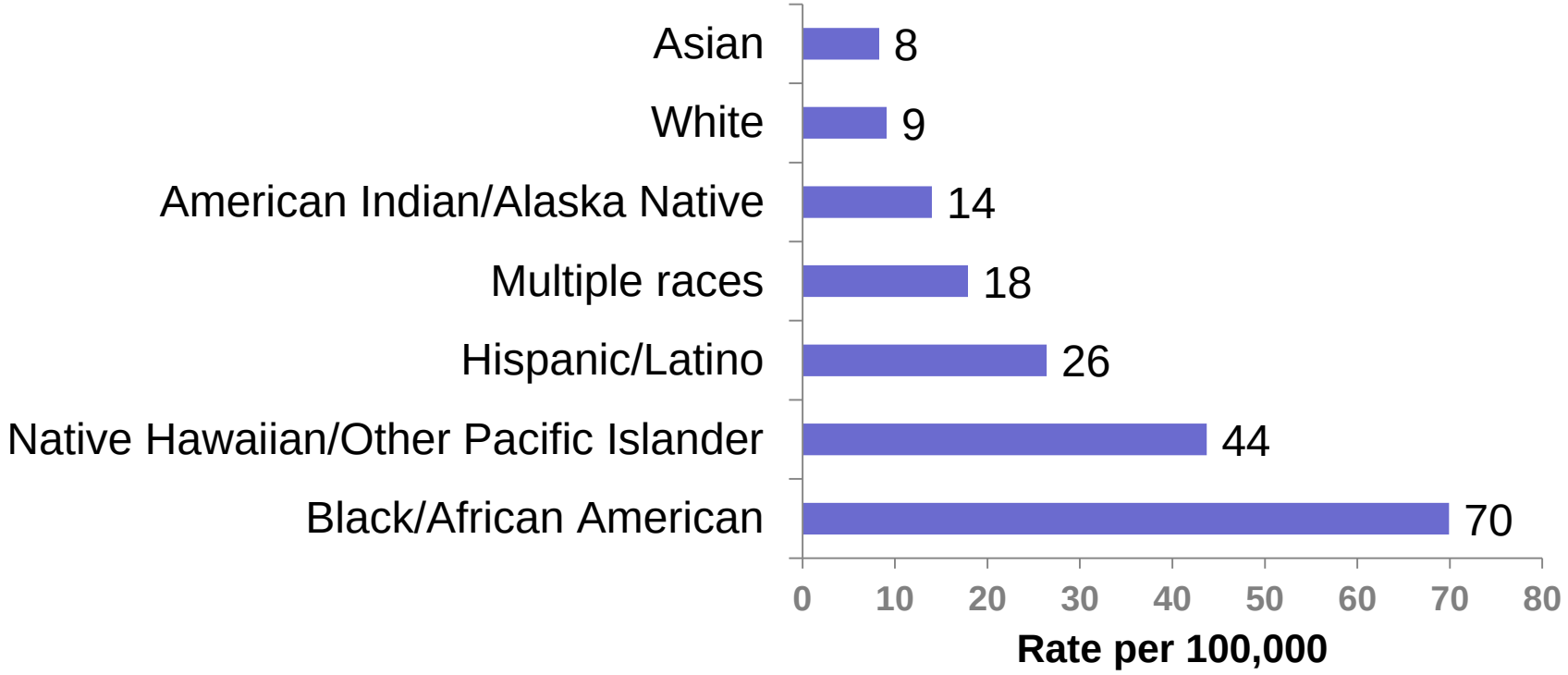
- **Incidence**
- **Prevalence, including undiagnosed persons**
  - Persons unaware of their infection disproportionately transmit HIV
  - Identifying them for targeted testing: first step in prevention efforts
- **Transmission rate**
  - Annual number of new infections per 100 persons living with HIV
- **Linkage to care**
- **Retention in care**
- **Viral suppression**

HIV Surveillance: Incidence

- First incidence estimates released in 2008
- First 4-year trend released in 2011
- Persons diagnosed with HIV may have been infected for many years
- Laboratory assays can distinguish recent from long-term infections at the population level
- Incidence estimates are based on the number of recent infections and additional information on testing among persons diagnosed with HIV

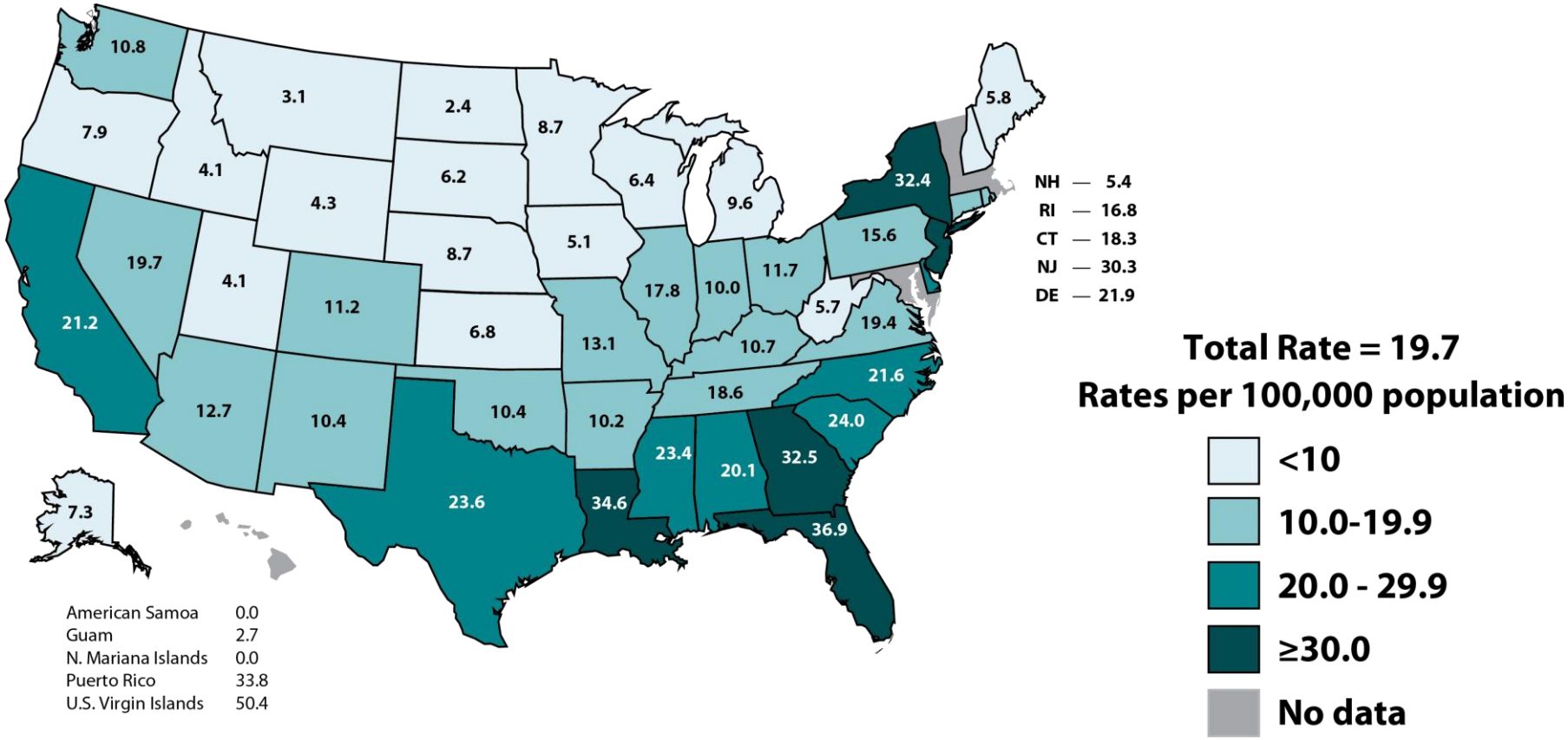
Estimated HIV Incidence Rates, by Race/Ethnicity United States, 2009

Annual U.S. incidence: **~ 50,000 cases**
2009 U.S. incidence rate: **9.0/100,000**



Prejean, J et al. PLoS ONE 6(8): e17502

HIV Infection Diagnosis Rates Among Adults and Adolescents, 2010

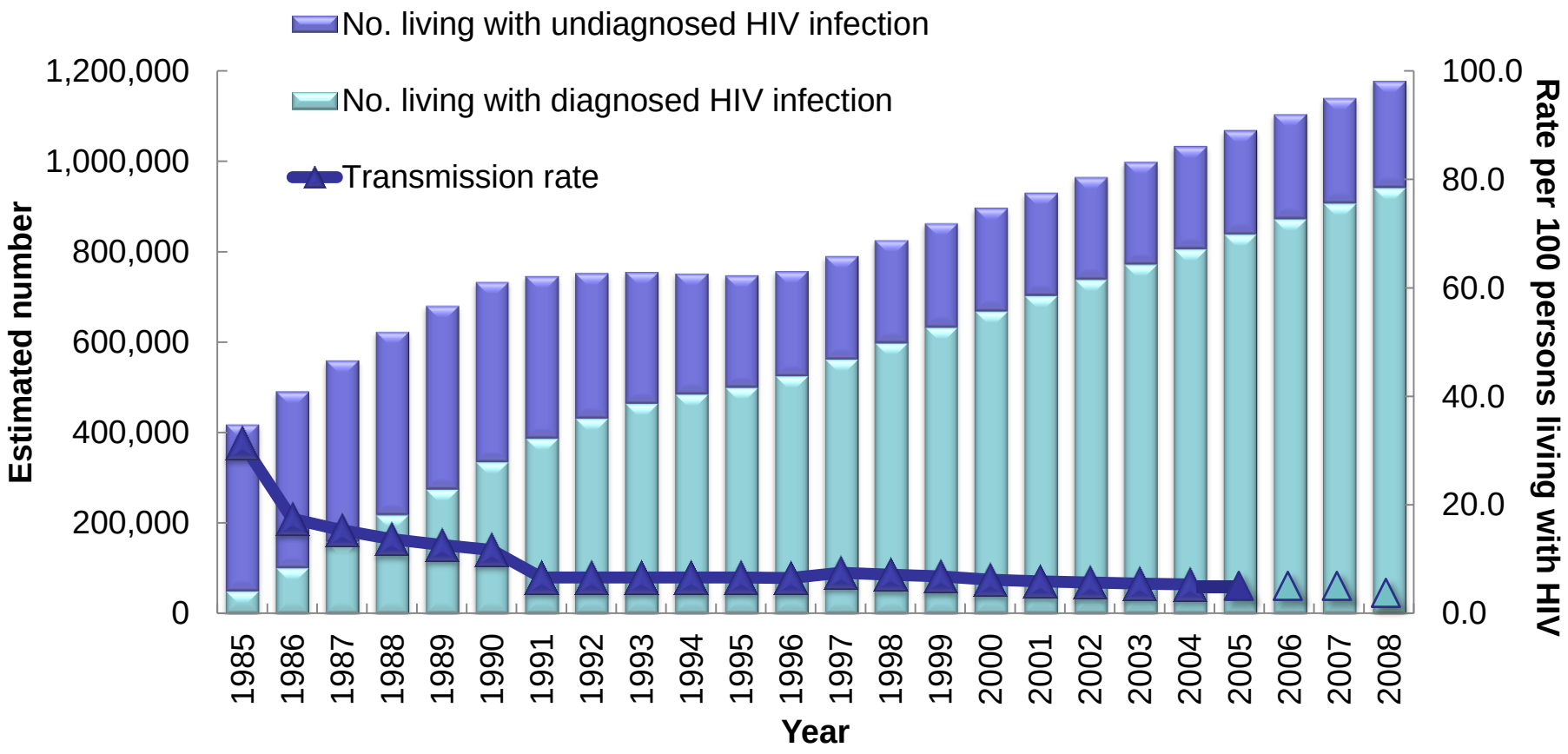


46 States and 5 U.S. Dependent Areas, N=48,079

Data include persons with a diagnosis of HIV infection regardless of stage of disease at diagnosis

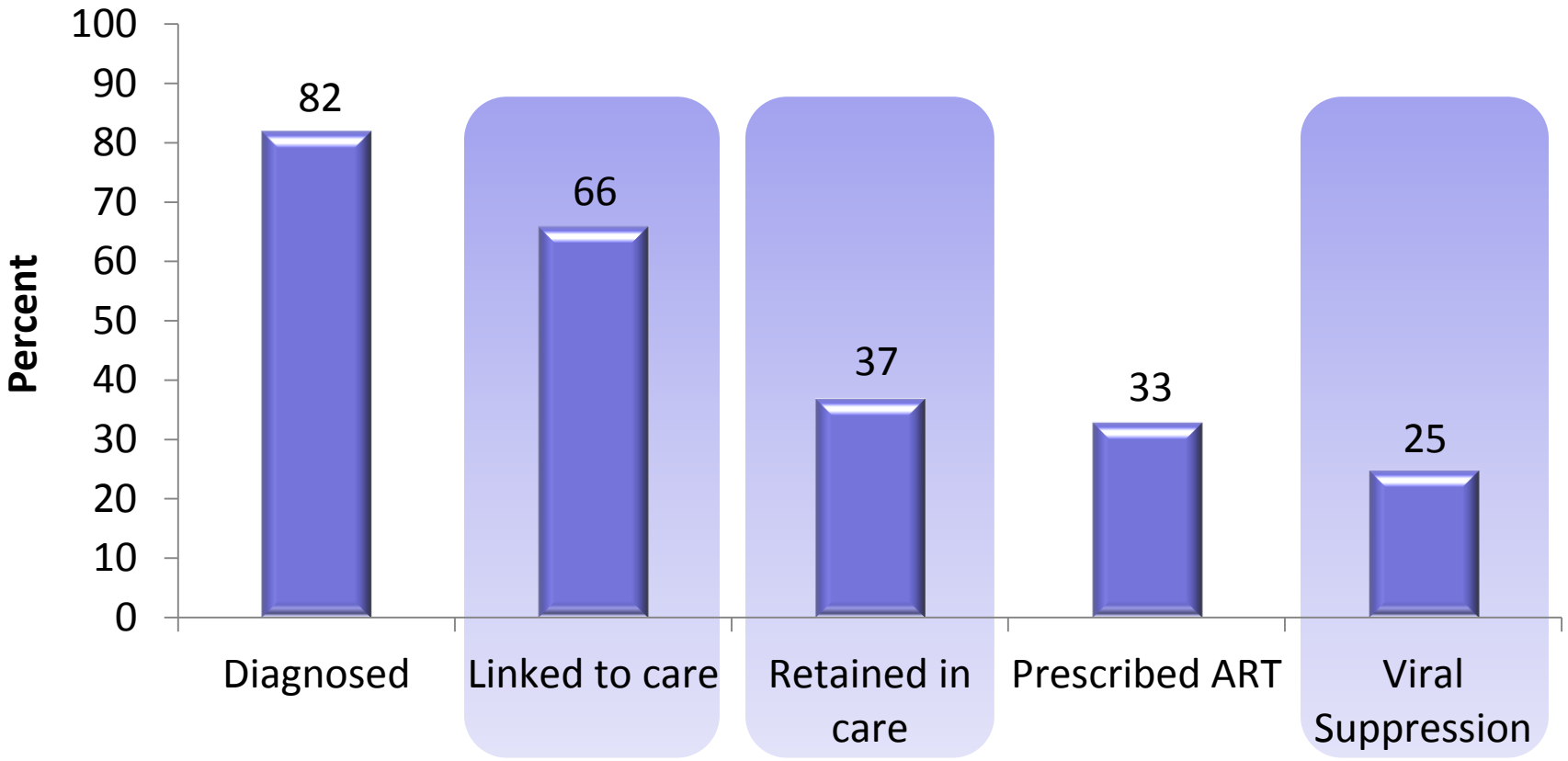
All displayed data have been statistically adjusted to account for reporting delays, but not for incomplete reporting

Adults and Adolescents Living with HIV Infection and HIV Transmission Rate, United States



MMWR 2012;61(Suppl; June 15, 2012):57-64
Holtgrave et al. J Acquir Immune Defic Syndr 2009;50(2):236-38
Holtgrave et al. The Open AIDS Journal 2012;6:20-22

Persons with HIV Engaged in Selected Stages of the Continuum of Care, United States



Hall et al. XIX International AIDS Conference, 2012
ART, Antiretroviral therapy

Public Health in Action: Aggregate Data

- **Aggregate data can be used on various geographic levels for**
  - Prevention planning
  - Resource allocation
  - Outcome evaluation

Public Health in Action: Individual Data

- **Individual level data help determine whether people are in care and/or have a suppressed viral load**
  - This information can be used
    - ✓ To alert providers to engage or re-engage people in care or
    - ✓ By the health department to contact patients directly in order to assure they receive the services they need
- **Maintaining personally identifiable data and these follow-up activities require careful planning**
  - Protocols for confidential data sharing
  - Seeking input from the community and care providers
  - Evaluation

Summary

**Surveillance has become
a continuous data collection system
that can provide data for public health action
on provider and individual level**

- **Data indicate targets for high-impact prevention**
- **Data allow monitoring of key outcome indicators of the National HIV/AIDS Strategy**

Modeling to Identify Optimal Allocation of HIV Prevention Resources in a City Health Department

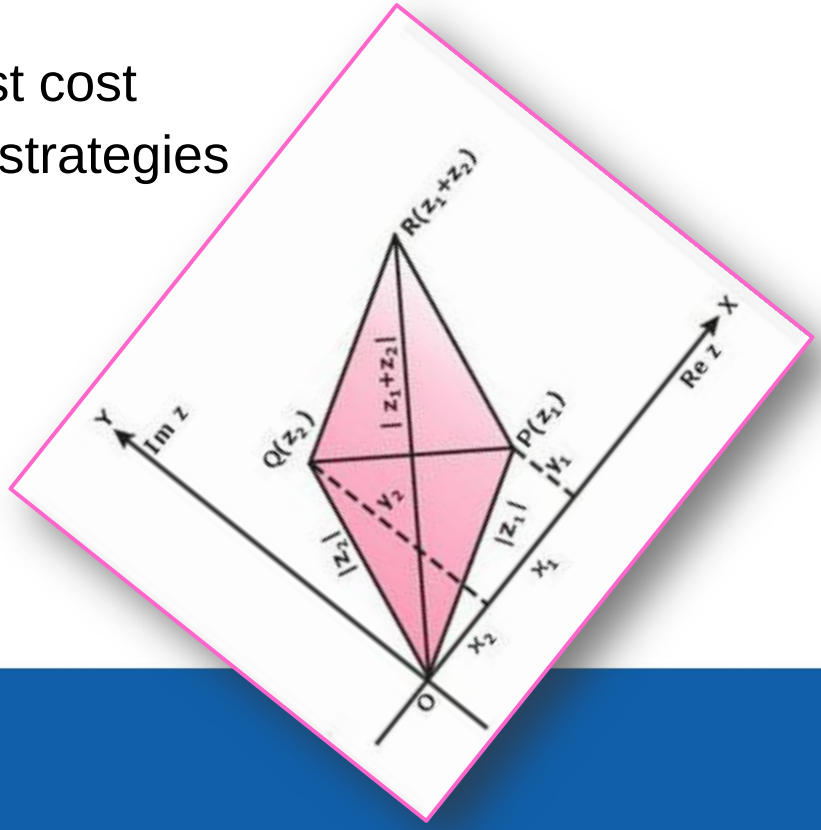
Stephanie L Sansom, PhD, MPP, MPH

Division of HIV/AIDS Prevention
Centers for Disease Control and Prevention

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

The Value of Modeling

- **Modeling of resource allocation helps state and local health departments**
  - Divide scarce prevention dollars among programs and population
  - Achieve the most impact at least cost
  - Identify high-impact prevention strategies



CDC - Philadelphia Collaboration 2011–2012

- Model optimal combination of HIV prevention programs to address city's HIV epidemic
- Develop a tool other local jurisdictions might use

Methods

- **HIV resource allocation model**
  - Projects new HIV cases for 1-–5 years
  - Estimates best allocation of HIV prevention budget
    - ✓Among programs and populations
    - ✓To prevent most HIV cases
  - Incorporates
    - ✓HIV prevention budget: $12 million
    - ✓Size and characteristics of populations with or at risk for HIV
    - ✓Percent of risk population reachable
    - ✓Prevention intervention characteristics
      - Cost, efficacy, and duration of effect

Methods

- **Calculate reduced likelihood of HIV infection following prevention intervention**
  - Number of and type of HIV exposures
    - ✓Unprotected sex and needle sharing
  - HIV prevalence among partners
  - HIV transmission probability per exposure
  - Efficacy of intervention in preventing HIV
- **Calculate cost of intervention per infection averted**
  - Cost of providing intervention divided by reduced likelihood of infection

Methods

- **CDC criteria: Inclusion of interventions that are**
  - Aligned with principles of high-impact HIV prevention
  - Required in CDC-funded cities with high HIV prevalence
  - Targeted to populations with greatest number of new infections
  - Supported by scientific evidence on infection rate reduction

Prevention with HIV(+) Persons

- ✓ **HIV testing, linkage to care and prevention services**
- ✓ **Antiretroviral therapy**
- ✓ **Retention in care and adherence**
- ✓ **Partner services**
- ✓ **Behavioral risk reduction interventions and condoms**
- ✓ STD screening and treatment
- ✓ Perinatal transmission interventions

Prevention with HIV (-) Persons

- ✓ Condom distribution
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- ✓ Pre-exposure prophylaxis (PrEP)
- ✓ Post-exposure prophylaxis
- ✓ Syringe services
- ✓ Male circumcision
- ✓ Microbicides
- ✓ STD screening and treatment

Prevention Not Focused on HIV Status

- ✓ Social mobilization
- ✓ Condom availability
- ✓ Substance use, mental health, and social support

Not all interventions are supported financially by CDC or other federal agencies

Philadelphia HIV Community Profile

Risk group	New diagnosis* Number (%)	PLWH population size& Number (%)	At-risk population size# Number (%)
High-risk heterosexuals	340 (37)	8,528 (35)	245,208 (76)
Intravenous drug users	136 (15)	7,175 (30)	41,001 (13)
Men who have sex with men	433 (48)	8,356 (35)	37,882 (12)
Total	909 (100)	24,060 (100)	324,091 (100)

* New HIV diagnoses in Philadelphia in 2009

& PLWH, People living with HIV, undiagnosed and diagnosed in Philadelphia in 2009

Estimated number of people at high risk of HIV infection in each risk category

Cost per Infection Averted ($)

Untargeted interventions	Cost per new infection averted (rank)		
Testing in clinical settings	51,293 (3)		
Partner services	99,105 (7)		
Linkage to care	114,644 (8)		
Retention in care	75,665 (5)		
Adherence to ART	42,753 (2)		
Targeted interventions	**HRH**	**IDU**	**MSM**
Testing in non-clinical settings	866,272 (12)	53,935 (4)	17,965 (1)
Behavioral intervention for HIV+ people	594,796 (10)	700,005 (11)	97,410 (6)
Behavioral intervention for HIV- people	15,642,127 (14)	2,931,406 (13)	327,210 (9)

ART, Antiretroviral therapy
HRH, High risk heterosexuals
IDU, Injection drug users
MSM, Men who have sex with men

Optimal Allocation: $12 Million Budget

Untargeted interventions	Budget (%)		
Testing in clinical settings	39		
Partner services			
Linkage to care			
Retention in care	32		
Adherence to ART	7		
Targeted interventions	**HRH**	**IDU**	**MSM**
Testing in non-clinical settings		13	8
Behavioral intervention for HIV+ people			
Behavioral intervention for HIV- people			
Total			

ART, Anti retroviral therapy
HRH, High risk heterosexuals
IDU, Injection drug users
MSM, Men who have sex with men

Optimal Allocation: $25 Million Budget

Untargeted interventions	Budget (%)		
Testing in clinical settings	19		
Partner services	19		
Linkage to care	16		
Retention in care	32		
Adherence to ART	3		
Targeted interventions	**HRH**	**IDU**	**MSM**
Testing in non-clinical settings		6	4
Behavioral intervention for HIV+ people	2		3
Behavioral intervention for HIV- people			11
Total			

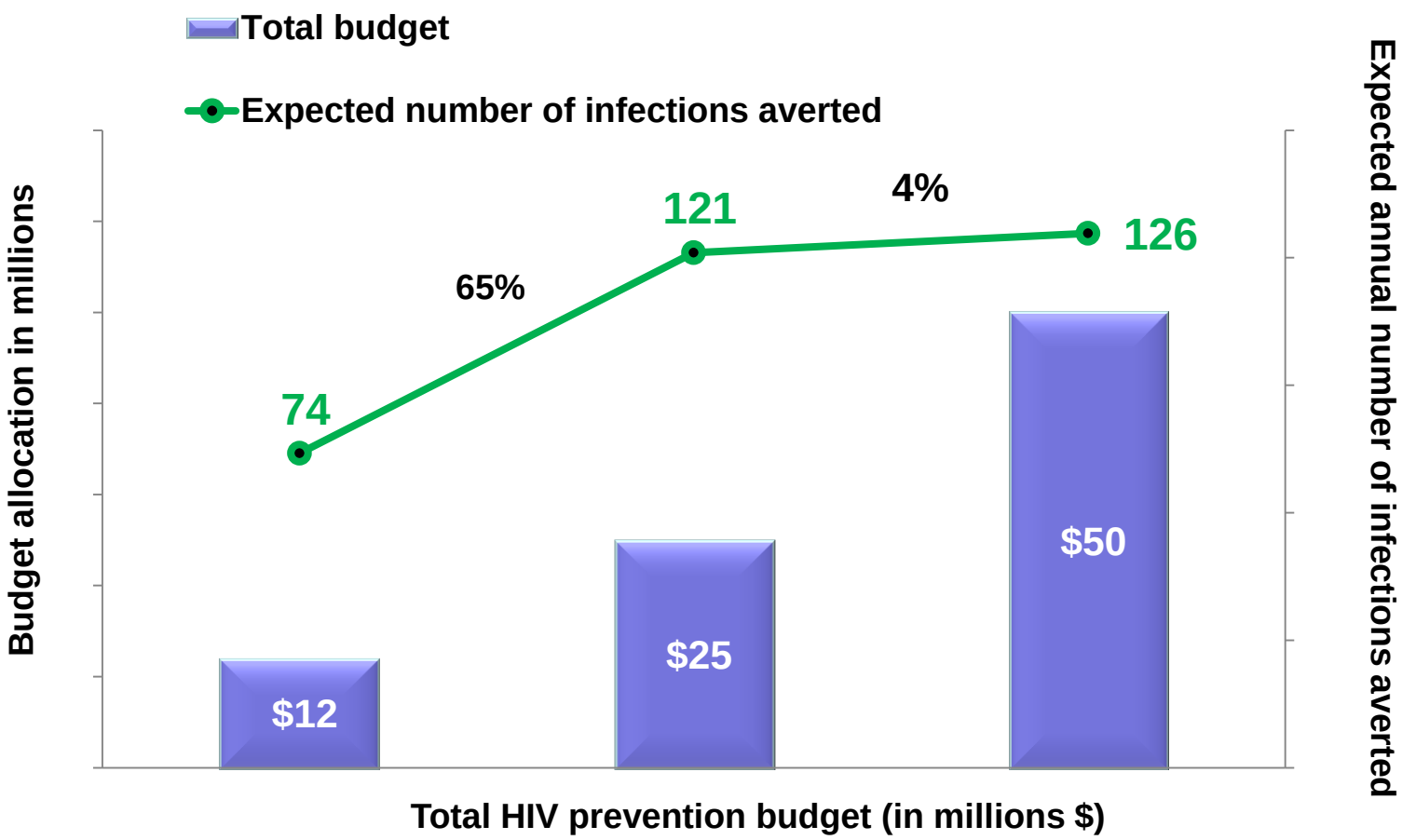
ART, Anti retroviral therapy
HRH, High risk heterosexuals
IDU, Injection drug users
MSM, Men who have sex with men

Optimal Allocation: $50 Million Budget

Untargeted interventions	Budget (%)		
Testing in clinical settings	10		
Partner services	9		
Linkage to care	8		
Retention in care	9		
Adherence to ART	2		
Targeted interventions	**HRH**	**IDU**	**MSM**
Testing in non-clinical settings	16	3	2
Behavioral intervention for HIV+ people	2	1	2
Behavioral intervention for HIV- people	7	6	5
Total			

ART, Anti retroviral therapy
HRH, High risk heterosexuals
IDU, Injection drug users
MSM, Men who have sex with men

HIV Infections Averted by Budget Amount



CDC - Philadelphia Collaboration 2011–2012

- **Philadelphia has used CDC model to inform funding decisions**
  - More screening of MSM in non-clinical settings
  - More behavior change programs for positives, especially MSM
  - Fewer behavior change programs for negatives, none for heterosexuals

MSM, Men who have sex with men

Limitations of Modeling

- **Models often rely on uncertain data and assumptions**
  - Critical to conduct sensitivity analyses
  - Validate projected outcomes against empirical data
- **Models may not incorporate important elements**
  - Equity
  - Political or practical barriers to implementation
  - Synergies among prevention interventions

Advantages of Modeling

- **Modeling can**
  - Synthesize data from many sources (including local data)
  - Summarize complex issues in a transparent way
  - Serve as a methodology for comparing interventions
  - Illuminate planning and programmatic decisions
- **CDC continues to refine models to help support planning of local HIV prevention**

Overview of the National HIV/AIDS Strategy Implementation

Grant Colfax, MD
Office of National AIDS Policy
The White House

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

National HIV/AIDS Strategy 2015 Health Targets

- **Reducing new infections**
  - Lower annual number of new infections by 25%
  - Reduce transmission rate by 30%
  - Increase from 79% to 90% the percentage of people living with HIV who know their status
- **Increasing access to care and improving health outcomes**
  - Increase the proportion of newly diagnosed patients linked to care within 3 months of diagnosis from 65% to 85%
  - Increase proportion of Ryan White clients who are engaged in care from 73% to 80%
  - Increase number of Ryan White clients with permanent housing from 82% to 86%

National HIV/AIDS Strategy
2015 Health Targets

- **Reducing HIV-related health disparities and health inequities**
  - Increase the proportion of diagnosed gay and bisexual men with undetectable viral load by 20%
  - Increase the proportion of Black Americans with undetectable viral load by 20%
  - Increase the proportion of Latinos with undetectable viral load by 20%

President Obama's 2013 HIV Budget

- $22.3 billion for domestic HIV-related activities
- $963 million increase over 2012
- $1 billion for AIDS Drug Assistance Programs

Reaching NHAS Goals

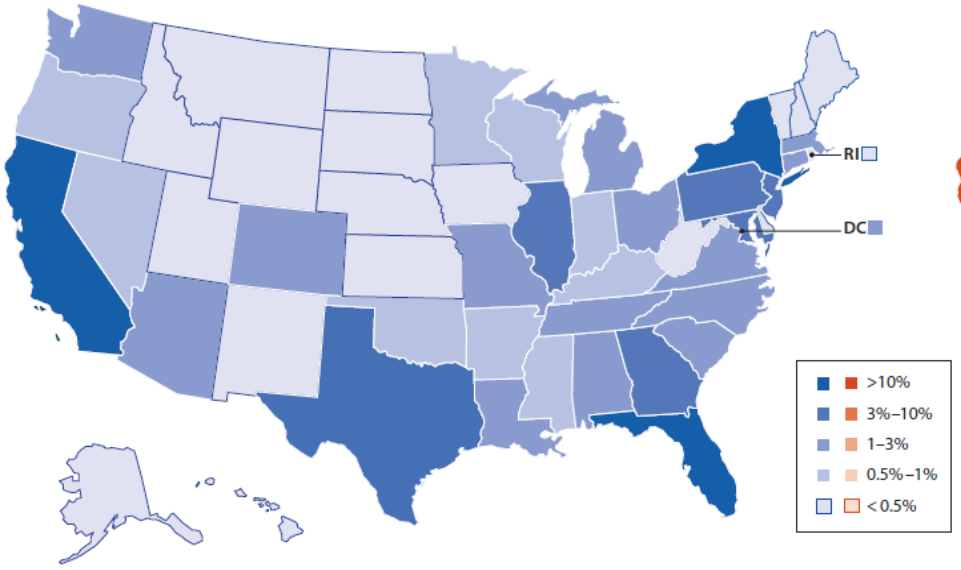
- **Prioritize health outcomes**
  - A few key metrics
- **Smarter investments**
  - Target populations
  - Evidence-based interventions
- **Shared responsibility**
  - Federal, State, local, non-profit and corporate partners
- **Accountability**
  - Scale up what's working
  - Change what's not
  - Emphasize effectiveness and cost savings

Aligning Resources with the Epidemic

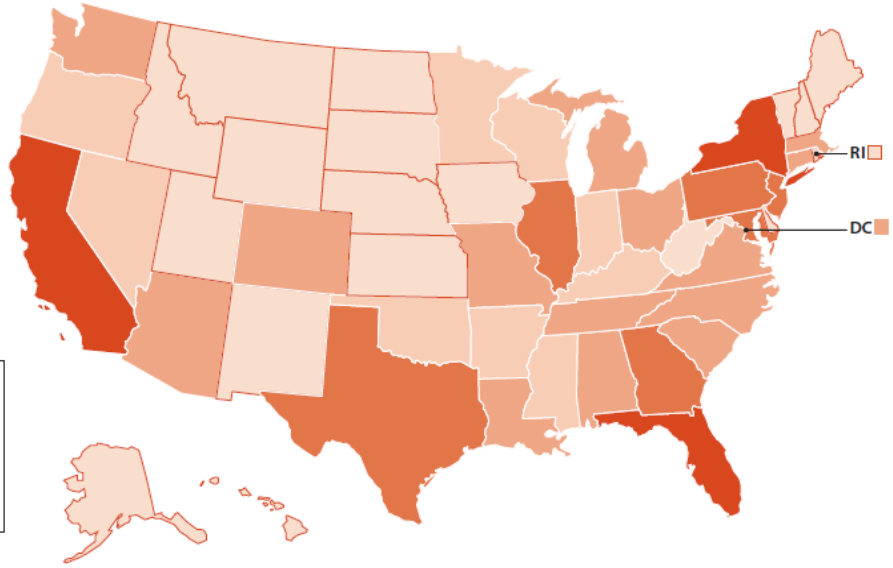
Matching Prevention Funds to the Epidemic[1]

When CDC's new approach is fully implemented, HIV prevention resources will closely match the geographic burden of HIV.

Proportion of Americans Living with an HIV Diagnosis (2008)



Proportion of CDC Core HIV Prevention Funding—FY2016[2]



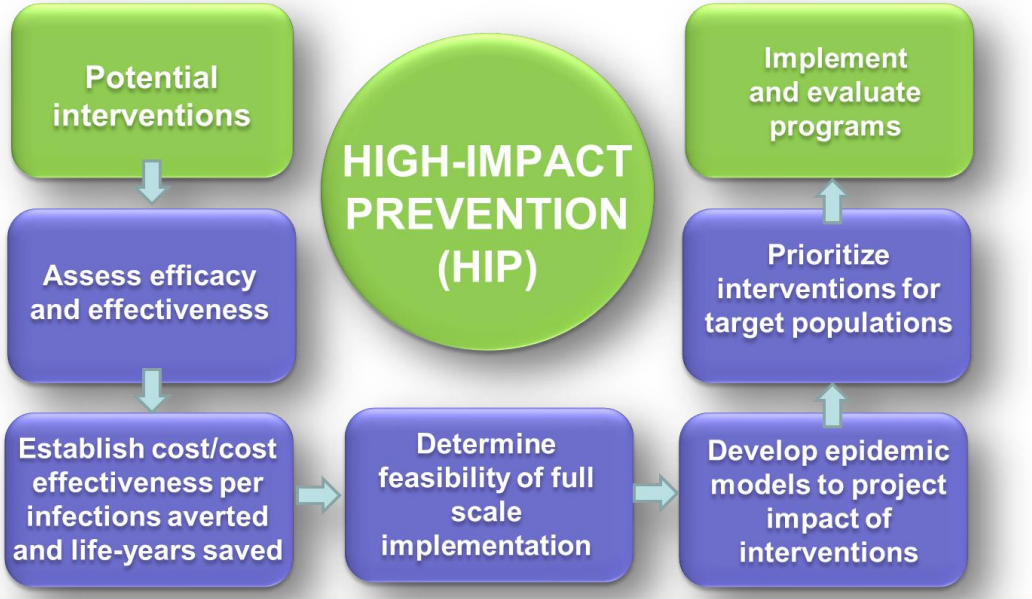
[1]Maps do not include U.S. territories receiving CDC HIV prevention funding.

[2] New funding allocation methodology will be fully implemented by FY2016; this breakdown assumes level overall funding.

www.cdc.gov/hiv/strategy/hihp/healthDepartments/

CDC's High-Impact Prevention: Ground Level Implementation of NHAS

- Optimal combination of interventions?
- Metrics to measure local program success?
- Resources used by populations at greatest risk?
- Are interventions evidence-based, scalable, sustainable, and effective?



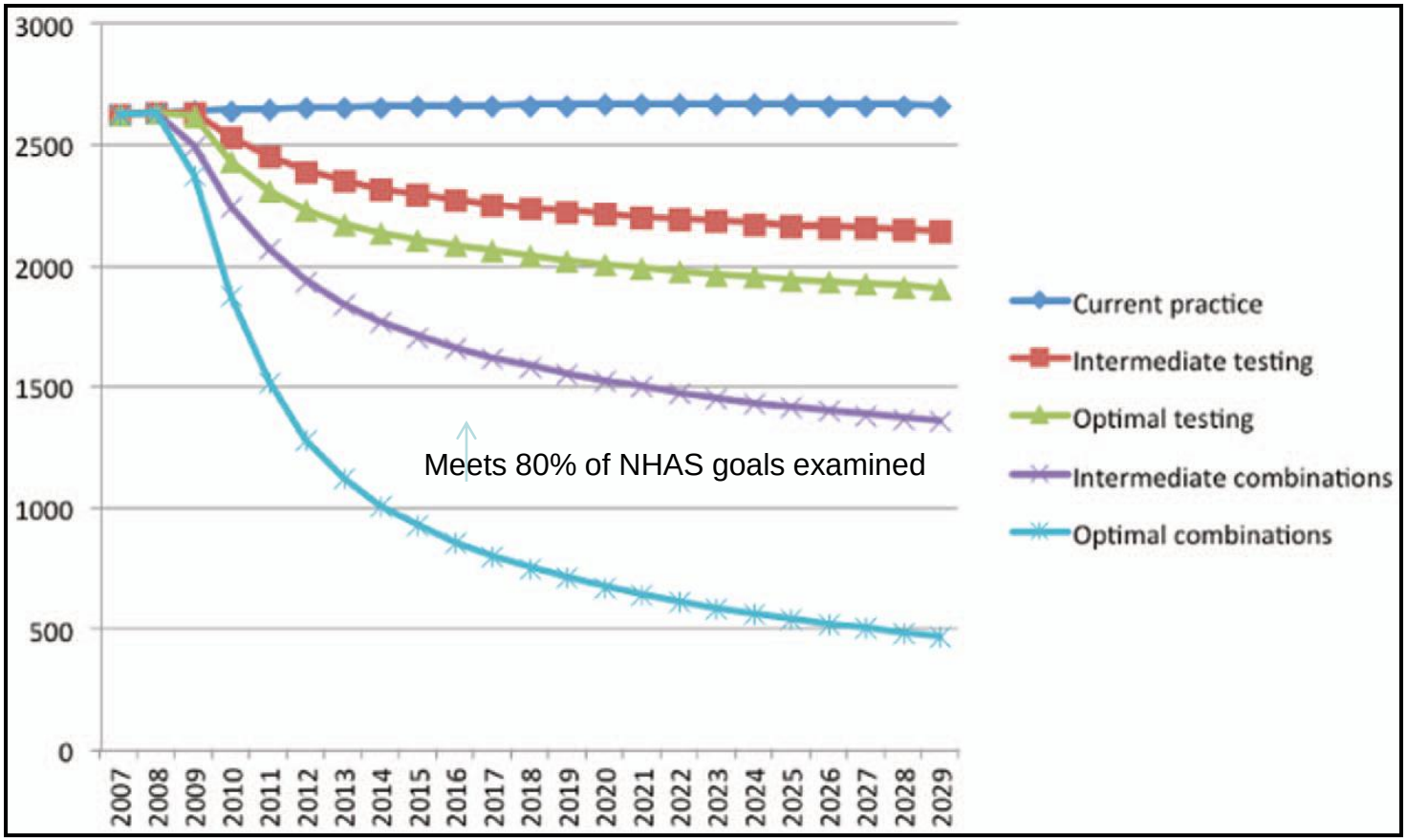
NHAS, National HIV/AIDS Strategy

HIV Treatment: a Win-Win-Win

- **Earlier treatment improves health: HHS and IAS guidelines now recommend starting treatment regardless of immune status**
- **Treatment is prevention: reduction in transmission risk to partners 96%**
- **Treatment is cost effective**

Cohen MS et al, N Engl J Med. 2011 Aug 11;365(6):493-505
Thompson MA et al, JAMA. 2012 Jul 25;308(4):387-402
DHHS HIV-1 Treatment Guidelines 2012; www.aidsinfo.nih.gov/contentfiles/lvguidelines/adultandadolescentgl.pdf

Increasing HIV Testing and Treatment to Achieve the Strategy's Goals

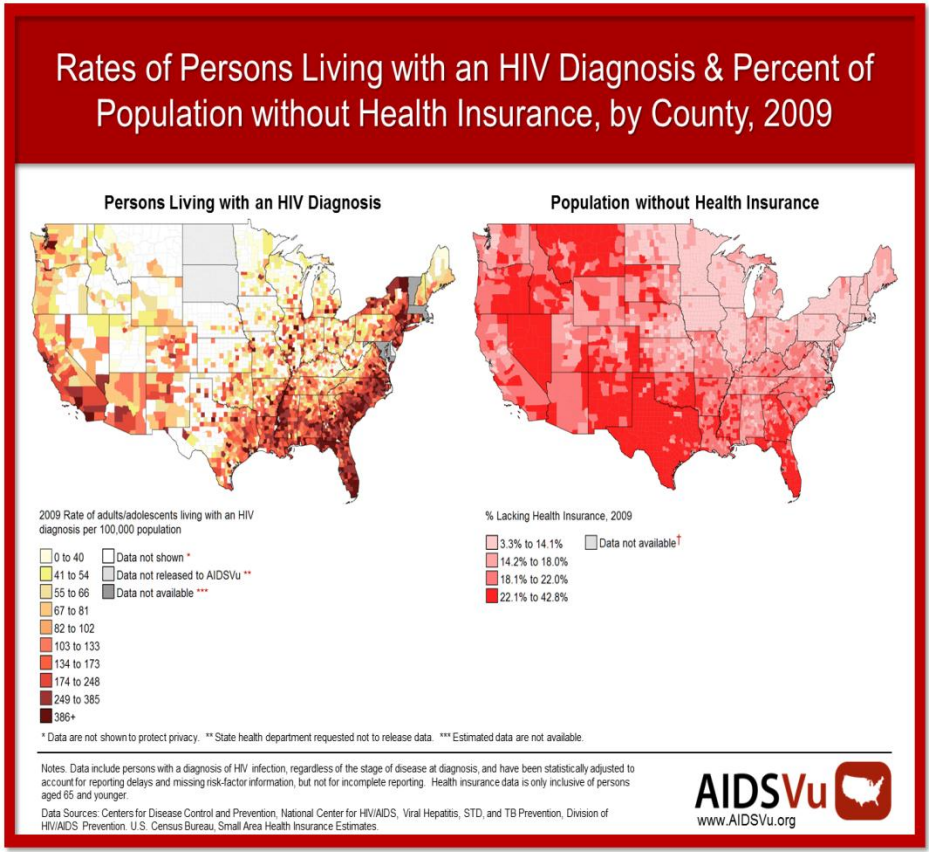


Sorensen SW et al, PLoS One 2012;7(2):e29098.
NHAS, National HIV/AIDS Strategy

HIV and Health Coverage

Of U.S. PLWHA, approximately:

- 13% have private coverage
- 24% have no coverage
- 47% receive Medicaid
- Over 500,000 receive some form of Ryan White services



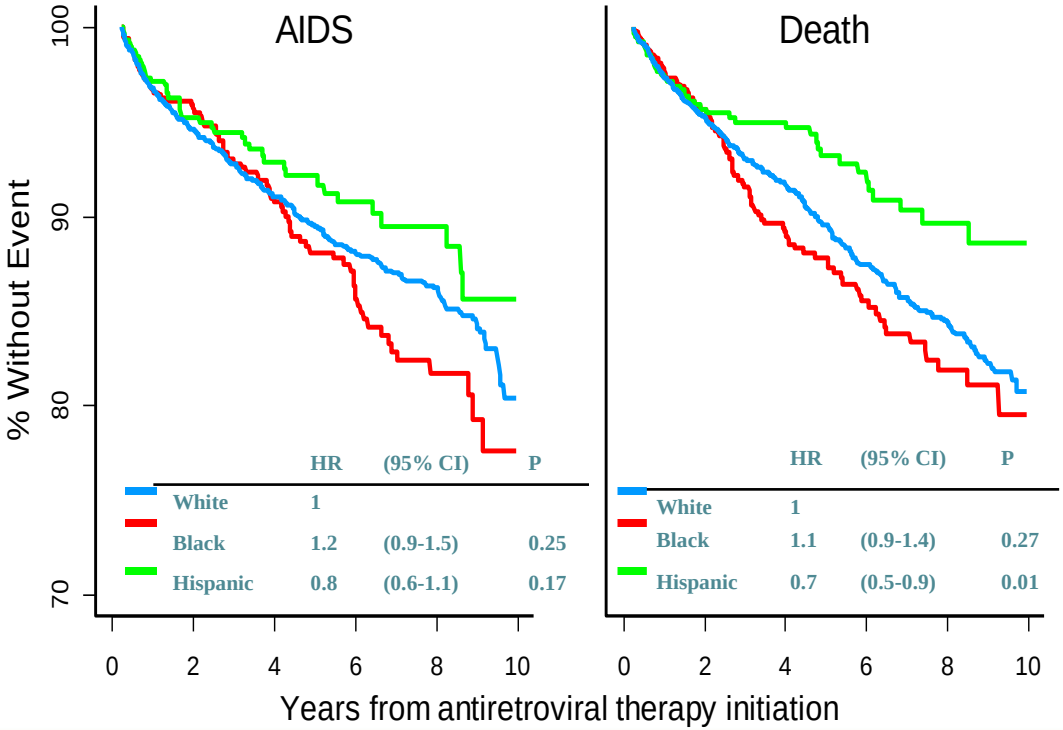
HRSA, http://www.healthcare.gov
Kaiser Family Foundation; aidsvu.org
PLWHA, Persons living with HIV/AIDS

HIV-related Disparities and Healthcare

HIV health outcome disparities in:

- Time To AIDS and death after AIDS diagnosis, for black and Latino MSM relative to white MSM
- Excess deaths, for blacks compared to whites
- Life expectancy losses, for Latinos compared to blacks or whites
- Life expectancy losses, for Latina and black women compared to white women

BUT: No difference in time to AIDS or mortality by race in HMO system

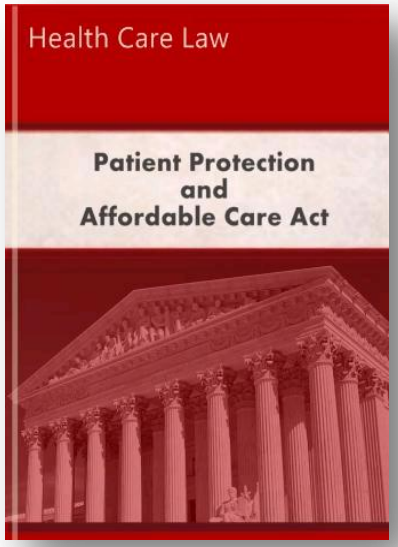


Silverberg et al, J Gen Intern Med. 2009 July 16;24(9): 1066-72
Hall et al, Am J Public Health. 2007 Jun;97(6):1060-6
Levine RS et al, Am J Public Health. 2010 Nov;100(11):2176-84
Losina E et al, Clin Infect Dis. 2009 Nov 15;49(10):1570-8

HMO, Health Maintenance Organization

Toward Health Equity: The Affordable Care Act

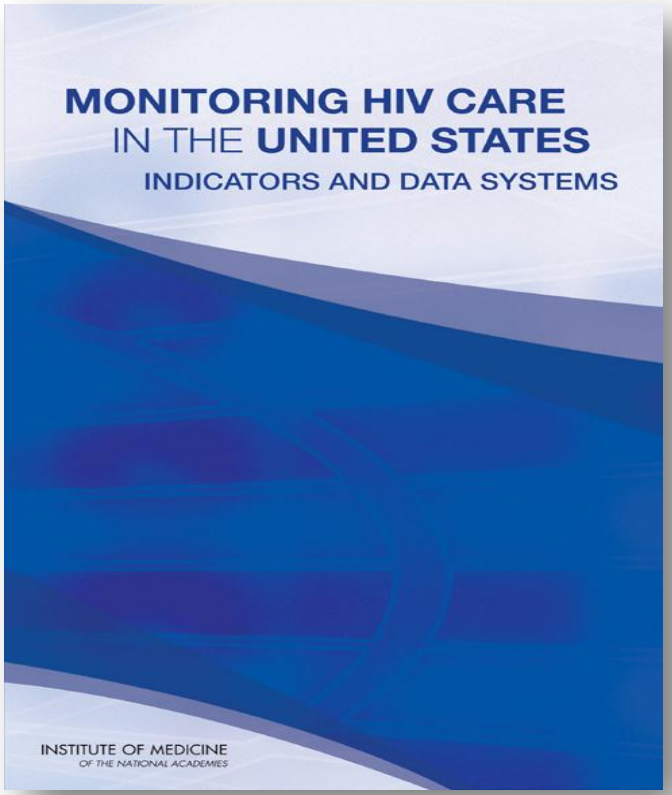
- **Expands coverage to 30 million Americans**
  - Tens of thousands with HIV
  - Millions of blacks and Latinos
- **Prohibits denials of coverage based on HIV status**
- **Already:**
  - Millions have increased prevention service coverage
  - Millions of young adults covered on parents' plans
- **Coverage necessary but not sufficient to improve HIV outcomes**
  - Continued need to address stigma, discrimination, and barriers to access and engagement in care



Office of the Assistant Secretary for Planning and Evaluation, 2012

Measuring HIV-related Outcomes: Towards a National Consensus

- Parsimony
- Harmony
- Achievability
- Sustainability
- Usability
- Shareability



www.iom.edu/Reports/2012/Monitoring-HIV-Care-in-the-United-States.aspx

Ongoing NHAS Implementation Needs

- Continued collaboration among Federal, State, local government, and private partners
- Flexibility at local level while maintaining alignment with NHAS principles
- Technical assistance to prepare HIV workforce for ongoing changes in environment
- Shift from process-oriented to outcome-oriented metrics
- Prioritize maximizing the continuum of care
- Research to determine best ways to move forward among multiple options
- Support ongoing basic and clinical research

NHAS, National HIV/AIDS Strategy

Vision for the National HIV/AIDS Strategy

"The United States will become a place where new HIV infections are rare and when they do occur, every person, regardless of age, gender, race/ethnicity, sexual orientation, gender identity or socio-economic circumstance, will have unfettered access to high quality, life-extending care, free from stigma and discrimination"

NHAS implementation update report:
aids.gov/federal-resources/national-hiv-aids-strategy/implementation-update-2012.pdf

NATIONAL HIV/AIDS STRATEGY

More Information

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HHS: Howard Koh, Ron Valdiserri, Andrew Forsyth, Greg Millett
ONAP team: James Albino, Aaron Lopata, Helen Pajcic

Grant Nash Colfax, MD
Director
Office of National AIDS Policy
Domestic Policy Council
The White House

Email: Grant_N_Colfax@who.eop.gov

WHITEHOUSE.GOV

HIGH-IMPACT HIV PREVENTION

- **Science of Optimizing HIV Prevention**
  Jonathan Mermin, MD, MPH, Director, Division of HIV/AIDS Prevention, Centers for Disease Control and Prevention
- **HIV Surveillance in Action**
  Irene Hall, PhD, MPH, *FACE,* Chief, HIV Incidence and Case Surveillance Branch, Division of HIV/AIDS Prevention, Centers for Disease Control and Prevention
- **Modeling to Identify Optimal Allocation of HIV Prevention Resources in a City Health Department**
  Stephanie Sansom, PhD, MPP, MPH
  Quantitative Sciences and Data Management Branch, Division of HIV/AIDS Prevention, Centers for Disease Control and Prevention
- **National HIV/AIDS Strategy Implementation Update**
  Grant Colfax, MD, Director, Office of National AIDS Policy, The White House