

# HIV Case-Based Surveillance Systems

Regional Consultation on HIV Epidemiologic Information in Latin America and the Caribbean, Nov 7-9 2012

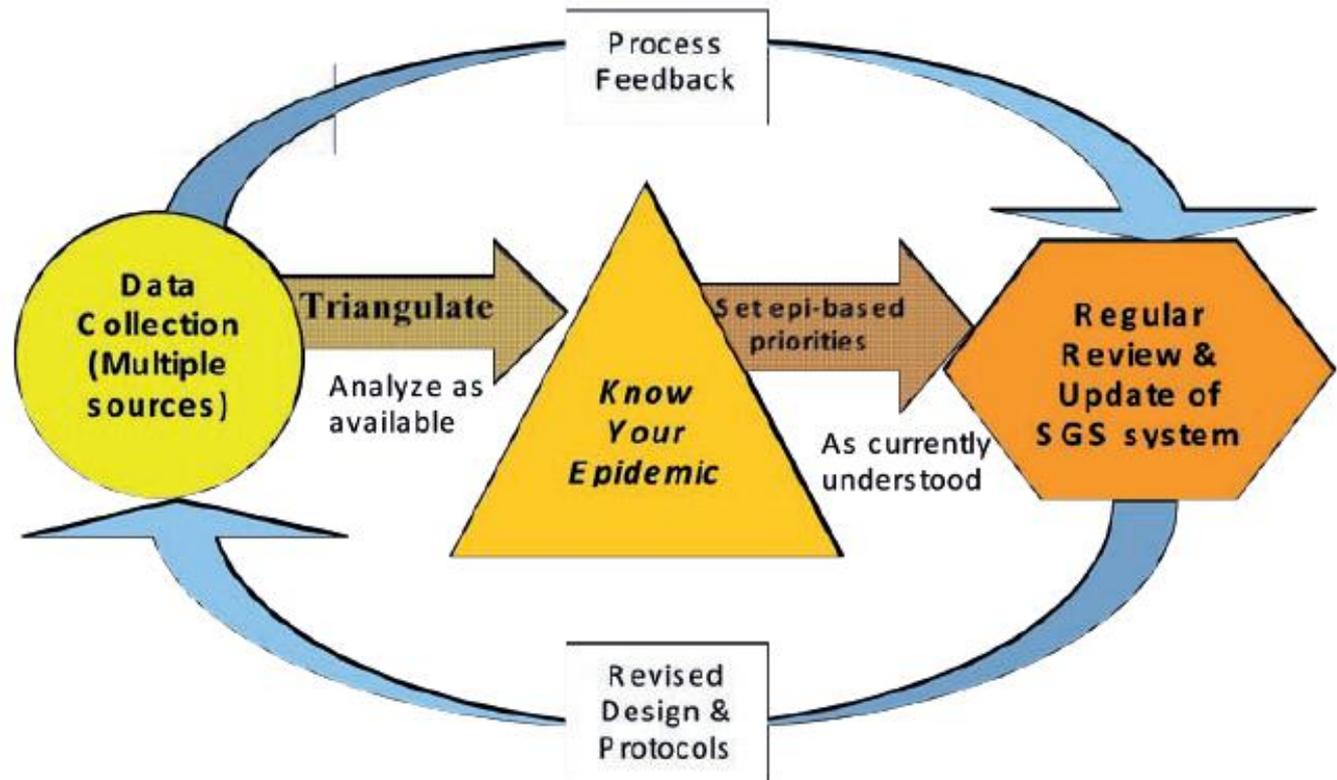
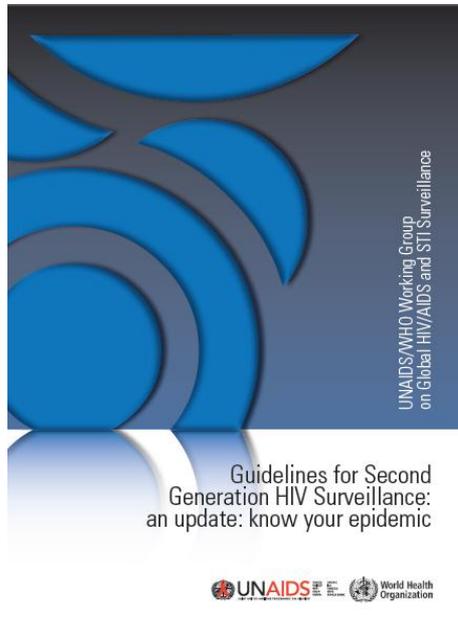
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Centers for Disease Control Prevention



# Second Generation Surveillance Update: “Know Your Epidemic” (2012)

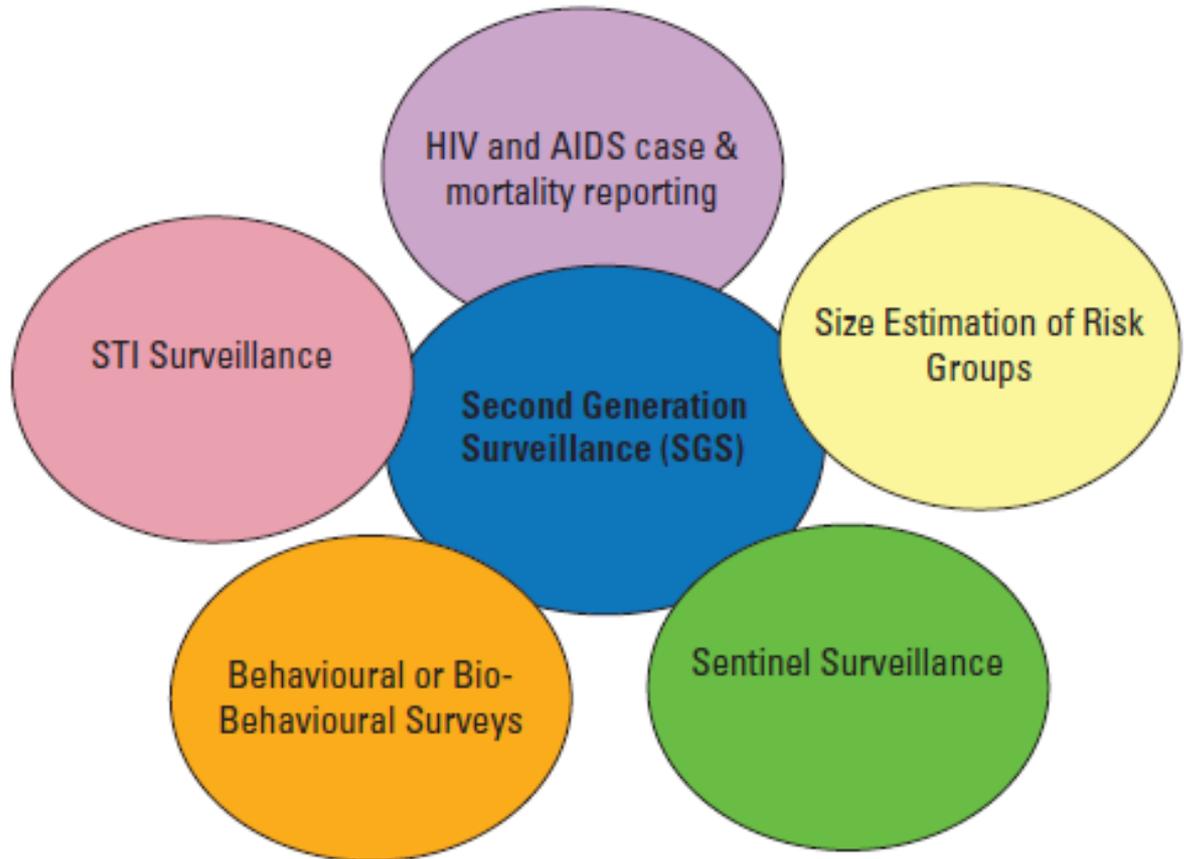


# Second Generation Surveillance Update: “Know Your Epidemic” (2012)

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Figure 1: Components of HIV second generation surveillance

- ▶ WHO recommends case surveillance as part of a comprehensive system of SGS



# History of HIV/AIDS case surveillance

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## Pre-2004

- ▶ Multiple case definitions for AIDS around the world (1984-98)
  - ▶ Few HIV case definitions
  - ▶ HIV case reporting was not a WHO recommendation; there were no guidelines

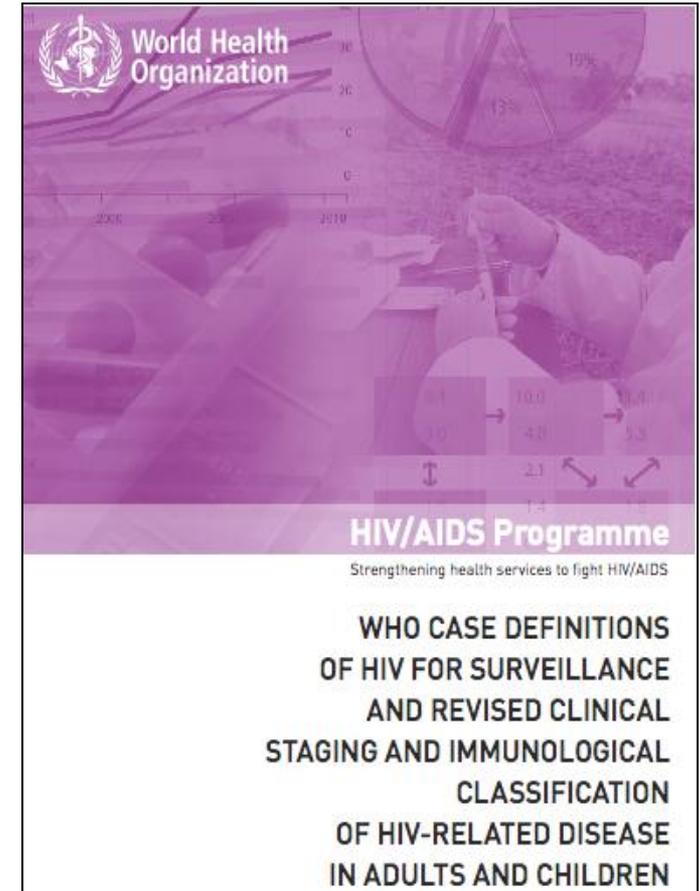
## 2004-2006

- ▶ WHO and CDC and others sought to:
  - ▶ Review and revise classification and staging
  - ▶ Consider revision of surveillance definitions to reflect HIV in need of ART
  - ▶ Harmonise surveillance & clinical definitions

# History of HIV/AIDS case surveillance

## 2006: New WHO guidance published

- ▶ Standardised simplified HIV case definition based on lab testing
- ▶ Standard AIDS and Advanced HIV case definitions for surveillance
- ▶ Recommends HIV case reporting in children and adults



# Uses of HIV Case Reporting Data

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- ▶ To effectively monitor trends in prevalent HIV infection
- ▶ To characterize the affected populations
- ▶ To identify the number of persons in need of care and treatment
- ▶ To allocate care, treatment and prevention resources
- ▶ To target and evaluate intervention and prevention programmes
- ▶ To provide a context for M&E data

# Comprehensive HIV Case-Based Surveillance system

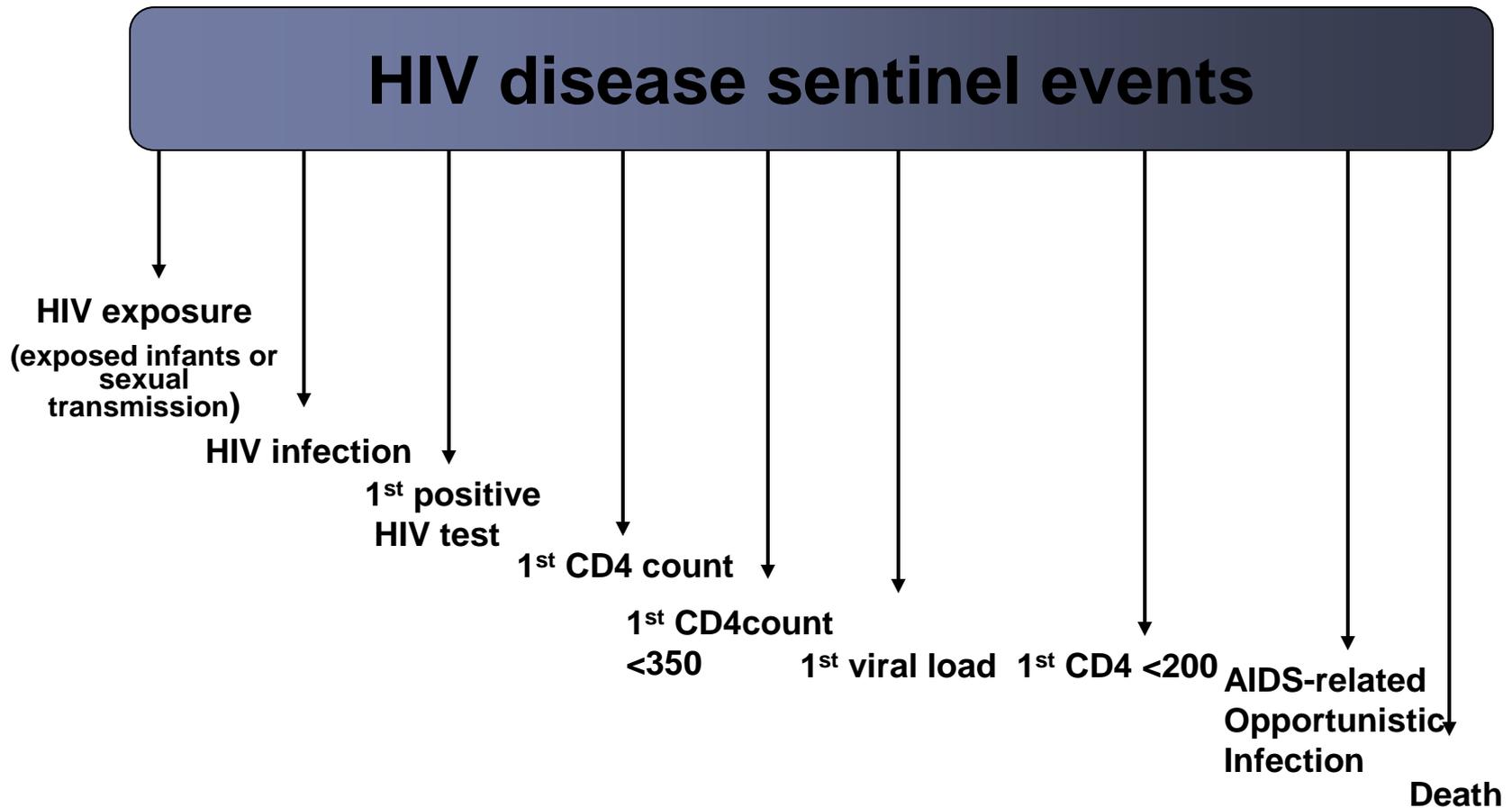
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- ▶ Reporting of all HIV infections (regardless of clinical stage)
  - ▶ Persons should be reported if they:
    - Are newly diagnosed regardless of clinical stage
    - Were previously diagnosed but not previously reported
    - Were previously diagnosed and reported at clinical stage 1 or 2 and progressed to stage 3 or 4
- ▶ Follow case longitudinally to get status updates:
  - ▶ sentinel events, including death



# Monitor HIV disease

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# Monitor HIV disease

## HIV disease sentinel events

HIV exposure  
(exposed infants or  
sexual  
transmission)

HIV infection

1<sup>st</sup> positive  
HIV test

1<sup>st</sup> CD4 count

1<sup>st</sup> CD4count  
<350

1<sup>st</sup> viral load

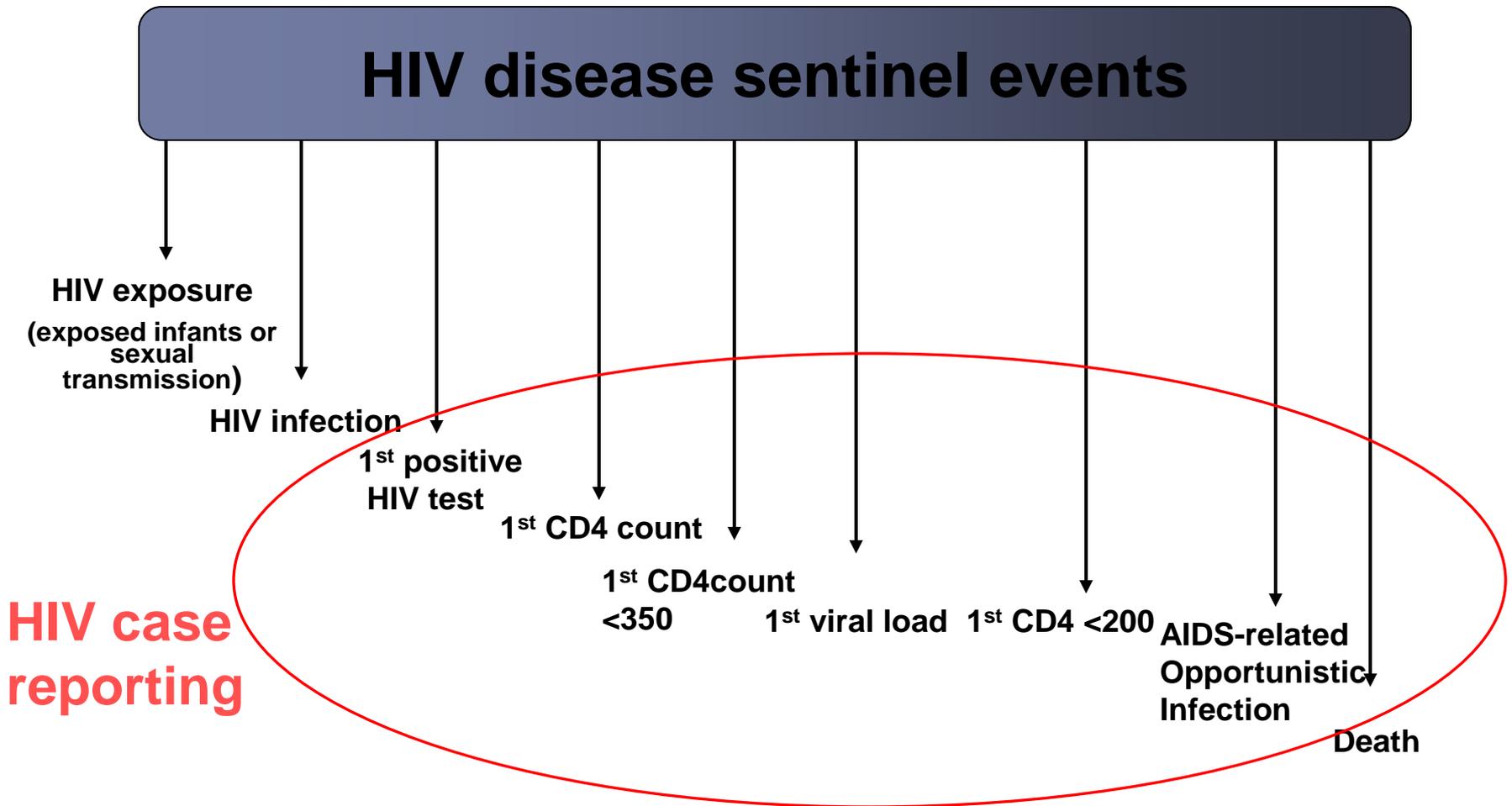
1<sup>st</sup> CD4 <200

AIDS-related  
Opportunistic  
Infection

Death

**AIDS**  
**reporting**

# Monitor HIV disease



# Basic Elements of HIV Case Surveillance

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- ▶ Define what will be reported
  - ▶ HIV infection (all stages)
  - ▶ Advanced stage HIV disease (stages 3, 4)
  - ▶ AIDS (stage 4)
  
- ▶ Define which events should be reported
  - ▶ 1<sup>st</sup> positive test
  - ▶ 1<sup>st</sup> viral load
    - ▶ All viral loads (tracking cases)
  - ▶ 1<sup>st</sup> CD4+ test
    - ▶ All CD4+ tests (tracking cases)
  - ▶ 1<sup>st</sup> CD4+ < 200
  - ▶ HIV exposure (children)

# Information to collect on each case

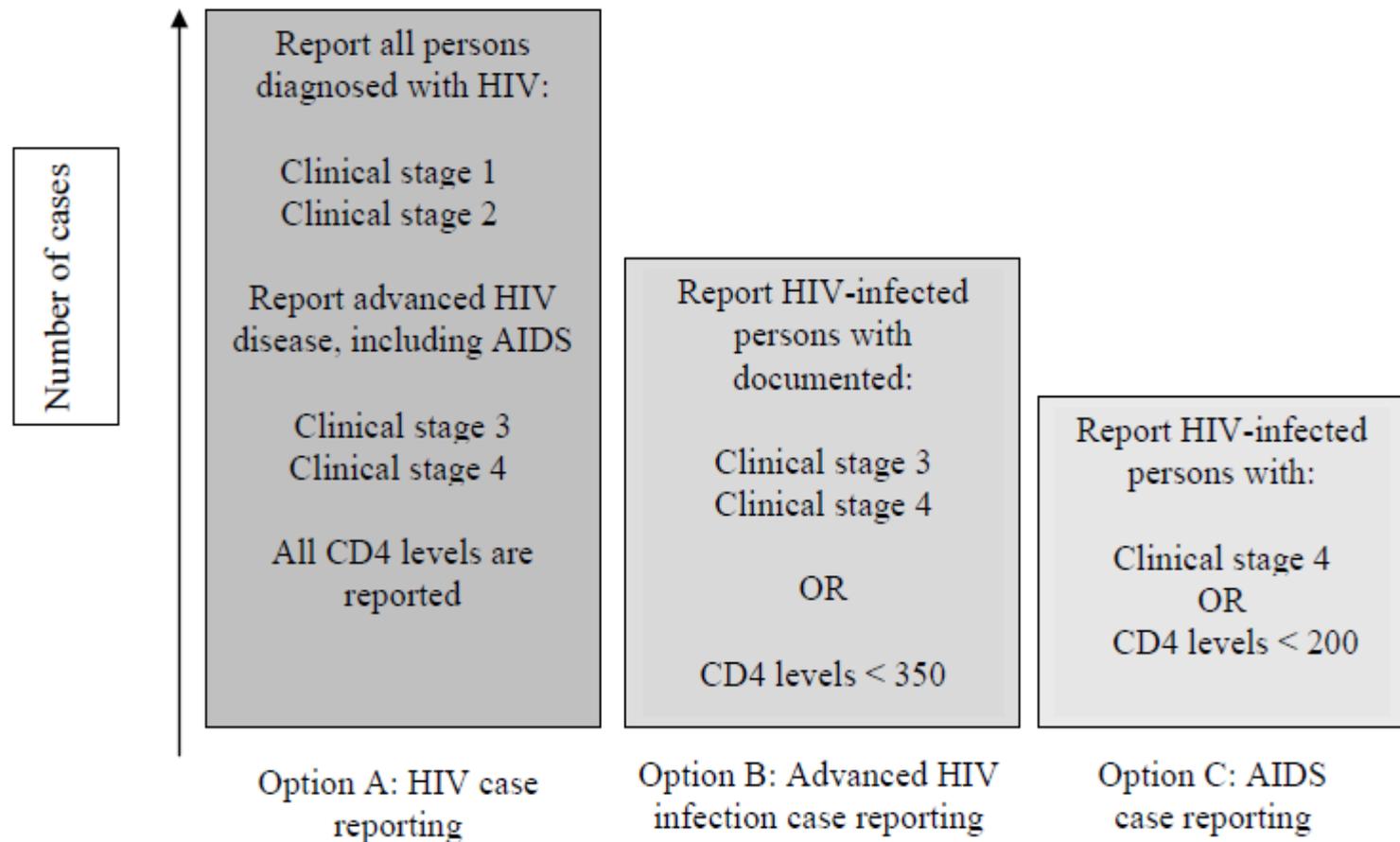
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- ▶ **Demographic Characteristics**
  - ▶ Sex, age, town, race/ethnicity
- ▶ Date of HIV diagnosis
- ▶ Date of report
- ▶ Reporting source
- ▶ Transmission risk
- ▶ CD4 count/% and/or clinical stage
- ▶ Supplemental – TB and virologic status



# Monitoring the HIV epidemic

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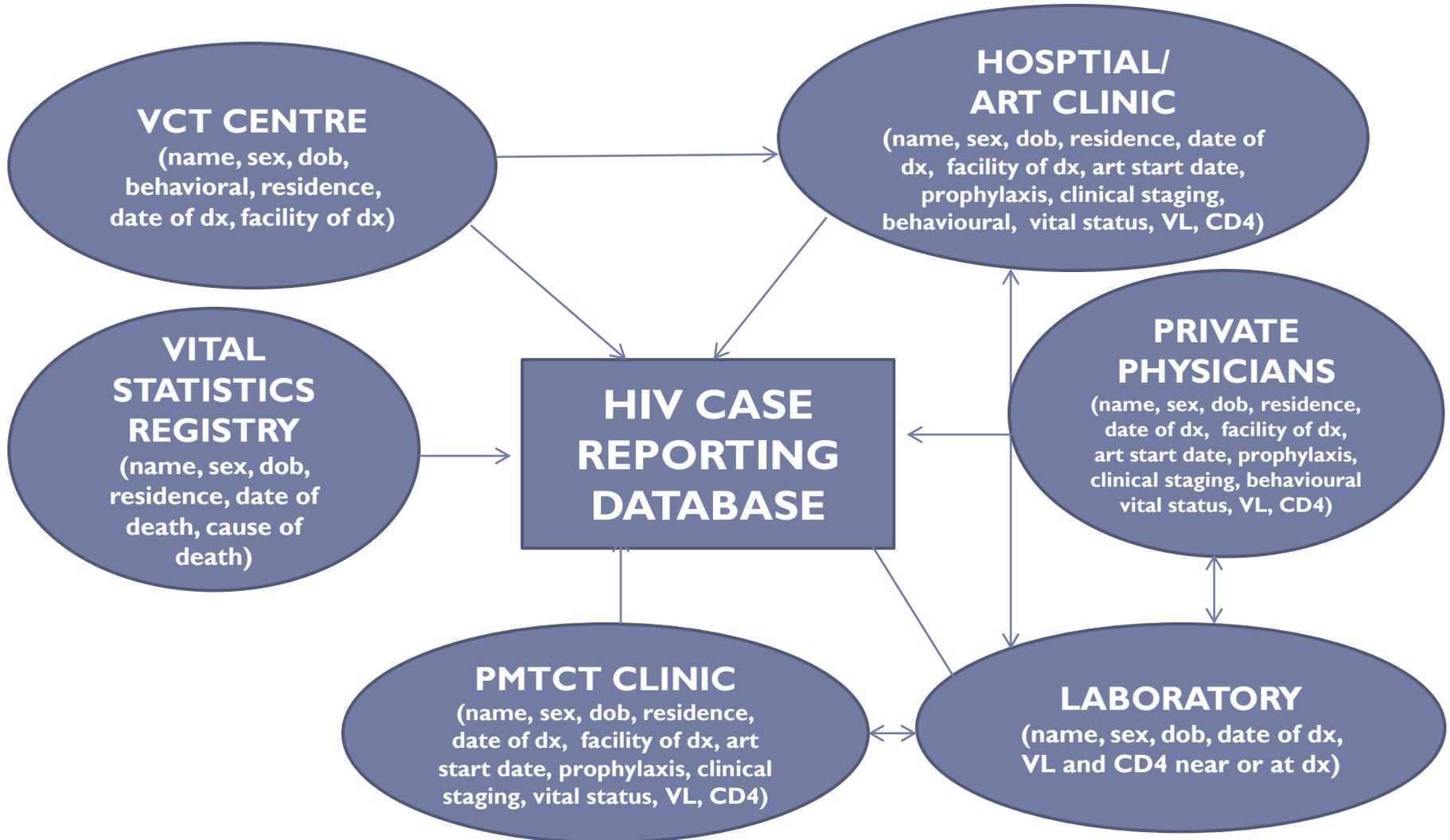


# Considerations to include first 'HIV positive result' in the HIV case surveillance system.

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- ▶ Why include it – the first positive test is closer to when a person was infected with HIV
- ▶ HIV testing programs
  - ▶ Identify which models yield the most positive tests
  - ▶ VCT, outreach, PICT, ANC, TB, hospital
  - ▶ Start incorporating testing data that have the same person-level UI to the case surveillance data
  - ▶ In anonymous testing programs, pilot effective referral system...after someone tests positive obtain the name of the individual for referral and actively refer and confirm referral
    - ▶ Evaluate this system to identify any problems with the confidentiality and assess if duplicate testing decreases

# Multiple Data Sources, One Case



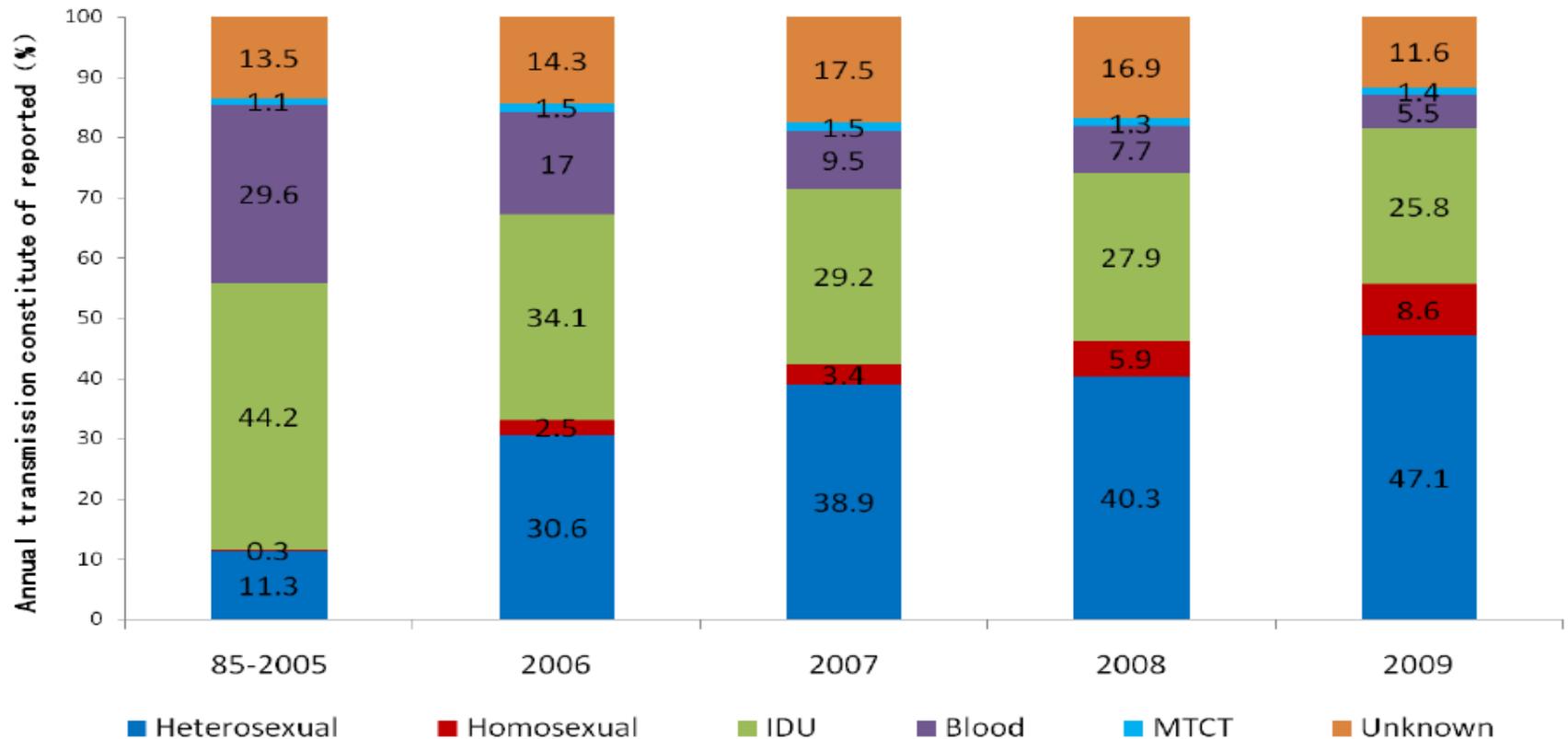
# High quality surveillance system

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- ▶ Unique identifier – name plus DOB, sex.....
- ▶ Standard operating procedures
- ▶ Standardized questions to obtain data on transmission risk
- ▶ Redundancy of reporting from multiple sites
- ▶ Training
  - ▶ Practical aspects of reporting
    - ▶ Who reports, when do they report, how do they report
  - ▶ Soliciting transmission risk information
- ▶ Data analysis, use and dissemination
  - ▶ Critical to feedback to data to those contribute to the system

# Types of Analysis from HIV Case Surveillance Data

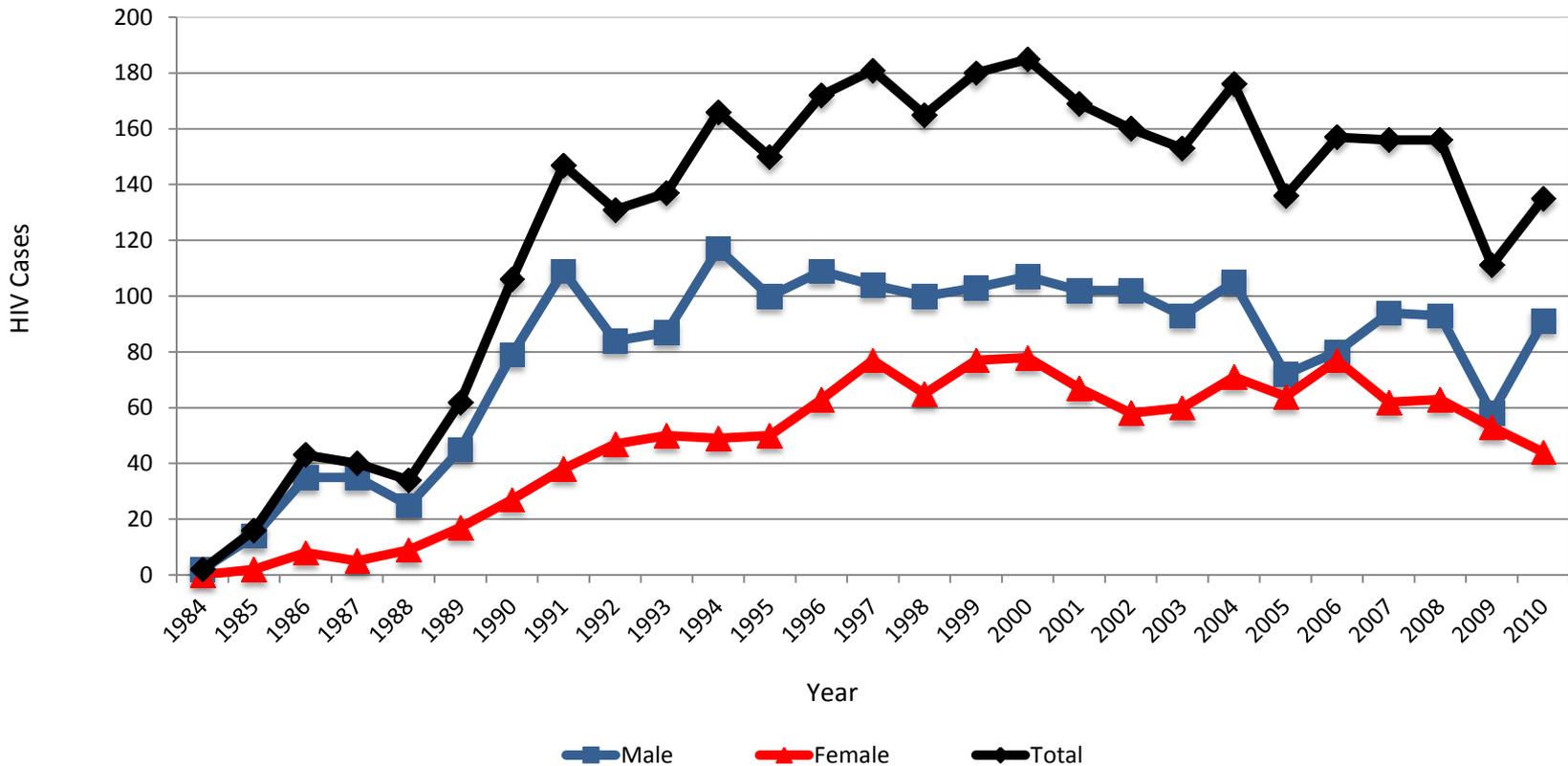
Where and among what populations is the burden of the epidemic high? What behaviors are promoting new infections?



**Figure 3.** Annual transmission breakdowns of reported HIV/AIDS cases in China, 1985-2009

# Where are new cases coming from?

## Barbados: Annual trend of new HIV cases, 1984 – 2010



Source: Barbados HIV/AIDS Surveillance Report 2010

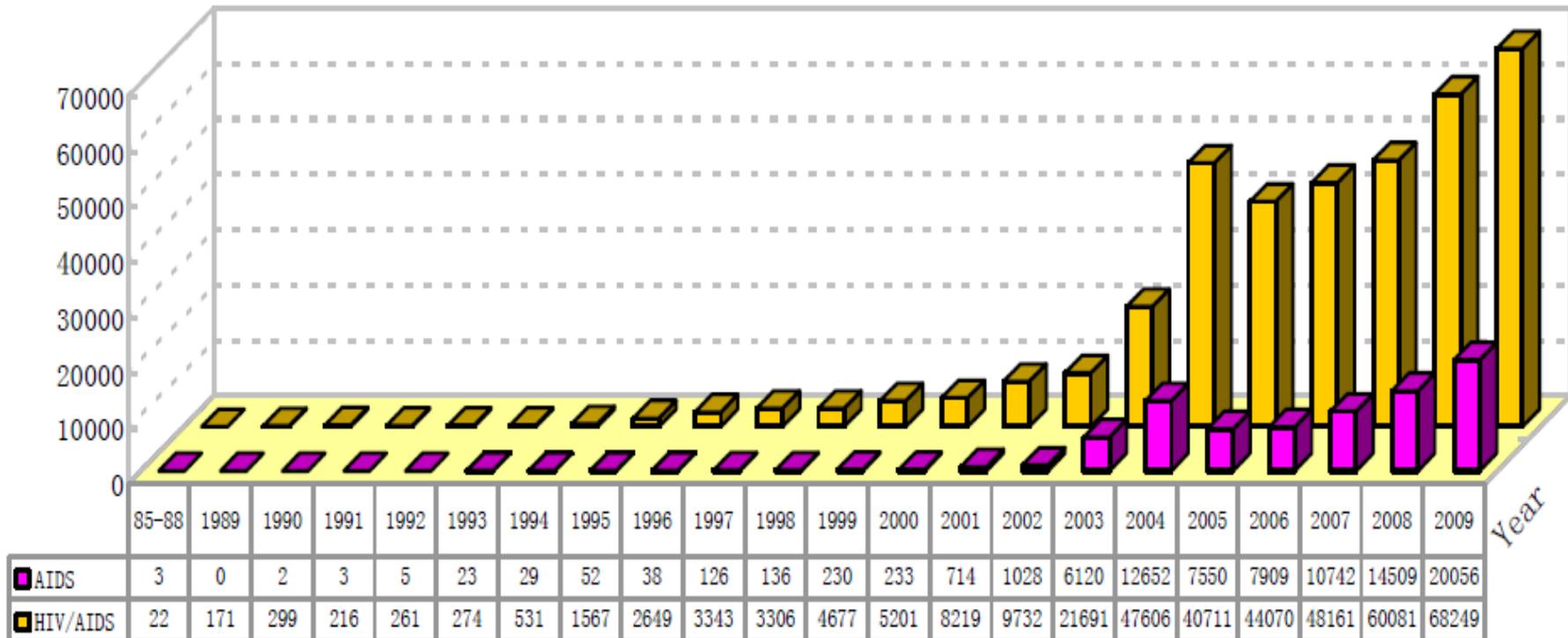
# Where are new infections coming from? What care and treatment services are needed?

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**Figure 6.** Geographic distribution of cumulative reported HIV positives in China (at end of 2009)

# What is the direction of the epidemic?



**Figure 1.** Annual reported HIV positives and AIDS cases in China, 1985-2009.

# What is the immunological status of newly dx?

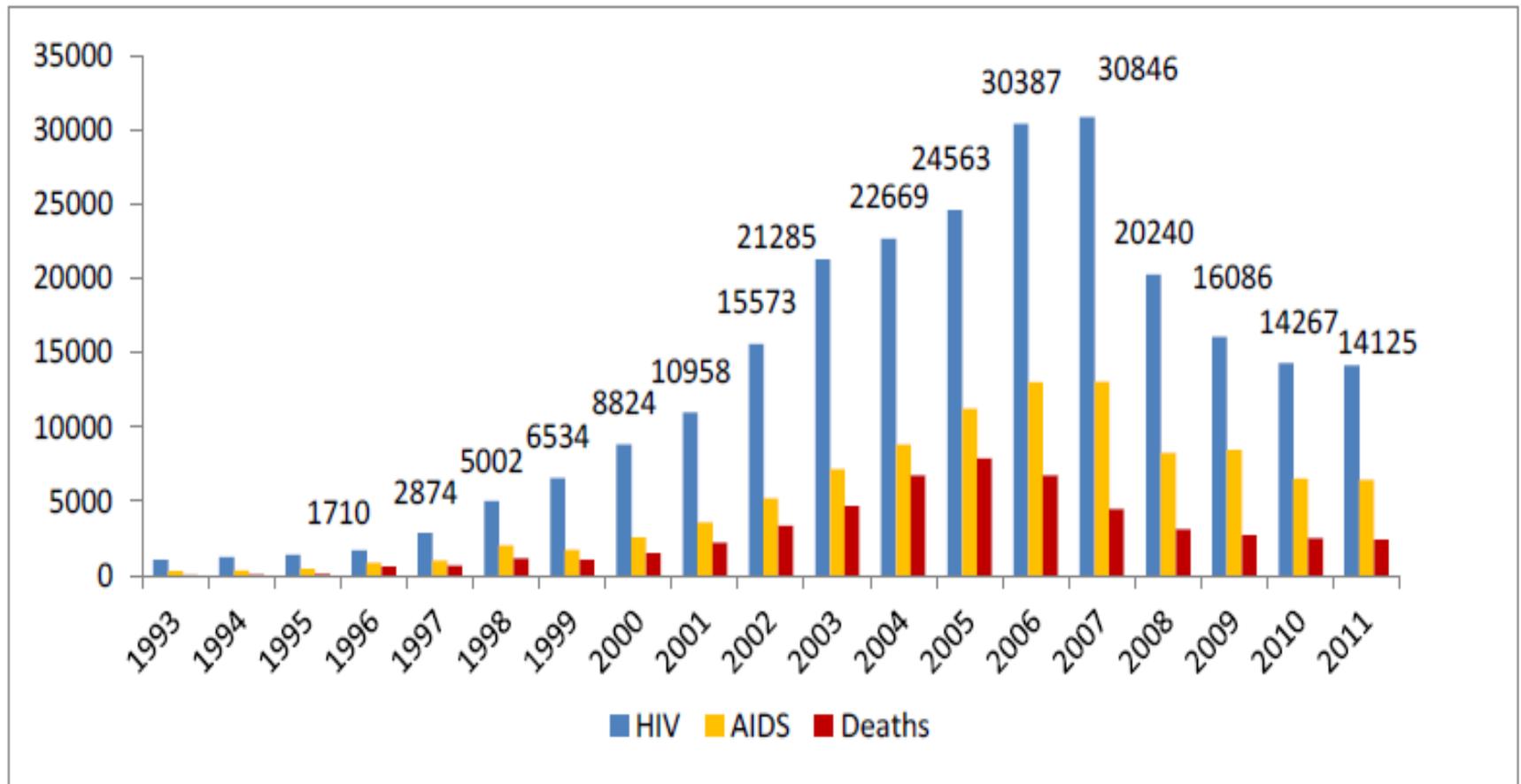
Barbados: Immunological classification of newly registered patients at the LRU in 2010

WHO HIV-associated immunological classification	CD4 (cells/ mm <sup>3</sup> )	Sex		Total	
		Male	Female	n	%
<b>Severe</b>	< 200	27	6	33	32.0
<b>Advanced</b>	200 - 349	15	7	22	21.4
<b>Mild</b>	350 - 499	12	6	18	17.5
<b>None or not significant</b>	≥ 500	13	13	26	25.2
<b>No Classification</b>	Not Known	3	1	4	3.9
<b>Total</b>		70 (68.0%)	33 (32.0%)	103	100.0

Source: Barbados HIV/AIDS Surveillance Report 2010

# How many are infected, progressing to advanced disease and dying?

Reported HIV, AIDS and Related Deaths, Viet Nam 1993-2011



# Advanced Analysis from HIV Case Surveillance Data

# Are prevention programs working?

Estimated prevalence of persons age >13 years living with HIV, and number undiagnosed, 2006—United States

	Persons living with HIV	Persons living with undiagnosed HIV	Percent undiagnosed
Total	1,106,400	232,700	21.0%
MSM	532,000	124,900	23.5%
IDU (men)	131,500	19,000	14.5%
IDU (women)	73,100	10,000	13.7%
White	382,600	72,000	18.8%
Black	510,100	113,100	22.2%

# Modeling undiagnosed infections

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The extended back calculation (EBC) is a modeling method to estimate HIV infections and prevalence for previous years (including undiagnosed infections) based on probabilities derived from case surveillance data.

**Campsmith ML, Rhodes PH, Hall HI, Green TA**  
**Undiagnosed HIV prevalence among adults and adolescents in the United States at the end of 2006. *J Acquir Immune Defic Syndr.* 2010;53:619-624**

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EPIDEMIOLOGY AND SOCIAL SCIENCE

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## Undiagnosed HIV Prevalence Among Adults and Adolescents in the United States at the End of 2006

*Michael L. Campsmith, DDS, MPH, Philip H. Rhodes, PhD, H. Irene Hall, PhD, and Timothy A. Green, PhD*

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**Objectives:** To describe adults/adolescents (age 13 years and older) living with undiagnosed HIV infection in the United States at the end of 2006.

**Methods:** HIV prevalence and percentage undiagnosed were estimated from cumulative HIV incidence using an extended back-calculation model (using both HIV and AIDS data, the time of first diagnosis with HIV, and disease severity at diagnosis) and estimated cumulative deaths.

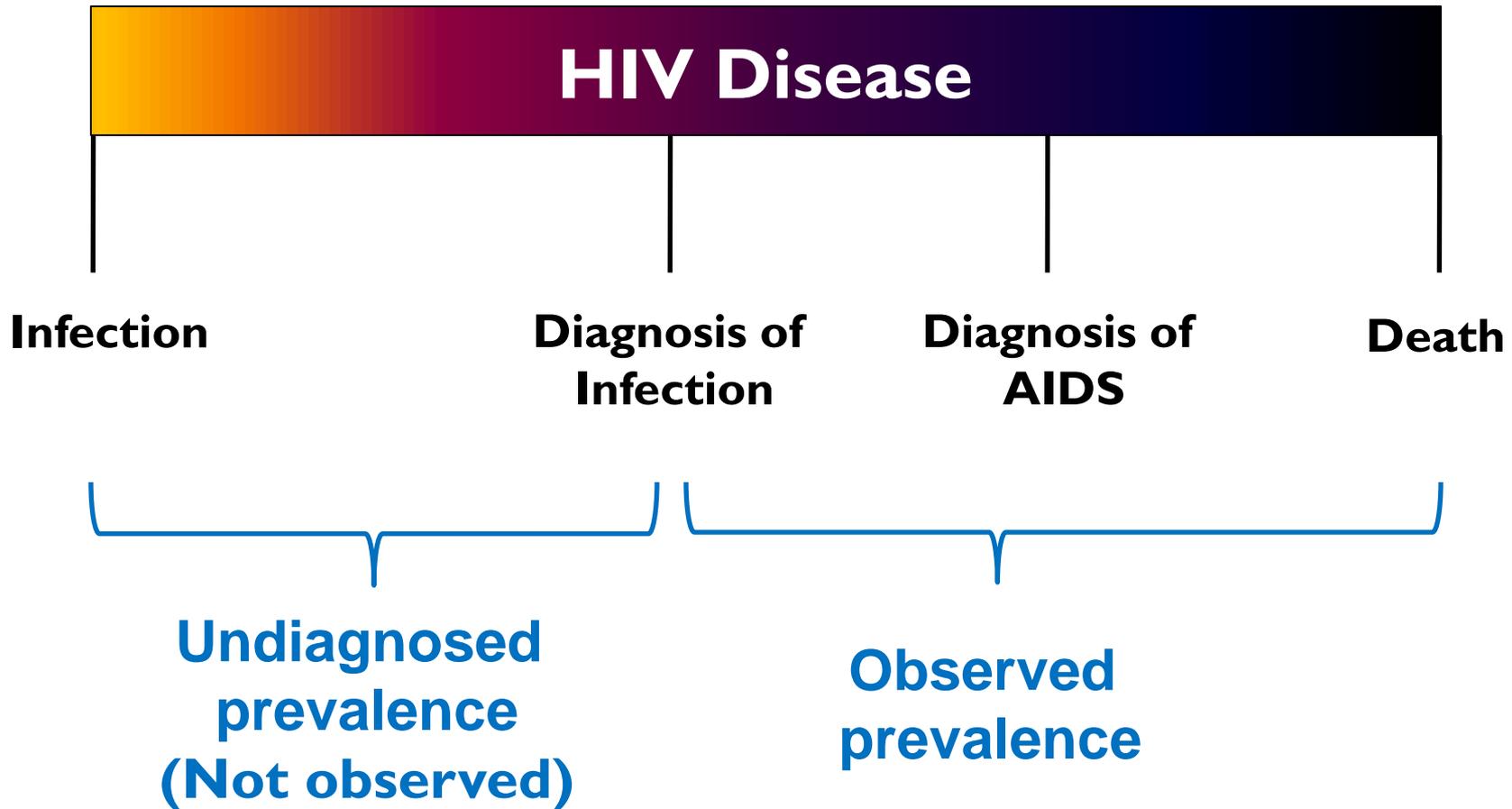
**Results:** An estimated 1,106,400 adults/adolescents (95% confidence interval = 1,056,400–1,156,400) were living with HIV in the United States at the end of 2006; overall, 21.0% (232,700; 95%

### INTRODUCTION

Current, accurate, and timely public health surveillance data on HIV prevalence are needed to guide decisions on planning for disease prevention activities, program evaluation, and resource allocation at the local, state, and national levels.<sup>1-3</sup> However, the overall prevalence of persons living with HIV cannot be directly observed, as a percentage of persons infected with HIV has not yet been tested, diagnosed, and reported to local disease surveillance programs. Having a better understanding of the characteristics of the undiagnosed population (eg, by race/ethnicity, sex, age, and risk) is important for focusing HIV testing and prevention initiatives and to measure progress in decreasing the size of the

# Undiagnosed prevalence

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# Benefits of modeled prevalence

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Provide more reliable data for the:

- ▶ Planning and prioritization of HIV prevention and intervention activities that aim to identify persons with undiagnosed HIV infection and link them to medical care and prevention services
- ▶ Evaluation of the effectiveness of HIV prevention and intervention programs
- ▶ Determination of needs for HIV-related care, treatment and ancillary services
- ▶ Allocation of limited resources at the local, regional and national levels

# Model inputs

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Modeling inputs from case surveillance data:

- ▶ The date of HIV diagnosis, AIDS diagnosis and death
- ▶ Stratification variables (e.g. gender, transmission category, etc)
- ▶ Concurrent diagnosis (HIV and AIDS diagnosed in the same year)
- ▶ HIV testing hazard\*

Modeling inputs from the literature:

- ▶ Assumptions about the distribution of the period between infection and the diagnosis of AIDS
- ▶ AIDS diagnosis hazard\*\*

\* The probability of being diagnosed with HIV in year  $t$  | Infected in year  $i$  but not diagnosed with HIV at the start of year  $t$

\*\* The probability of being diagnosed with AIDS in year  $t$  | Infected in year  $i$  but not diagnosed with HIV at the start of year  $t$  and not diagnosed with AIDS at year  $t$

# Adjustments for modeling

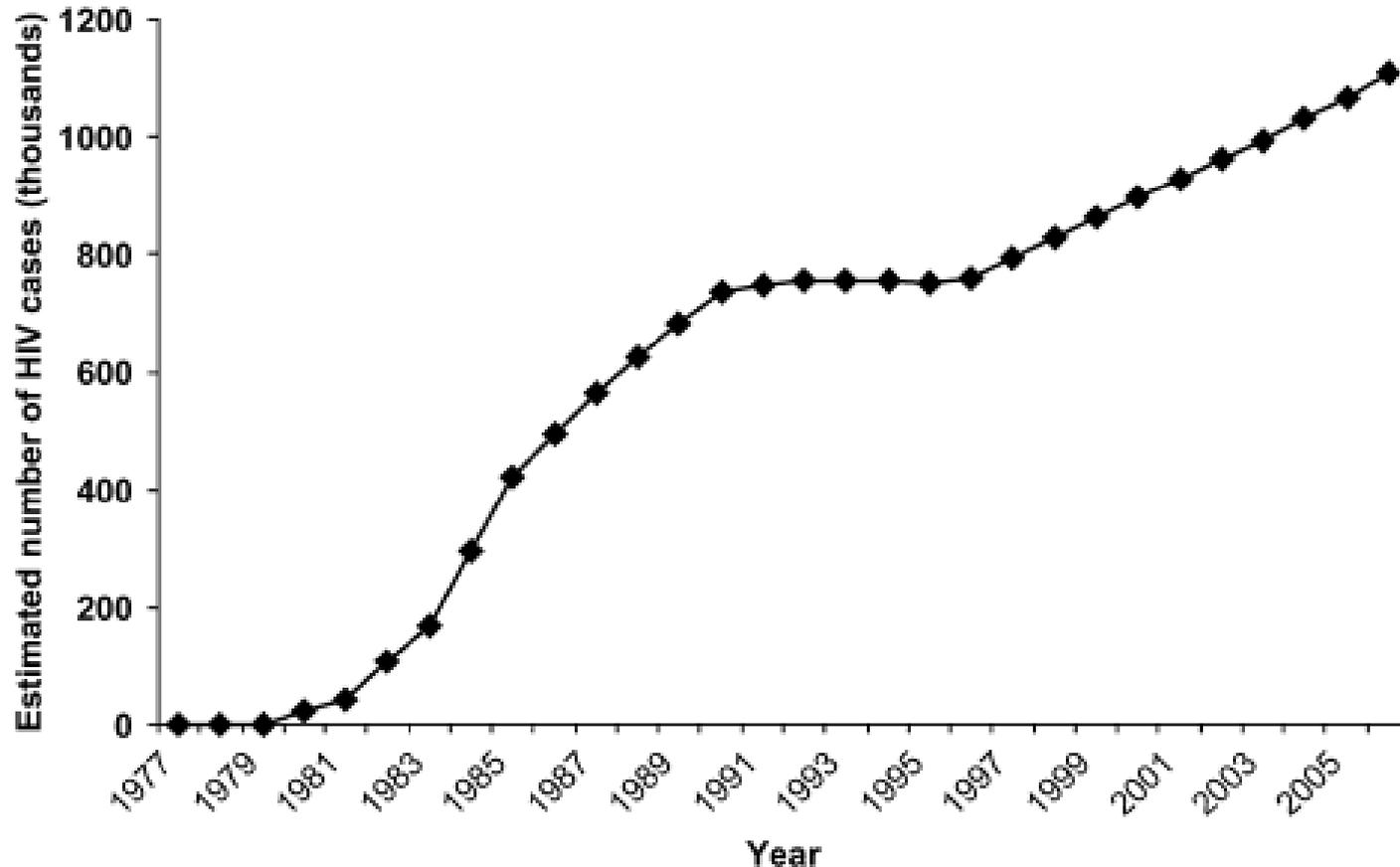
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Case surveillance data must be adjusted for:

- ▶ Reporting delay
  - ▶ Modeled based on recent historical reporting delay data
- ▶ Incomplete reporting
  - ▶ Data imputed from recent historical data of reporting areas based on demographic characteristics
- ▶ Missing transmission category
  - ▶ Probability for each transmission category imputed from for each report based on demographic characteristics
    - Recent historical data or special survey

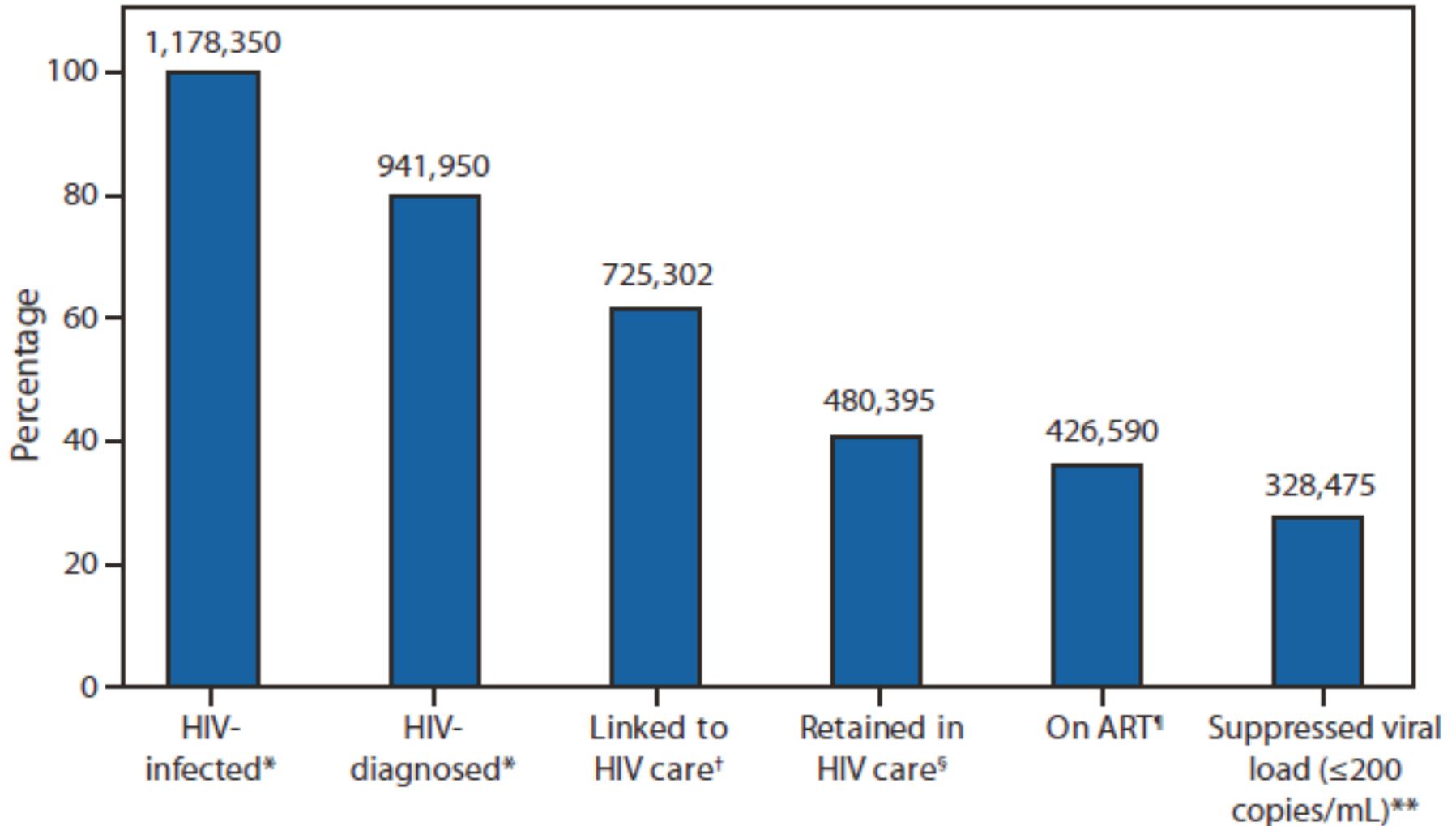
# HIV prevalence in the US 1977-2005 (diagnosed and undiagnosed)

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Campsmith ML, Rhodes PH, Hall HI, Green TA Undiagnosed HIV prevalence among adults and adolescents in the United States at the end of 2006. *J Acquir Immune Defic Syndr.* 2010;53:619-624

How many are infected, progressing to advanced disease and dying? What care and treatment services are needed?





# Thank You



Working Together to Plan, Implement, and Use  
HIV Surveillance Systems



# Key variables

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# Incorporating 1<sup>st</sup> HIV test

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- ▶ Where do positives come from?
  - ▶ PMTCT
  - ▶ VCT
  - ▶ TB