# HIV Incidence Surveillance and Estimation in the United States

**Angela Hernandez, MD, MPH**
Acting Team Supervisor, Incidence and Viral Resistance Team
HIV Incidence and Case Surveillance Branch
Division of HIV/AIDS Prevention

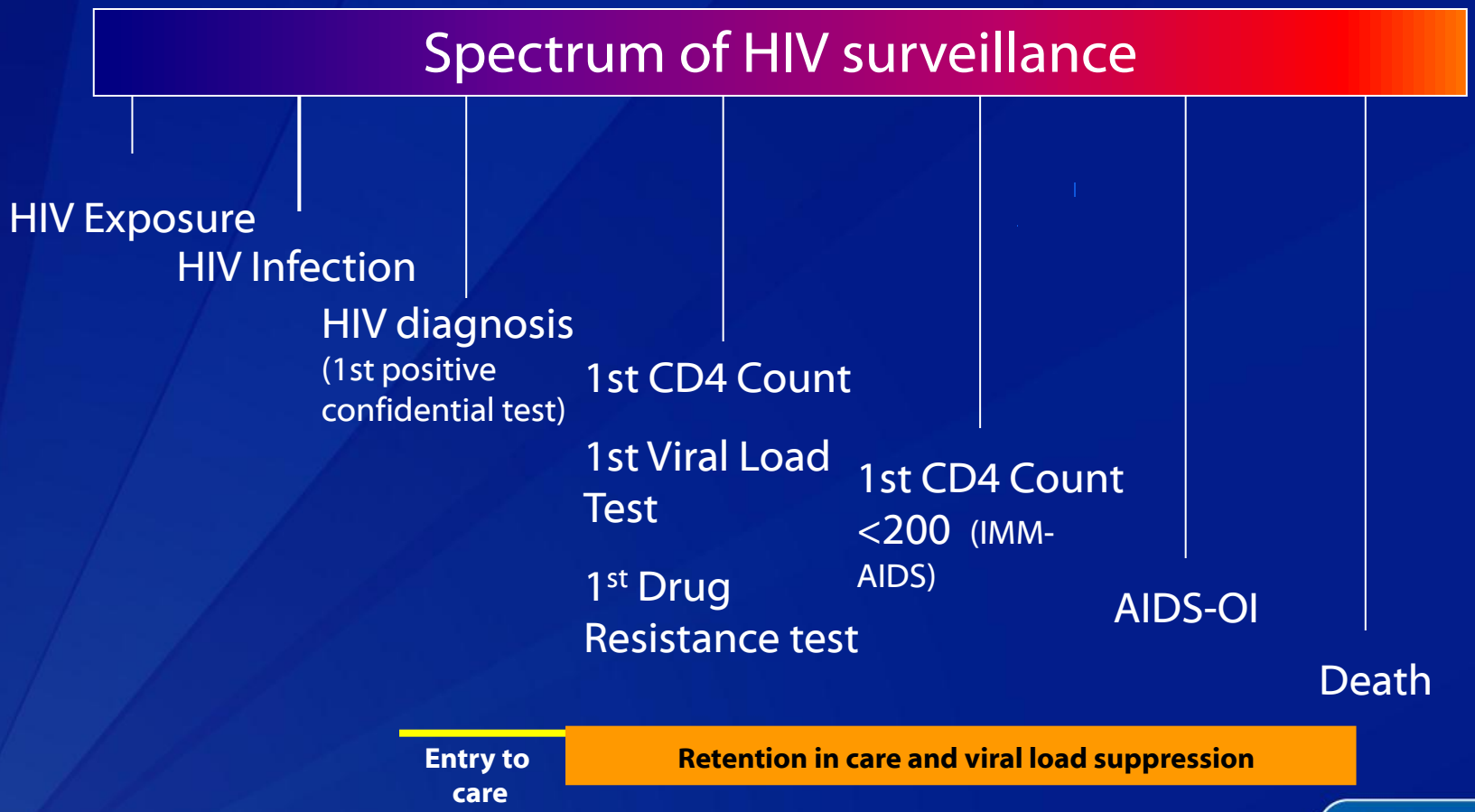
November 9, 2012

*The findings and conclusions in this presentation are those of the presenter and do not necessarily represent the views of the Centers for Disease Control and Prevention.*

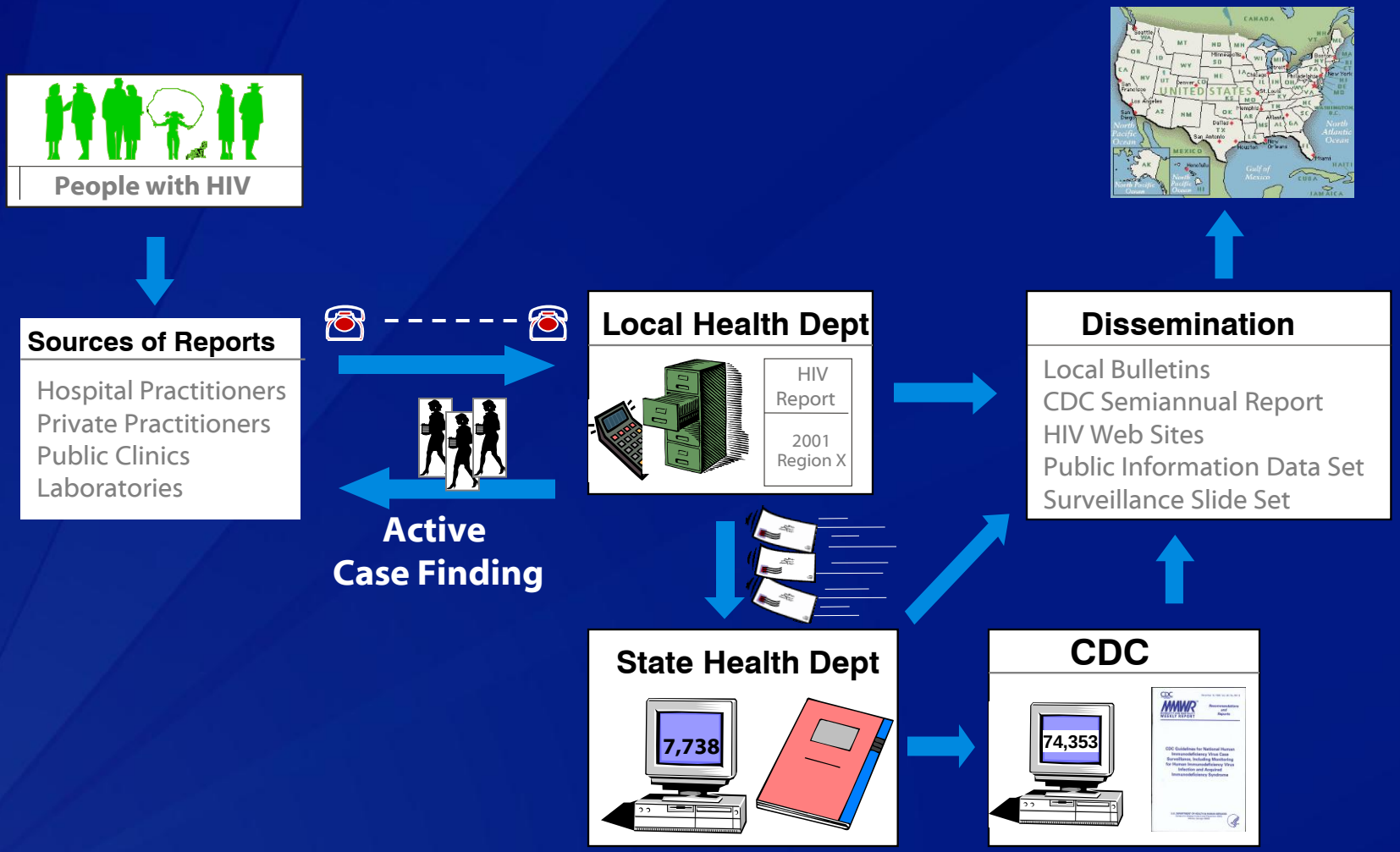
# Overview

- **United States National HIV Surveillance System**
- **Brief history of HIV incidence estimates**
- **HIV incidence surveillance activities**
- **HIV Incidence information:**
  - Testing and Treatment History (TTH)
  - STARHS specimen information and results
- **Issues and challenges**

# HIV Surveillance



# HIV Case Surveillance Information Flow



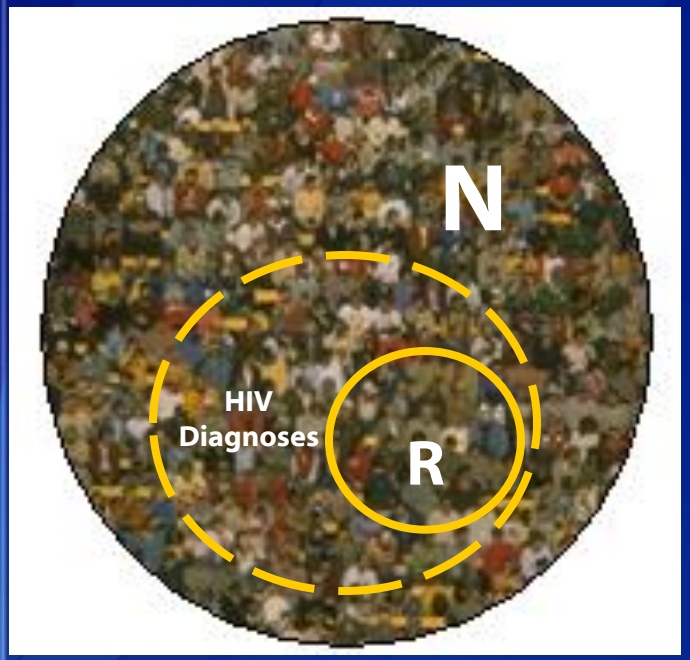
# Brief History of HIV Incidence Estimates

- CDC had estimated that HIV incidence had been stable since the early 90's at about 40,000
- 2005 the BED incorporated into HIV incidence surveillance allowing full integration with HIV case surveillance
- Hall et al., 2008 published first results from national HIV incidence surveillance using a Stratified Extrapolation Approach
- Prejean et al., 2011 published first 4-year estimates and described trends
  - Revised SEA – direct calculation of *P*

# Stratified Extrapolation Approach

- Assigns a weight to each new diagnosis deemed recent using the BED assay
- Weight is the inverse of the probability that an individual would choose to have an HIV test in his or her recency period
- The weights for each of the individuals deemed recent are added together for the total incidence
- That incidence is extrapolated to the areas that did not provide data through HIV incidence surveillance

| Target Population | Observed Sample | Probability of Being Observed | Sample Weight | Population Size |
|---|---|---|---|---|
| N | R | P | Wt = 1/P | N = R/P<br>= R*Wt |



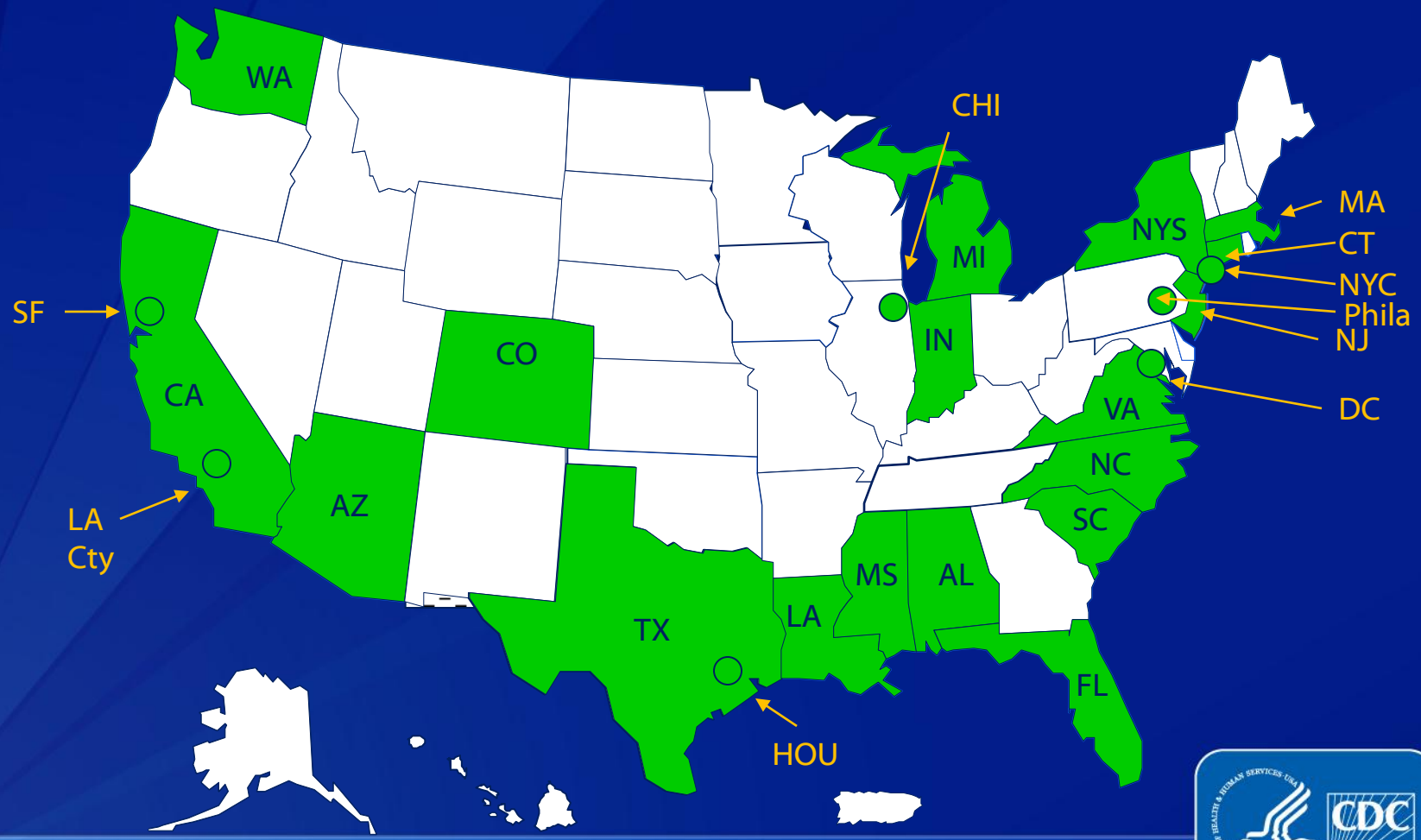

Incidence estimated by the number of BED-recent specimens divided by the probability of being classified as recent:

N = R/P
= R*Wt

The total incidence in the population is the sum of incidence estimates of all strata:

$$I = \sum_{i=1}^{r} N_i$$

# Funded National HIV Incidence Surveillance Areas



# HIS Activities

- Conduct ongoing collection of TTH on all individuals aged 13 years or older newly diagnosed with HIV infection and reported to HIV surveillance
- Conduct ongoing collection of results from tests for recent HIV infection for all individuals 13 years and older newly diagnosed with HIV, excluding those diagnosed with HIV infection, Stage 3 (AIDS)
- At least monthly, enter HIS data into the eHARS database
- Monthly, transfer HIS data electronically to CDC
- Routinely, conduct data quality control activities
- At least annually, provide training to HIV reporters and data collectors in HIV surveillance and HIS methods*
- Calculate and disseminate annual population-based HIV incidence estimates and promote the use of HIV incidence data for prevention and health services planning
- Annual systematic evaluation of HIV incidence surveillance
- Comply with Security and Confidentiality Guidelines

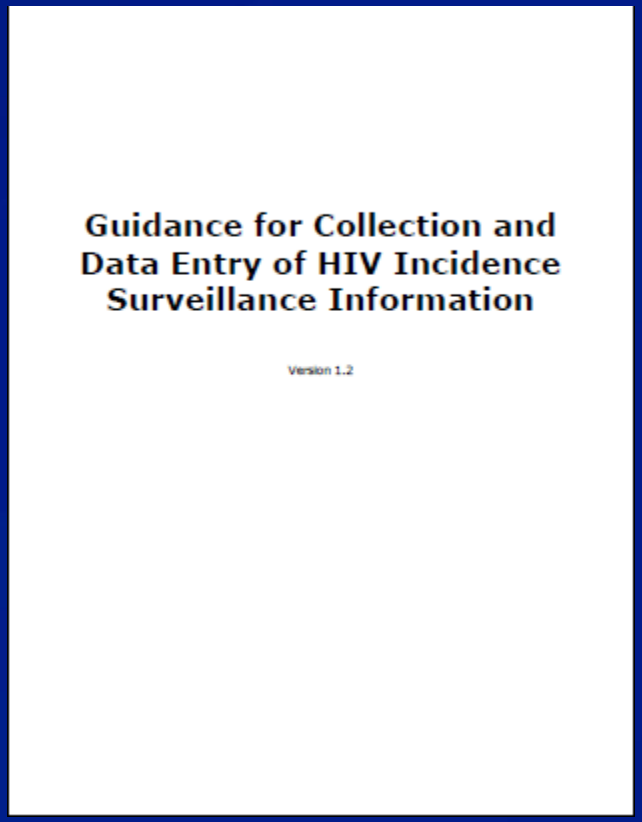
# Requirements for HIV Incidence Surveillance

- **HIV Incidence Surveillance is one part of HIV Surveillance**
- **Cases reported to surveillance should include:**
  - Adult Case Report Form
    - Demographic data
    - Risk Factor data
    - Clinical/Laboratory Information (CD4 counts, viral loads, etc.)
  - Testing History Information
    - Date of last negative HIV test
    - Date of first positive HIV test
    - Testing frequency
    - History of antiretroviral use
  - STARHS Result from the Diagnostic Specimen

# Definition of Reportable HIV Incidence Information

- **STARHS specimen information and results**

- **Testing and Treatment History Data (TTH)**
  - A standard set of HIV testing and ARV use history data elements needed for the HIV incidence estimate has been developed

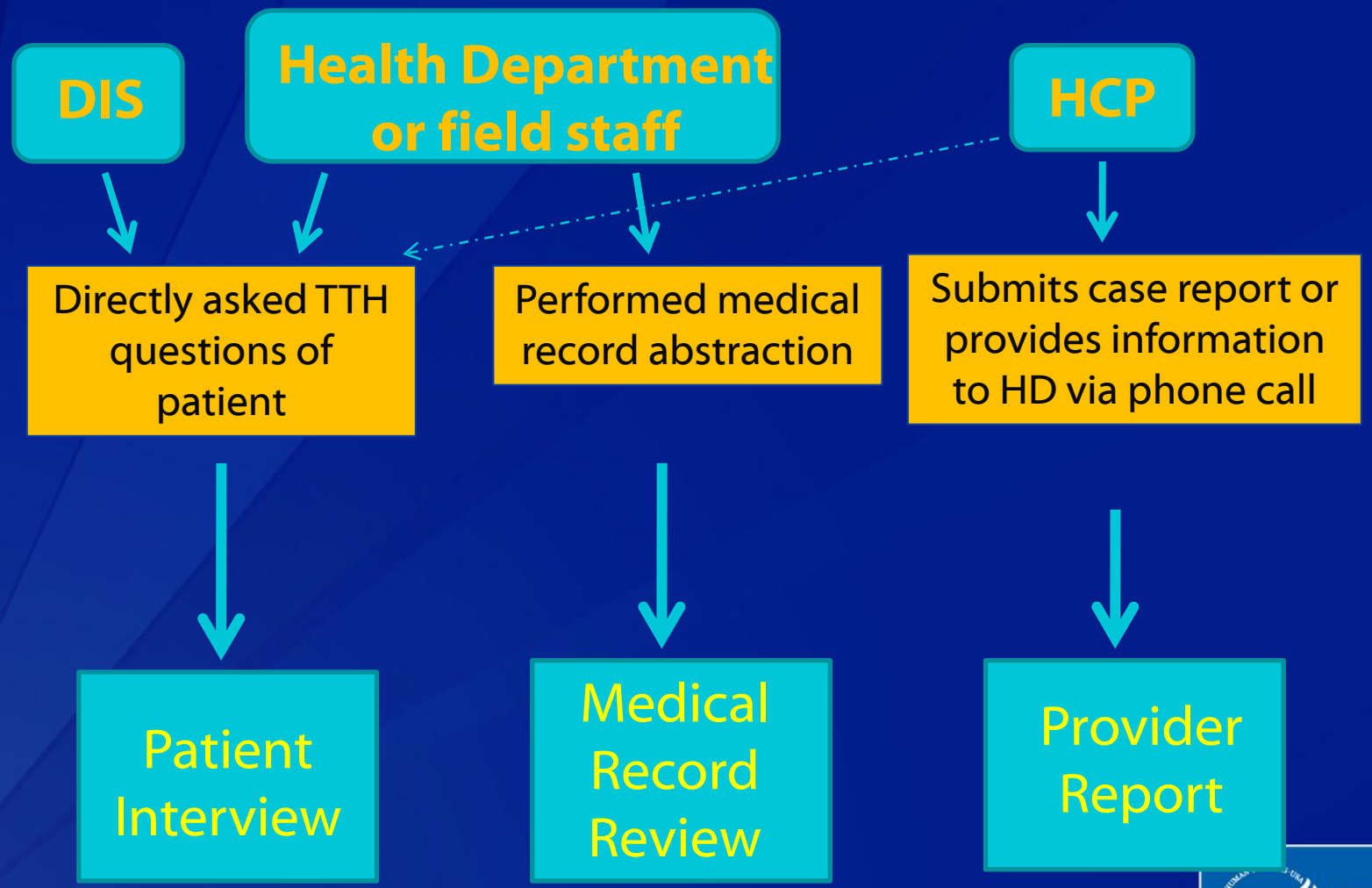

Guidance for Collection and Data Entry of HIV Incidence Surveillance Information

Version 1.2

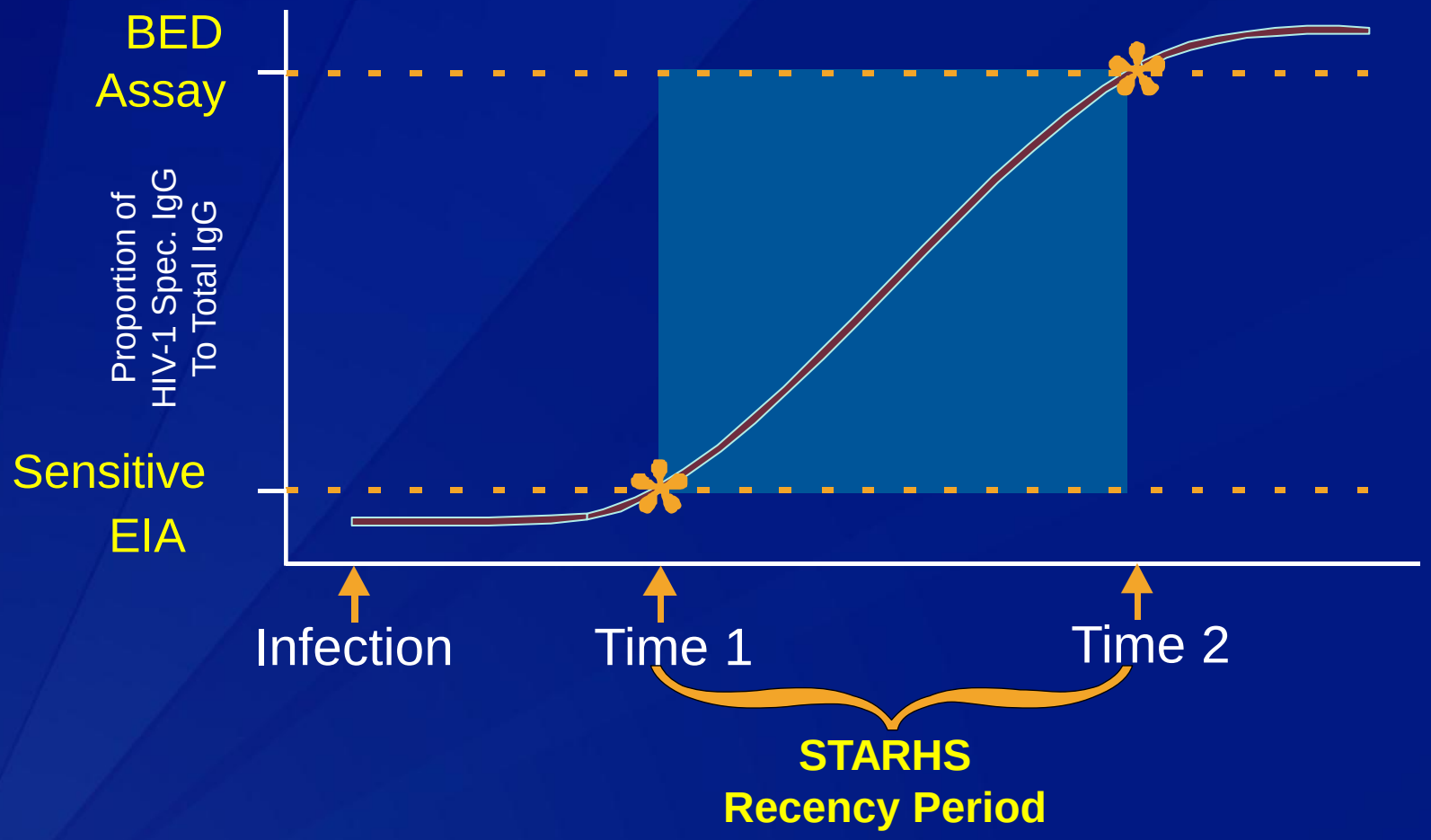
# HIV Incidence Surveillance Data

| | | |
|---|---|---|
| Prior Positive HIV Tests | Ever had a previous positive HIV test?<br>Date of previous positive HIV test? | Used to ascertain if an earlier positive test exists that was not reported to HIV surveillance.<br><br>May be used to adjust BED results |
| Prior Negative HIV Tests | Ever had a negative HIV test prior to the first positive HIV test?<br>Date of most recent negative HIV test?<br>Number of negative HIV tests in the 24 months preceding the first positive HIV test? | Classify cases into new vs. repeat testers<br><br>Determine inter-test interval (T) |
| Antiretroviral Medications (ARVs) | Ever taken ARVs?<br>Name of ARV taken?<br>Date first began ARV use?<br>Date of most recent ARV use? | Determine if the patient was taking ARVs at, or within 6 months of collection of the specimen used for BED testing which might affect the BED result<br><br>Adjust BED results |
| STARHS specimen information and result | BED recent v. Long- standing | Classify recent vs. long- standing infection |

# TTH Data Sources

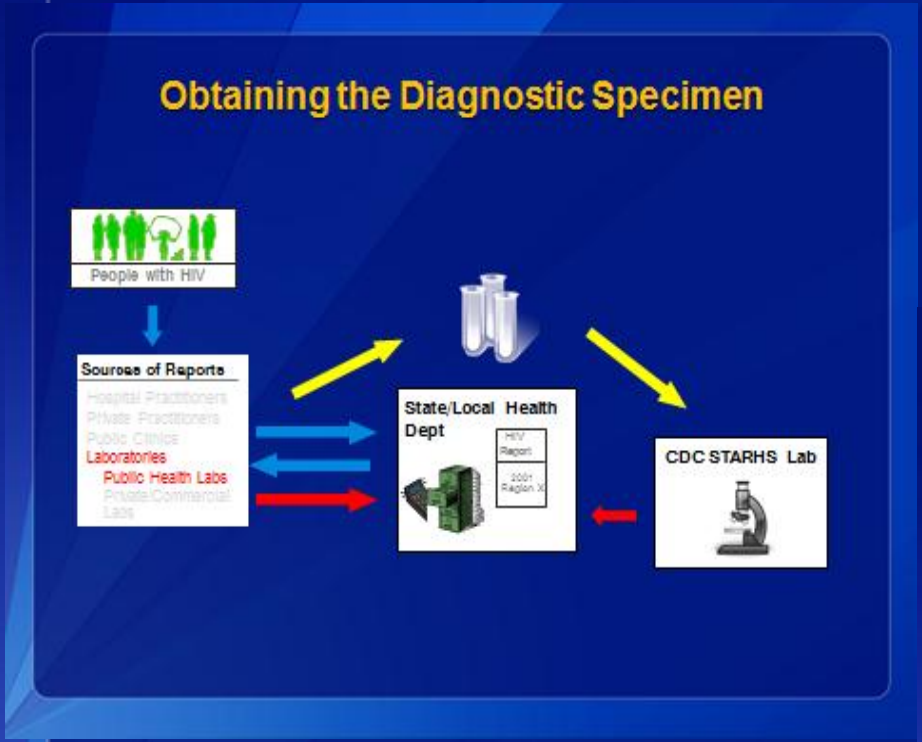


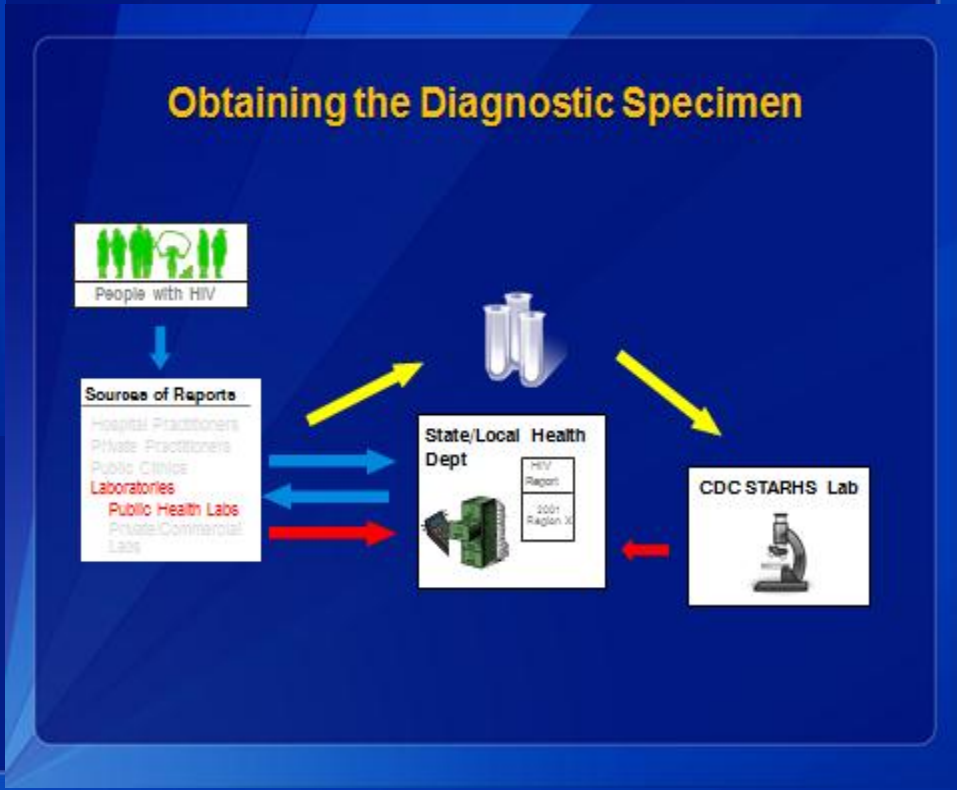
# Serologic Testing Algorithm for Recent HIV Seroconversion - STARHS




Mean Recency Period = 162 days

# STARHS Specimen Information and Result



# Issues and Challenges

- **Self-report**
- **Reporting delay or incomplete reporting**
- **Incomplete data on testing and treatment history**
- **Changes in HIV testing behavior**
- **Unavailable specimens for testing**
  - Non-blood based testing
  - Reliance on remnant specimens
  - Viral load confirmation
  - Voluntary support from laboratories
- **Change in HIV testing algorithm**

# Summary

- Success of HIV incidence surveillance in the United States depends on integration with the national case-based surveillance system
- Stratified Extrapolation Approach continually being refined
- HIV incidence estimated in the United States for 4-year periods to examine trends

# Questions?

# Thanks!


## Angela Hernandez
## 404 639 8969
## awh4@cdc.gov


**For more information please contact Centers for Disease Control and Prevention**


1600 Clifton Road NE, Atlanta, GA 30333
Telephone: 1-800-CDC-INFO (232-4636)/TTY: 1-888-232-6348
E-mail: cdcinfo@cdc.gov Web: http://www.cdc.gov