

# CORE CURRICULUM



# Why is TB of Concern?

- **One-third of the world infected with TB**
  - **8000 people/day die from TB**
  - **100,000 children will die this year from TB**
- **In US, estimated 10-15 million persons infected with M. tuberculosis**
  - **Without intervention, about 10% will develop TB disease at some point in life**

# Transmission of *M. tuberculosis*

- Spread by droplet nuclei
- Expelled when person with infectious TB coughs, sneezes, speaks, yells, or sings
- Close contacts at highest risk of becoming infected
- Transmission occurs from person with infectious TB disease (not latent TB infection)

# Probability TB Will Be Transmitted

- **Infectiousness of person with TB**
- **Environment in which exposure occurred**
- **Duration of exposure**
- **Virulence of the organism**

# What Is the Difference Between Latent TB Infection and TB Disease?

- ***latent TB infection:***
  - TB bacteria present but not active
  - Person is not sick and cannot spread disease
  - May develop disease in the future
  - Often prescribed treatment to prevent them from developing TB disease.
- ***TB disease:***
  - Person is sick from TB bacteria which are active and multiplying
  - Can infect other people
  - Are prescribed drugs that can cure TB disease.

# Pathogenesis

- **10% of infected persons with normal immune systems develop TB at some point in life**
- **HIV strongest risk factor for development of TB if infected**
  - **Risk of developing TB disease 7% to 10% each year**
- **Certain medical conditions increase risk that TB infection will progress to TB disease**

# Risk Factors for TB include:

## Risk of Exposure

- Spending time with someone with active TB
- HCW
- Being foreign born or spending significant amount of time in country with high incidence of TB
- Congregate settings: Jails/prisons, homeless shelters, migrations camps, nursing homes

## Risk of Progression to Disease

- Reduction in Immune System: Age, Medication, HIV, Diabetes, RA, other medical conditions
- Alcohol, drug use
- Overall health status: malnutrition, access to health care, etc.

# Common Sites of TB Disease

- Lungs
- Pleura
- Central nervous system
- Lymphatic system
- Genitourinary systems
- Bones and joints
- Disseminated (miliary TB)

# How is TB Treated?

## For Latent TB Infection

- Approximately 6-9 months of INH

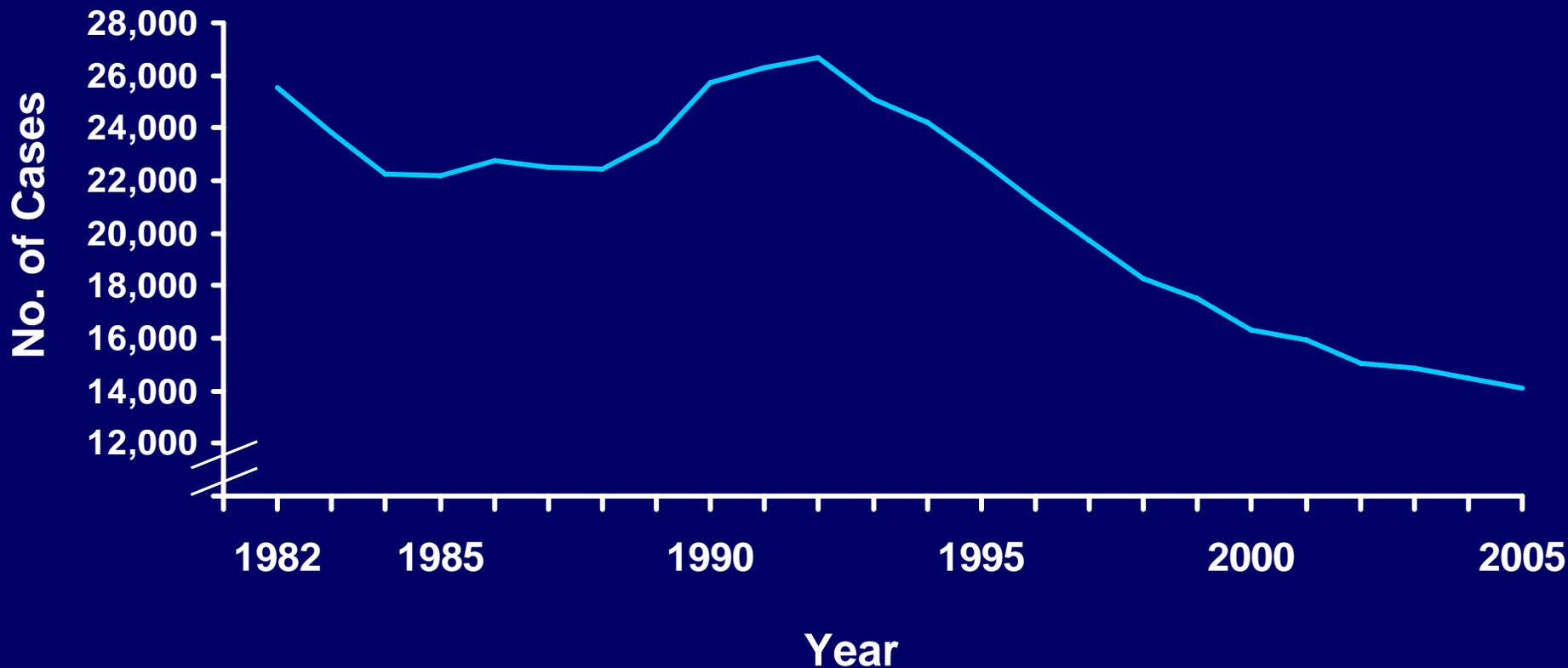
## For Active TB Disease

- Between 9 months and 2 yrs of a multi-drug regiment
- Longer course for MDR TB
- DOT is the standard of care

# Drug-Resistant TB

- Drug-resistant TB transmitted same way as drug-susceptible TB
- Drug resistance is divided into two types:
  - Primary resistance develops in persons initially infected with resistant organisms
  - Secondary resistance (acquired resistance) develops during TB therapy
- XDR TB reported in 2% of cases worldwide

# Reported TB Cases\* United States, 1982–2005



\*Updated as of March 29, 2006

# **Factors Contributing to the Increase in TB Morbidity: 1985-1992**

- **Deterioration of the TB public health infrastructure**
- **HIV/AIDS epidemic**
- **Immigration from countries where TB is common**
- **Transmission of TB in congregate settings**

# Factors Contributing to the Decrease in TB Morbidity Since 1993

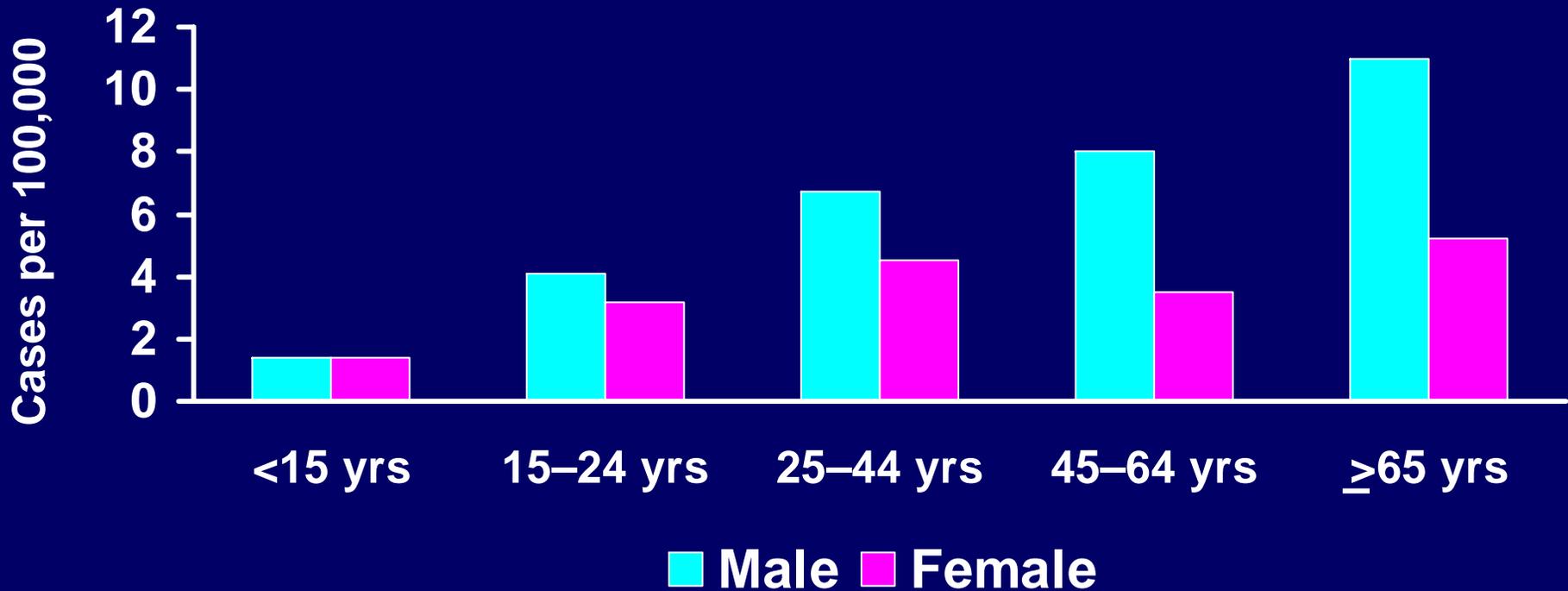
- Increased efforts to strengthen TB control programs that:

**Promptly identify persons with TB**

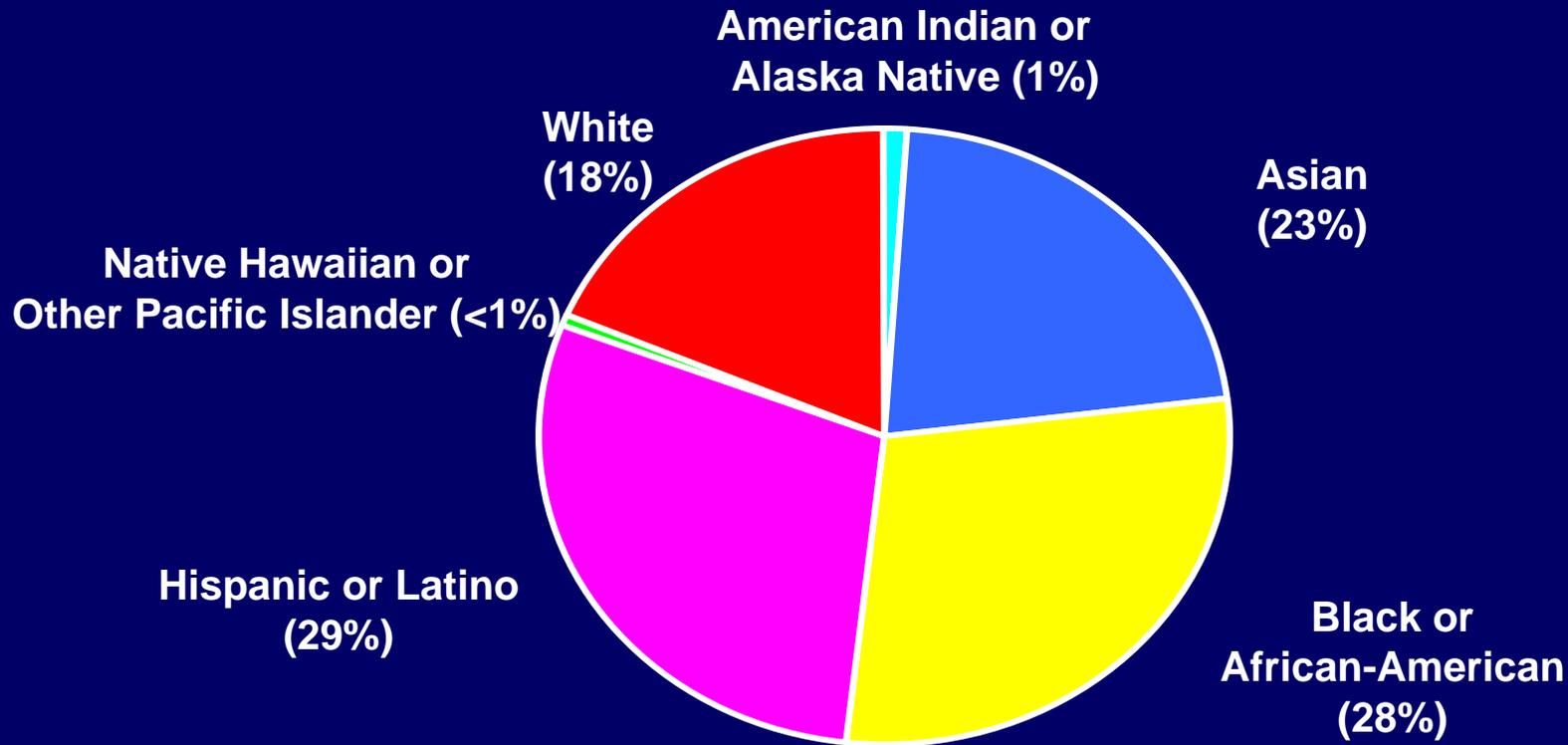
**Initiate appropriate treatment**

**Ensure completion of therapy**

# TB Case Rates by Age Group and Sex, United States, 2005

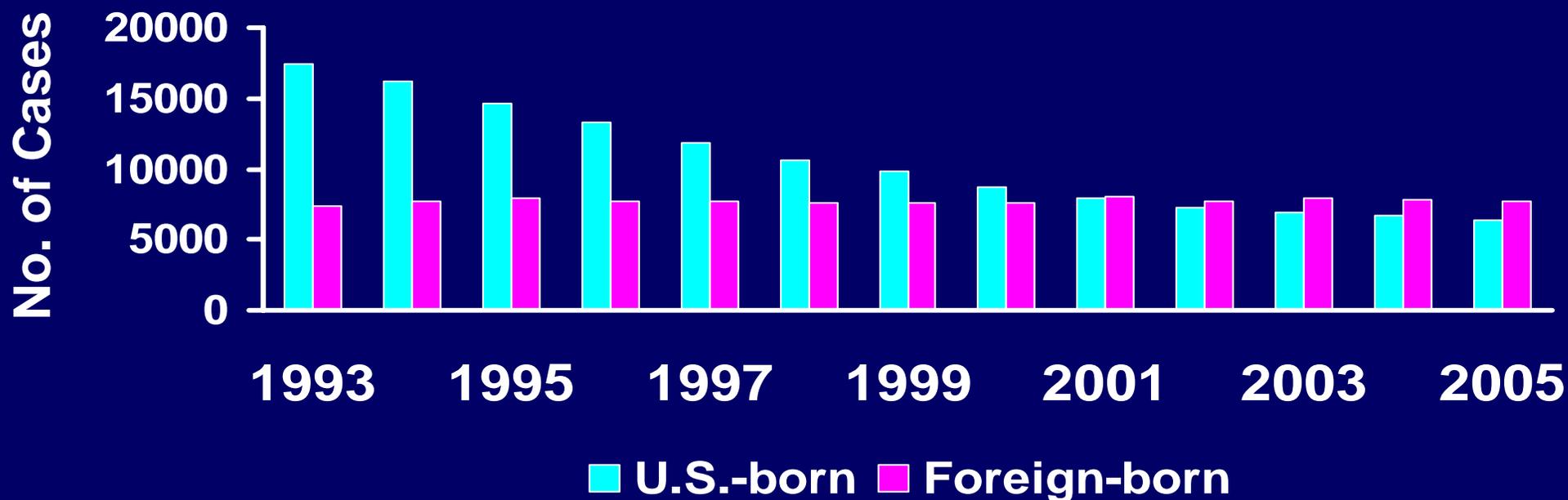


# Reported TB Cases by Race/Ethnicity\* United States, 2005



\*All races are non-Hispanic. Persons reporting two or more races accounted for less than 1% of all cases.

# Number of TB Cases in U.S.-born vs. Foreign-born Persons United States, 1993–2005\*

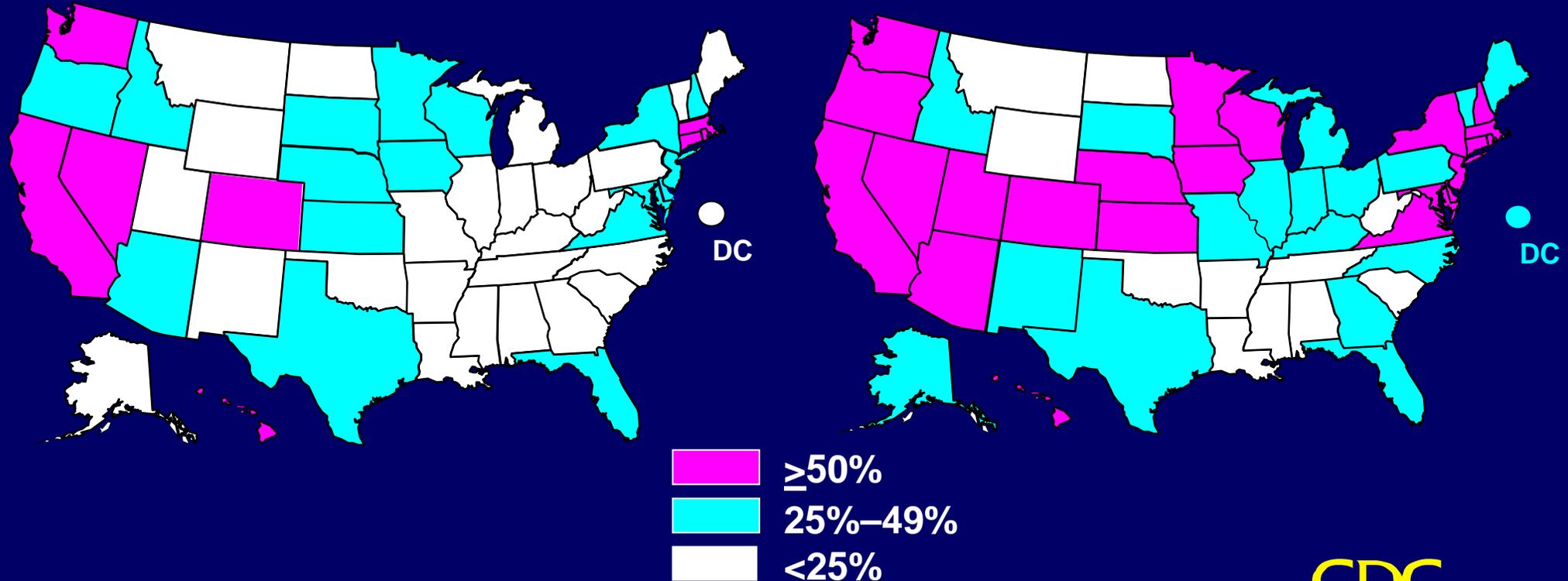


\*Updated as of March 29, 2006.

# Percentage of TB Cases Among Foreign-born Persons, United States\*

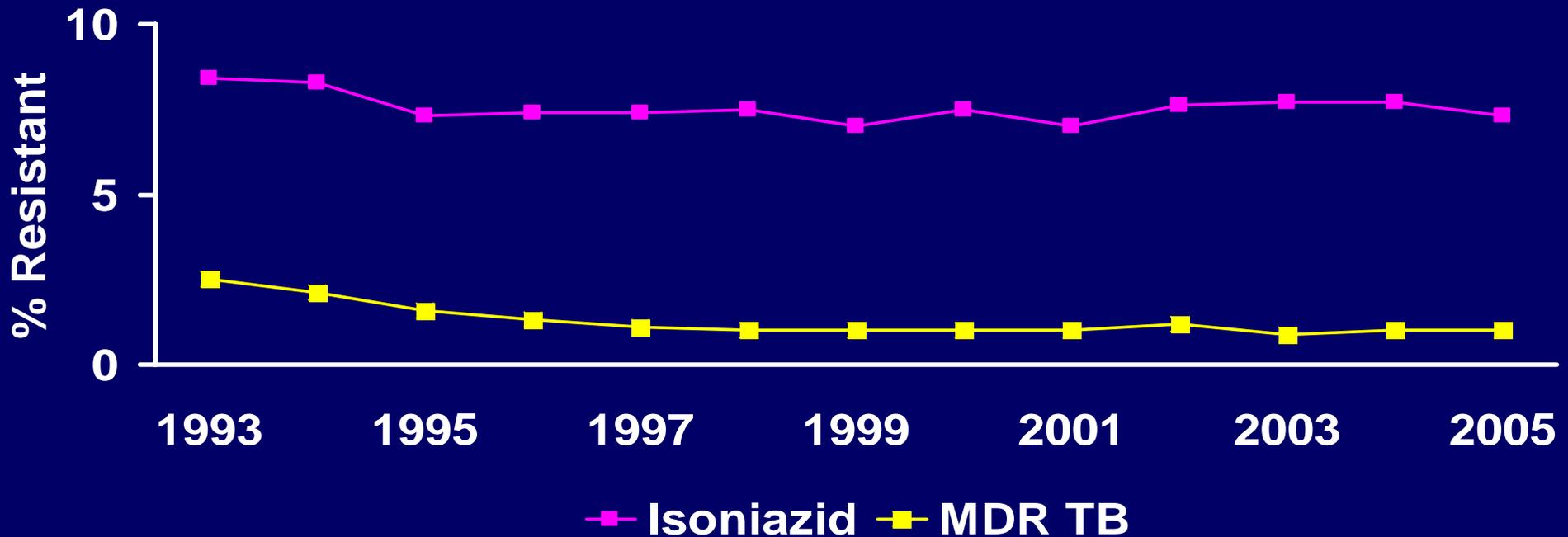
1995

2005



\*Updated as of March 29, 2006.

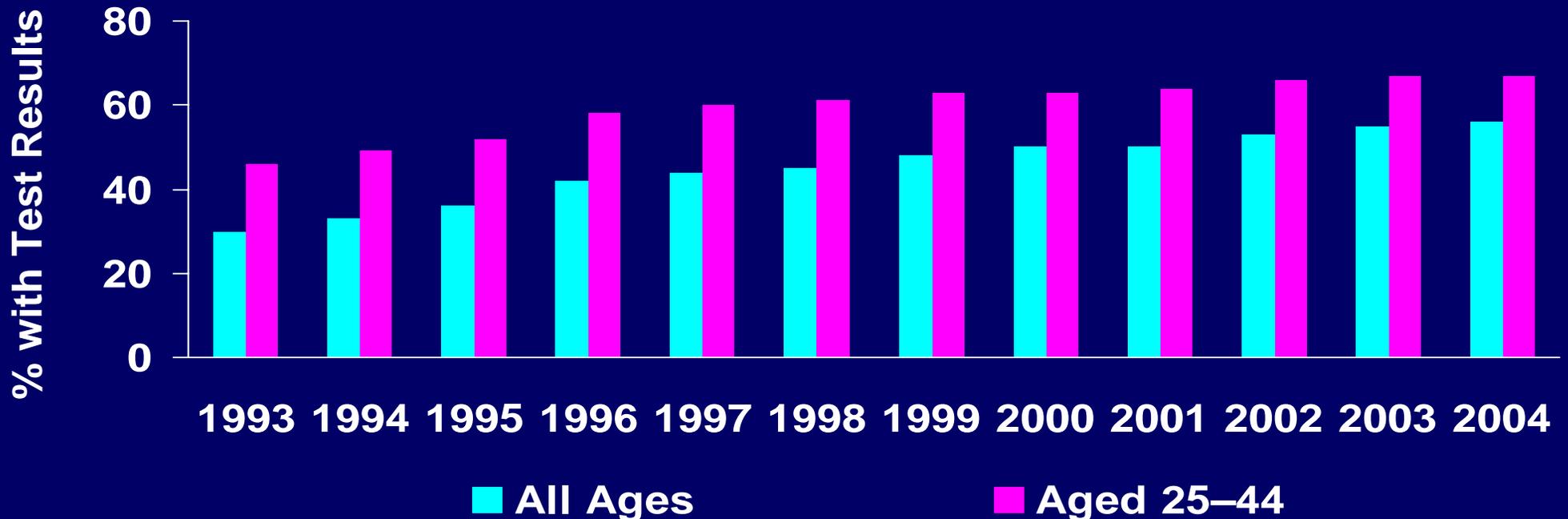
# Primary Anti-TB Drug Resistance United States, 1993–2005\*



\*Updated as of March 29, 2006.

Note: Based on initial isolates from persons with no prior history of TB.  
MDR TB defined as resistance to at least isoniazid and rifampin.

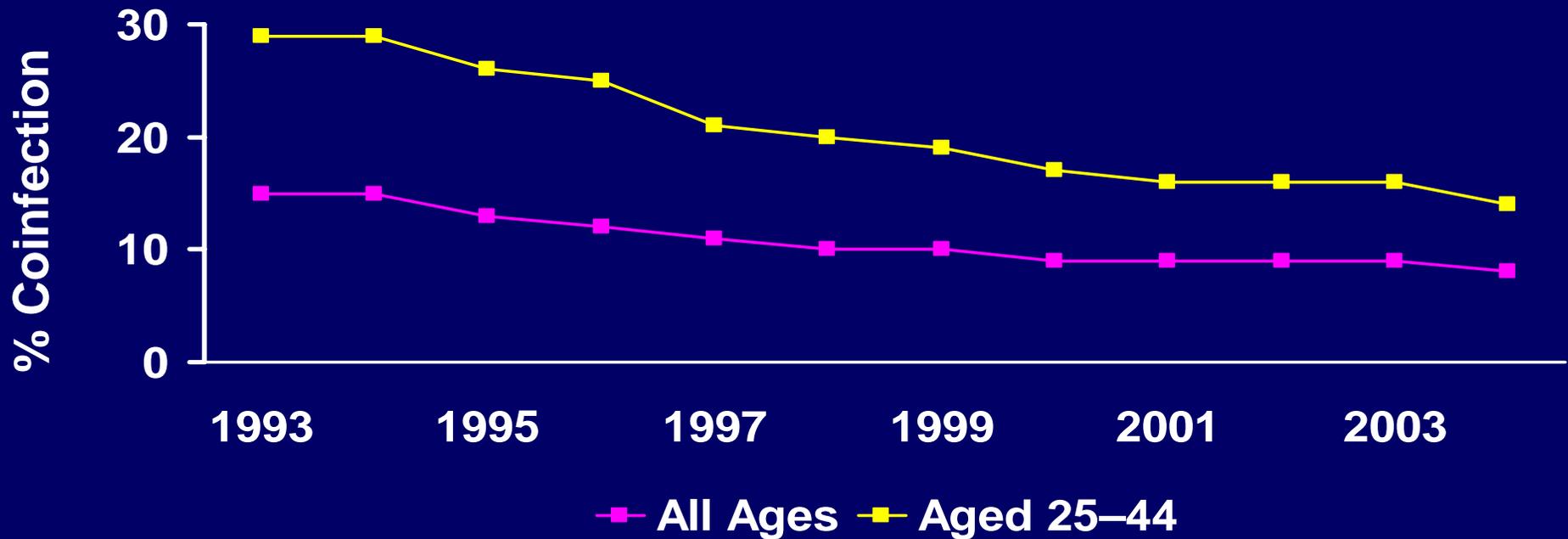
# Reporting of HIV Test Results in Persons with TB by Age Group United States, 1993–2004\*



\*Updated as of March 29, 2006.

Note: Includes TB patients with positive, negative, or indeterminate HIV test results and persons from California reported with AIDS.  
(HIV test results are not reported from California)

# Estimated HIV Coinfection in Persons Reported with TB, United States, 1993–2004\*



\*Updated as of March 29, 2006.

Note: Minimum estimates based on reported HIV-positive status among all TB cases in the age group.

# Purpose of Targeted Testing

- Find persons with LTBI who would benefit from treatment
- Find persons with TB disease who would benefit from treatment
- Groups that are not high risk for TB should not be tested routinely

# Groups That Should Be Tested for LTBI

## Persons at higher risk for exposure to or infection with TB

- **Close contacts of a person known or suspected to have TB**
- **Foreign-born persons from areas where TB is common**
- **Residents and employees of high-risk congregate settings**
- **Health care workers (HCWs) who serve high-risk clients**

## **Groups That Should Be Tested for LTBI (cont.)**

### **Persons at higher risk for exposure to or infection with TB**

- **Medically underserved, low-income populations**
- **High-risk racial or ethnic minority populations**
- **Children exposed to adults in high-risk categories**
- **Persons who inject illicit drugs**

# Groups That Should Be Tested for LTBI (Cont.)

## Persons at higher risk for TB disease once infected

- Persons with HIV infection
- Persons recently infected with *M. tuberculosis*
- Persons with certain medical conditions
- Persons who inject illicit drugs
- Persons with a history of inadequately treated TB

# Evaluation for TB

- **Medical history**
- **Physical examination**
- **Mantoux tuberculin skin test/  
Interferon testing**
- **Chest radiograph**
- **Bacteriologic or histologic exam**

# Systemic Symptoms of TB

- **Fever**
- **Chills**
- **Night sweats**
- **Appetite loss**
- **Weight loss**
- **Easy fatigability**

# Symptoms of Pulmonary TB

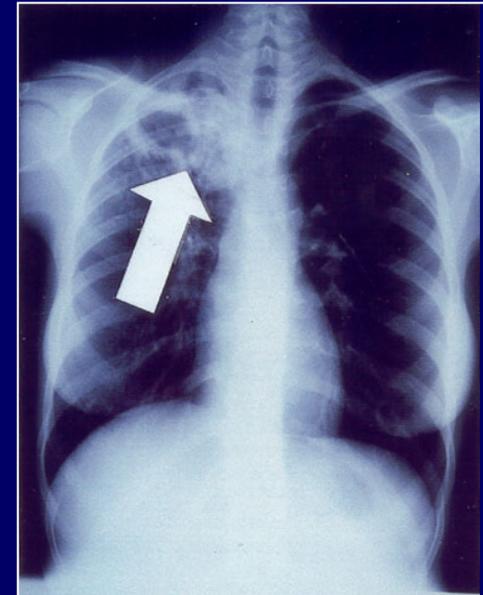
- **Productive, prolonged cough (duration of >3 weeks)**
- **Chest pain**
- **Hemoptysis**

# Mantoux Tuberculin Skin Test

- Preferred method of testing for TB infection in adults and children
- Tuberculin skin testing useful for
  - Examining person who is not ill but may be infected
  - Determining how many people in group are infected
  - Examining person who has symptoms of TB

# Chest Radiograph

- **Abnormalities often seen in apical or posterior segments of upper lobe or superior segments of lower lobe**
- **May have unusual appearance in HIV-positive persons**
- **Cannot confirm diagnosis of TB**



Arrow points to cavity in patient's right upper lobe.

# Specimen Collection

- **Obtain 3 sputum specimens for smear examination and culture**
- **Persons unable to cough up sputum, induce sputum, bronchoscopy or gastric aspiration**
- **Follow infection control precautions during specimen collection**

# Smear Examination

- **Strongly consider TB in patients with smears containing acid-fast bacilli (AFB)**
- **Results should be available within 24 hours of specimen collection**
- **Presumptive diagnosis of TB**

# Cultures

- Use to confirm diagnosis of TB
- Culture all specimens, even if smear negative
- Results in 4 to 14 days when liquid medium systems used



Colonies of *M. tuberculosis* growing on media

# Drug Susceptibility Testing

- Drug susceptibility testing on initial *M. tuberculosis* isolate
- Repeat for patients who
  - Do not respond to therapy
  - Have positive cultures despite 2 months of therapy
- Promptly forward results to the health department

# Persons at Increased Risk for Drug Resistance

- History of treatment with TB drugs
- Contacts of persons with drug-resistant TB
- Foreign-born persons from high prevalent drug resistant areas
- Smears or cultures remain positive despite 2 months of TB treatment
- Received inadequate treatment regimens for >2 weeks

# Basic Principles of Treatment

- Provide safest, most effective therapy in shortest time
- Multiple drugs to which the organisms are susceptible
- Never add single drug to failing regimen
- Ensure adherence to therapy

# Adherence

- **Nonadherence is a major problem in TB control**
- **Use case management and directly observed therapy (DOT) to ensure patients complete treatment**

# Directly Observed Therapy (DOT)

- Health care worker watches patient swallow each dose of medication
- Consider DOT for all patients
- DOT should be used with all intermittent regimens
- DOT can lead to reductions in relapse and acquired drug resistance
- Use DOT with other measures to promote adherence

# Treatment of TB in HIV-Positive Persons

- Management of HIV-related TB is complex
- Care for HIV-related TB should be provided by or in consultation with experts in management of both HIV and TB

# Monitoring for Adverse Reactions

- **Baseline measurements**
- **Monitor patients at least monthly**
- **Monitoring for adverse reactions must be individualized**
- **Instruct patients to immediately report adverse reactions**

# Infection Control Measures

- **Administrative controls** to reduce risk of exposure
- **Engineering controls** to prevent spread and reduce concentration of droplet nuclei
- **Personal respiratory protection** in areas where increased risk of exposure

# Preventing and Controlling TB

## Three priority strategies:

- Identify and treat all persons with TB disease
- Identify contacts to persons with infectious TB; evaluate and offer therapy
- Test high-risk groups for LTBI; offer therapy as appropriate

# TB and HIV

- Each disease speeds up the progress of the other
  - HIV affects the immune system and increases likelihood acquiring new TB infection (AIDS defining illness)
  - HIV increases progression from LTBI to active disease
  - TB is harder to diagnose in HIV-positive people
  - TB progresses faster in HIV-positive people

# TB and HIV

- **TB bacteria accelerates the progress of AIDS in a patient**
  - **TB substantially impacts the morality of people of HIV/AIDS**
  - **TB occurs earlier in the course of HIV infection than many other OIs**

# TB and HIV

- **Take home message**
  - **Persons with HIV should be tested for TB**
  - **Persons with TB should be tested for HIV**
- **Therefore, need collaboration between programs**

# Some questions to be answered

- What strategies or models for collaboration lead to better patient outcomes for TB/hepatitis/HIV?
- Using an HIV case model, what type of comparison can be made on the following:
  - an increase in the number of those who know their TB/hepatitis status
  - the number who receive appropriate treatment?

# Some questions to be answered

- **What mix of TB/hepatitis/other services are most effective with HIV services in different communities and what are the difficulties encountered in providing such a mix?**
- **What can be applied from HIV practices to TB/hepatitis with regard to incorporating screening and care into jail settings?**
- **How can TB/hepatitis be integrated into HIV provider and community planning group activities? What about substance abuse provider activities?**

# Some questions to be answered

- How can systems of care be increased for patients with multiple health issues, such as co-morbid conditions?