Tuberculosis: The Epidemiology, Diagnosis and Prevention

Assisted Living Residence Advisory Committee Meeting

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Tuberculosis Epidemiology

~ 2 billion people are infected –

A Third of the World!

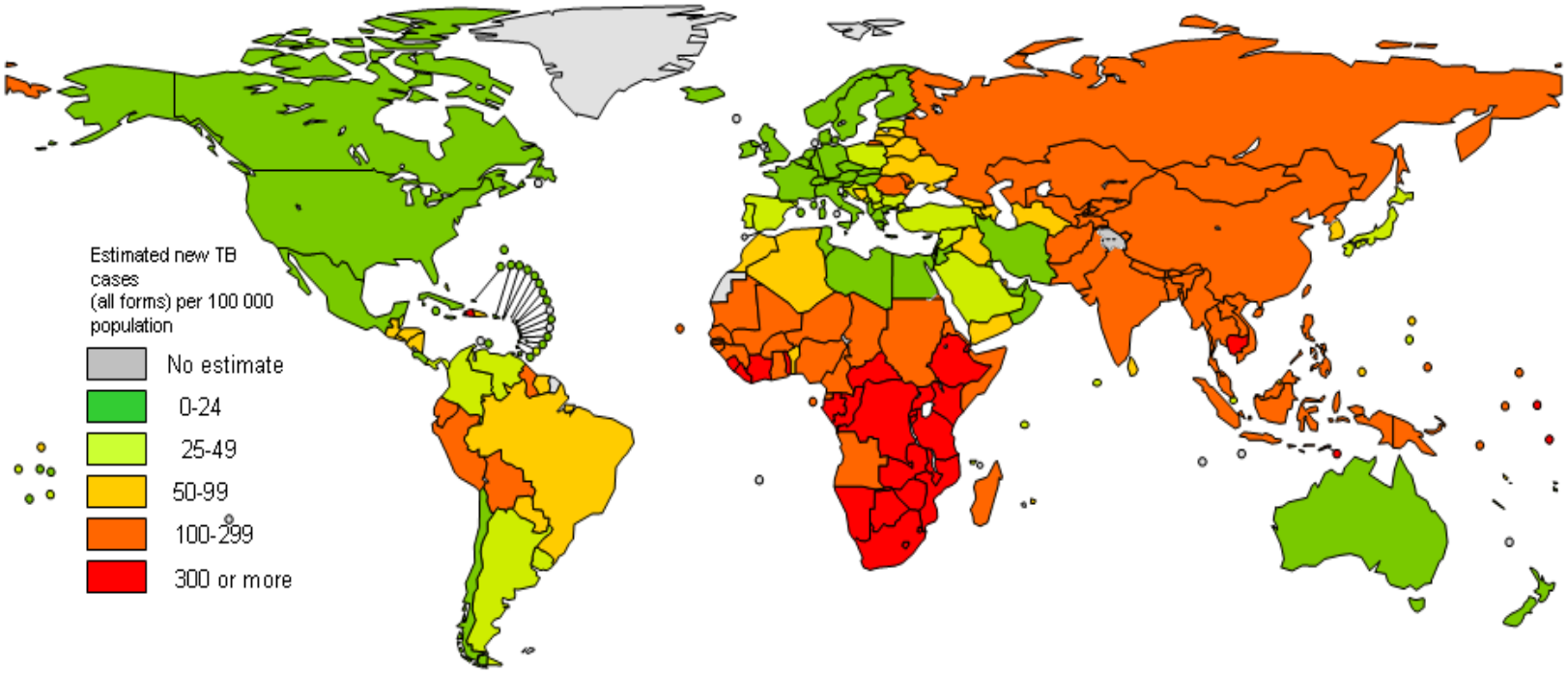
10% will develop active TB in their lifetime

→ 10 million new active TB / yr

→ 2 million deaths / yr

World Health Organization

Estimated TB incidence rate, 2005



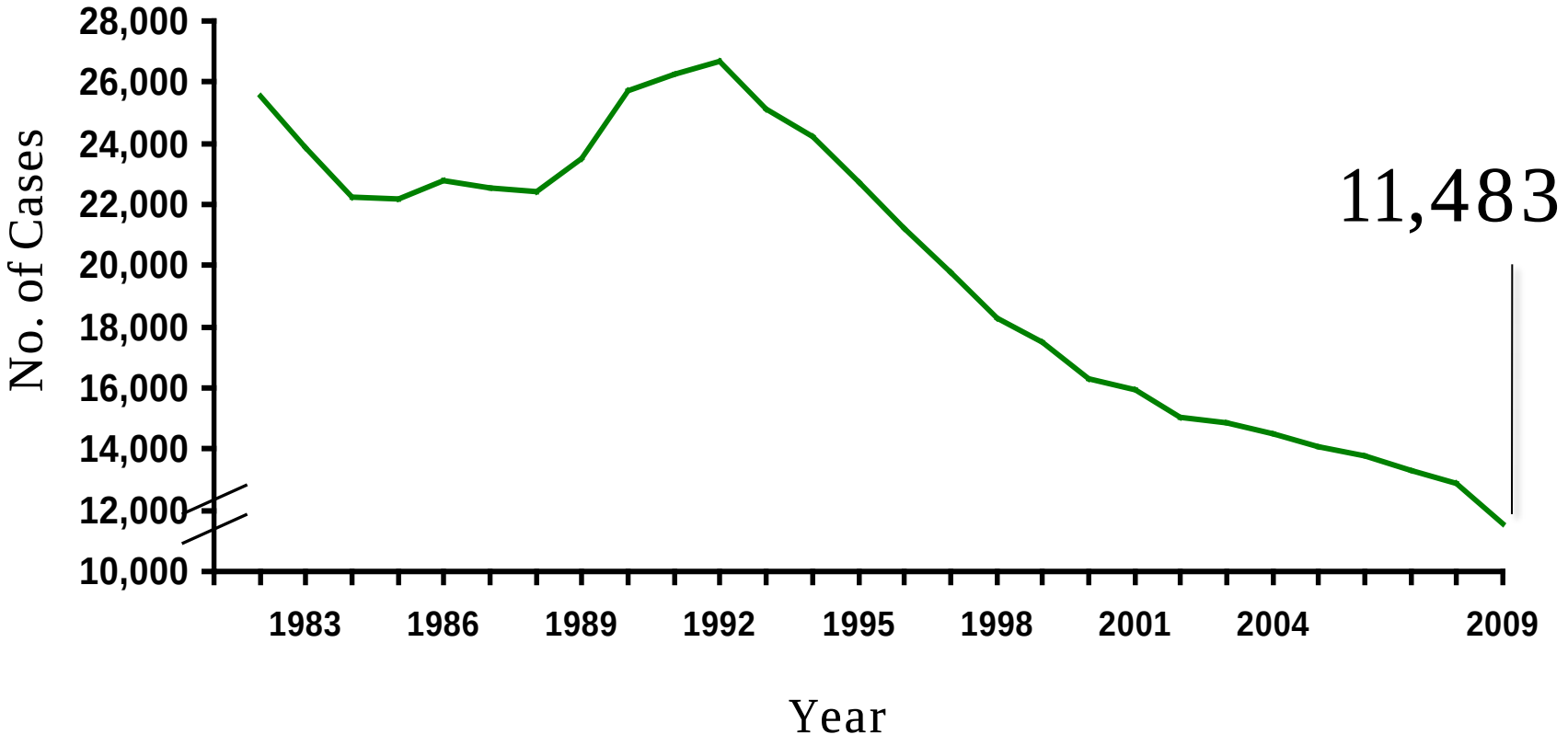
WHO 2006

WHO Global Surveillance Report, 2008

- 10.2 million new cases
- 14.4 million prevalent cases
- 1.5 million deaths
- 500,00 cases of MDR TB

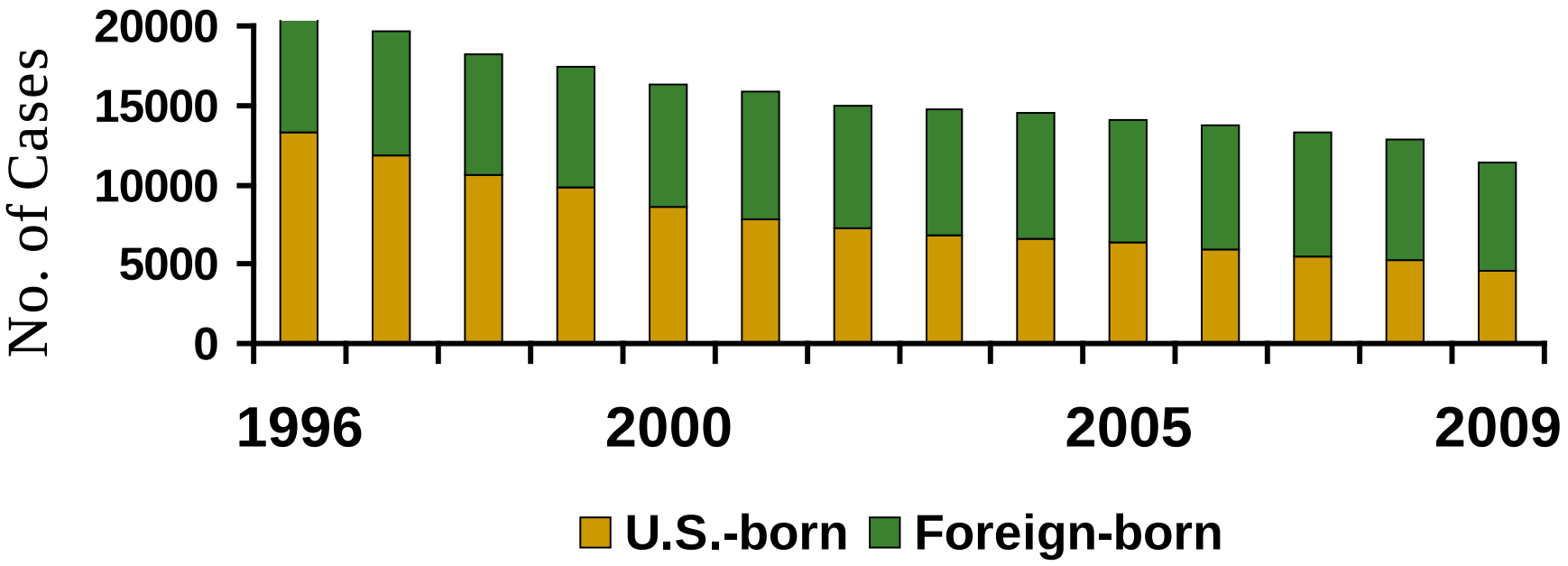
www.who.int/tb

Reported TB Cases United States, 1982–2009



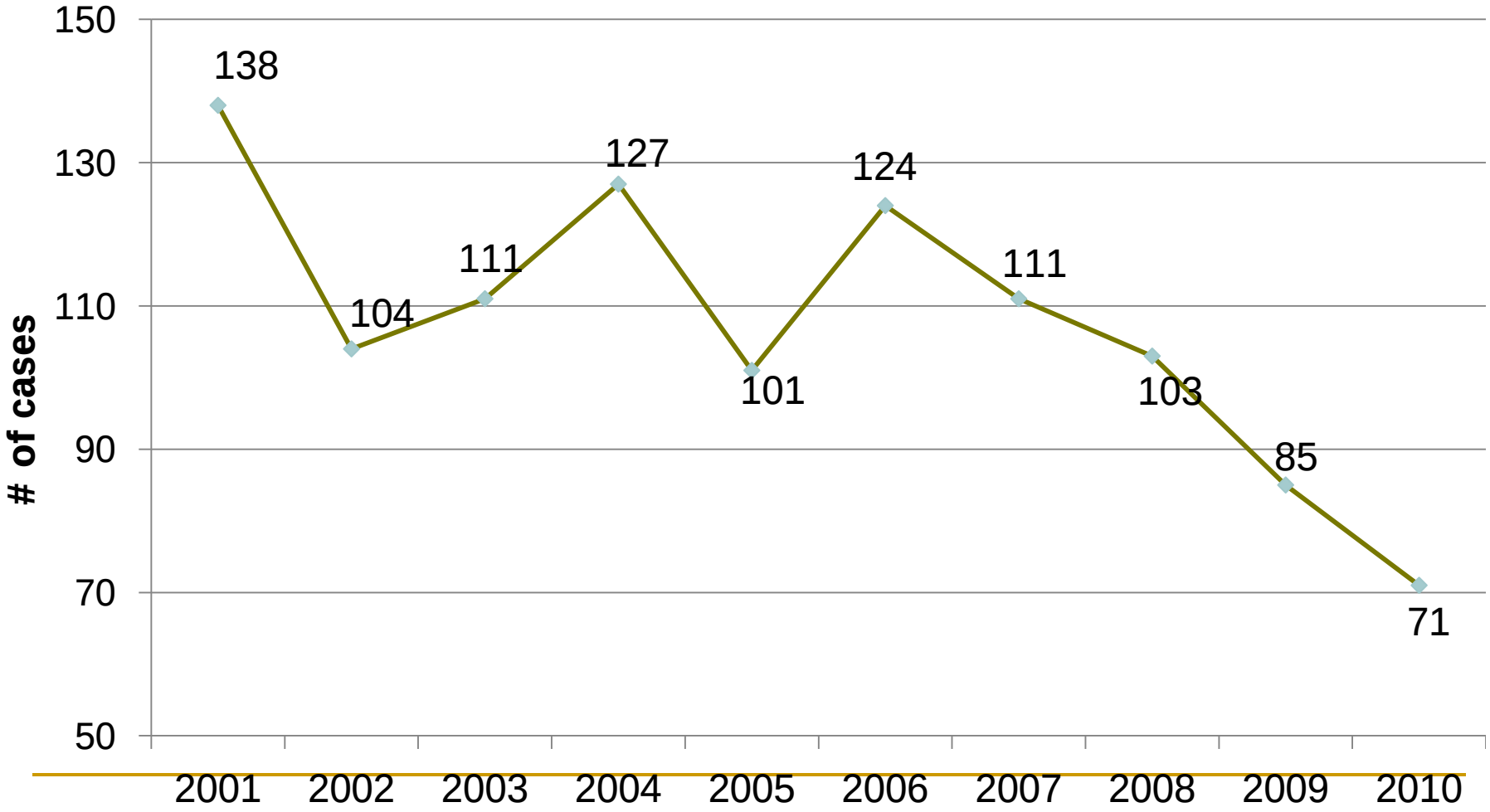
CDC Report of Tuberculosis in the United States, 2009.

Number of TB Cases in U.S. vs Foreign-born Persons United States, 1996–2009

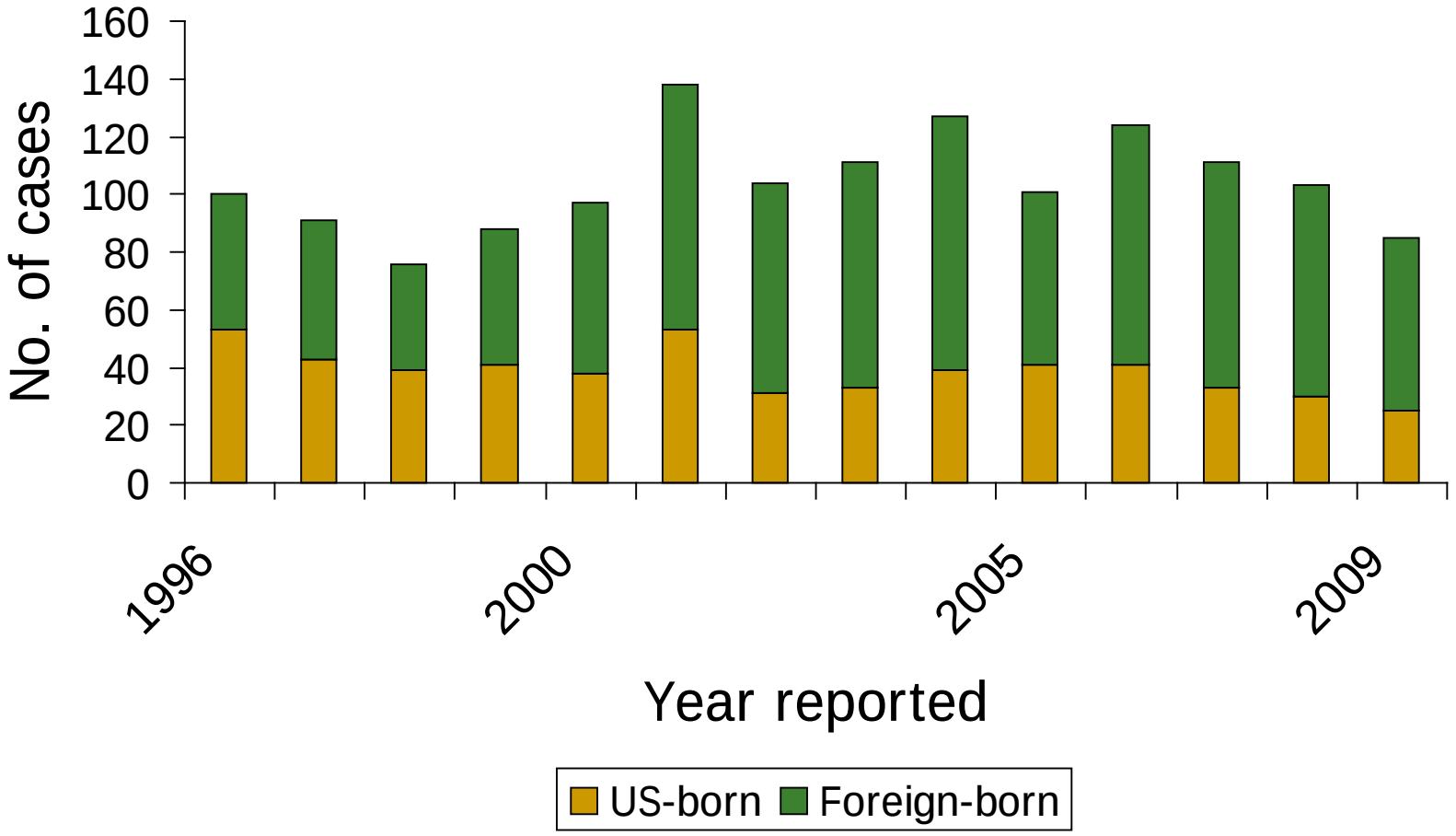


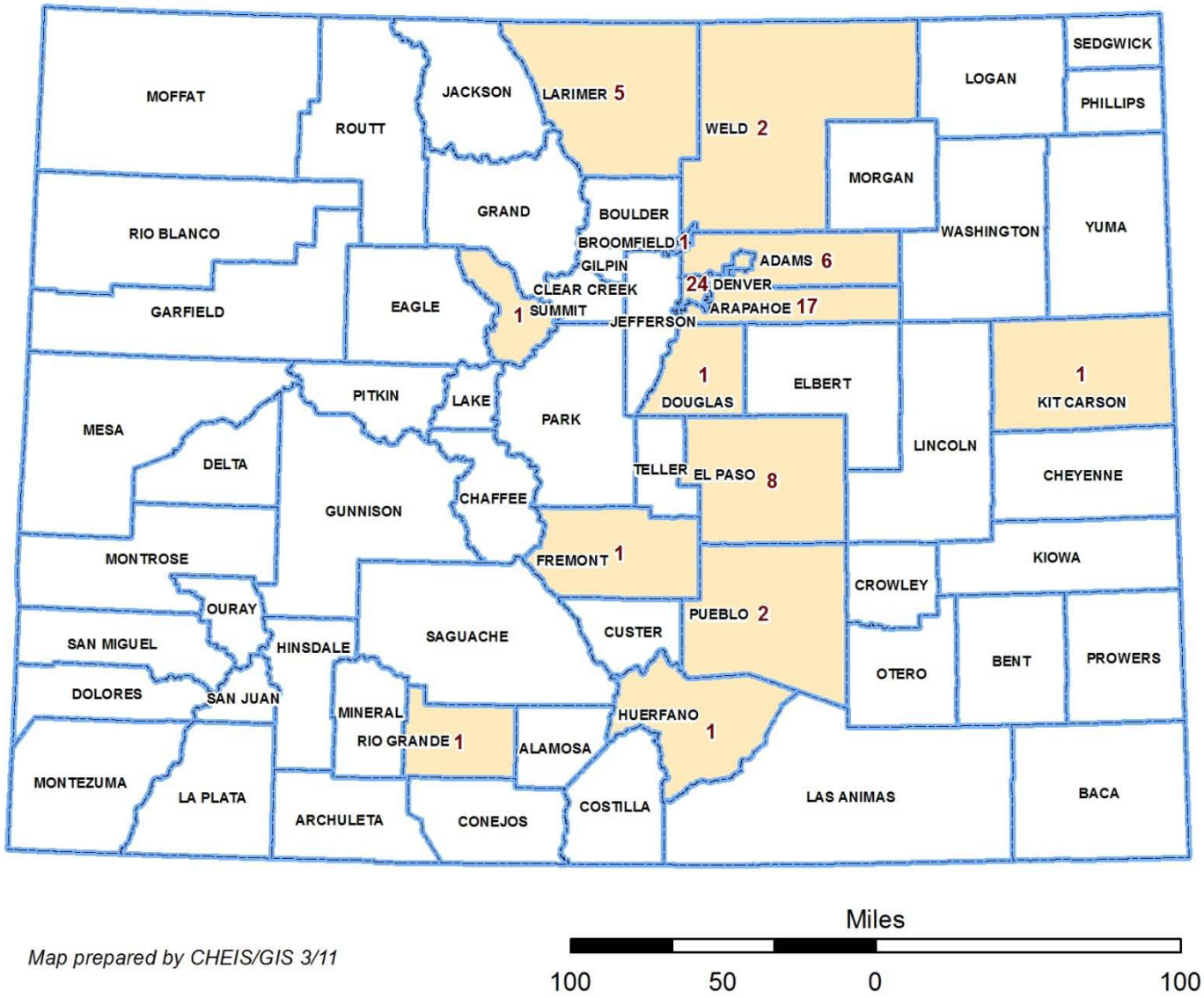
TB in Colorado: 2001-2010

Cases of Active TB by Year of Report



Colorado TB Cases US-born and Foreign-Born (1996-2009)





State of Colorado

2010 Tuberculosis Cases by County

Explanation:
Shaded areas indicate counties reporting Tuberculosis cases in 2010.

The total number of cases is indicated as a red number.

Map prepared by CHEIS/GIS 3/11

Colorado Department of Public Health and Environment

TB history

- Leading cause of death in the U.S. during the nineteenth and early twentieth centuries
- Until Robert Koch's discovery of the TB bacteria in 1882, many scientists believed that TB was hereditary and could not be prevented
- Koch’s discovery brought hopes for a cure but also bred fear of contagion
- A person with TB was frequently labeled an outcast

What is TB?

- TB is a communicable disease caused by the bacteria Mycobacterium tuberculosis (MTB)
- It is spread person to person by breathing in infectious particles
- These particles are produced when a person with infectious TB coughs, sneezes, speaks, or sings

Transmission & pathogenesis

- Spread by droplet nuclei
- Close contacts at highest risk of becoming infected
- Once infected, 5% will develop TB disease within a year or two and another 5% will develop disease later in life

Risk Factors for Infection

1. Persons born or lived where TB is common

   Central and South America, Africa, Eastern Europe, Asia and the Pacific Islands

2. Close Contacts to persons with active TB
3. Elderly U.S. born (>70)

LTBI vs. pulmonary TB disease

- Latent TB Infection
  - Tuberculin skin test (TST) positive
  - Negative chest radiograph
  - No symptoms or physical findings suggestive of TB disease
- Pulmonary TB Disease
  - TST usually positive
  - Chest radiograph may be abnormal
  - Symptomatic
  - Respiratory specimens may be smear or culture positive

Inactive (Latent)TB Infection

- LTBI- asymptomatic state in people infected with *MTB*
- Live, inactive TB organisms are “walled off” inside the body by the immune system
- Person with LTBI doesn’t feel sick & is not contagious, but they may have abnormal CXR
- TB can reactivate & begin to multiply at anytime after the initial infection (this may occur decades later)

Latent TB Infection (LTBI)

- For adults with untreated LTBI & intact immunity the estimated risk of developing active TB is 5% - 10% over a lifetime

  (50% of those in 1st 2 yrs after infection)

- With HIV co-infection risk is 5%-10% per year

- Infants under a year have a 25% - 40% likelihood

- Adolescents & elderly also at higher risk

Latent TB Infection

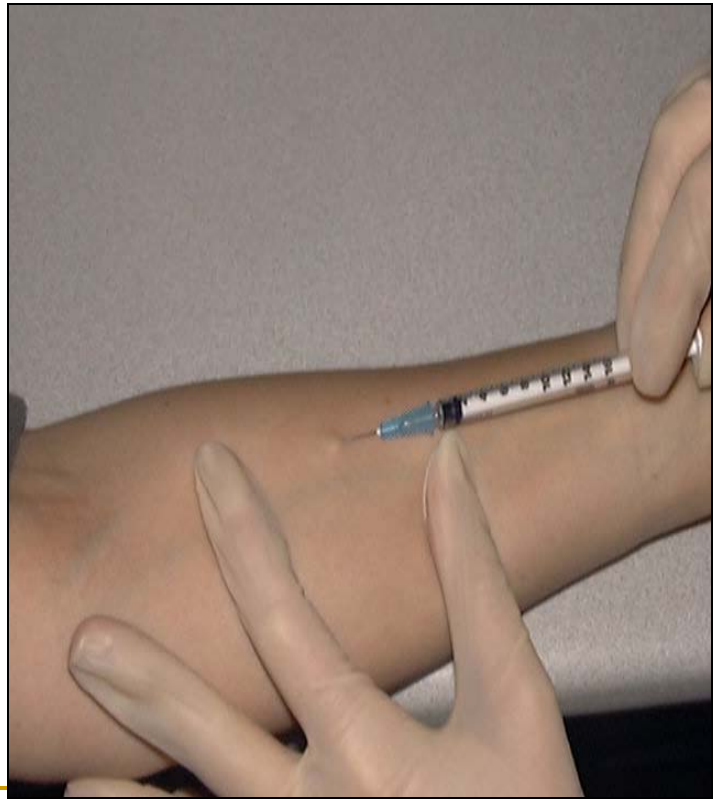
- Evaluate persons for risk factors
- Test those with a risk factor using the TST or Interferon-gamma release assay (IGRA)
- Evaluate those with a (+) TST or IGRA by doing a symptom history and chest X-ray
- Refer to PCP or local public health for treatment recommendations and medication administration

Diagnosing LTBI

- The Mantoux tuberculin skin test (TST) is the most common method
- A TST reaction can take 3-12 weeks after TB infection to become positive
- A negative TST in a symptomatic patient does NOT rule out TB

Administering the Tuberculin Skin Test (TST)

- Inject 0.1 ml of tuberculin intradermally
- Produce a wheal 6-10 mm in diameter



Tuberculin Skin Test Reading

- The test is read after 48-72 hours by a trained health care worker
- Diameter of the induration (firmness) is measured in millimeters (mm)
- Erythema (redness) is <u>not</u> measured

TST for LTBI Diagnosis

Criteria for a Positive Reaction

≥5 mm	≥10 mm	≥15 mm
HIV infection	Recent immigrants	No risk
Contact to active TB case	Injection drug users	
Abnormal CXR	Children	
Immunosuppression	High-risk medical conditions	
	Residents and employees of jails/nursing homes, hospitals	

Note: Skin test conversion is an increase of ≥10 mm within a 2-year period

2 Commercially Available IGRAs

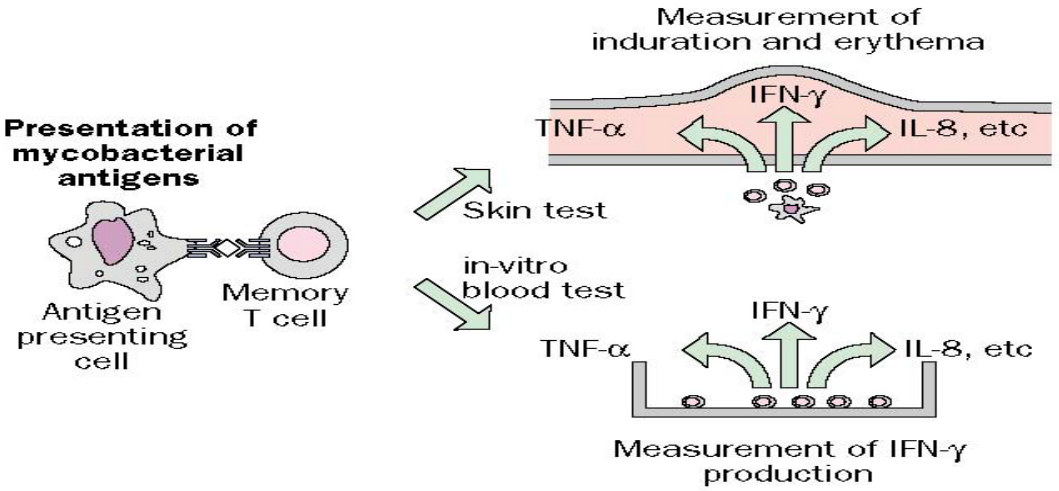
T-SPOT.TB 96

Oxford Immunotec

Harnessing the power of T cell measurement

Interferon-gamma Release Assays

- Blood test for detecting TB infection
- Requires 1 visit (TST requires 2 visits)
- Results less subject to reader bias and error
- More specific with less cross-reaction with non-tuberculosis mycobacterium and BCG than the TST



MMWR™
Morbidity and Mortality Weekly Report
www.cdc.gov/mmwr

Recommendations and Reports | June 25, 2010 / Vol. 59 / No. RR-5

Updated Guidelines for Using Interferon Gamma Release Assays to Detect *Mycobacterium tuberculosis* Infection — United States, 2010

Thoughts

- IGRAs are the preferred test in:
  - BCG vaccinated
  - Persons unlikely to get a TST completed
- Implementing IGRAs requires careful thought about logistical hurdles but can be done
- IGRAs may be less accurate (i.e. specific) in low risk populations than previously reported
- Additional longitudinal data is needed in all populations to understand the true implications of a positive test

TB Prevention

- Diagnosis and treatment of latent TB infection (LTBI) has been an important component of TB control in the U.S. for more than 40 years
- 1965: American Thoracic Society recommended treatment of LTBI for those with previously untreated TB, tuberculin skin test (TST) converters, and young children
- 1967: Recommendations expanded to include all TST positive reactors

Recommended Treatment for Latent TB Infection

- INH daily for 9 months

  or

- Rifampin daily for 4 months

Risk Factors for Progression

- **HIV**
- **Fibrotic CXR c/w prior TB**
- Immunosuppression (transplants, TNF-alpha inhibitors)
- Recent close contact to active TB
- **Diabetes**
- **Chronic renal failure**
- Silicosis
- Leukemia / lymphoma
- Head/neck cancer
- Wt loss > 10%
- gastric bypass surgery

Common sites of TB disease

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

Systemic symptoms of TB

- Fever
- Chills
- Night sweats
- Appetite loss
- Weight loss
- Fatigue

Symptoms of pulmonary TB

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

Treatment of Active TB Disease

Usually patients with active TB are no longer considered infectious if:

- They are on effective treatment (as demonstrated by M. tuberculosis susceptibility results) for >2 weeks
- Their symptoms have diminished ***and***
- There is a mycobacteriologic response (e.g., decrease in grade of sputum smear positivity detected on sputum-smear microscopy)

Licensed facilities must be in compliance with state licensure standards

- P0114, 104(3)(a)(i)(B)

  TB test before direct contact with residents

- P1144, 8.495.6.F.5.a.iii (ACF)

  Documentation of annual TB testing

CDC recommendations for screening in Assisted Living Facilities

- If less than 3 TB patients per year, consider facility low risk and conduct baseline two-step TST or IGRA
- Repeat TST or IGRA only if unprotected exposure to TB occurs
- http://www.cdc.gov/tb/publications/guidelines/infectioncontrol.htm

TB resources

- CDC Division of TB Elimination web site
  - http://www.cdc.gov/nchstp/tb/default.htm
  - Interactive Core Curriculum on Tuberculosis: What the Clinician Should Know
  - Self Study Modules on Tuberculosis
- CDPHE TB Program web site
  - http://www.cdphe.state.co.us/dc/TB/tbhome.html
- CDPHE TB Program – 303.692.2638

Questions?