

# TB-Diabetes: From Targeted LTBI Testing to TB Treatment Outcomes in California

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A green rectangular sign with rounded corners and a white border, mounted on two wooden posts. The sign reads 'Welcome to California' in white, bold, sans-serif font. The background of the sign is a textured green. The sign is positioned in the foreground, slightly to the right of the center. In the background, a paved road stretches into the distance under a clear blue sky. The landscape is arid with dry, brownish hills and sparse vegetation.

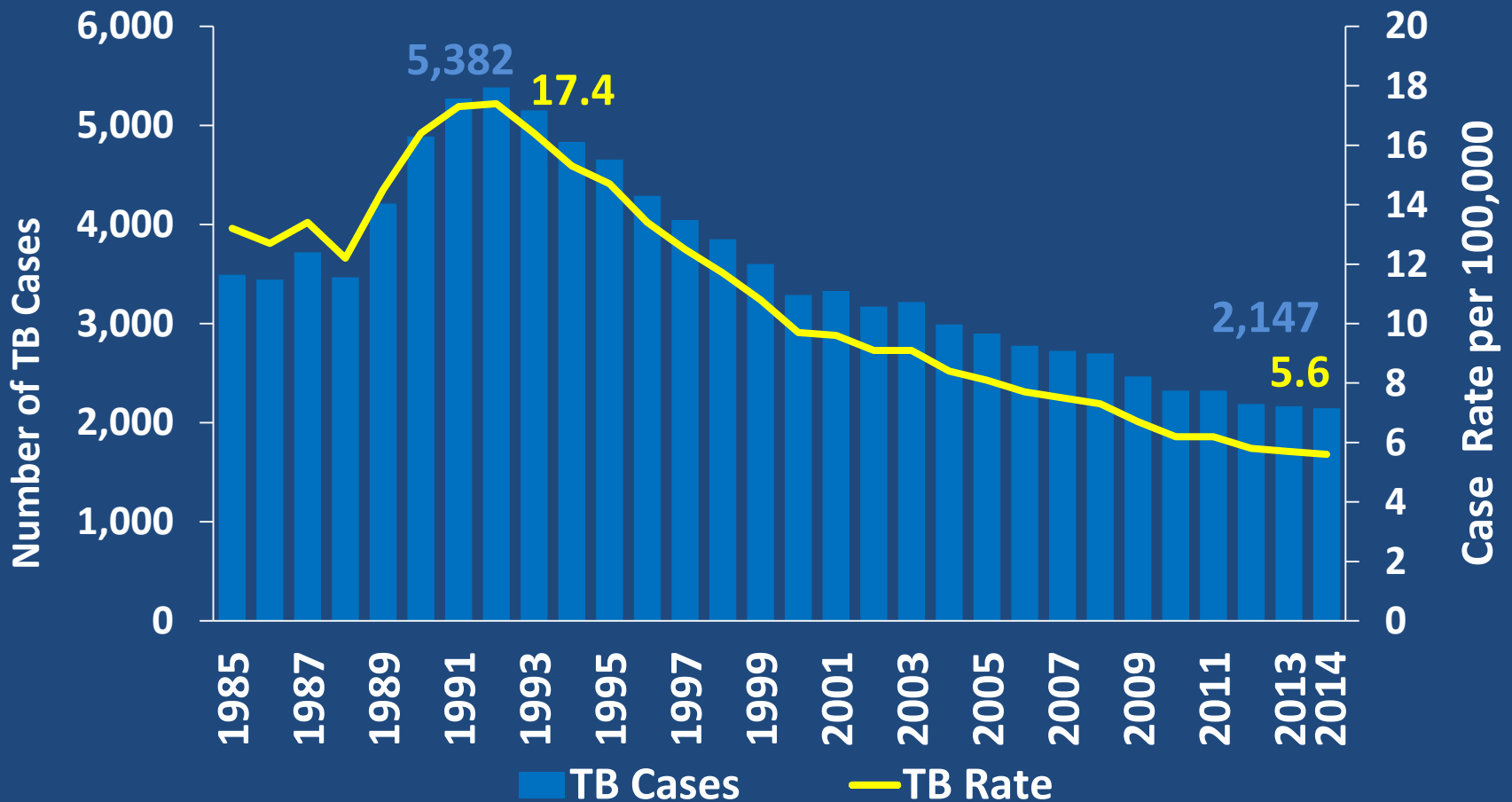
# Welcome to California

- Pop 38.8 million
- > 10 million immigrants (27% of pop.)
  - >1 million with diabetes
  - ~25% of foreign-born in U.S.
- ~25% of TB in U.S.
  - 78% foreign-born

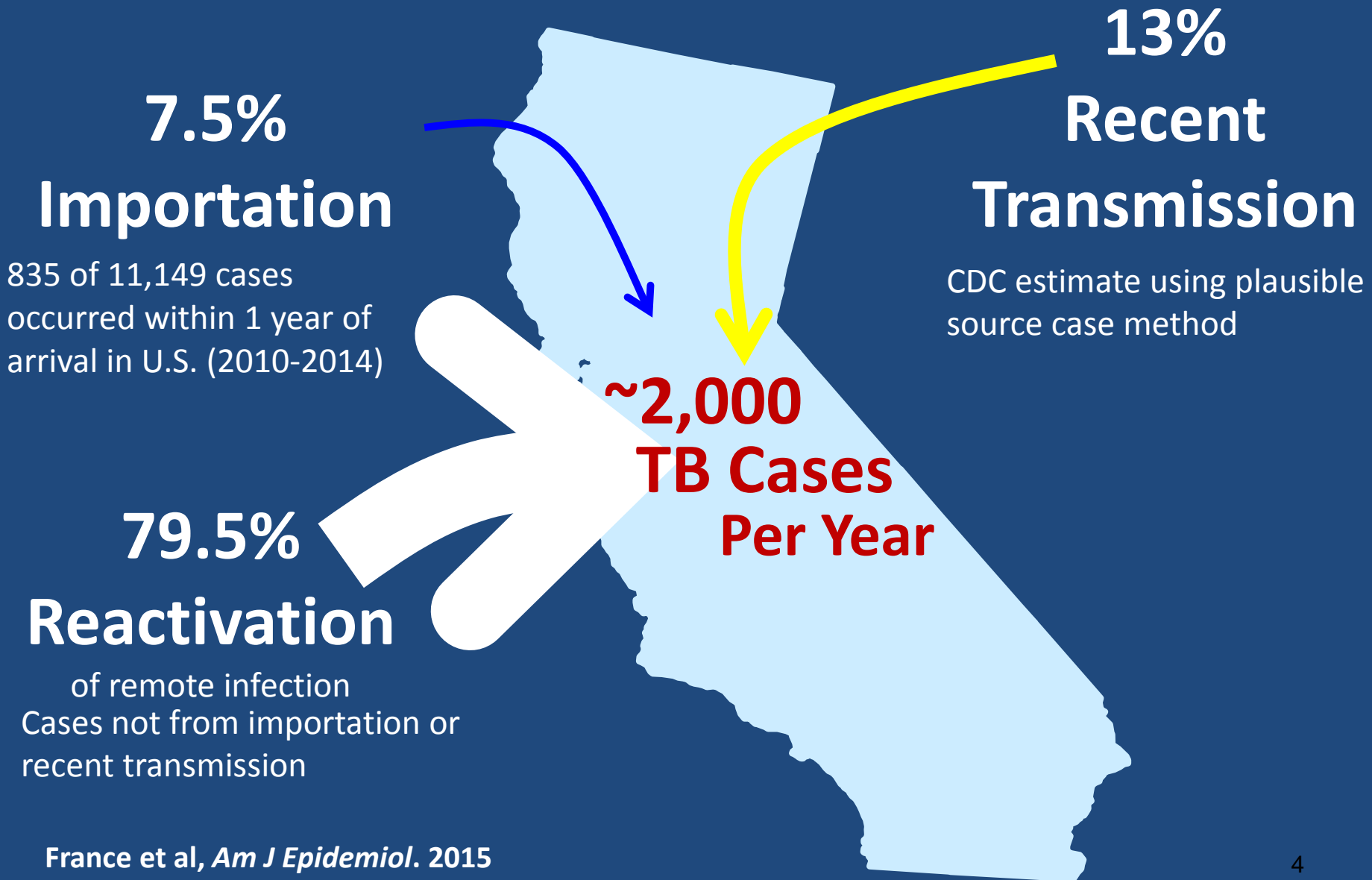
From Public Policy Institute of California ([http://www.ppic.org/main/publication\\_show.asp?i=258](http://www.ppic.org/main/publication_show.asp?i=258))

Sources: U.S. Census Bureau Decennial Censuses, American Community Survey, and the Department of Homeland Security, California Health Interview Survey

# Tuberculosis Cases and Case Rates California, 1985-2014

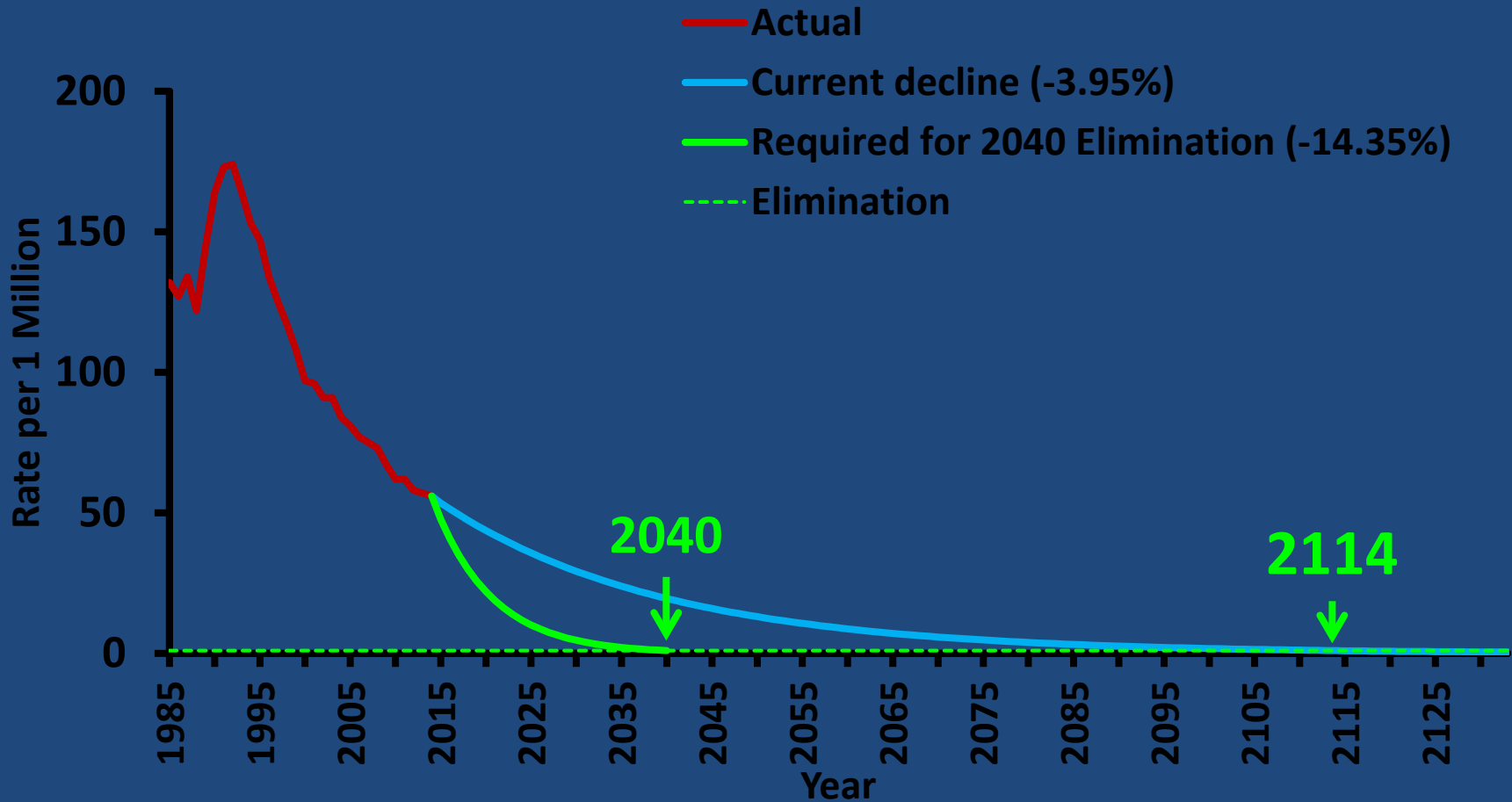


# How do TB Cases Occur in California?



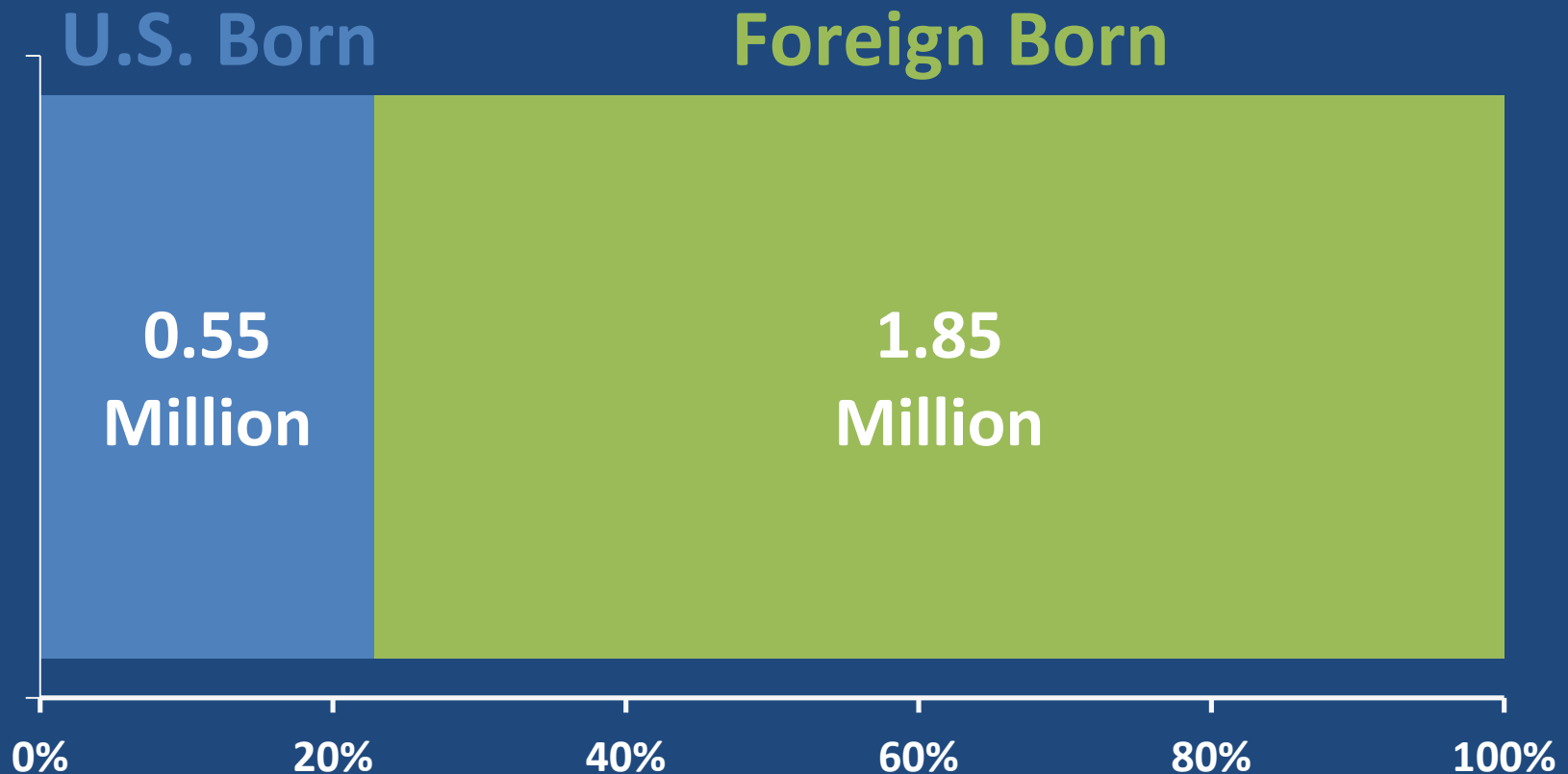
# Year of TB elimination in California

## Extrapolation based on current rate of decline



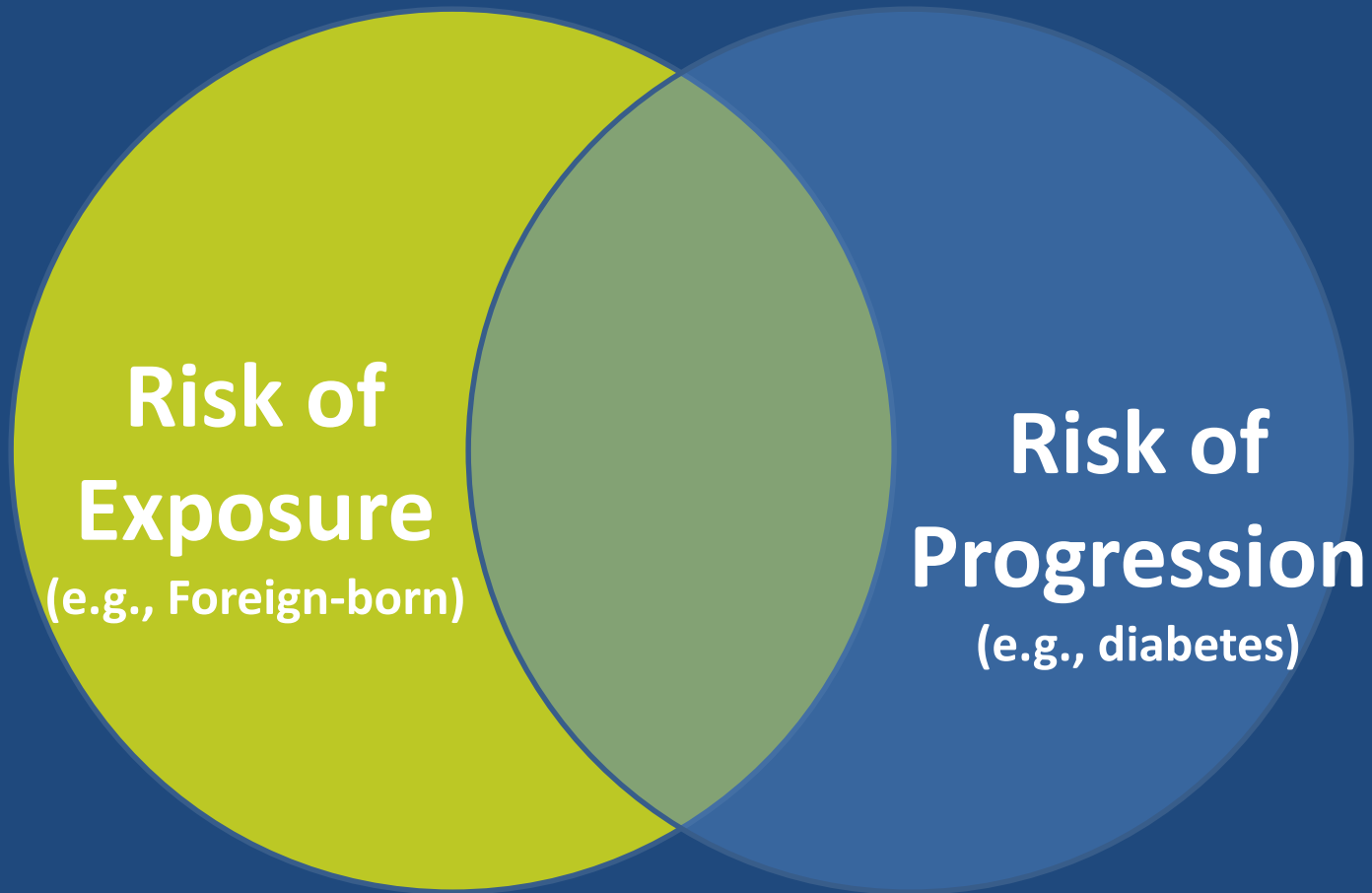
To reach TB elimination goal:  
increase TB prevention through  
screening and treatment of TB  
infection (LTBI)

# 2.4 Million persons with LTBI, California 2014



Estimated by applying nativity and race/ethnicity-specific TB infection prevalence from NHANES (Miramontes, 2015) to the California ACS population estimates using TST for US born and IGRA for foreign born 7

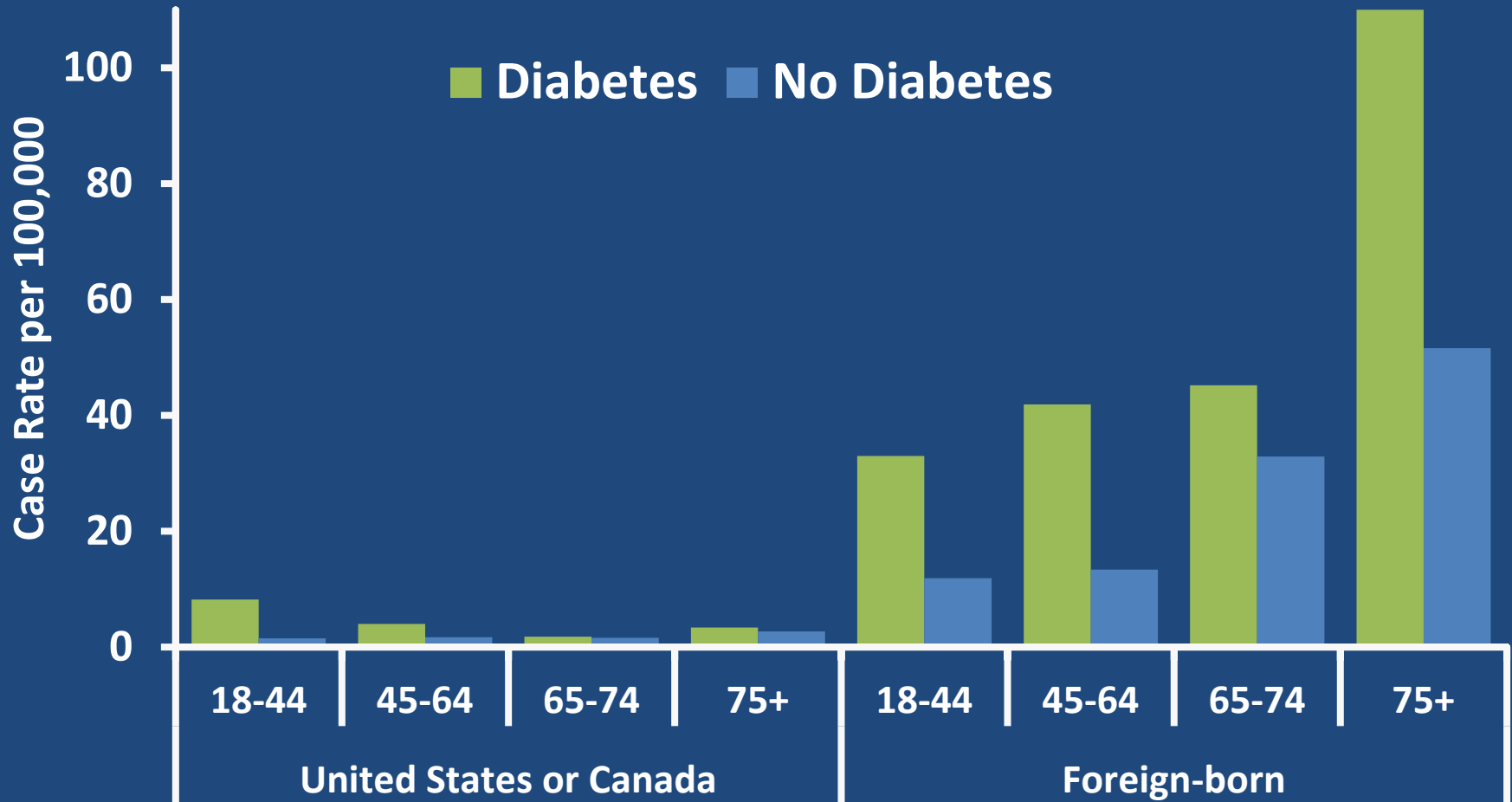
# Who to Test for latent TB infection?





# TB Rate by Diabetes, Age, and Nativity California, 2010–2012

(Persons aged ≥18)



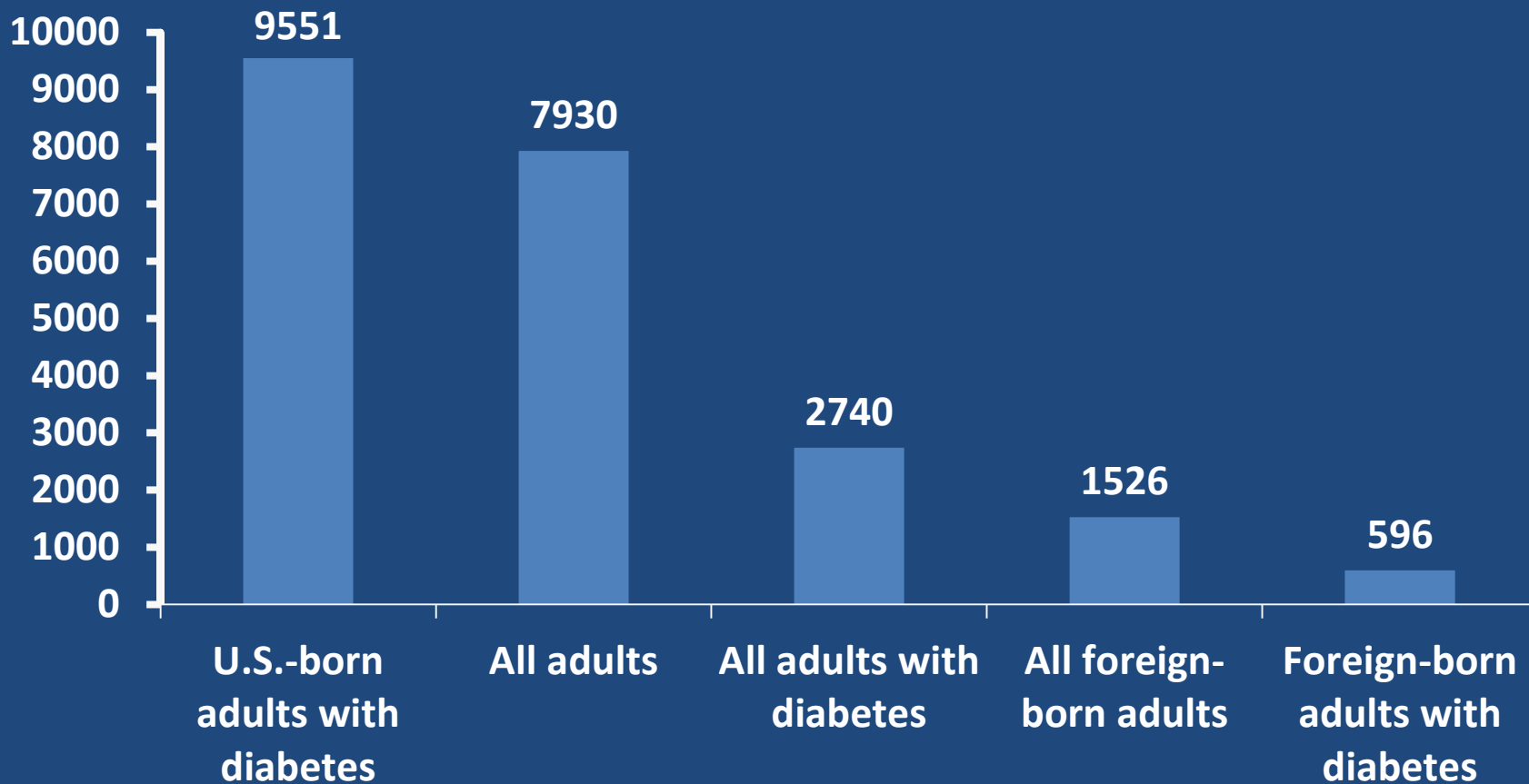
Demlow et al, *BMC Public Health* 2015

Sources: Denominator: 2011-2012 California Health Interview Survey | Numerator: CA TB Registry

# Number Needed to Screen

(and treat if infected)

to prevent one case of TB in next 5 years



Calculated using increased risk of TB conferred by diabetes and published estimates for LTBI prevalence, risk of progression, test sensitivity, LTBI treatment efficacy, and proportion of persons starting and completing treatment.

Demlow et al, *BMC Public Health* 2015

# Compared to NNS to prevent death for other conditions

- 2000 mammograms to prevent 1 death from breast cancer
- 596 hemoccult test to prevent 1 death from colon cancer

Many prevention strategies are cost-effective: Colon cancer screening \$10,000 per QALY gained. The literature tends to use \$50,000 - \$100,000 per QALY gained as threshold for a cost-effectiveness analysis. We have not yet performed a CE analysis

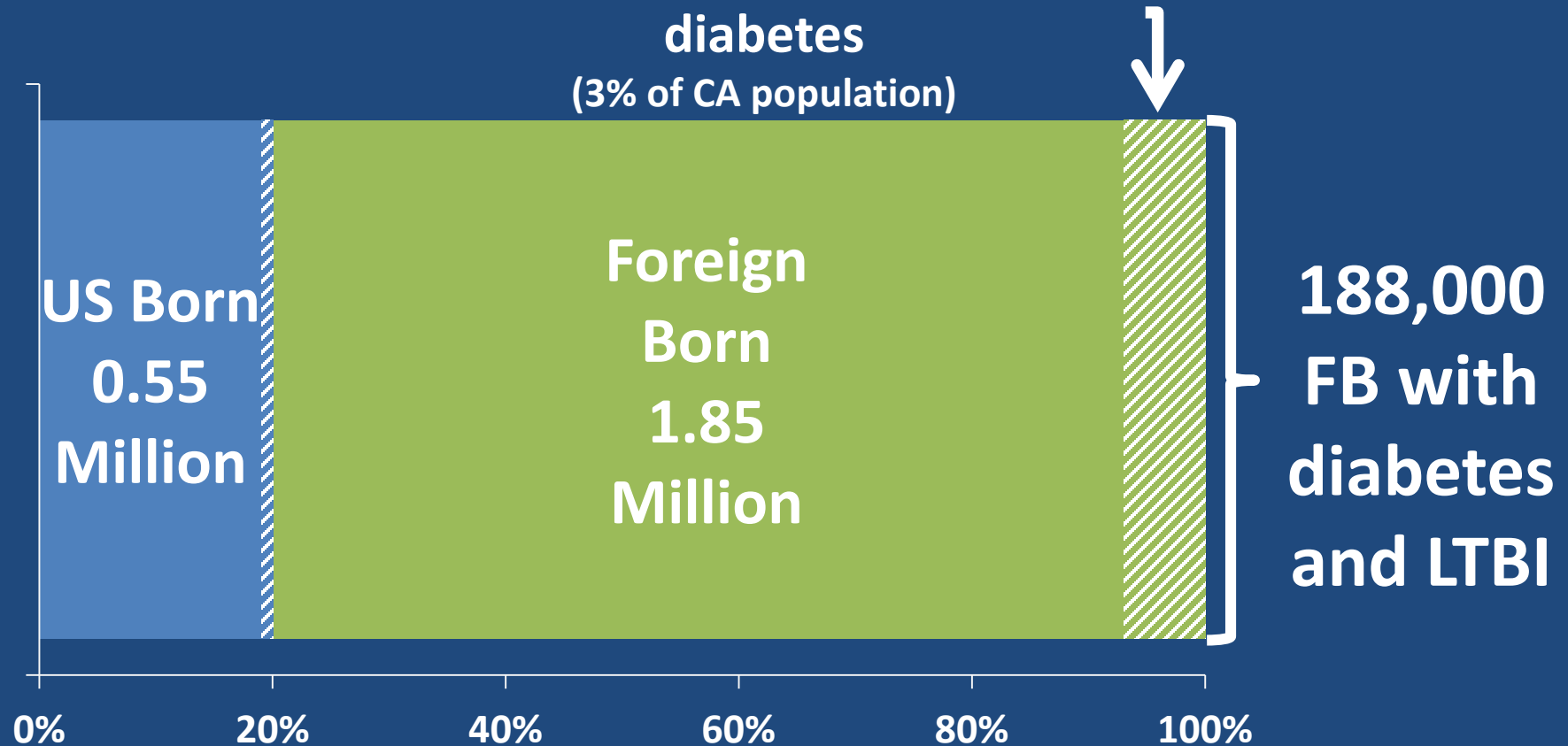
# 2.4 Million Estimated TB Infections

## California



Diabetes

1.1 million FB adults with  
diabetes  
(3% of CA population)



DM estimated using data from California Health Interview Survey

# Back of the envelope prevention effectiveness estimates

- If we screened 1.1 million FB with diabetes in CA, we could prevent 1,846 TB cases (over a 5 yr period)
  - 369 cases per year
- If we found the 188,000 FB persons with DM and LTBI, we could prevent 6,768 (5% progression x 80% treatment completion x 90% treatment effectiveness) TB cases over the lifetime of each individual

# How to find the 188,000 foreign-born persons with DM and LTBI?

- **Dynamic decentralized healthcare system**
- **Federally Qualified Health Care centers care for about 11% of CA population**
- **A large HMO in CA provides care to 14% of TB cases**
- **Varied DM screening practices at public TB clinics (with declining LTBI services)**
- **Large at-risk population not accessing care**

# Preventing TB among persons with diabetes

- Practical step toward TB elimination
- Requires:
  - Building case for why health systems and providers should care
  - Collaboration with primary care
  - Performance measure
  - Integrated into electronic medical records

# How are TB patients with DM different than TB patients without DM?

- Older
- More extensive disease (pulmonary, culture-positive, sputum smear-positive, cavities on CXR)
- More likely to have additional medical conditions
- More likely to die on treatment



# Questions

- Higher risk of TB among patients with DM and lower BMI?
- LTBI short course treatment effectiveness in persons with DM?
- How can we prevent deaths for TB DM patients on TB treatment?
  - Would earlier/more aggressive treatment of DM prevent TB mortality in TB DM patients?
- Methods to encourage providers to test and treat for LTBI (and patients to accept)?
- How to find FB persons with DM?
- Best practices to incorporate LTBI treatment regimen into routine DM care?

# Acknowledgments

- Pennan Barry
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