Predictive model for the development of TB disease among recent arrivers to the U.S. with abnormal pre-immigration chest radiographs

Chee Kin Lam[1,2], Adam Readhead[1], Phil Lowenthal[1], Amit Chitnis[3], Sonal Buhain[3], Pennan Barry[1]

1. Tuberculosis Control Branch, California Department of Public Health, Richmond, CA, USA; 2. Division of Tuberculosis Elimination, Centers for Disease Control, Atlanta, GA, USA; 3. Tuberculosis Section, Alameda County Public Health Department, San Leandro, CA, USA

Background

U.S.-bound immigrants and refugees undergo pre-immigration tuberculosis (TB) screening prior to departure.

Upon arrival, those with abnormal chest radiographs are referred to local health departments for follow-up evaluation.

Objective

To develop a predictive model to prioritize recent arrivers with high TB-risk for earlier domestic follow-up using pre-immigration medical evaluation data.

Methods

Extracted pre-immigration medical evaluation data from CDC's electronic disease notification system on class B1 arrivers to California between 2014 and 2018.

Matched data with the California (CA) TB registry to identify cases of TB within 1 year of arriving in CA.

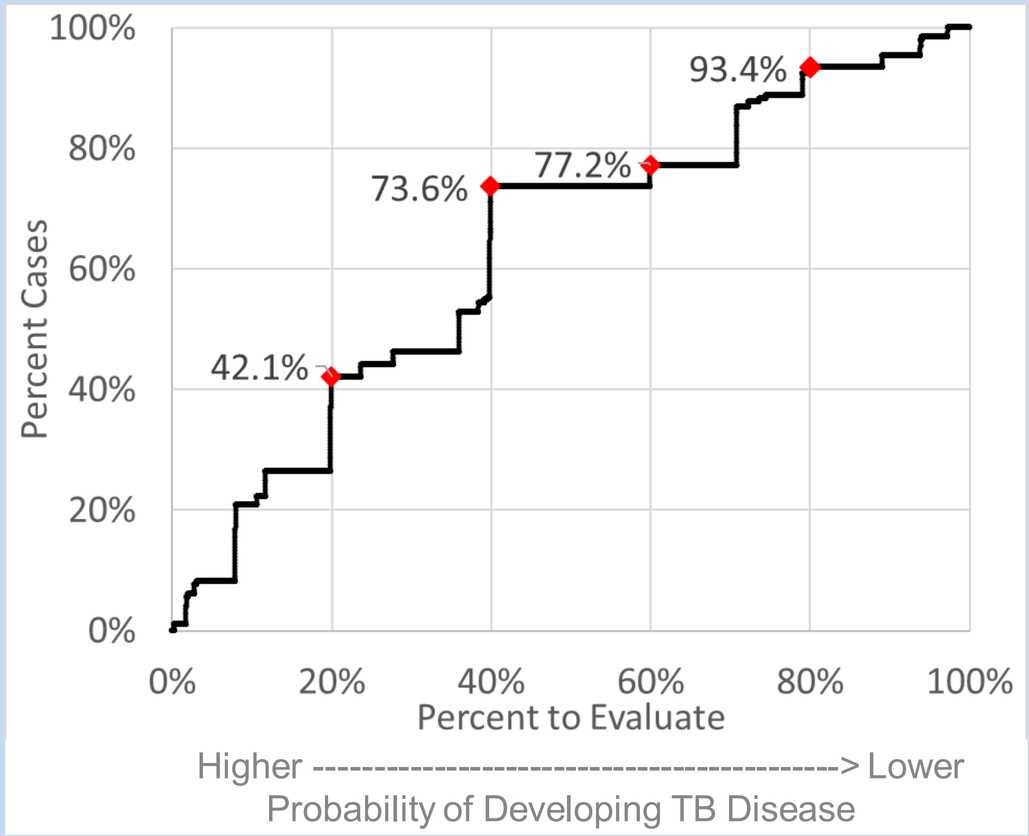
Performed a logistic regression with backward elimination at 0.2 significance level to generate a model for development of pulmonary TB disease.

Model variables: age (category), sex, countries of origin (top 5 countries), chronic renal disease, HIV, any history of TB treatment

Sorted by descending probability of developing TB disease.

Acknowledgments:
LeiAnn Keuth, Jennifer Flood
California Public Health TB and Refugee Health Programs

Use **Sex**, **Country of Origin**, **History of TB Treatment**, and **Diabetes** to Prioritize Class B1 Arrivers



Varying proportions of cases captured by evaluating different percentages of arrivers starting with those more likely to develop TB disease

Results

21,987 Class B1 arrivers

- 197 (0.9%) developed pulmonary TB disease within one year.
- 155 (78.7%) were sputum culture positive.

Demographics of Class B1 Arrivers in CA, 2014—2018 (N=21,987)

Category	n	%
Sex		
Male	10,315	46.9
Female	11,672	53.1
Age Category (years)		
<= 15	223	1.0
16 - 45	5,717	26.0
46 - 65	10,106	46.0
> 65	5,941	27.0
Country of Origin		
China	2,280	10.4
India	799	3.6
Mexico	2,344	10.7
Philippines	9,672	44.0
Vietnam	2,955	13.4
Other	3,937	17.9
History of TB Treatment	4,501	20.5
Diabetes	2,281	10.4
Chronic Renal Disease	200	0.9
HIV	185	0.8

Model fit: AUC = 0.63

Variables in model: sex, diabetes, any history of prior TB treatment, and originating from China, Mexico, Vietnam, or Philippines

Age, chronic renal disease, HIV, and originating from India were removed by backward elimination.

Limitations

Model may not capture local health jurisdiction differences.

Conclusions

Using a predictive model to prioritize those at greatest risk of developing TB disease allows resource-strained LHDs to use limited resources more efficiently.