Challenges and Solutions to Estimating Disparities in TB Disease by Country of Birth in Los Angeles County

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BACKGROUND

- Among U.S. residents, there are large, known disparities in tuberculosis (TB) disease incidence by country of birth, but these disparities are not routinely examined because of technical challenges namely:
  1. Population estimates by country of birth can be difficult to access and have a margin of error;
  2. Standard regression analyses rely on independence of outcomes which is violated with a communicable disease such as TB.
- We demonstrated methods for overcoming these challenges using data from Los Angeles County which has more than 3.5 million non-U.S.-born residents.

METHODS

Population: Los Angeles County residents 2005-2011

Data :

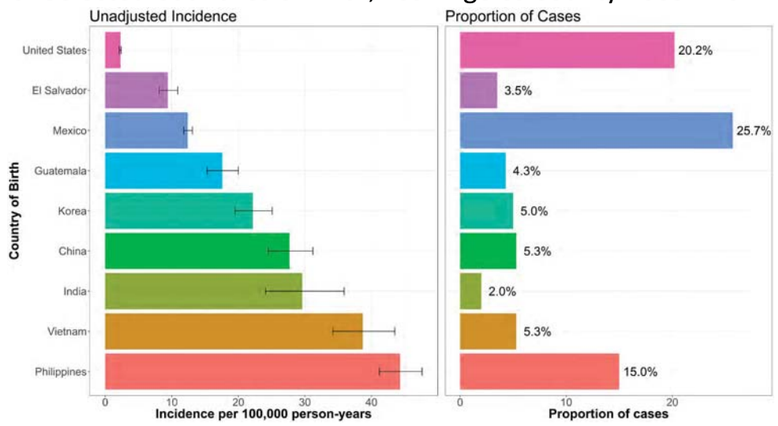
- Data on 5,447 TB cases from Los Angeles County TB Surveillance;
- Population estimates from the Public Use Microdata Survey (PUMS), a specialized data release from American Community Survey (ACS).

Analysis:

- Unadjusted incidence rates calculated by country of birth
- Adjusted incidence rates were modelled using a Negative Binomial regression.
- Adjusted analysis included covariates for age at diagnosis, gender, years in residence and year of diagnosis.
- Bayesian models were used to account for the uncertainty in population estimates by specifying prior distributions for these estimates to mirror their margins of error.

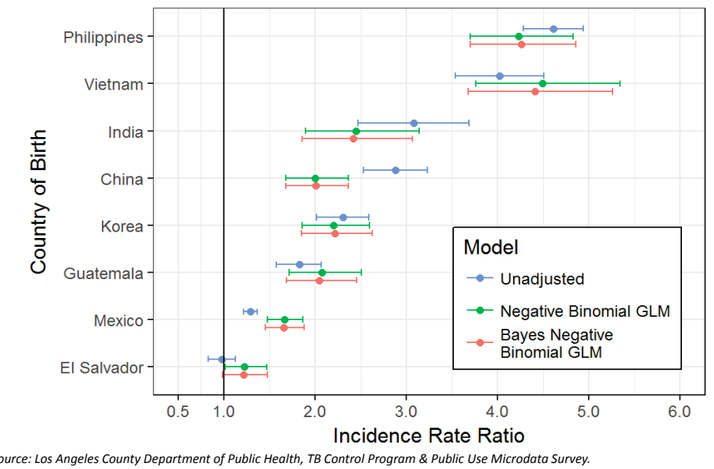
RESULTS

Unadjusted TB Disease Incidence Rate and Proportion of Cases for Selected Countries of Birth, Los Angeles County 2005*-2011



Source: Los Angeles County Department of Public Health, TB Control Program & Public Use Microdata Survey.
**Excluded homeless, incarcerated or in long-term care facility cases from 2005; ACS did not estimate these populations.*
Confidence intervals (mid-p method) are likely understate the variability of the estimate because data were over-dispersed.

Incidence Rate Ratio by Country of Birth using Three Models, Los Angeles County 2005*-2011



Source: Los Angeles County Department of Public Health, TB Control Program & Public Use Microdata Survey.
**Excluded homeless, incarcerated or in long-term care facility cases from 2005; ACS did not estimate these populations.*
Reference category for adjusted models was "Other foreign country."
Negative Binomial general linear model (GLM) adjusted for age at diagnosis, gender, years in residence and year of diagnosis.
Bayes Negative Binomial Model additionally accounted for uncertainty in population estimates.

SUMMARY

Among Los Angeles County residents, the unadjusted incidence rate among non-U.S.-born persons was 15 per 100,000 person-years in contrast to the rate among U.S-born persons, 2 per 100,000. The unadjusted incidence rates were 44, 39 and 12 per 100,000 person-years among persons born in the Philippines, Vietnam and Mexico, respectively.

In adjusted analysis, persons born in Vietnam were 4.5 (95% CI: 3.8-5.3) times as likely to be reported as a TB case than other non-U.S.-born persons; persons born in Mexico were 1.7 (95% CI: 1.5-1.9) times as likely. Bayesian models accounting for uncertainty in population estimates showed similar results.

CONCLUSIONS

1. This study confirms substantial disparities in TB disease by country of birth in Los Angeles County.
2. Even accounting for age, gender, years in residence and year of diagnosis, persons from the Philippines, Vietnam and select countries had much higher rates of reported TB disease than other foreign countries.
3. We have also demonstrated that incidence rates by country of birth can be readily estimated using available data, despite the challenges of dependent outcomes and uncertainty in underlying data.

Contact Information: TBD???

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