Assessment of risk factors affecting complete evaluation of contacts exposed to infectious tuberculosis patients in Maryland

May 8, 2015, PHASE Symposium, DHMH
Jun Sugihara, MD, MPH candidate 2014/2015
Preceptors: Lisa Paulos, RN, MPH, Wendy Cronin, PhD, MS
Background

- Investigation of contacts (CI) who are exposed to infectious tuberculosis (TB) patients is an essential component of TB control and prevention in low-incidence settings.

- The purpose of complete evaluation of contacts is to diagnose latent TB infection (LTBI), active TB disease, or neither.

- Consequences of incomplete evaluation are missed TB diagnoses and inability to treat TB infection.

- In Maryland, only 69.5% of contacts to sputum smear-positive TB cases completed evaluation in 2013 (CDC target 93%)

- Factors associated with the incomplete contact evaluation have not been well studied
Research Questions

• **Question 1**
  What are the TB *index patient* factors associated with incomplete contact evaluation?

• **Question 2**
  What are the TB *contacts* factors associated with incomplete contact evaluation?
Methods – Question 1: Patient factors

• **Study Design:** Case-Control Study

• **Participants:** Infectious TB patients in 5 high-incidence counties

• **Period:** Jan 2012 – Dec 2013

• **Eligibility:** Patients who had 1 to 24 contacts

• **Source:** TB Case Surveillance Database at CTBCP

• **Outcomes:**
  - **Cases:** Patients with $< 93\%$ completely-evaluated contacts
  - **Controls:** Patients with $\geq 93\%$ completely-evaluated contacts

• **Exposure:** Demographics, Risk factors of TB, Clinical characteristics

• **Analysis:** Logistic regression
### Significant Results – Question 1  
#### Index Patient factors

<table>
<thead>
<tr>
<th>Bivariate analysis</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Significant variables</strong></td>
<td><strong>OR (95% CI)</strong></td>
</tr>
<tr>
<td>Age group 45-64</td>
<td>1.0 (reference)</td>
</tr>
<tr>
<td>Age group 25-44</td>
<td>3.9 (1.3 – 11.4)</td>
</tr>
<tr>
<td>Age group 65+</td>
<td>4.0 (1.0 – 16.2)</td>
</tr>
<tr>
<td>Asian, non-Hispanic</td>
<td>1.0 (reference)</td>
</tr>
<tr>
<td>Black non-Hispanic</td>
<td>2.9 (1.1 – 7.5)</td>
</tr>
<tr>
<td>Born in East Asia</td>
<td>1.0 (reference)</td>
</tr>
<tr>
<td>Born in the U.S.</td>
<td>8.3 (1.6 – 43.3)</td>
</tr>
<tr>
<td>Born in Africa</td>
<td>8.15 (1.68 – 39.6)</td>
</tr>
<tr>
<td>Born in Latin America</td>
<td>10.2 (1.9 – 55.3)</td>
</tr>
<tr>
<td>HIV infection</td>
<td>2.8 (1.1 – 7.3)</td>
</tr>
<tr>
<td>Homelessness</td>
<td>5.9 (1.1 – 32.0)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Multivariable analysis</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Significant variables</strong></td>
<td><strong>OR (95% CI)</strong></td>
</tr>
<tr>
<td>Born in Latin America</td>
<td>4.1 (1.08 – 15.3)</td>
</tr>
</tbody>
</table>

- Most of HIV co-infected “cases” with incomplete evaluation (82%, n=9/11) were non-Hispanic black and the majority of them (78%, n=7/9) were foreign born.

- Race/Ethnicity was excluded from the multivariate analysis due to collinearity with Region of Birth.
Methods – Question 2: Contact factors

• **Study Design:** Case-Control Study
• **Participants:** High/medium priority TB Contacts in 4 counties
• **Period:** Jan 2012 – Dec 2013
• **Eligibility:** CI that included between 1 and 24 contacts
• **Source:** CI charts in local health departments.
• **Outcome:**
  - **Cases:** Contacts who did not complete evaluation
  - **Controls:** Contacts who completed evaluation
• **Exposure:** Demographics, Jurisdiction, Relationship to the TB patient, TB-related medical history, TB risk factors
• **Analysis:** Mixed effects logistic regression
Methods – Final Sampling for Question 2

CTBCP Database:
463 Contacts  (45 Incompletely evaluated  418 Completely evaluated)

Actual sample:
270 Contacts sampled
  63   Incompletely evaluated
  207 Completely-evaluated contacts sampled

+25 contacts were not reported in CTBCP database
  (15 of them were incompletely evaluated)

-70 contact records were not found in the chart review
  (11 of them were reported as incompletely evaluated)

- 8 completely-evaluated contacts were misclassified as incomplete
- 22 incompletely-evaluated contacts were misclassified as complete
- 207 completely-evaluated contacts were sampled to achieve ~1:3 ratio

Question 2 Actual sample
Cases   n = 63
Controls n = 207
<table>
<thead>
<tr>
<th>Variable</th>
<th>n (%incomplete)</th>
<th>OR</th>
<th>(95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Relationship (n = 242)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Core Family</td>
<td>108 (15%)</td>
<td>1.0</td>
<td>(reference)</td>
</tr>
<tr>
<td>Friend</td>
<td>41 (37%)</td>
<td>8.7</td>
<td>(1.9, 40.7)</td>
</tr>
<tr>
<td>Co-worker</td>
<td>19 (53%)</td>
<td>14.7</td>
<td>(2.5, 85.5)</td>
</tr>
<tr>
<td><strong>Jurisdiction (n = 269)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inside</td>
<td>240 (18%)</td>
<td>1.0</td>
<td>(reference)</td>
</tr>
<tr>
<td>Outside</td>
<td>29 (66%)</td>
<td>20.3</td>
<td>(5.4, 76.5)</td>
</tr>
</tbody>
</table>
Discussion – Strengths and Limitations

• Possibly the first study assessing the factors associated with the incomplete TB contact evaluation in the U.S.

• Identified management and data quality issues

• Pilot - Small sample size
• Too many missing values for contacts, which might lead to biases
• One county with the most incomplete evaluation reported was not included in the contact-side analysis.
Conclusion

- **Patients:** Those born in Latin America were significantly associated with having incomplete evaluation of their contacts.
- **Contacts:** co-workers and friends of the index patient were at high risk of incomplete TB contact evaluation.
- Final updated reports of inter-jurisdictional investigations, complete CI records in LHDs, and reports to DHMH were often lacking.

Recommendation

- Increase focus on index patients and contacts where evaluation is less likely.
- Improve reporting of contact investigation results to DHMH.
- Maintain more complete records of contacts in LHD charts.
- A systematic CI database that is shared between jurisdictions may help to improve inter-jurisdictional reporting.