

Trends in Screening Tests for Tuberculosis, Saint Louis County, MO, 2009 to 2016

Jennifer Hurd, MPH; Jenelle Leighton, RN, BSN; Amanda Brzozowski, MPH, PhD
Saint Louis County Department of Public Health

Abstract

Objective: Traditionally, a Mantoux (i.e., PPD – purified protein derivative) test has been used as a screening tool to assess *M. tuberculosis* infection. PPD testing requires patients return to their doctor 48-72 hours after injection for evaluation. This method can potentially lead to false positives if *M. tuberculosis* antigens from a previous Bacillus Calmette-Guérin (BCG) vaccine are identified. Interferon-Gamma Release Assays (IGRAs) mitigate these limitations by requiring only a single healthcare visit and distinguishing between latent tuberculosis infection (LTBI) and prior BCG vaccination. We examined trends in the number of PPD and IGRA tests conducted on Saint Louis County residents from 2009 to 2016 and determined whether those trends varied by reporter type (e.g., hospitals, health departments, primary care practitioners (PCPs), laboratories, etc.).

Methods: Data were obtained from WebSurv, Missouri's communicable disease surveillance system. Saint Louis County residents, regardless of testing jurisdiction, who were diagnosed with LTBI between 01/01/2009 and 12/31/2016 were included in this analysis. Statistical analysis was conducted using Microsoft Excel 2013.

Results: Among Saint Louis County residents, there were 4,899 positive PPD and IGRA tests between 01/01/2009 and 12/31/2016. Although the overall annual proportion of IGRAs increased each year from 12.1% in 2009 to 54.4% in 2016 ($\beta = 0.067$, $p < 0.01$), the trend was neither linear nor constant across reporter type. In 2011 the IGRA-to-PPD proportion increased sharply within health departments (from 13% to 30%), laboratories (33% to 74%), and PCPs (11% to 33%). The remaining reporter types had similar increases from 2012 to 2014. Health departments, laboratories, and hospitals conducted the most IGRAs per year, averaging 82.4, 61.0, and 26.8 IGRAs/year, respectively. For six of the 11 reporter types, the overall change in annual proportion of IGRAs was statistically significant (all p-values < 0.01).

Conclusion: The relative proportion of IGRAs vs. PPDs among Saint Louis County residents changed significantly from 2009 to 2016. The three entities conducting the most IGRAs– health departments, laboratories, and hospitals – were the prime drivers of this change. As testing practices evolve, it is possible that this ratio, as well as the relative cost-benefits of each test, may similarly change.

Objectives

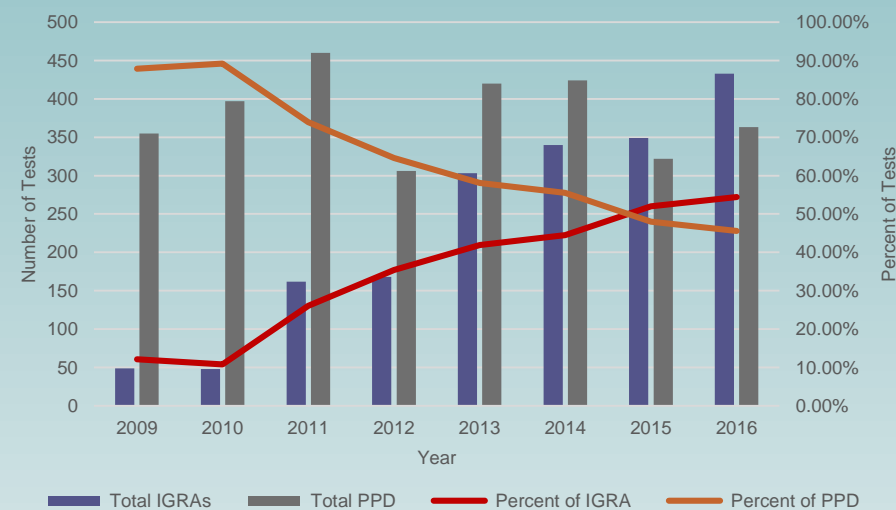
- The Mantoux (**PPD**) test is the original screening test for TB
 - TB antigen is injected intradermally
 - Results are read 48 to 72 hours later, requires 2 healthcare visits, false positives can occur
- Interferon-Gamma Release Assays (**IGRAs**) are a newer screening test
 - Requires a one time blood draw, can distinguish between *M. tuberculosis* antigens from prior BCG vaccination
- Saint Louis County Department of Public Health (DPH) examined trends in the number of PPD and IGRA tests conducted on Saint Louis County residents from 2009 to 2016
- Sought to determine whether those trends varied by reporter type (e.g., hospitals, health departments (DPH), primary care practitioners (PCPs), laboratories, etc.)

Methods

- Data were obtained from WebSurv (Missouri's communicable disease surveillance system)
- Saint Louis County residents, regardless of testing jurisdiction, who had a positive PPD or IGRA were included
- Test dates: 01/01/2009 to 12/31/2016
- Analysis: **linear regression** (Microsoft Excel 2013)
 - % IGRA by year (overall, by reporter type)

Results

Figure 1: Number and Percent Screening Tests per Year by Test Type, Saint Louis County, MO, 2009 to 2016, n = 4899



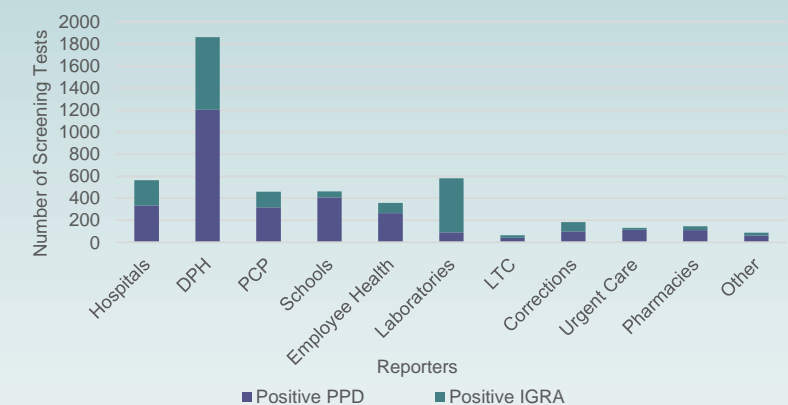
- The overall annual proportion of IGRAs to PPDs increased each year from **12.1%** in 2009 to **54.4%** in 2016 ($\beta = 0.067$, $p < 0.01$)
- Across reporter type, the trend was neither linear nor constant
- From 2010 to 2011 the IGRA to PPD proportion increased sharply within:
 - DPHs (from 13% to 30%)
 - Laboratories (33% to 74%)
 - PCPs (11% to 33%)
- The remaining reporter types had similar increases from 2012 to 2014
- In 2015 and 2016, Saint Louis County DPH began receiving more positive IGRA reports than PPD

Figure 2: 2009 to 2016 Percent Change for IGRAs by Reporter Type

Reporter Type	Total PPDs and IGRAs Reported (n = 4899)	2009 Percent IGRAs	2016 Percent IGRAs	2009 to 2016 Percent Change	P-value
Corrections	184	0%	32%	-	0.02
Employee Health	358	15%	29%	87%	0.12
Health Departments (DPH)	1860	19%	50%	158%	<0.001
Hospitals	565	4%	83%	1975%	0.001
Laboratories	580	50%	97%	94%	0.011
Long Term Care (LTC)	65	0%	29%	-	0.04
Pharmacies	146	0%	31%	-	0.0096
Primary Care Practitioner (PCP)	458	8%	37%	363%	0.008
Schools	462	4%	34%	750%	0.0042
Urgent Cares	132	6%	20%	233%	0.02
Other	89	22%	50%	127%	0.31

- There were **4,899** positive PPD and IGRA tests reported to Saint Louis County DPH between 01/01/2009 and 12/31/2016
 - 62%** (n = 3,047) were positive PPDs
 - 38%** (n = 1,852) were positive IGRAs
- For 6 of the 11 reporter types, the overall change in the annual proportion of IGRAs was statistically significant, as seen in Figure 2 (all p-values < 0.01)
- Percent change from the PPD to IGRAs could be calculated for 8 of the 11 reporter types
 - Of the reporters that a percent change could be calculated, the majority had over a 100% increase in IGRA use in 2016 compared to 2009

Figure 3: PPDs vs IGRAs by Reporter Types, 2009 to 2016



- 38%** of all positive reports came from local and state health agencies
- Health departments, laboratories, and hospitals conducted the most IGRAs per year, averaging 82.4, 61.0, and 27.0 IGRAs/year, respectively

Conclusion

- The relative proportion of IGRAs vs PPDs changed significantly from 2009 to 2016
- The three entities conducting the most IGRAs– health departments, laboratories, and hospitals – were the prime drivers of this change
- As testing practices evolve, it is possible that this proportion, as well as the relative cost-benefits of each test, may similarly change
- Future studies will look into how many times a single resident is reported as screening positive for TB