Trends in Testing for *Mycobacterium tuberculosis* Complex from US Public Health Laboratories, 2009–2013

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- Trends in Testing for *Mycobacterium tuberculosis* Complex From US Public Health Laboratories, 2009–2013. Public Health Reports, Vol 132, Issue 1, 2017
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  - http://journals.sagepub.com/doi/pdf/10.1177/0033354916679989

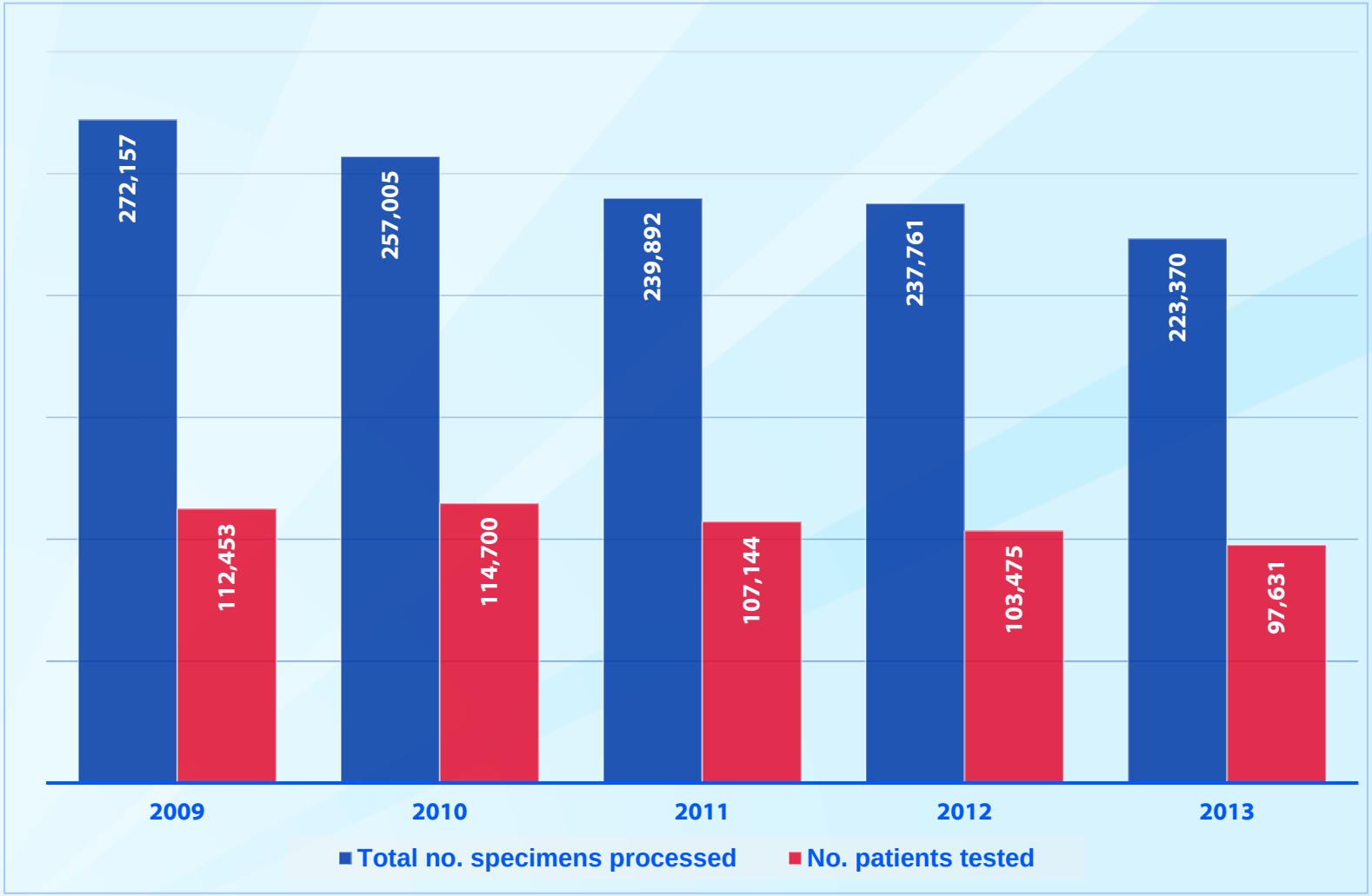
Sources of Data

- **TB Elimination Cooperative Agreement Applications**
  - Required elements
    - Workload
    - Turnaround times
  - Narratives
    - Methods
    - Algorithms
- **Site Visits**
  - More details regarding laboratory operations
- **National TB Surveillance Data**
  - How much TB testing is performed in PHL?

Trends Analyzed

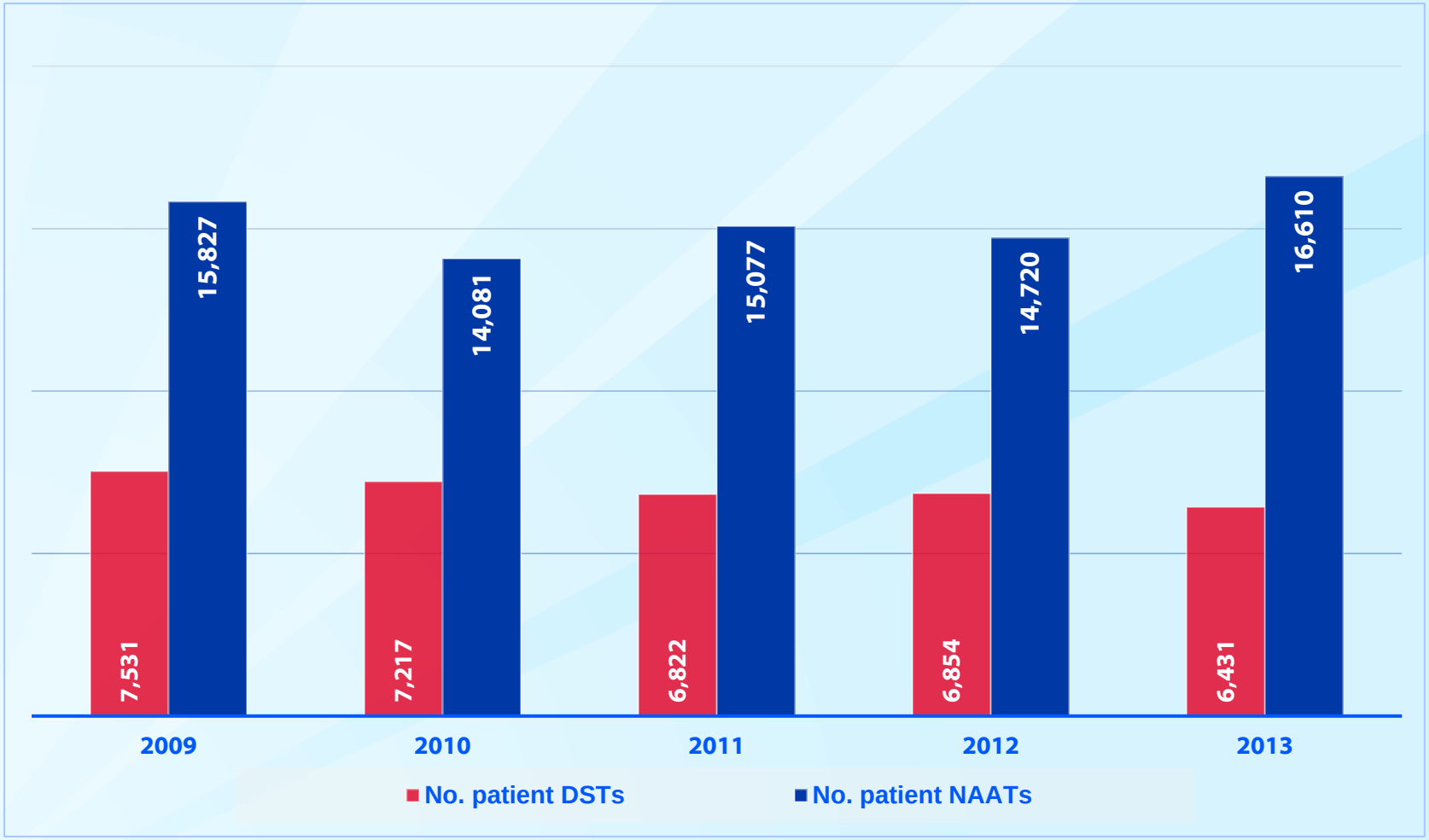
- Workload
- Turnaround Times
- Testing Methods and Algorithms
- Comparisons to Surveillance Data

Workload Trends, 2009 – 2013
Specimens Processed/Patients Tested

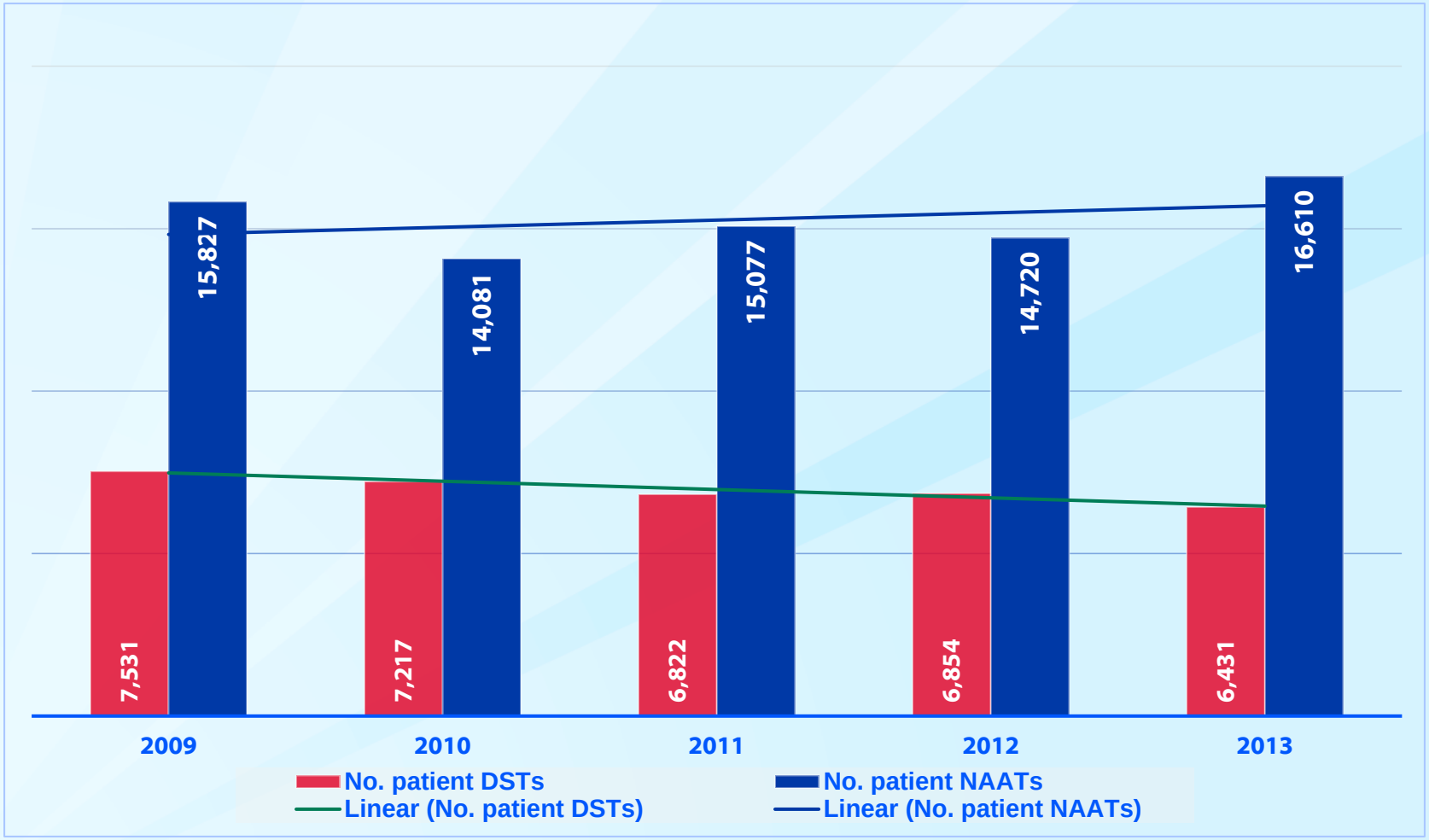


Workload Trends, 2009 – 2013
Specimens Processed/Patients Tested

Workload Trends, 2009 – 2013
DSTs/NAATs



Workload Trends, 2009 – 2013
DSTs/NAATs



National Workload and *Mycobacterium tuberculosis* complex Data from 58 U. S. Public Health Laboratories Receiving Support through CDC Cooperative Agreements: Years 2009—2013

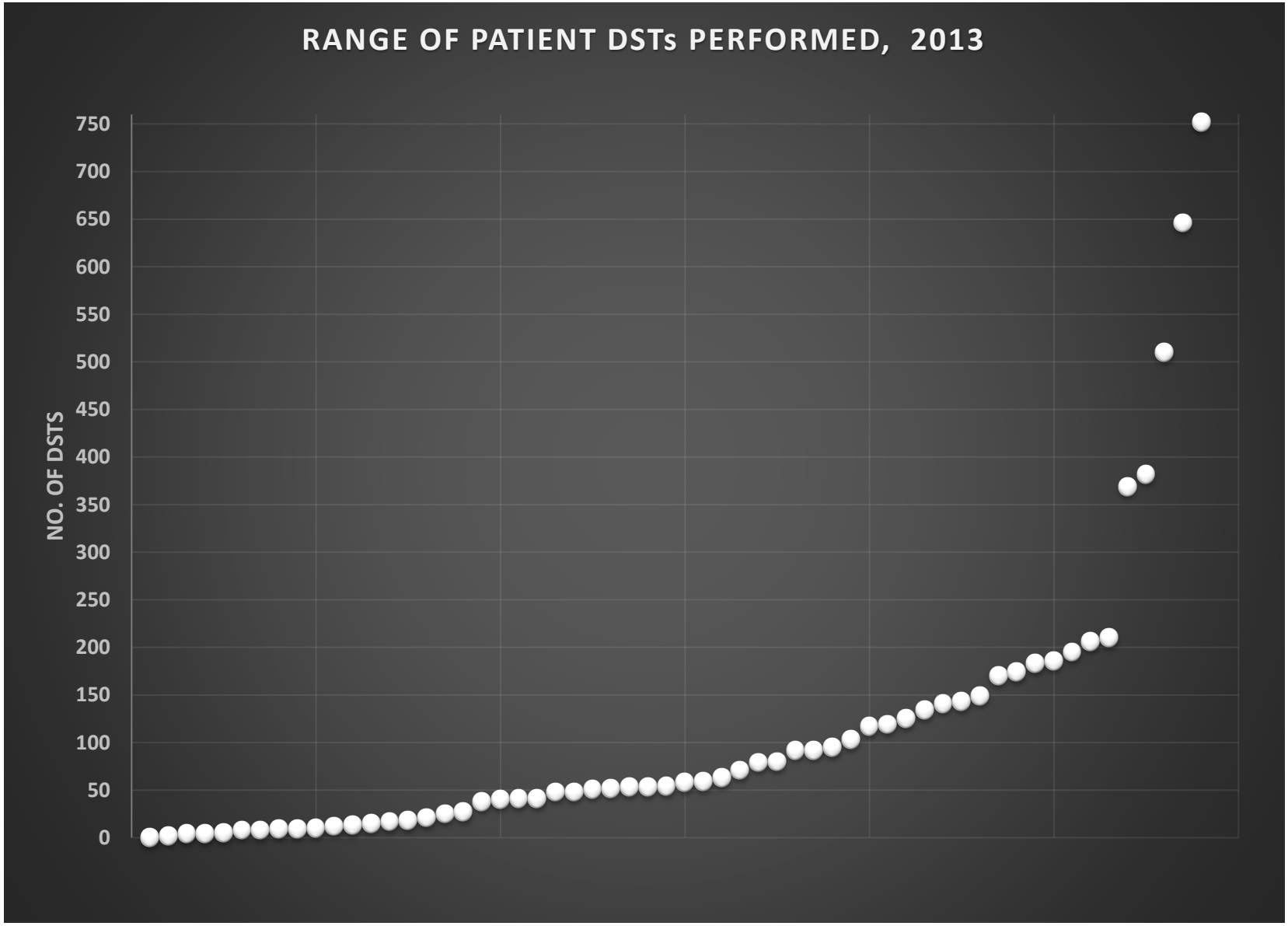
Variable	Total No. or Percent (Range Among 58 Laboratories Reporting)					2013 Compared to 2009 No. or Percent (% change)
	2009	2010	2011	2012	2013	
Clinical specimens received	272,157 (288—21,862)	257,005 (251—23,250)	239,892 (283—21,943)	237,761 (273—21,082)	223,363 (239—19,275)	↓ -48,784 (-17.9)
Patients specimens submitted	112,453 [a] (88—8,555)	114,700 (126—10,404)	107,144 (94—10,057)	103,475 (152—10,695)	97,632 (107—11,487)	↓ -14,821 (-13.2)
Patients culture positive for MTBC	5,005 (1—628)	4,285 (0—599)	4,399 (2—586)	4,270 [a] (1—560)	4,210 (1—584)	↓ -795 (-15.9)
Patient DSTs performed	7,531 (2—883)	7,217 (0—758)	6,822 (1—705)	6,854 (1—685)	6,429 (0—752)	↓ -1,102 (-14.6)
Patients tested by NAAT	15,827 (0—772)	14,081 (0—6,253)	15,077 (0—6,450)	14,720 (2—5,599)	16,610 (1—5,197)	↑ 783 (4.7)
Patients NAAT positive for MTBC	2,355 (0—177)	2,507 (0—408)	2,430 (0—361)	3,045 (0—706)	2,918 (1—382)	↑ 563 (19.3)
Percent patients culture positive for MTBC [b]	4.4 (0.2 – 23.9)	3.7 (0 – 27.8)	4.1 (0.2 – 21.1)	4.2 (0.3 – 19.9)	4.3 (0.2 – 19.8)	↔ -0.1 (-2.2)
Percent patients NAAT positive for MTBC [c]	14.9 (0—90.1)	17.8 (0—71.0)	16.2 (0—64.9)	16.6 (0—75.0)	17.6 (1—90.9)	↑ 2.7 (18.1)

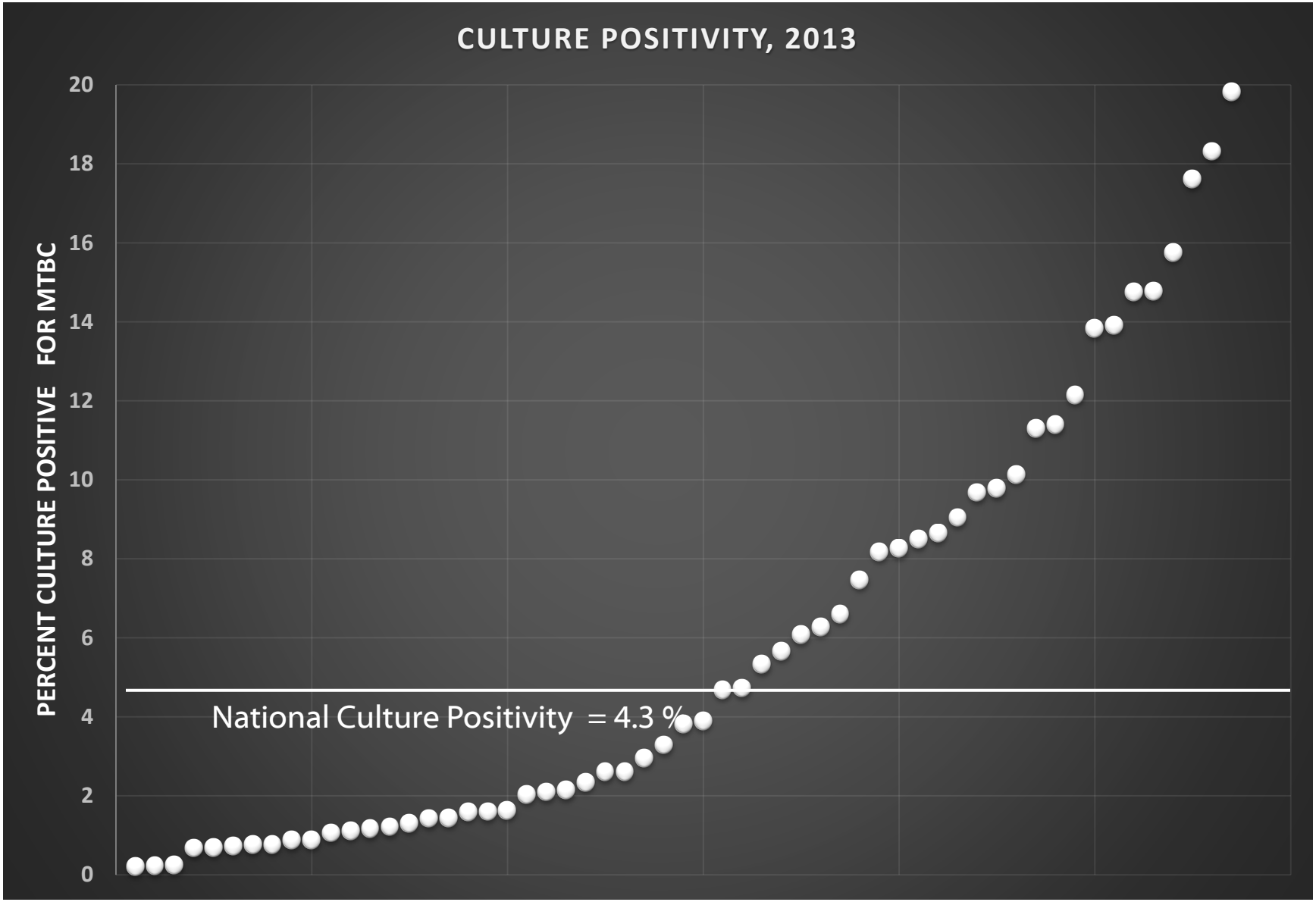
Note. MTBC = *Mycobacterium tuberculosis* complex. DST = Drug susceptibility test for MTBC. NAAT = Nucleic acid amplification test.

[a]Number based on 57 sites reporting.

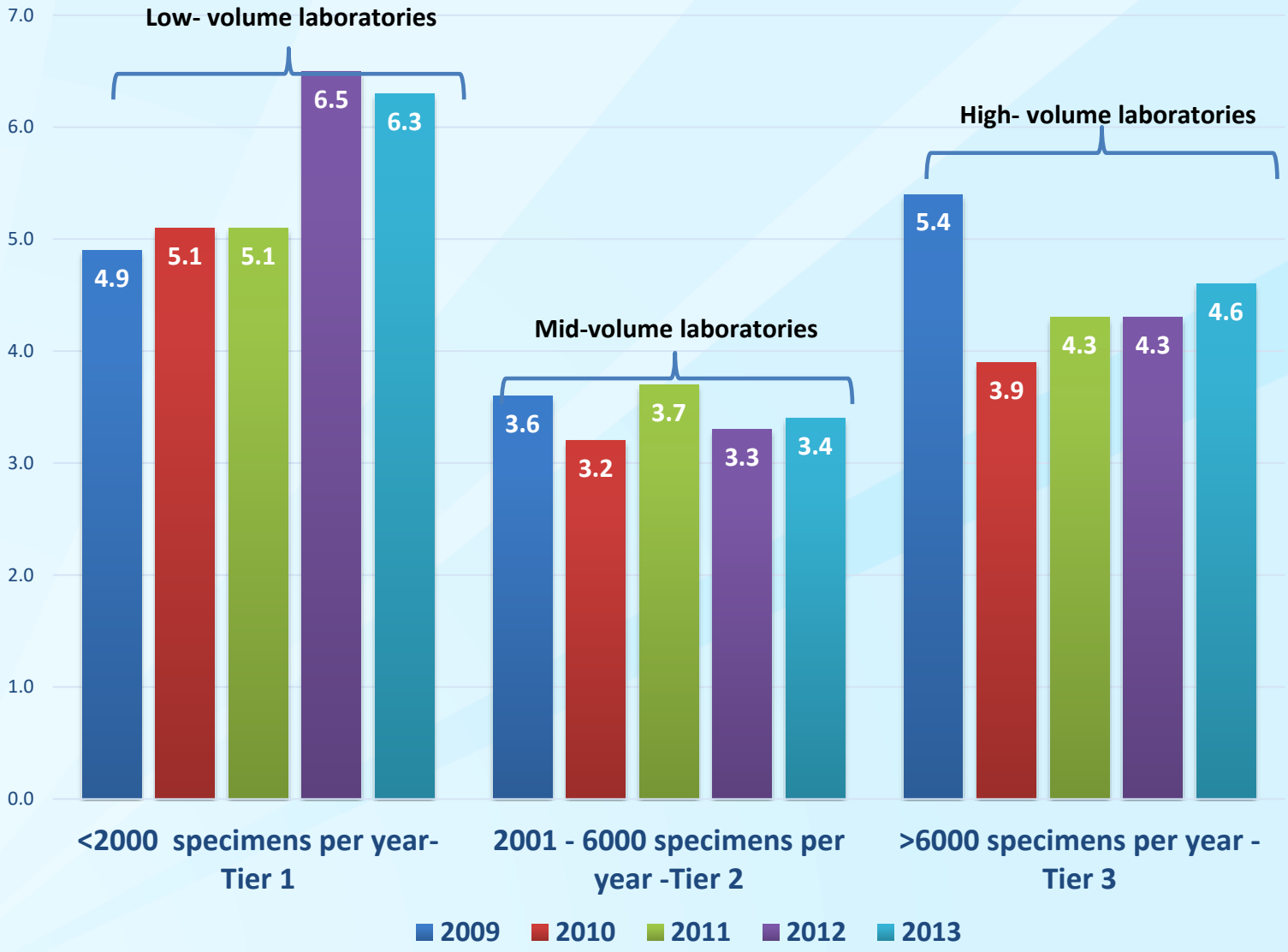
[b]Percent culture-positive for MTBC of patient specimens received for smear and culture.

[c]Percent positive for MTBC of those patients tested by NAAT.

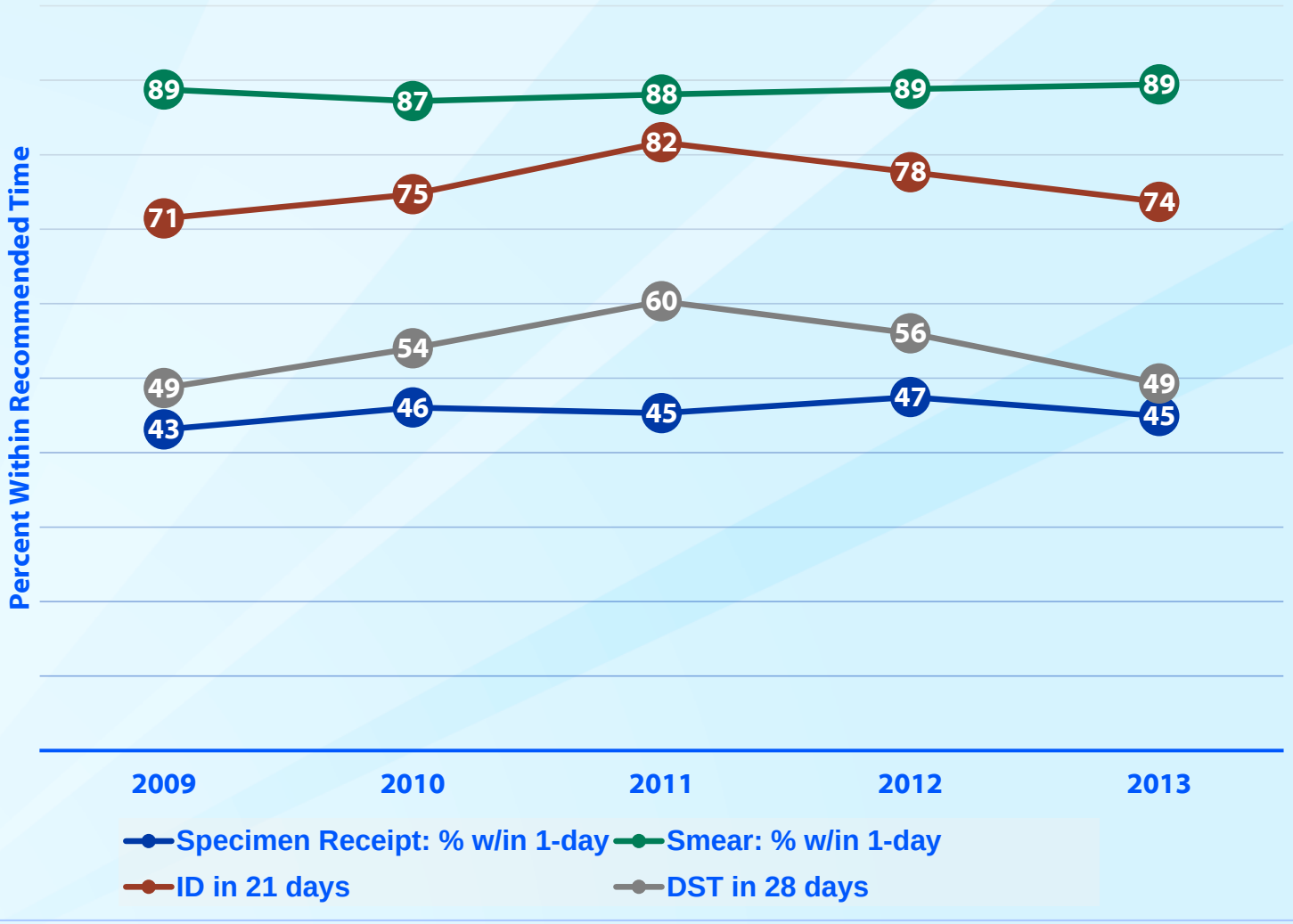

RANGE OF PATIENT DSTs PERFORMED, 2013
NO. OF DSTS
750
700
650
600
550
500
450
400
350
300
250
200
150
100
50
0


CULTURE POSITIVITY, 2013
PERCENT CULTURE POSITIVE FOR MTBC
20
18
16
14
12
10
8
6
4
2
0
National Culture Positivity = 4.3 %

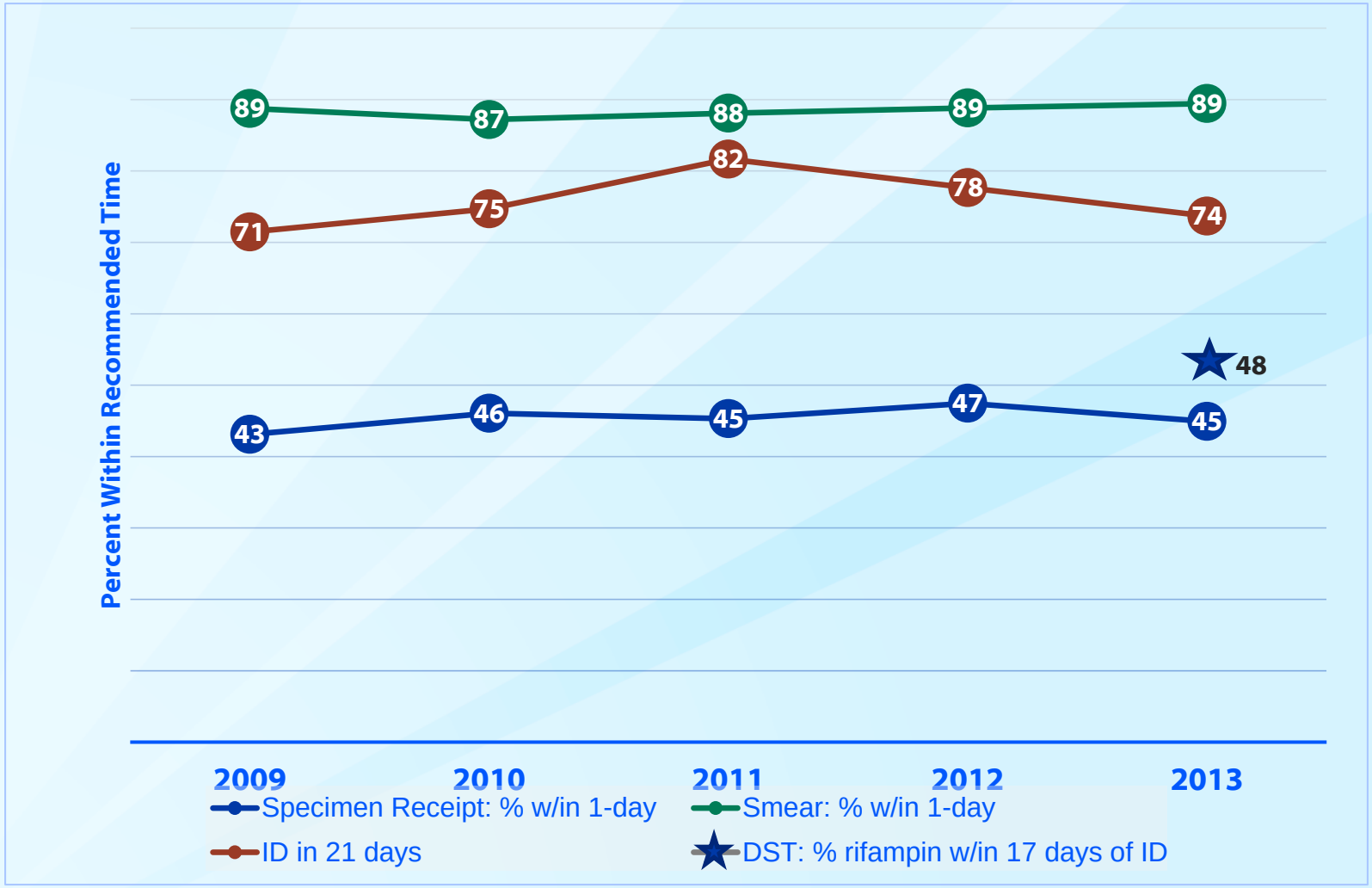
Culture Positivity Stratified by Testing Volume



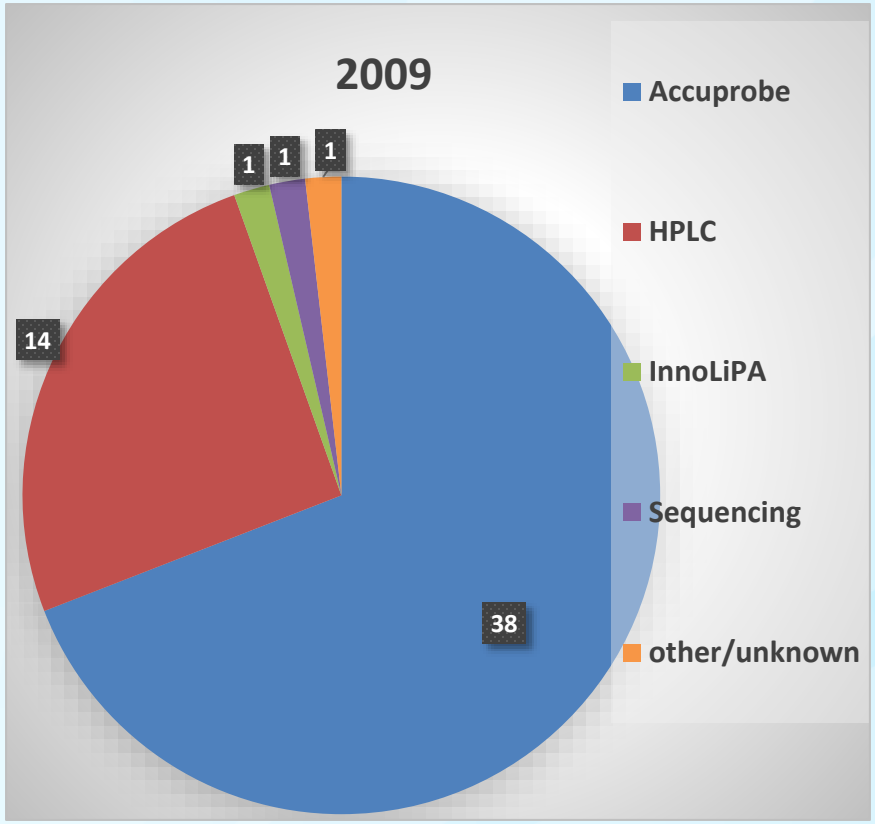
National Trends in TAT

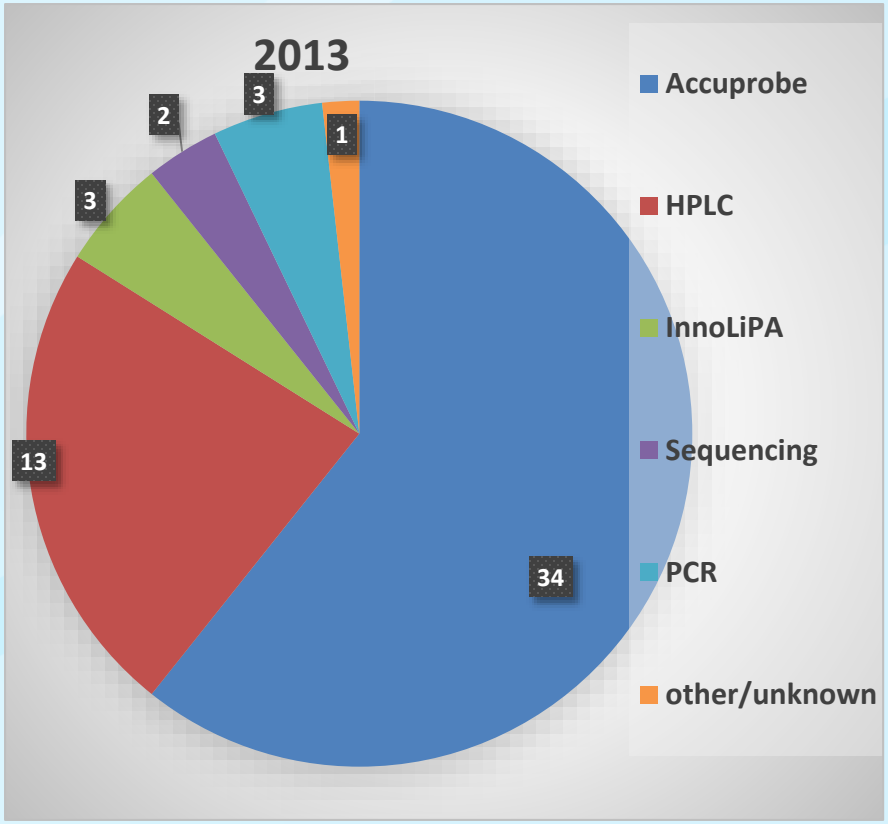


National Trends in TAT

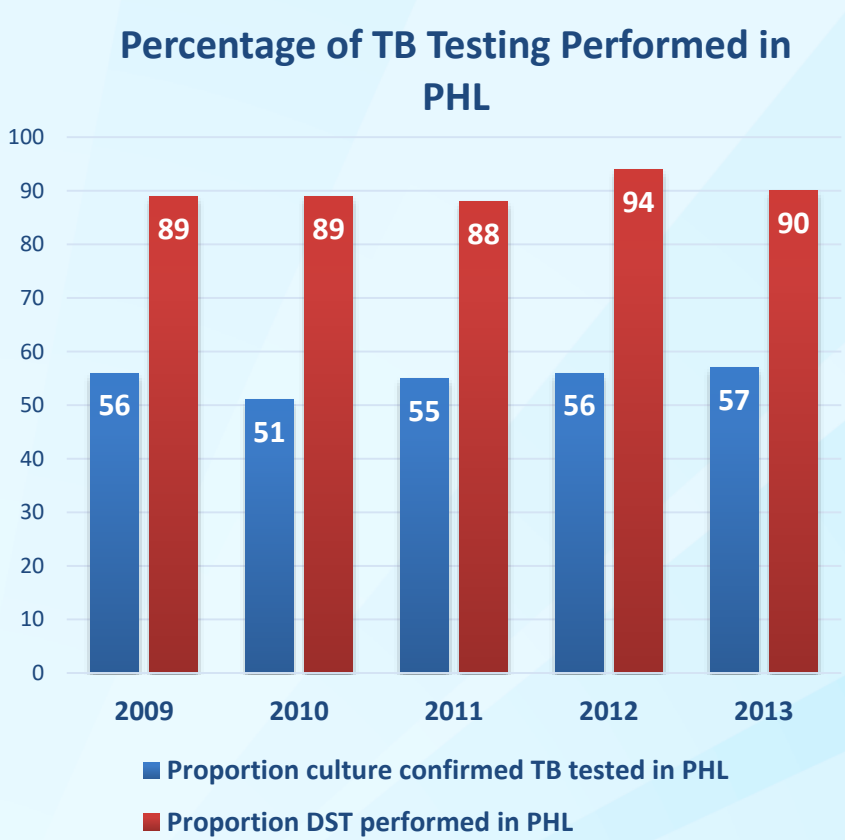


Trends in Primary Identification Methods





Comparisons to Surveillance Data



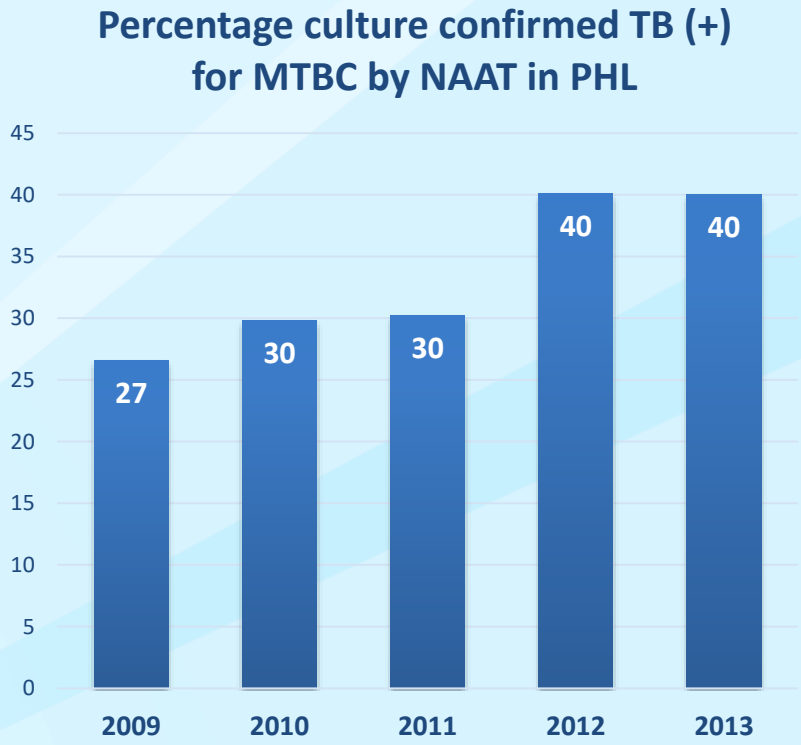


Chart 1: Denominators: Number of culture confirmed TB, and number of culture-confirmed TB that had DST performed, U.S., 2013. Numerators, number of patients (+) for MTBC by culture in PHL, and number of patient DSTs performed in PHL, 2013.

Chart 2: Denominator: Number of culture confirmed TB cases, U.S,. 2013. Numerator: Number of patients (+) for MTBC by NAAT in PHL, 2013

Limitations

- **Only the 58 PHL receiving cooperative agreement funding included**
  - ≈76 PHL in the U.S. perform TB testing
    - 18 laboratories not funded are local/county PHL—many in CA
    - Private sector not included
- **TAT data**
  - Measured as % of test results reported within a recommended time
    - Might impact PHLs with low denominators for benchmarks
    - Difficult to compare to older studies—measured differently
  - Self-reported
    - Subject to differences in recording capabilities within laboratories
- **Proportional estimates of PHL contributions taken from different data sources**
  - May not account for duplicate testing

Discussion

Importance of PHLs

- Identified as principal partners in the recently announced National Action Plan for Combating Multidrug-Resistant TB[1]
- TB diagnosis is only one of many functions that PHLs provide
  - Assessing relative infectiousness of TB patients
  - Determining presence of antibiotic resistance
  - Monitoring treatment response
  - Investigating and validating new methodologies
  - Providing confirmatory and referral testing for other laboratories
  - Providing consultation and interpretation of results to TB Control and other submitters

[1] USAID, December, 2015: https://www.usaid.gov/what-we-do/global-health/tuberculosis/national-action-plan-combating-mdr-tb

Discussion (2)

- **Public health compared to private sector**
  - Hospitals provide ≈ 55% of public health assessment activities related to diagnostic needs [1]
  - Less likely to contribute to assurance activities
    - e.g. regular evaluations of effects of public health services on community health status
  - Assurance activities achieved by ongoing, frequent communication with providers, TB health practitioners, program officials
    - Vital to successful TB Control
    - PHLs continually engage in theses activities, private sector less so
  - However, public health programs experiencing falling share of US health spending [2]
    - Determination of cost-effective yet accurate and high-quality testing will continue to be critical

[1]Hogg RA, Mays GP, Mamaril CB. Hospital contributions to the delivery of public health activities in US metropolitan areas: national and longitudinal trends. Am J Public Health. 2015;105(8):1646–1652
[2] Himmelstein DU, Woolhandler S. Public health's falling share of US health spending. Am J Public Health. 2015;106(1):56–57.

Conclusions

- **Volume of TB diagnostic testing is declining in the United States**
  - However, NAAT volume is on the rise
- **Substantial proportion of TB testing is contributed by PHLs**
  - Culture and DST proportion has remained relatively stable
  - NAAT proportion significantly increased from 2009
- **PHLs are diverse in their roles**
  - Demonstrated by wide ranges in culture positivity, testing volumes, and proportions of all TB testing within jurisdictions
- **PHLs are adaptive**
  - Uptake of rapidly changing technologies, changes in data-driven algorithms, and increased collaborations with partners

Acknowledgements

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For more information please contact Centers for Disease Control and Prevention

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