Virginia TB Epidemiology Update and Surveillance News

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Division of Tuberculosis and Newcomer Health

Virginia Department of Health

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Outline

2017 Epi Data Review

Surveillance News and Updates
- VEDSS/RVCT
- LTBI
- Genotyping

Uses of TB Surveillance Data

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Learning Objectives

- Describe the 2017 TB epidemiologic profile for Virginia

- Discuss options for directly entering Report of Verified Case of Tuberculosis (RVCT) data into the Virginia Electronic Disease Surveillance System (VEDSS)

- Discuss estimated latent tuberculosis infection (LTBI) prevalence rates and surveillance changes for LTBI

- Discuss whole genome sequencing (WGS) in the context of TB

- Understand how TB surveillance data is used
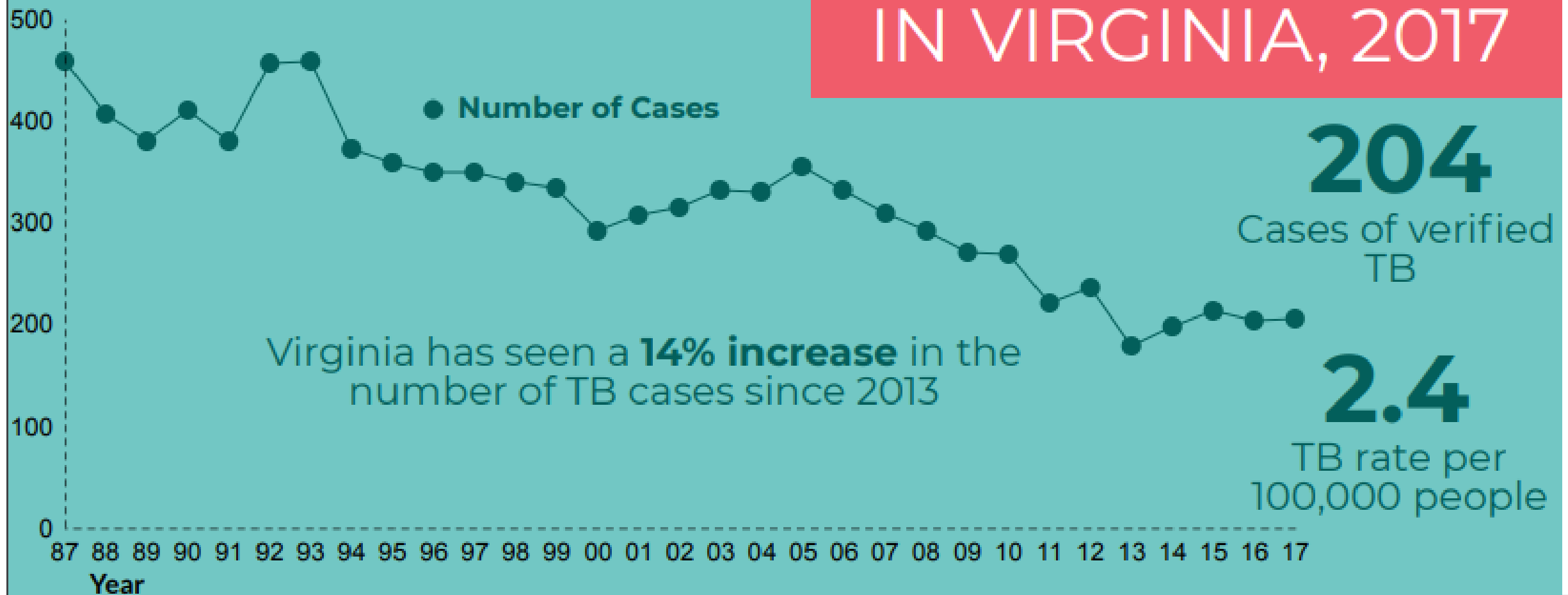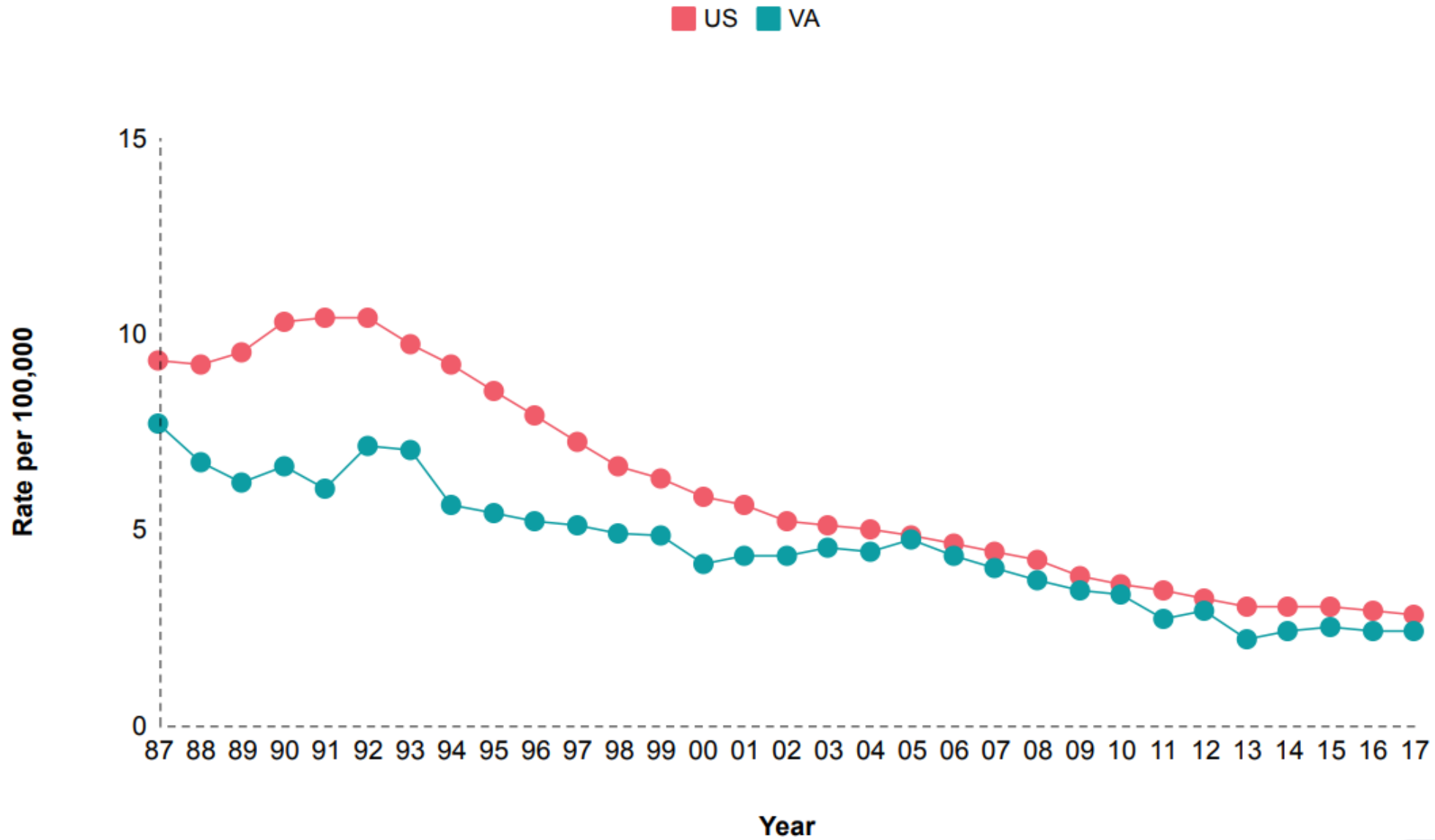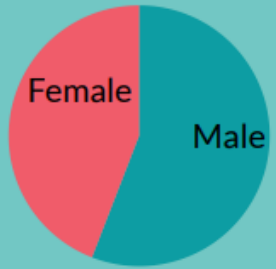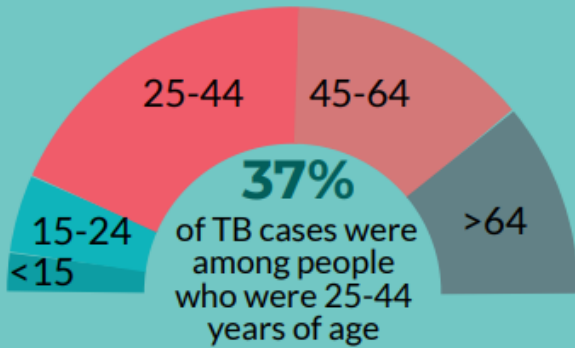
TUBERCULOSIS

IN VIRGINIA, 2017

● **Number of Cases**

Virginia has seen a **14% increase** in the number of TB cases since 2013

204
Cases of verified TB

2.4
TB rate per 100,000 people

Year

87 88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17

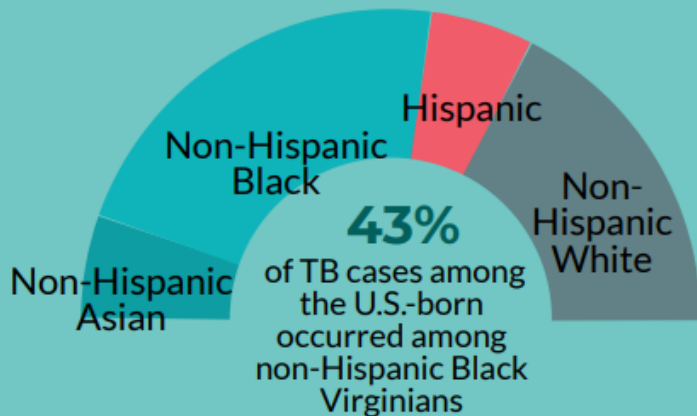**Figure 1:** Tuberculosis rates, Virginia and the United States, 1987-2017
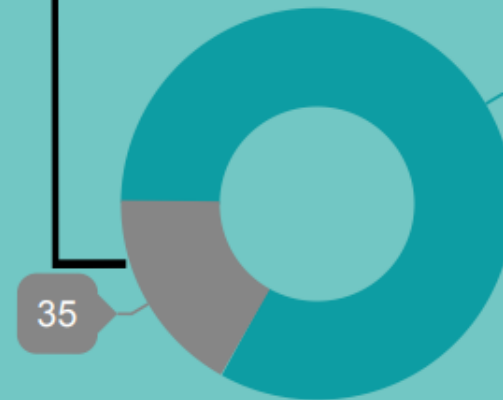
Figure 5: Non-U.S.-born and U.S.-born* Tuberculosis Cases, Virginia, 2013-2017

Non-U.S.-born cases

	2013	2014	2015	2016	2017
Non-U.S.-born	148	147	167	165	169
U.S.-born	31	51	45	38	35
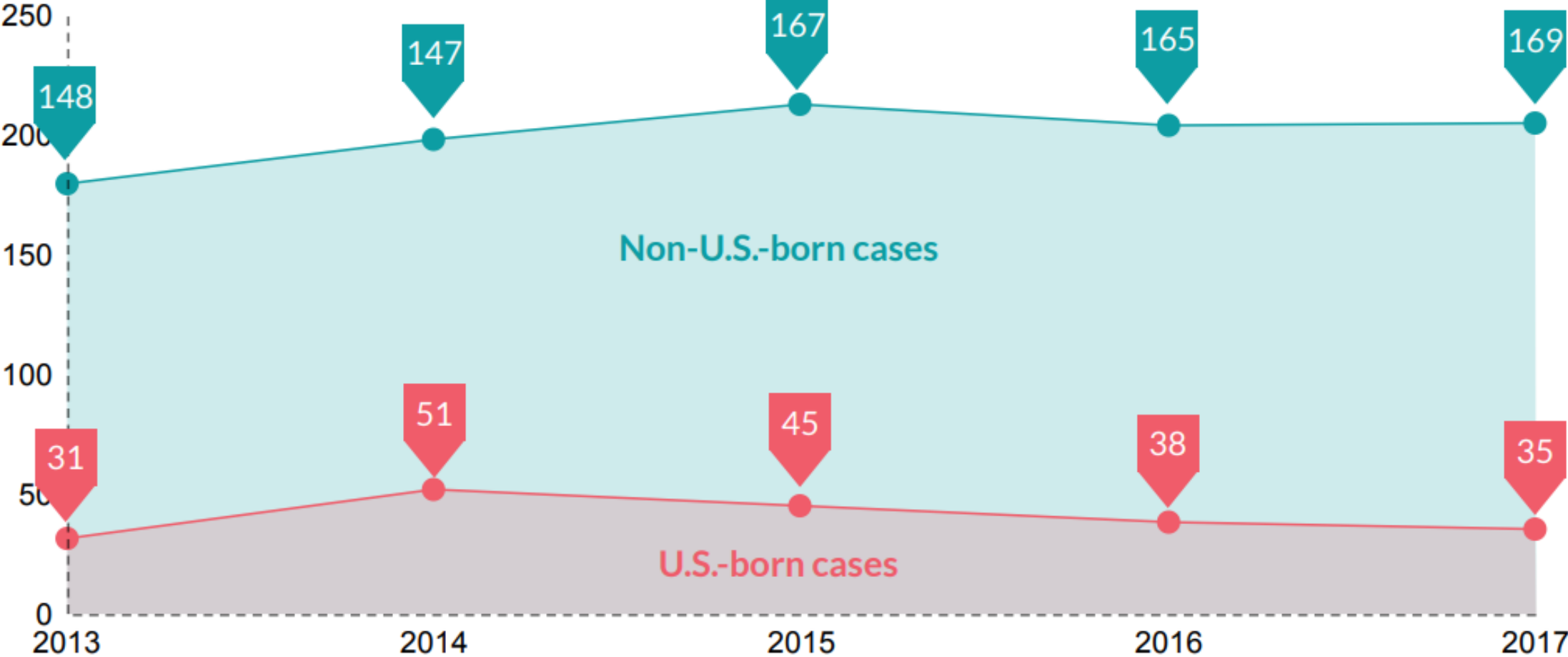
U.S.-born cases

Figure 6: Top Five Countries of Birth of Tuberculosis Cases, Virginia, 2017

United States - 35

India - 21

Vietnam - 11

Philippines -22

Ethiopia - 19

TIME IN THE U.S.

9.7 Median number of years in the U.S. at time of diagnosis among Non-U.S.-born patients

Origin

83% Proportion of cases among patients born outside of the U.S.
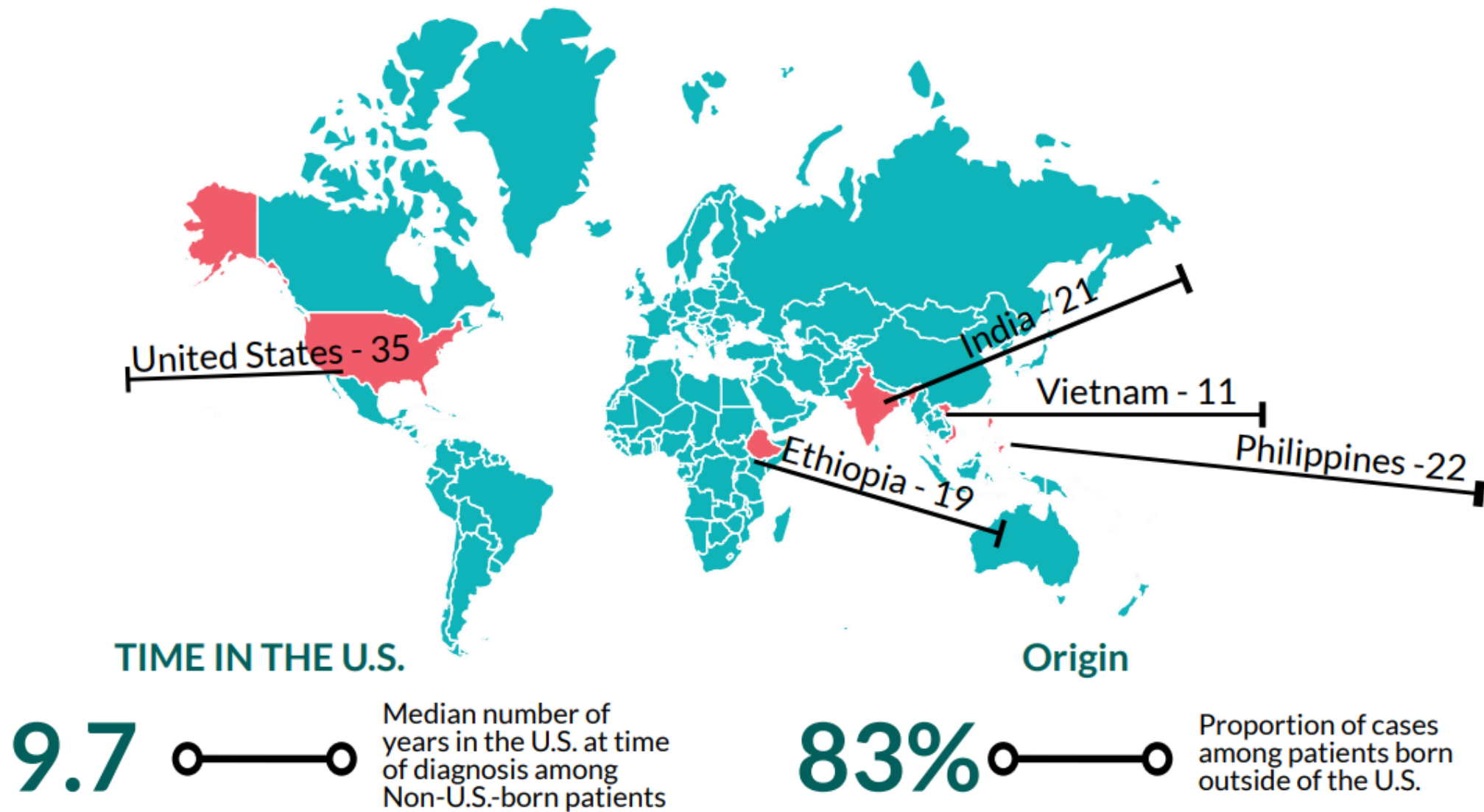
Figure 7: Race and Ethnicity of U.S.-born TB Cases, Virginia, 2013-2017

2017

43% Proportion of U.S.-born TB cases in Virginia among non-Hispanic Blacks

35% Proportion of U.S.-born TB cases in Virginia among non-Hispanic Whites

11% Proportion of U.S.-born TB cases in Virginia among Hispanics

11% Proportion of U.S.-born TB cases in Virginia among Asians

Legend: Asian/Pacific Islander, NH; Black, Not Hispanic; Hispanic; Multi-Race, Not Hispanic; White, Not Hispanic
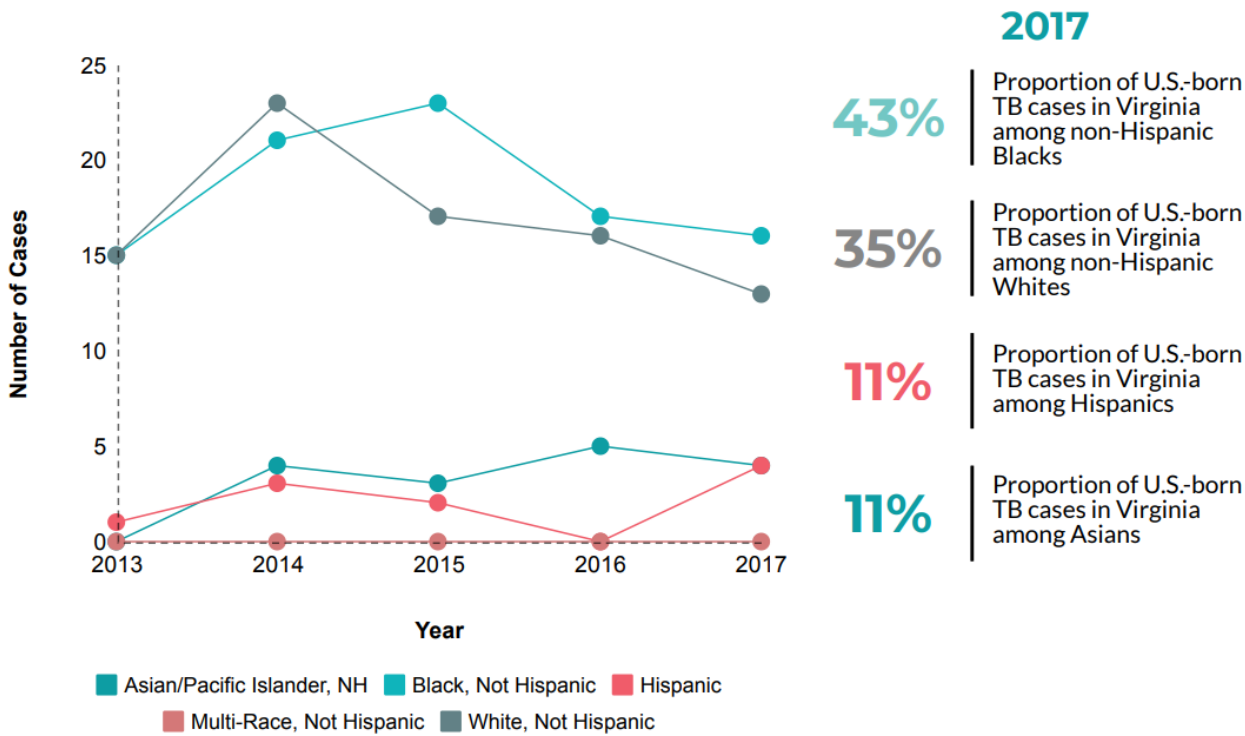
Figure 8: Race and Ethnicity of Non-U.S.-born TB Cases, Virginia, 2013-2017

2017

52% Proportion of non-U.S.-born TB cases in Virginia among Asians

23% Proportion of non-U.S.-born TB cases in Virginia among Hispanics

18% Proportion of non-U.S.-born TB cases in Virginia among non-Hispanic Blacks

7% Proportion of non-U.S.-born TB cases in Virginia among non-Hispanic Whites

Legend: Asian/Pacific Islander, NH; Black, Not Hispanic; Hispanic; Multi-Race, Not Hispanic; White, Not Hispanic

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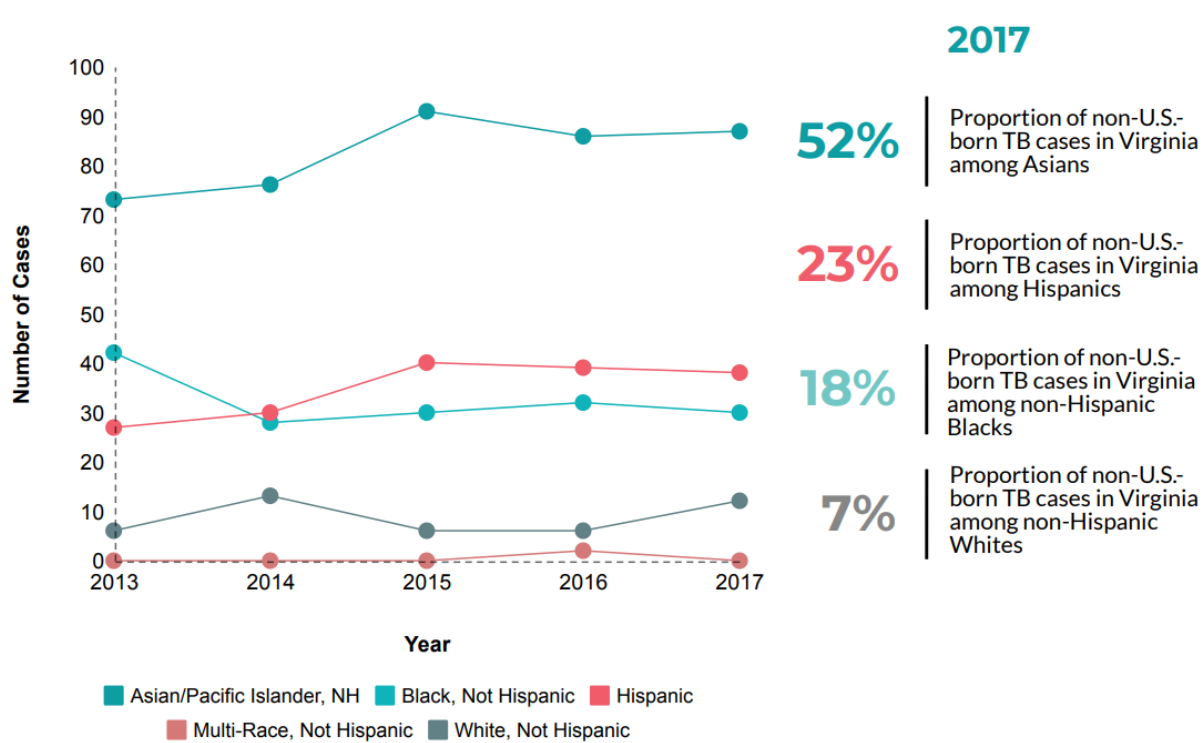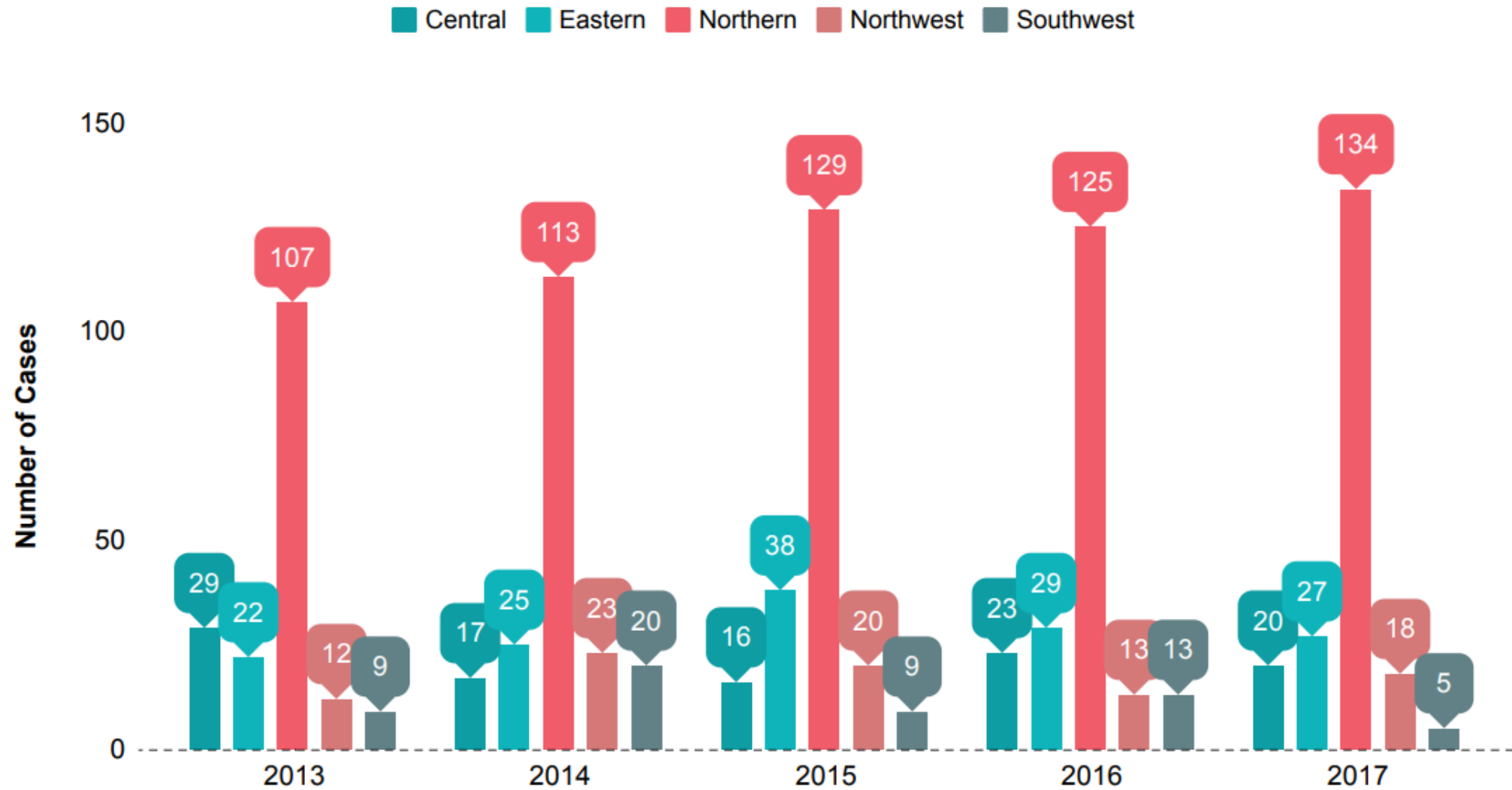*To protect the health and promote the well-being of all people in Virginia.*

Figure 9: Tuberculosis Cases by Region, Virginia, 2013-2017

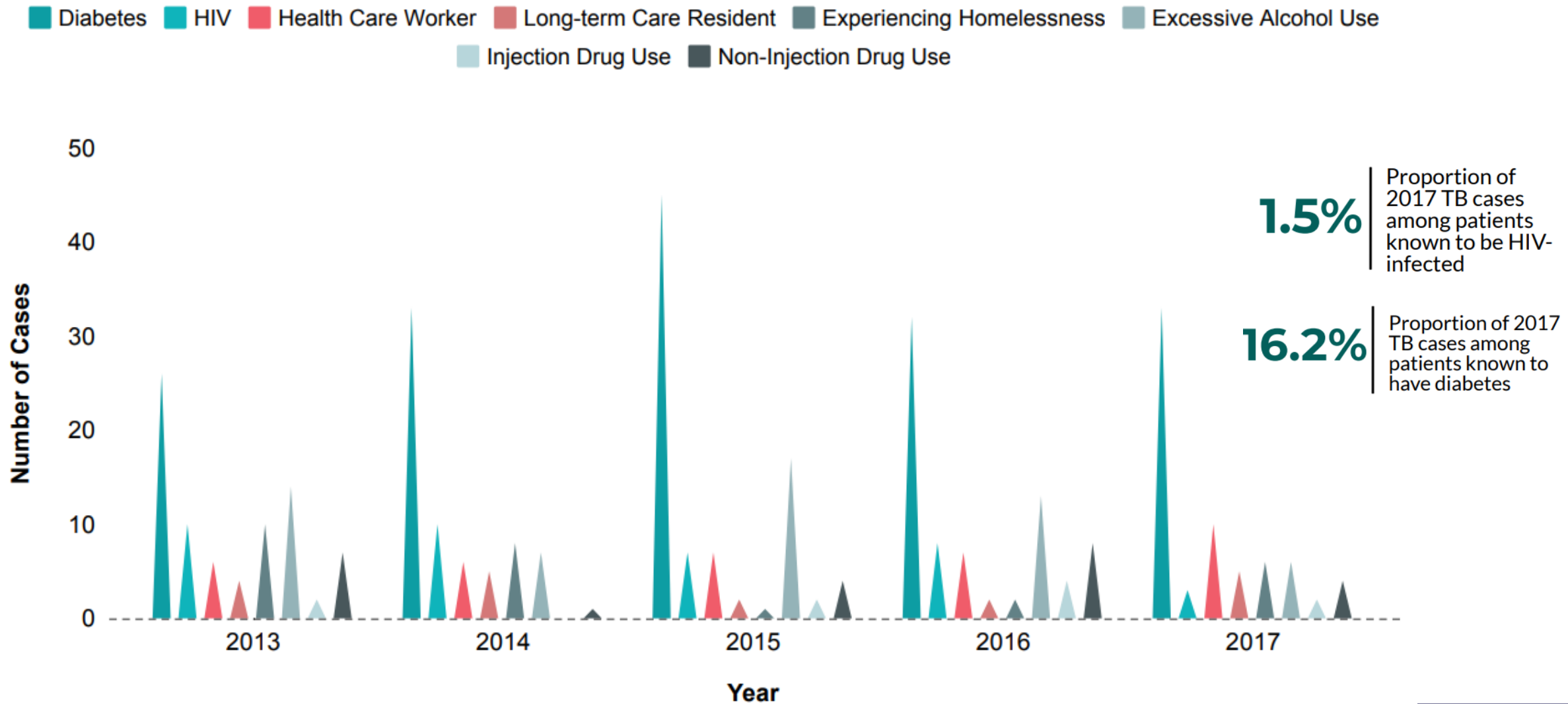Figure 11: Selected Risk Factors of Tuberculosis Cases, Virginia, 2013-2017

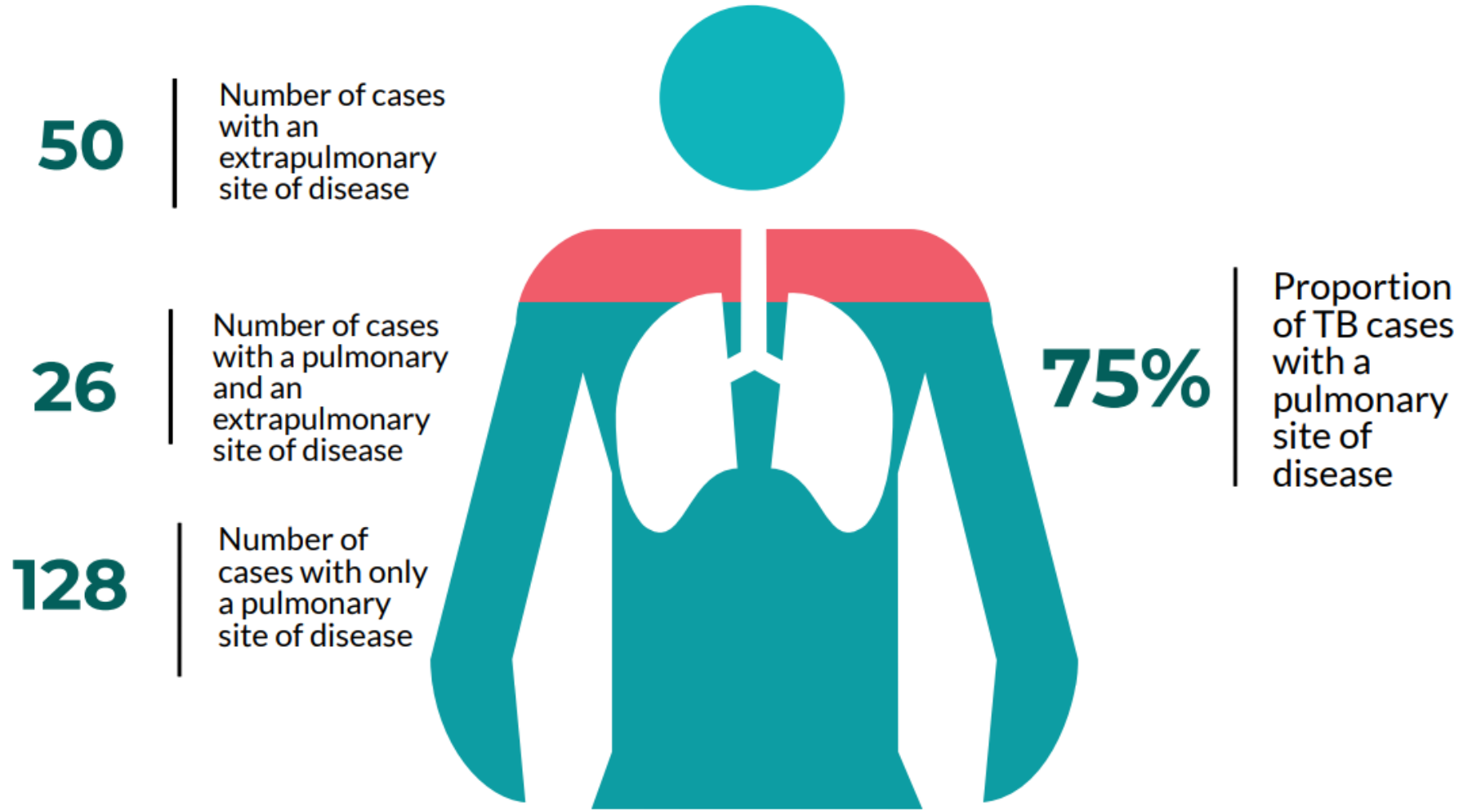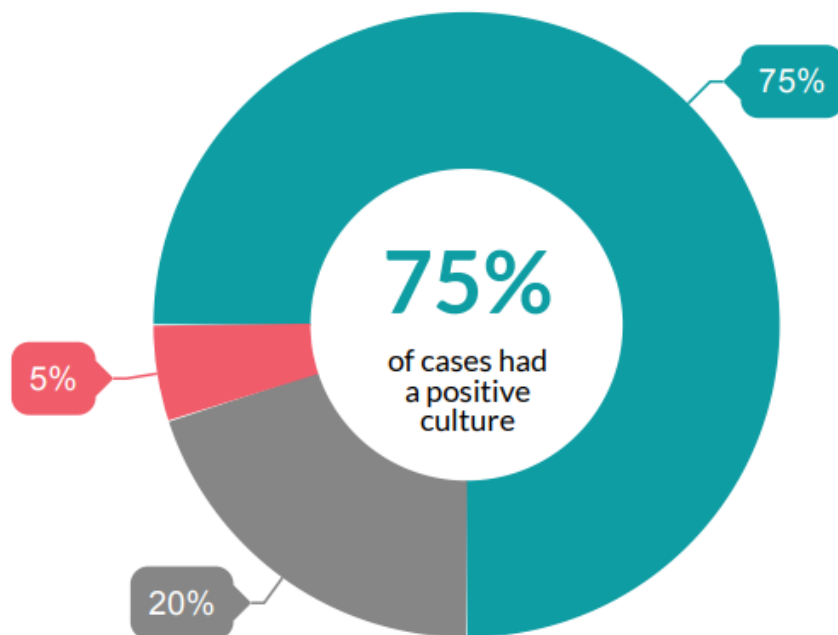**Figure 12:** Tuberculosis cases by disease site, Virginia, 2017

50 | Number of cases with an extrapulmonary site of disease

26 | Number of cases with a pulmonary and an extrapulmonary site of disease

128 | Number of cases with only a pulmonary site of disease

75% | Proportion of TB cases with a pulmonary site of disease

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Figure 13: Tuberculosis cases by confirmation method, Virginia, 2017*

75%

75%
of cases had
a positive
culture

5%

20%

- Culture-positive** (153)
- Clinical case definition (41)
- Verified by provider diagnosis(10)

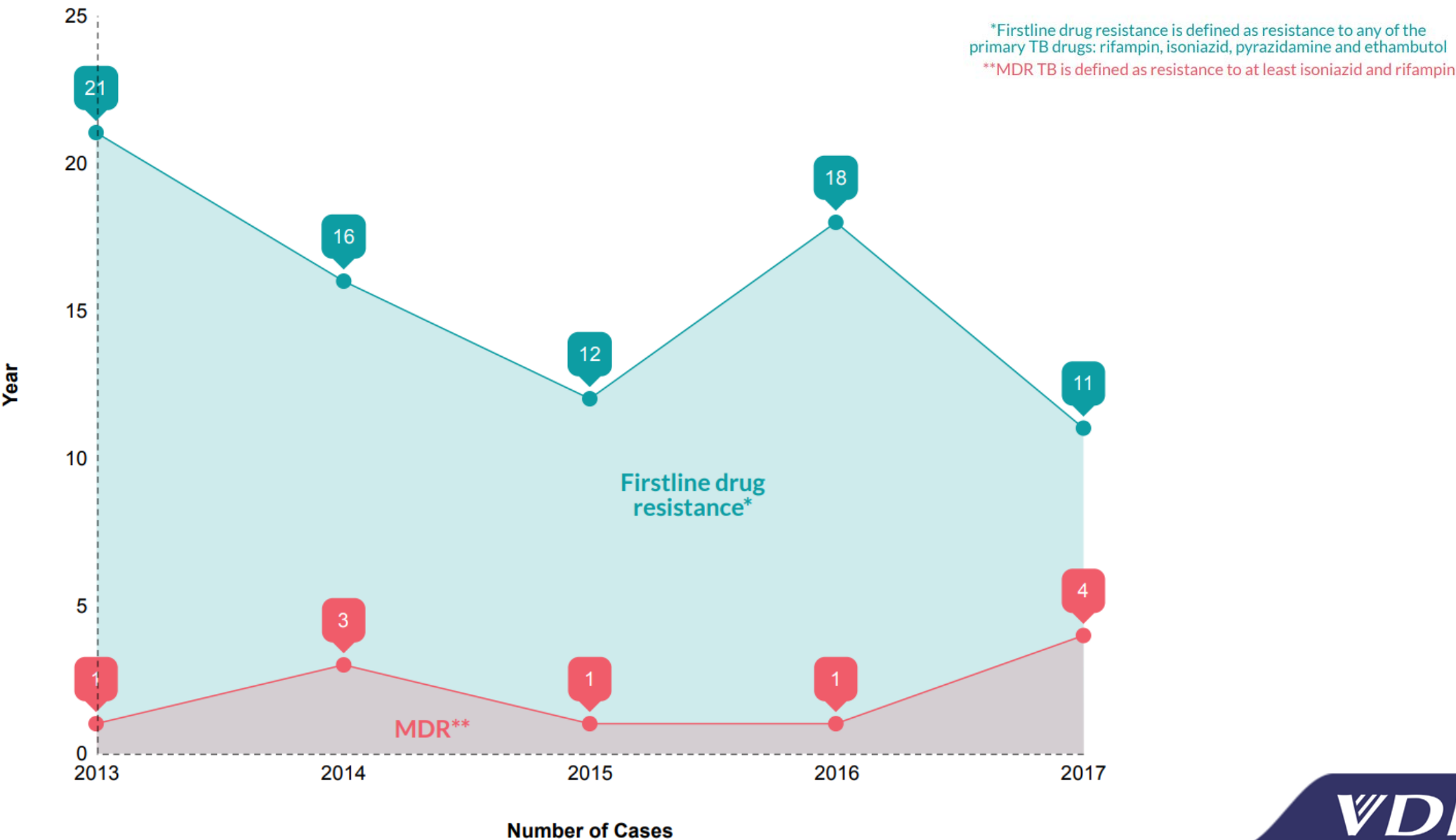**74%** Proportion of TB cases evaluated primarily for TB symptoms

15% Proportion of TB cases evaluated primarily due to an abnormal chest radiograph
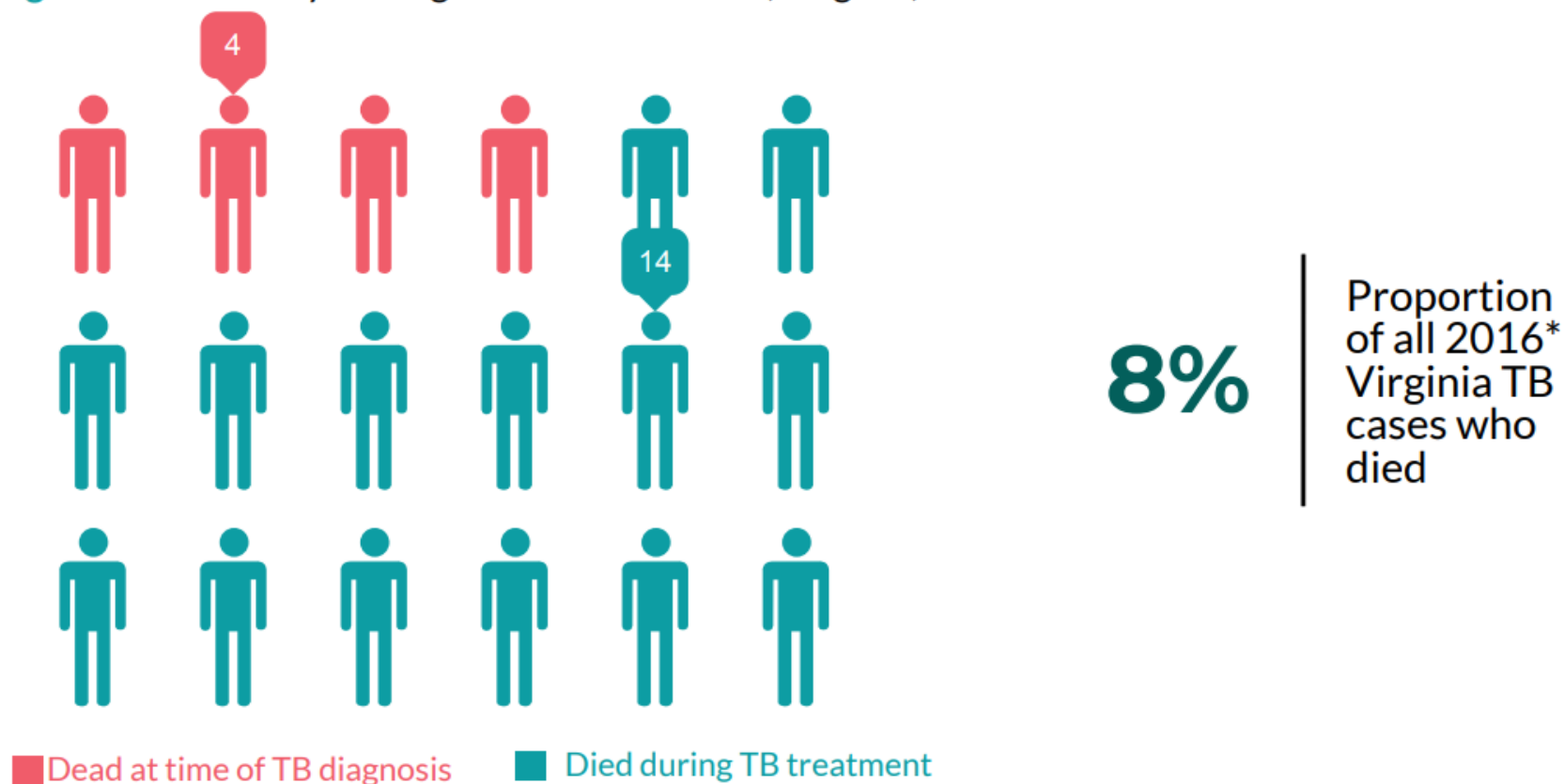
6% Proportion of TB cases evaluated primarily due to an incidental lab result

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Figure 14: Drug Resistance of Tuberculosis Cases, Virginia, 2013-2017

*Firstline drug resistance is defined as resistance to any of the primary TB drugs: rifampin, isoniazid, pyrazidamine and ethambutol

**MDR TB is defined as resistance to at least isoniazid and rifampin

Firstline drug resistance*

MDR**

Year

Number of Cases

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Figure 15: Mortality Among Tuberculosis Cases, Virginia, 2016

8% Proportion of all 2016* Virginia TB cases who died

■ Dead at time of TB diagnosis   ■ Died during TB treatment

Figure 16: Treatment outcomes for tuberculosis (TB) cases counted in 2016, Virginia (n=203)

■ Completed treatment (88%)   ■ Died (8%)   ■ Refused (1.5%)   ■ Lost to follow-up (1.5%)   ■ Adverse treatment event (0.5%)

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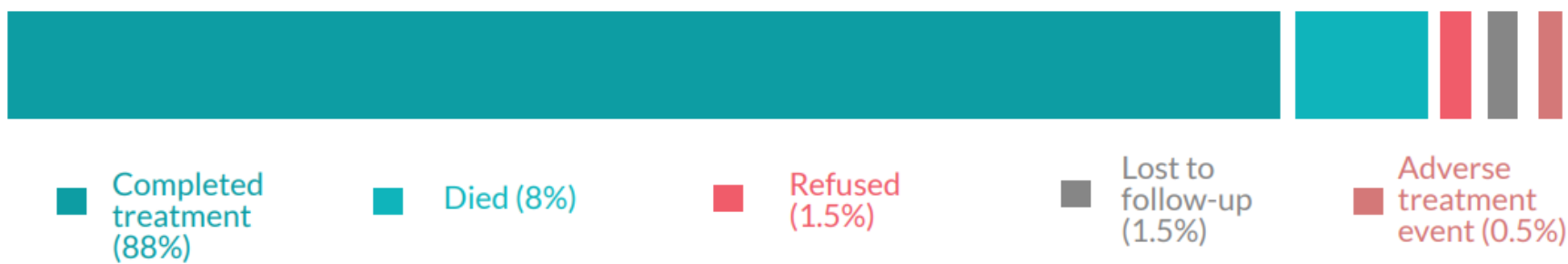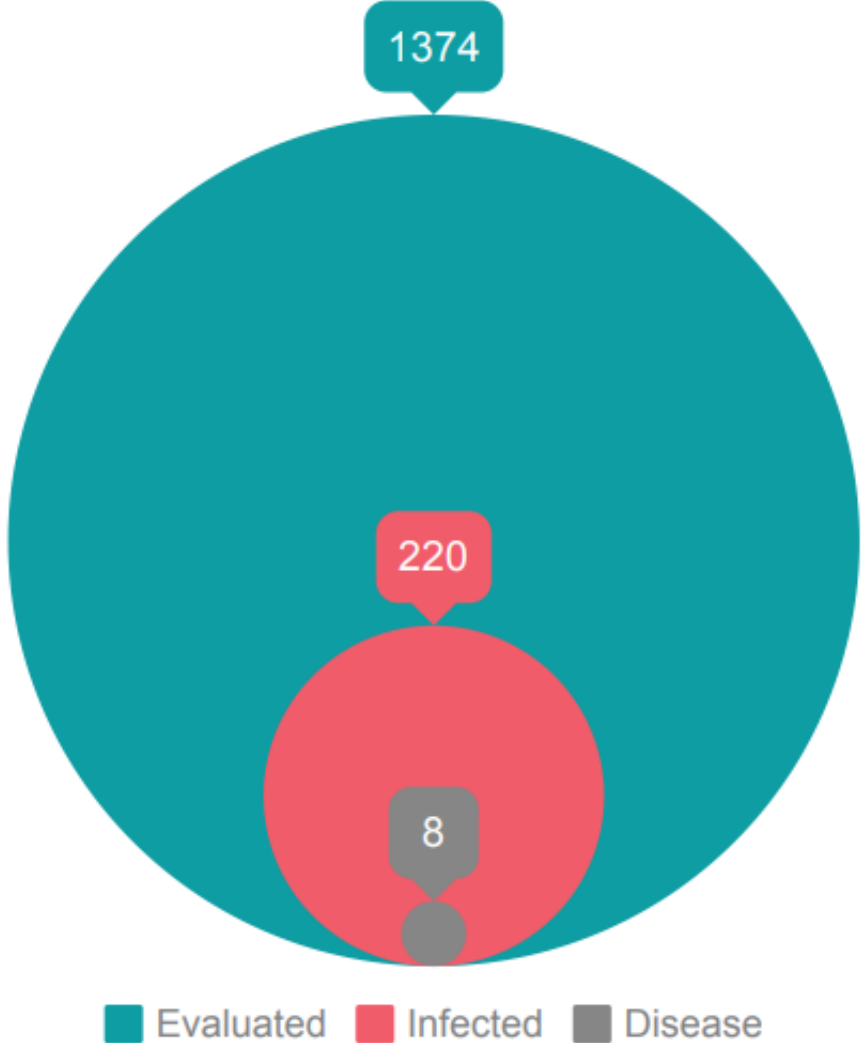
Figure 17: Contact evaluation outcomes, Virginia, 2016

16% Proportion of evaluated contacts for 2016 TB cases with LTBI

0.6% Proportion of evaluated contacts for 2016 TB cases with TB disease

■ Evaluated   ■ Infected   ■ Disease

Surveillance News

VDH TB Surveillance team is currently working with local TB programs to train district staff in VEDSS and move toward direct entry of Report of Verified Case of Tuberculosis (RVCT)

- Potential to improve reporting timeliness
- Potential to improve outbreak/cluster detection as quickly as possibly by linking results to genotyping data
- Provide district TB programs with access to all TB and Mycobacterium lab results in VEDSS

If your district TB program might be interested, please contact me!

Fairfax is up and running and several other districts have been trained

Surveillance News

2020 RVCT

- CDC is in the final stages of developing an updated RVCT
  - Will capture molecular results
  - Will add a question about smoking status
  - Will capture pregnancy
  - Will capture "country of usual residency" in addition to country of birth
  - May enhance specificity of how occupation is captured
  - Will include specific additional drugs (such as bedaquiline)
  - Will remove immigration status

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Surveillance News

Latent tuberculosis infection (LTBI) reporting is coming soon!
- LTBI reporting **for all ages** will be added to the list of reportable conditions as soon as October of 2018
  - This is much sooner than originally anticipated!
- Eliminating TB requires expanding testing and treatment of LTBI, but surveillance efforts have had mixed results in other states
  - ~16 states currently require LTBI reporting
- Additional information will be coming out as soon as possible from TB Control with guidance for how to handle incoming reports of LTBI
- As of October 1st, Civil Surgeons are also required to report diagnoses of LTBI regardless of state reporting requirements

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LTBI – Focusing on prevention below the surface

- The annual percent decline in TB cases in the US has slowed over the past several years to just 2%
  - To reach TB elimination by 2100, a sustained annual decline of 3.9% is required
- Approximately 25% of the world's population is latently infected with *Mycobacterium tuberculosis*
- Although not infectious, LTBI can be activated years later as infectious TB, which is why diagnosing and treating LTBI in high-risk populations is a key component of the World Health Organization End TB Strategy
- To reach TB elimination we must begin to focus some of our efforts on LTBI

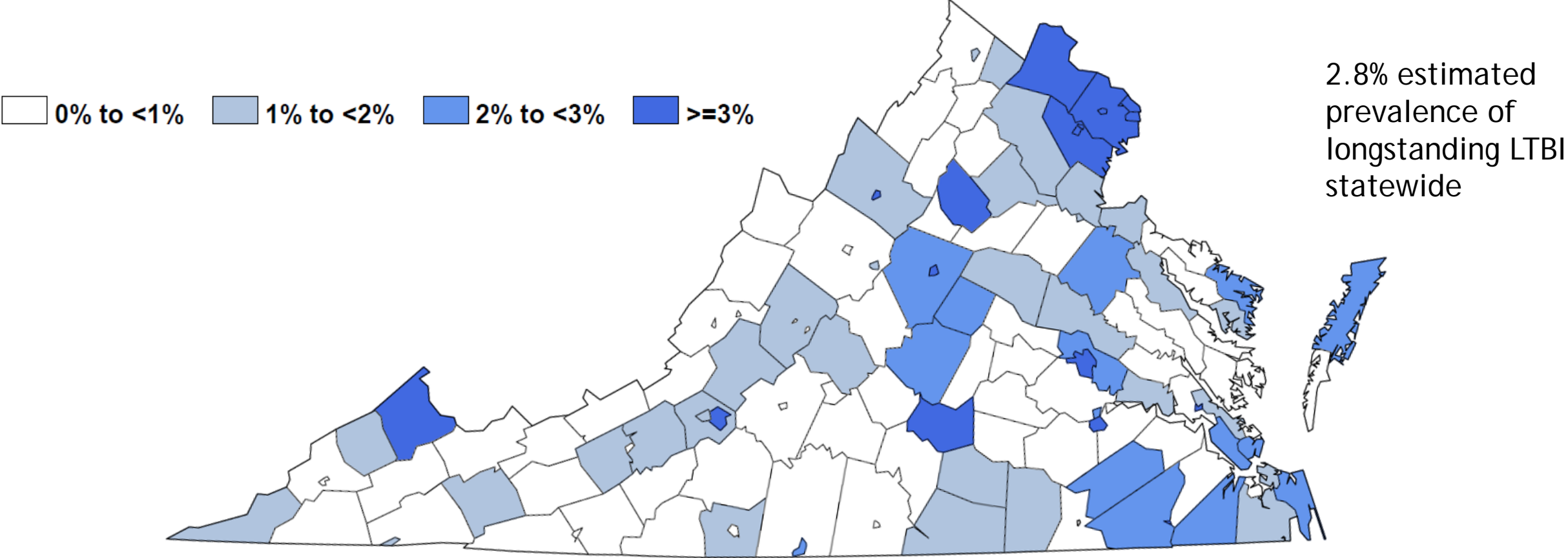# Estimated Longstanding Prevalence of LTBI by County in the U.S.
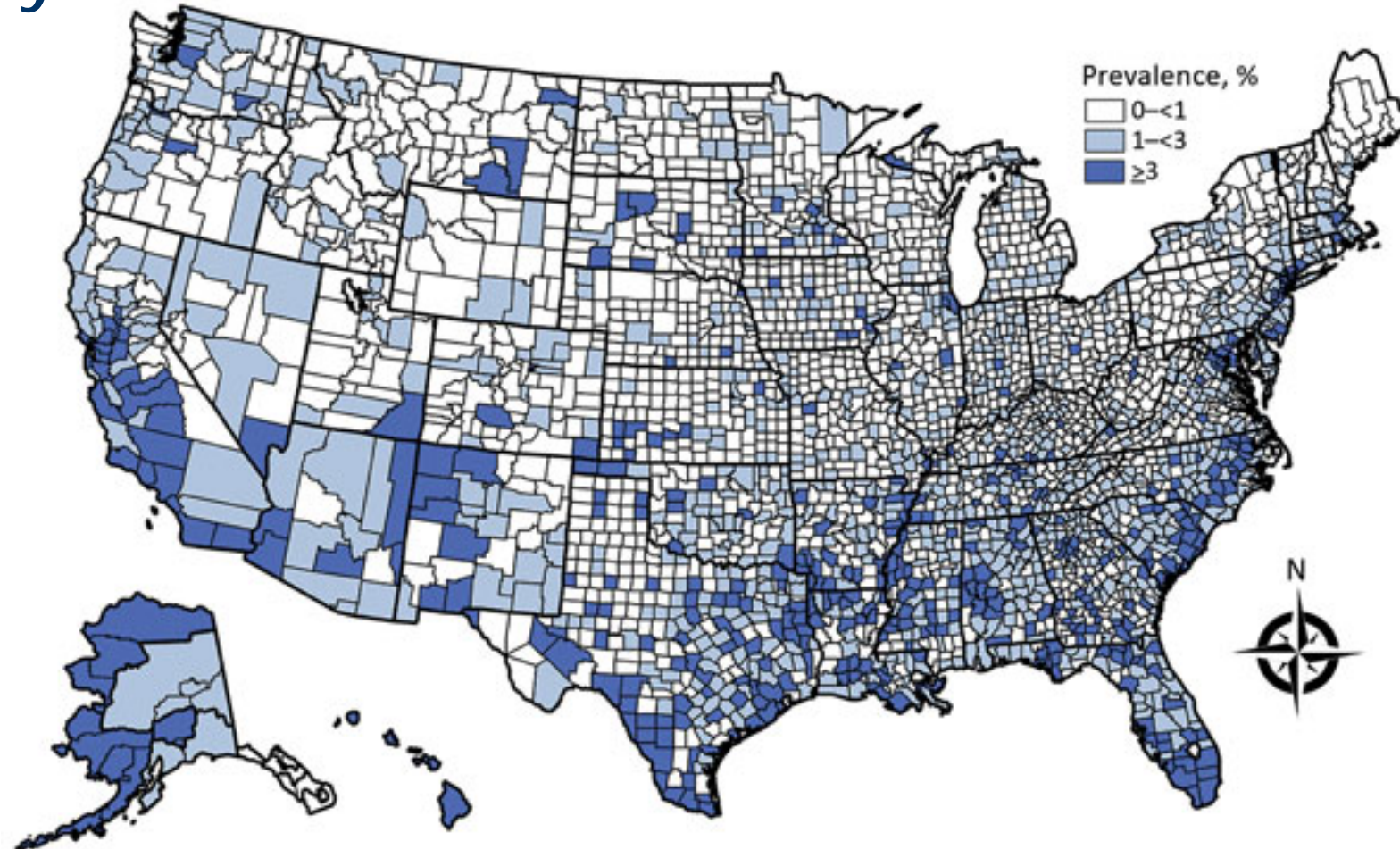
Prevalence, %
- ☐ 0–<1
- ☐ 1–<3
- ■ ≥3

3.1% estimated prevalence of LTBI nationwide

NHANES estimates are about 1% in U.S.-born and 13% in Non-U.S.-born

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Estimated Longstanding LTBI Prevalence by County in Virginia

0% to <1%   1% to <2%   2% to <3%   >=3%

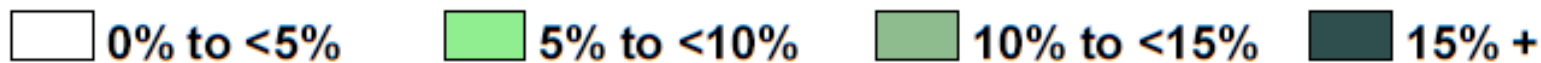2.8% estimated prevalence of longstanding LTBI statewide

Haddad MB, Raz KM, Lash TL, Hill AN, Kammerer JS, Winston CA, et al. Simple estimates for local prevalence of latent tuberculosis infection, United States, 2011–2015. Emerg Infect Dis. 2018 Oct [*date cited*]. https://doi.org/10.3201/eid2410.180716

Estimated Longstanding LTBI Prevalence among Non-U.S.-born, by County

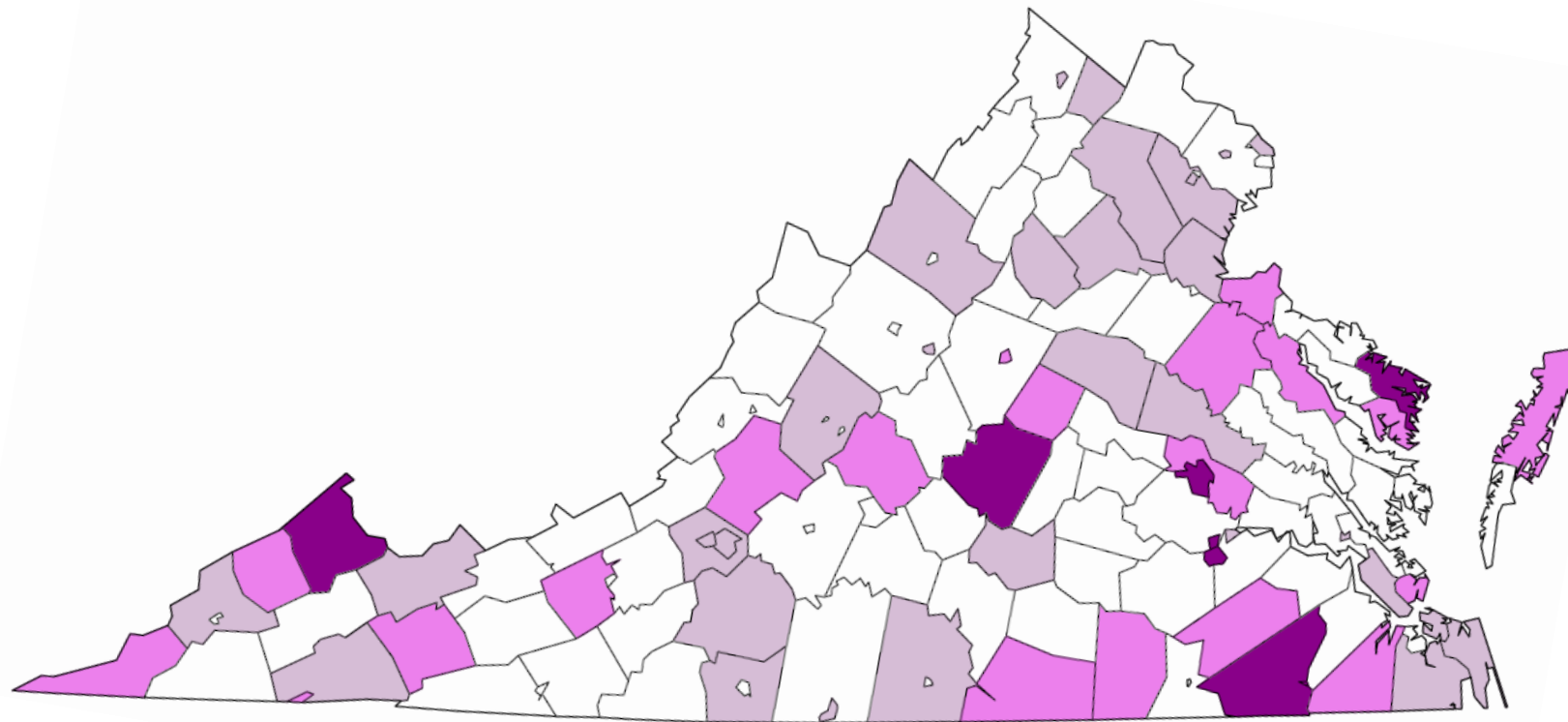Based on simple back calculation from all genotyped active TB cases in 2011-2015
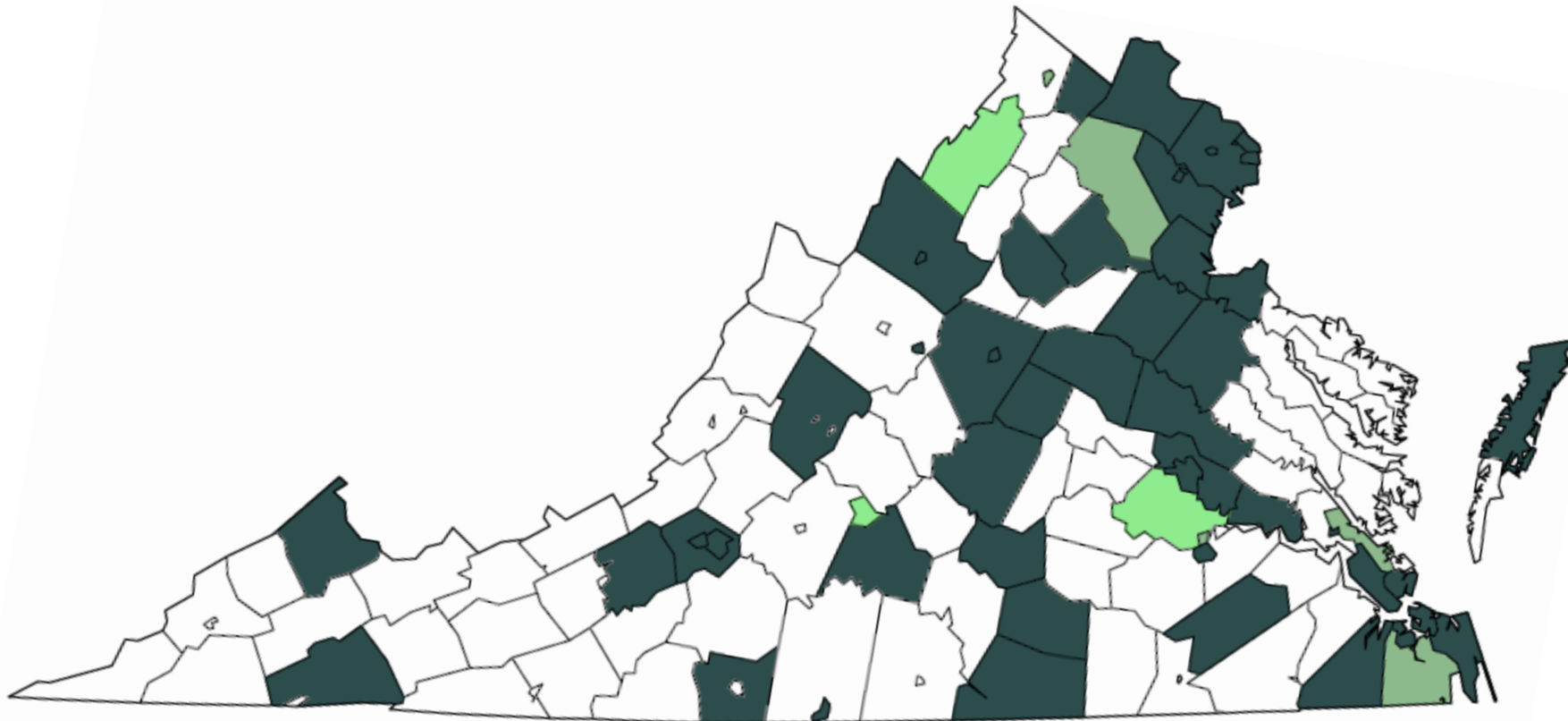
20.2% estimated prevalence of longstanding LTBI statewide among Non-U.S.-born

Legend: 0% to <5% | 5% to <10% | 10% to <15% | 15% +

Haddad MB, Raz KM, Lash TL, Hill AN, Kammerer JS, Winston CA, et al. Simple estimates for local prevalence of latent tuberculosis infection, United States, 2011–2015. Emerg Infect Dis. 2018 Oct [*date cited*]. https://doi.org/10.3201/eid2410.180716
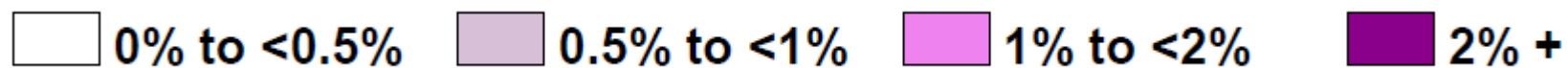
Estimated Longstanding LTBI Prevalence among U.S.-born, by County

Based on simple back calculation from all genotyped active TB cases in 2011-2015

0.7% estimated prevalence of longstanding LTBI statewide among U.S.-born

0% to <0.5%	0.5% to <1%	1% to <2%	2% +

Haddad MB, Raz KM, Lash TL, Hill AN, Kammerer JS, Winston CA, et al. Simple estimates for local prevalence of latent tuberculosis infection, United States, 2011–2015. Emerg Infect Dis. 2018 Oct [date cited]. https://doi.org/10.3201/eid2410.180716

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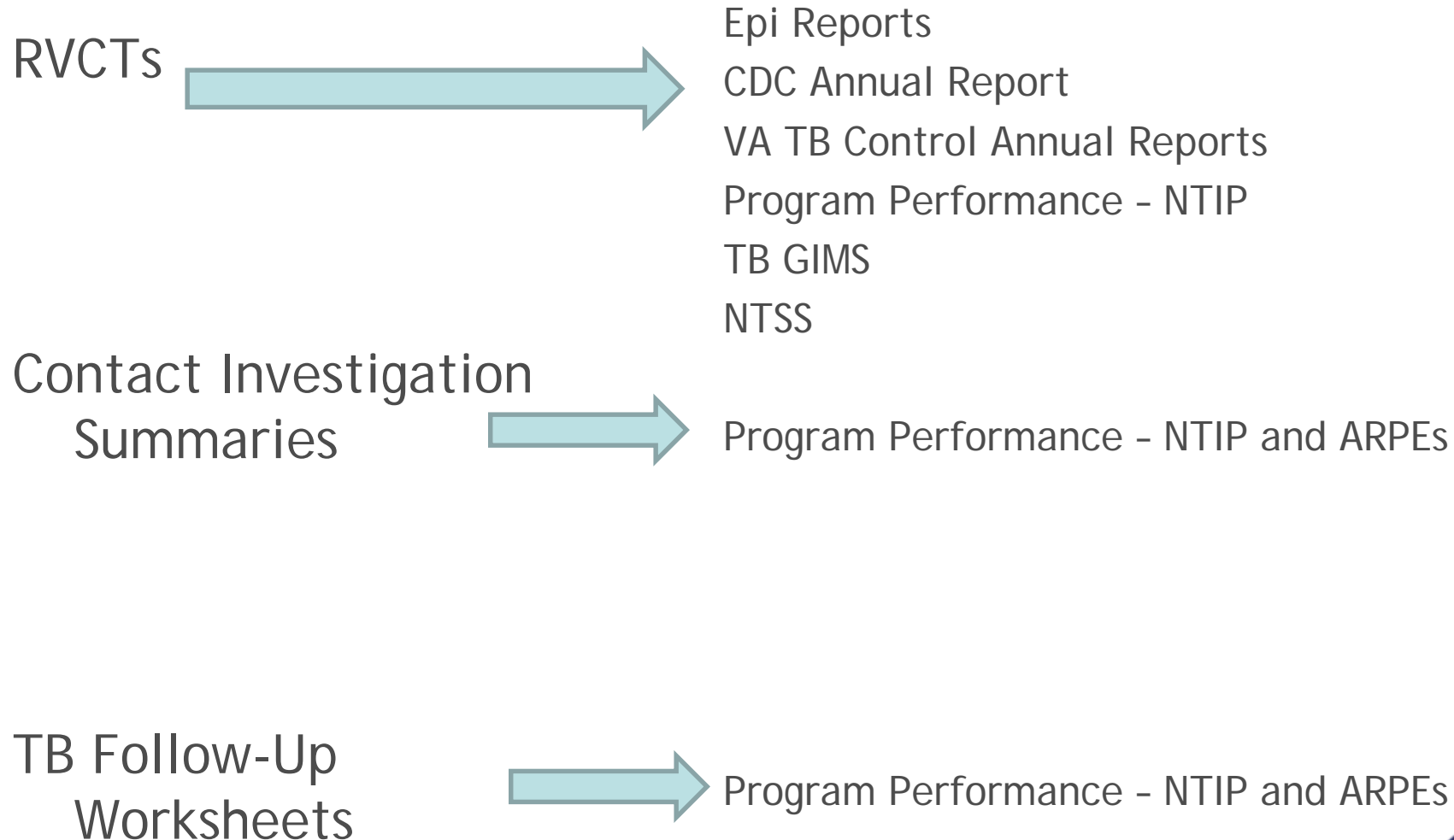
Surveillance News

CDC is moving from classic genotyping to whole genome sequencing this year for improved TB cluster and outbreak detection

- Conventional Genotyping:
  - Represents <1% of the pathogen's genome
  - Targets are stable over long periods of time
  - Data is difficult to interpret when highly related strains remain circulating in a community for long periods of time
- Whole genome sequencing
  - Represents ~90% of the pathogen's genome
  - Mutations accumulate at the rate of 0.5 SNPs per year

Why is accurate and complete TB data so important?

- Helps ensure appropriate patient follow-up
- Helps ensure that Virginia's TB burden is represented at a local and state level
- Allows for measurement of TB program performance
- Provides data to support policy development
- Provides data to support program resource requests
- Data is directly connected to funding

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End Uses of TB Surveillance Data

RVCTs →

Epi Reports
CDC Annual Report
VA TB Control Annual Reports
Program Performance – NTIP
TB GIMS
NTSS

Contact Investigation Summaries →

Program Performance – NTIP and ARPEs

TB Follow-Up Worksheets →

Program Performance – NTIP and ARPEs

National TB Surveillance System (NTSS)

Tuberculosis Genotyping Information Management System (TB GIMS)

National TB Indicators Project (NTIP)

National Tuberculosis Indicators Project

Sputum Culture Conversion

Data Updated: 04/07/2018

National Objective:
Increase the proportion of TB patients with positive sputum culture results who have documented conversion to sputum culture-negative within 60 days of treatment initiation to 73.0% by 2020.

Sputum Culture Conversion Documented Within 60 Days of Treatment Initiation for Patients with Positive Sputum Culture Results
Virginia
2011 to 2015
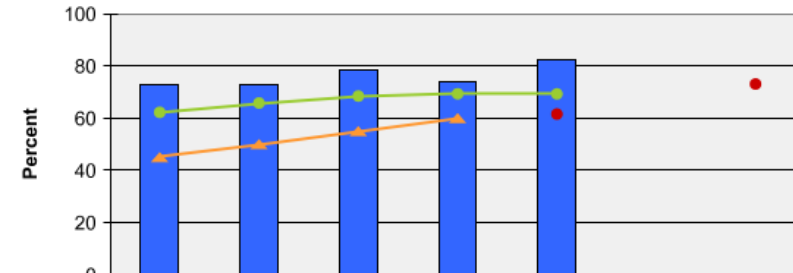
Cohort Period	2011	2012	2013	2014	2015	--	2020
Documented Conversion Within 60 Days (%)	72.9	73.0	78.2	74.0	82.6	--	
Program Targets (%)	45.0	50.0	55.0	60.0	N/A	--	N/A
National Average (%)	62.1	65.7	68.4	69.3	69.2	--	
National Target (%)					61.5	--	73.0

Cohort Period	2011	2012	2013	2014	2015
Total TB Patients with Positive Sputum Culture Results Initiated Treatment (N)	118	111	87	104	109
Converted Within 60 Days (n)	86	81	68	77	90
Converted After 60 Days (n)	26	25	16	26	18
No Documentation of Conversion (n)	6	5	3	1	1

Objective: Increase the proportion of TB patients with positive sputum culture results who have documented conversion to sputum culture-negative within 60 days of treatment initiation

Indicator: Percent of TB patients with positive sputum culture results who have documented conversion to sputum culture-negative within 60 days of treatment initiation

Data Sources: RVCT fields: Status at Diagnosis of TB, Sputum Culture, Date Therapy Started, Initial Drug Regimen, Sputum Culture Conversion Documented, Moved, Date Therapy Stopped, Reason Therapy Stopped.

Cohort: Number of TB cases with positive sputum culture results (alive at diagnosis) who initiated treatment, counted in the cohort period of interest. Patients who died within 60 days of initiating treatment are excluded. For cohort 2009 onward, patients who moved out of the country within 60 days of initiating treatment are also excluded. Records with missing or incomplete data where exclusion criteria cannot be assessed are included in the analytic cohort.

Calculation: [Number of TB patients with positive sputum culture results who have documented conversion to sputum culture-negative within 60 days of treatment initiation / Cohort] X 100

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National TB Program Objectives & Performance Targets for 2020

Mission: To promote health and quality of life by preventing, controlling, and eventually eliminating tuberculosis (TB) from the United States, and by collaborating with other countries and international partners in controlling global tuberculosis.

Goals for Reducing TB Incidence[1, 2, 5]

		Targets
TB Incidence Rate	Reduce the incidence of TB disease.	1.4 cases per 100,000
U.S.-Born Persons	Decrease the incidence of TB disease among U.S.-born persons.	0.4 cases per 100,000
Foreign-Born Persons[6]	Decrease the incidence of TB disease among foreign-born persons.	11.1 cases per 100,000
U.S.-Born Non-Hispanic Blacks or African Americans[6]	Decrease the incidence of TB disease among U.S.-born non-Hispanic blacks or African Americans.	1.5 cases per 100,000
Children Younger than 5 Years of Age	Decrease the incidence of TB disease among children younger than 5 years of age.	0.3 cases per 100,000

Objectives on Case Management and Treatment[1, 2, 5]

		Targets
Known HIV Status	Increase the proportion of TB patients who have a positive or negative HIV test result reported.	98%
Treatment Initiation	For TB patients with positive acid-fast bacillus (AFB) sputum-smear results, increase the proportion who initiated treatment within 7 days of specimen collection.	97%
Recommended Initial Therapy	For patients whose diagnosis is likely to be TB disease, increase the proportion who are started on the recommended initial 4-drug regimen.	97%
Sputum Culture Result Reported	For TB patients ages 12 years or older with a pleural or respiratory site of disease, increase the proportion who have a sputum culture result reported.	98%
Sputum Culture Conversion	For TB patients with positive sputum culture results, increase the proportion who have documented conversion to negative results within 60 days of treatment initiation.	73%
Completion of Treatment	For patients with newly diagnosed TB disease for whom 12 months or less of treatment is indicated, increase the proportion who complete treatment within 12 months.	95%

August 2015

Objectives on Laboratory Reporting[1, 2, 5]

		Targets
Turnaround Time — Culture	For TB patients with cultures of respiratory specimens identified with *M. tuberculosis* complex (MTBC), increase the proportion reported by the laboratory within 25 days from the date the specimen was collected. **NOTE:** 25 days includes 21 days for culture to grow and 4 days for specimen collection and delivery to lab.	78%
Turnaround Time — Nucleic Acid Amplification (NAA)	For TB patients with respiratory specimens positive for MTBC by nucleic acid amplification (NAA), increase the proportion reported by the laboratory within 6 days from the date the specimen was collected. **NOTE:** 6 days includes 2 days for detection and 4 days for specimen collection and delivery to lab.	92%
Drug-Susceptibility Result	For TB patients with positive culture results, increase the proportion who have initial drug-susceptibility results reported.	100%
Universal Genotyping	For TB patients with a positive culture result, increase the proportion who have a MTBC genotyping result reported.	100%

Objectives on Contact Investigations[1, 3, 5]

Contact Elicitation	For TB patients with positive AFB sputum-smear results, increase the proportion who have contacts elicited.	100%
Examination	For contacts to sputum AFB smear-positive TB cases, increase the proportion who are examined for infection and disease.	93%
Treatment Initiation	For contacts to sputum AFB smear-positive TB cases diagnosed with latent TB infection, increase the proportion who start treatment.	91%
Treatment Completion	For contacts to sputum AFB smear-positive TB cases who have started treatment for latent TB infection, increase the proportion who complete treatment.	81%

Objectives on Examination of Immigrants and Refugees[1, 4, 5]

		Targets
Examination Initiation	For immigrants and refugees with abnormal chest radiographs (X-rays) read overseas as consistent with TB, increase the proportion who initiate a medical examination within 30 days of notification.	84%
Examination Completion	For immigrants and refugees with abnormal chest X-rays read overseas as consistent with TB, increase the proportion who complete a medical examination within 90 days of notification.	76%
Treatment Initiation	For immigrants and refugees with abnormal chest X-rays read overseas as consistent with TB who are diagnosed with latent TB infection or have radiographic findings consistent with prior pulmonary TB (ATS/CDC Class 4) on the basis of examination in the U.S., for whom treatment was recommended, increase the proportion who start treatment.	93%
Treatment Completion	For immigrants and refugees with abnormal chest X-rays read overseas as consistent with TB who are diagnosed with latent TB infection or have radiographic findings consistent with prior pulmonary TB (ATS/CDC Class 4) on the basis of examination in the U.S., and who have started on treatment, increase the proportion who complete treatment.	83%

Objectives on Data Reporting

		Targets
• RVCT[7]	Ensure the completeness of each core Report of Verified Case of Tuberculosis (RVCT) data item reported to CDC, as described in the TB cooperative agreement announcement.	100%
• ARPE[8]	Ensure the completeness of each core Aggregate Reports for Tuberculosis Program Evaluation (ARPE) data items reported to CDC, as described in the TB cooperative agreement announcement.	100%
• EDN	Ensure the completeness of each core Electronic Disease Notification (EDN) system data item reported to CDC, as described in the TB cooperative agreement announcement.	93%

Objectives on Program Evaluation

• Evaluation Activities	Increase program evaluation activities by monitoring program progress and tracking evaluation status of TB cooperative agreement recipients.
• Evaluation Focal Point	Increase the percent of TB cooperative agreement recipients that have an evaluation focal point.

Objectives on Human Resource Development

• Development Plan	Increase the percent of TB cooperative agreement recipients who submit a program-specific human resource development plan (HRD) and a yearly update of progress, as outlined in the TB cooperative agreement announcement.
• Training Focal Point	Increase the percent of TB cooperative agreement recipients that have a TB training focal point.

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Proposed 2020 Funding Formula

	Needs Component: 76%		
	Indicator	**Weight**	**Definition**
1.	Incident Cases	39%	Total number of incident cases.
2.	Foreign-born & US-born Minorities	8%	Number of incident foreign-born and US-born minority cases.
3.	Sputum smear-positive cases with Respiratory and pleural site of disease	12%	Number of incident sputum smear-positive cases with respiratory and pleural site of disease.
4.	Medical Risk Factors and Comorbidities	4%	Number of incident cases with the following risk factors, reported by Co-Ag recipient: HIV; end-stage renal disease; post-organ transplant; other immunocompromised conditions. Hepatitis B & C are recommended for inclusion in the funding formula, pending their inclusion to the 2020 RVCT.

5.	MDR-TB	5%	Number of incident MDR TB cases (resistant to at least isoniazid and rifampin).
6.	Social Risk Factors	4%	Number of incident cases with the following risk factors: homelessness, injection drug use, non-injection drug use or alcohol use.
7.	Class B Arrivals	4%	Number of immigrants and/or refugees who are assigned to a Co-Ag recipient based on initial settlement address in EDN.
	Performance Component: 24%		
8.	TB Case Completion of Treatment	10%	Number of incident cases for whom treatment of 12 months or less is indicated, who complete treatment within 12 months (366 days).
9.	Drug-Susceptibility Testing (DST)	5%	Number of incident cases with a positive culture result who have initial drug-susceptibility results reported.
10.	TB Contact Completion of LTBI Treatment	5%	Number of contacts to sputum AFB smear-positive cases or to sputum AFB sputum-smear-negative and culture-positive cases, who were diagnosed with LTBI and completed LTBI treatment. Data source: ARPE and/or Revised RVCT 2020. Contacts in the ARPE category of "Other" category of the ARPE report are not included.
11.	Completion of Examination for Class B1	4%	Number of immigrants and/or refugees with abnormal chest X-rays read overseas as consistent with TB who completed medical examination within 90 days of notification, as reported through EDN. For this indicator, completion of examination within 90 days will be credited to the Co-Ag recipient in which the immigrant/refugee was originally assigned, regardless of the location where examination was completed.

Thank you for all that you do to provide this data which allows Virginia to track our movement toward TB elimination

Without your diligent and compassionate work, we would not be where we are today

Questions?

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References

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