**National TB Indicators Project (NTIP)—Tennessee Performance, 2015 – 2019**

**Table 1. National TB Indicators Project (NTIP)—Tennessee Performance, 2015 – 2019**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **National TB Program Objective** | **2015** | **2016** | **2017** | **2018** | **2019\*** | **2020 Target** |
| **TB Incident Rates (cases/100,000 population)** |
| TB incidence rate | 2.0 | 1.5 | 1.8 | 2.1 | NA | **1.4** |
| U.S.-born persons | 1.1 | 1.0 | 1.0 | 1.2 | NA | **0.4** |
| Non-U.S.-born persons | 18.3 | 12.1 | 17.3 | 18.8 | NA | **11.1** |
| U.S.-born, non-Hispanic blacks | 3.1 | 3.4 | 3.0 | 3.7 | NA | **1.5** |
| Children younger than 5 years of age | 1.5 | 1.0 | 1.2 | 1.0 | NA | **0.3** |
| **Indicators for Case Management (%)** |
| Known HIV status | 98.4 | 97.0 | 97.5 | 97.0 | 95.9 | **98.0** |
| Treatment initiation  | 84.2 | 90.5 | 94.1 | 93.0 | 100.0 | **97.0** |
| Recommended initial therapy | 95.3 | 90.0 | 95.9 | 96.2 | 90.9 | **97.0** |
| Sputum culture result reported | 96.9 | 97.6 | 97.0 | 96.4 | 92.0 | **98.0** |
| Sputum culture conversion | 87.1 | 90.0 | 82.4 | 85.0 | 69.4 | **73.0** |
| Completion of therapy | 95.3 | 95.3 | 95.2 | 92.6 | 28.4 | **95.0** |
| **Indicators for Laboratory Reporting (%)** |
| Turnaround time—culture | 32.0 | 52.5 | 53.9 | 59.7 |  59.3 | **78.0** |
| Turnaround time—NAA | 61.9 | 82.9 | 87.5 | 93.6 |  95.2 | **92.0** |
| Drug-susceptibility results | 94.4 | 96.2 | 100.0 | 98.9 | 86.2 | **100.0** |
| Universal genotyping | 94.4 | 93.8 | 100.0 | 97.8 |  86.2 | **100.0** |
| **Indicators for Examination of Immigrants and Refugees (%)** |
| Examination initiation | 76.6 | 75.4 | 71.7 | 60.8 | 59.9 | **84.0** |
| Examination completion | 67.2 | 64.5 | 61.4 | 56.3 | 46.0 | **76.0** |
| LTBI treatment initiation | 52.5 | 73.3 | 60.0 | 66.7 | 68.2 | **93.0** |
| LTBI treatment completion | 90.5 | 79.5 | 85.7 | 60.0 | 0.0 | **98.0** |
| **Indicators for Data Reporting (%)** |
| RVCT | 100.0 | 100.0 | 100.0 | 99.8 | 88.5 | **100.0** |
| ARPEs | 100.0 | 100.0 | 100.0 | 88.9 | NA | **100.0** |
| EDN | 94.3 | 93.7 | 91.3 | 87.1 | 64.5 | **93.0** |
| **Indicators for Contact Investigation (%)** |
| Contact elicitation | 97.3 | 100.0 | 100.0 | 100.0 | NA | **100.0** |
| Contact examination | 87.5 | 80.5 | 82.3 | 89.8 | NA | **93.0** |
| LTBI treatment initiation | 87.2 | 75.5 | 84.5 | 79.5 | NA | **91.0** |
| LTBI treatment completion | 68.3 | 90.0 | 91.4 | 71.4 | NA | **81.0** |

*Source:* National TB Indicators Project (NTIP): Indicator Summary 2015 to 2019

\*Data updated 12/31/19

**Table 2. Status of NTIP Objectives, 2018 – 2019 and Barriers to Meeting 2020 NTIP Targets**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NTIP Objective** | **2020 Target** | **2018 Tennessee Progress**  | **2019\* Tennessee Progress** | **Barriers** |
| Known HIV status | **98.0** | 97.0 (unmet) | 95.9 (unmet) | HIV testing is not being offered to young children and elderly patients. Antibody testing at the state lab cannot be performed on children <2 due to the risk of interference from the mother’s antibodies. HIV RNA testing must be performed for these patients, requires additional specimen, an additional requisition and processing time. |
| Treatment initiation | **97.0** | 93.0 (unmet) | 100.0 (met) | Some outside providers consistently collect sputum specimens without initiating treatment. When smear results are available, the patient may already have been discharged and treatment is not initiated until the patient is under the care of the public health department. |
| Recommended initial therapy | **97.0** | 96.2 (unmet) | 90.9 (unmet) | TB cases that are identified as contacts to an INH-resistant case may not be started on INH initially. Also, ethambutol is often times not prescribed by providers for pediatric cases of TB or for patients with pre-existing optical conditions. |
| Sputum culture results reported | **98.0** | 96.4 (unmet) | 92.0 (unmet) | The most common reasons for patients not meeting this indicator are: patient unable to produce despite induction or the patient was dead or dying prior to the health department collecting sputum. |
| Sputum culture conversion | **73.0** | 85.0 (met) | 69.4 (unmet) | Decreased frequency of sputum collection as well as delay in collecting therapeutic drug monitoring levels may contribute to the decreased performance toward meeting this indicator.  |
| Completion of treatment | **95.0** | 92.6 (unmet) | 28.4 (unmet) |  |
| TAT—culture | **78.0** | 59.7 (met) | 59.3 (unmet) | Delays in or lack of submitting isolates from commercial and other laboratories to the Tennessee Department of Health, Division of Laboratory Services. |
| TAT—NAA | **92.0** | 93.6 (met) | 95.2 (met) | This indicator continues to be met. The TTBEP encourages providers and the laboratory to perform NAAT on specimens early in the diagnosis instead of waiting until after treatment has been initiated. |
| Drug-susceptibility results | **100.0** | 98.9 (unmet) | 86.2 (unmet) | Delays in or lack of submitting isolates from commercial and other laboratories to the Tennessee Department of Health, Division of Laboratory Services. |
| Universal genotyping | **100.0** | 97.8 (unmet) | 86.2 (unmet) | Delays in or lack of submitting isolates from commercial and other laboratories to the Tennessee Department of Health, Division of Laboratory Services. |
| Examination initiation Immigrants & refugees | **84.0** | 60.8 (unmet) | 59.9 (unmet) | Difficulty in locating immigrants and refugees that arrived in Tennessee. Transportation is often a barrier for immigrants and refugees to initiate and complete the evaluation. One metropolitan region is partnering with a large refugee family health center to initiate evaluations on-site to reduce the number of clinician visits. Length of treatment (9-months of INH or 4-months of RIF) is also a barrier so regional TB programs are encouraged to use the 3HP short course regimen. |
| Examination completionImmigrants & refugees | **76.0** | 56.3 (unmet) | 46.0 (unmet) |
| LTBI treatment initiationImmigrants & refugees | **93.0** | 66.7 (unmet) | 68.2 (unmet) |
| LTBI treatment completionImmigrants & refugees | **98.0** | 60.0 (unmet) | 0.0 (unmet) |
| Data reporting—RVCT | **100.0** | 99.8 (unmet) | 88.5 (unmet) | Staff turnover and retention has affected timely data entry. Central office staff assist with data entry whenever possible. |
| Data reporting—ARPEs | **100.0** | 88.9 (unmet) | NA | Staff turnover has decreased the familiarity with the ARPE and completion of ARPE. Incomplete contact investigations have also affected data reporting on the ARPEs. |
| Data reporting—EDN | **93.0** | 87.0 (unmet) | 64.5 (unmet) | Delays in locating and evaluating B-notifications have resulted in delays with data reporting in EDN. Lack of familiarity of staff with the EDN form and variables have affected this objective. |
| Contact elicitation—Contact investigation | **100.0** | 100.0 (met) | NA | Lack of willingness of patients to provide information on contacts. Length of treatment (9-months of INH and 4-months of RIF) and method of delivery (DOT for patients on 3HP) deter some contacts from initiating and completing a TBI regimen. |
| Contact examination—Contact investigation | **93.0** | 89.8 (unmet) | NA |
| LTBI treatment initiationContact investigation | **91.0** | 79.5 (unmet) | NA |
| LTBI treatment completionContact investigation | **81.0** | 71.4 (unmet) | NA |

*Source:* National TB Indicators Project (NTIP): Indicator Summary 2015 to 2019

\*Data updated 12/31/19

**TENNESSEE TUBERCULOSIS (TB) PROGRAM OVERVIEW**

The Tennessee TB Elimination Program (TTBEP) is a centralized state program that provides programmatic oversight, clinical guidance, education, training, and resources to the 12 regional TB programs which serve the 95 counties in Tennessee. The TTBEP utilizes the National Electronic Disease Surveillance System (NEDSS) based system (NBS) for surveillance of persons with suspected or active TB disease and persons with TB infection (TBI) diagnosed at public health departments. For the years 2015 – 2019, the average number of persons with active TB disease was 124.3 with an average case rate of 1.9 cases per 100,000 population. **Table 3** shows the number of cases and corresponding case rates for the grant period. In 2016, Tennessee experienced the lowest number of active TB cases on record with 103; however, the number of active TB cases steadily increased in subsequent years.

**Table 3. Tennessee TB Cases and Rates, 2015 – 2019**

|  |  |  |
| --- | --- | --- |
| **Year** | **Number of Active TB Cases** | **Case Rate (per 100,000)** |
| 2015 | 131 | 2.0 |
| 2016 | 103 | 1.5 |
| 2017 | 124 | 1.8 |
| 2018 | 139 | 2.1 |
| 2019 | 126 |  |

*Source*: National TB Indicators Project (NTIP), National Electronic Disease Surveillance System (NEDSS) TB Program Area Module (TB PAM)

**Cohort Review**

The TTBEP implemented the cohort review process in 2011 with the two (2) largest metropolitan areas, Memphis/Shelby County and Nashville/Davidson County, that consistently account for >50% of the state’s burden of active TB. **Table** 4 shows the number of cohort reviews held and the number of patients reviewed during this grant period. Systems issues are identified during each review, and regional TB programs are asked to develop a plan to address each systems issue identified.

**Table 4. Tennessee TB Cohort Review Summary, 2015 – 2019**

|  |  |  |
| --- | --- | --- |
| **Year** | **Number of Cohort Reviews Held** | **Number of Active TB Patients Reviewed**  |
| 2015 | 6 | 69 |
| 2016 | 4 | 48 |
| 2017 | 4 | 60 |
| 2018 | 3 | 45 |
| 2019 | 3 | 43 |

*Source:* Tennessee TB Elimination Program Cohort Review Worksheets

Consistent themes of systems issues identified include: (a) need for improvement in contact investigations (e.g., expanding contact investigation if positivity rate >10%, timely initiation and completion, etc.); (b) delayed notification to the public health department of persons with

suspected or confirmed TB from outside providers; and (c) timely use of therapeutic drug monitoring (TDM) for patients with risk factors for malabsorption.

**GENOTYPING AND RECENT TRANSMISSION**

During this grant period, there were three (3) clusters that were high alert level clusters based on log likelihood ration that were high-alert clusters:

G03948 (Shelby County): There were eight (8) cases added to this cluster from 2015 – 2019. Characteristics of this cluster include: U.S.-born (100%); African-American (100%); experiencing homelessness (37.5%); and any substance abuse (62.5%). Whole-genome sequencing (WGS) identified six (6) of the eight cases were considered closely related. Of those six cases, five (5) had known epidemiologic links that were identified through contact investigations.

G11097 (Lauderdale County): Two (2) cases were added to this original single-person cluster in 2015 and 2016 for a total of three (3) cases from 2014 – 2016. Characteristics of this cluster include: U.S.-born (100%) and African-American (100%).

G15975 (Knox, Loudon, and Blount Counties): Nine (9) cases were added to this cluster from 2016 – 2019. Characteristics of this cluster include: U.S-born (100%); white (77.8%); experiencing homelessness (55.6%); corrections at diagnosis (44.4%); current or previous history of incarceration (77.8%); and any substance abuse (66.7%). The primary sites of exposure included correctional facilities in two (2) counties. WGS identified eight (8) of the nine (9) cases were considered closely related. Four (4) cases had two (2) separate social epidemiologic links that were identified through contact investigations.

**Table 5** shows estimates of recent transmission 2015-2018. **Table 6** shows the number of clusters by size reported during the grant timeframe.

**Table 5. Estimates of Recent Transmission—Tennessee, 2015 – 2018**

|  |  |  |  |
| --- | --- | --- | --- |
| **Timeframe** | **Number of Genotyped Cases\*** | **Cases Attributed to Recent Transmission\*\* (%)** | **Cases Attributed to Extensive Recent Transmission§ (%)** |
| 2015-2016 | 160 | 34 (21.3) | 19 (11.9) |
| 2016-2017 | 171 | 30 (17.5) | 17 (9.9) |
| 2017-2018 | 182 | 31 (17.0) | 13 (7.1) |

\*Total number of *M. tuberculosis* genotyped cases who are eligible to be evaluated for recent transmission (i.e., complete data for the plausible-source case method’s algorithm).

\*\*Number of cases attributed to recent transmission includes any given case with a plausible source case regardless of cluster size.

§Number of cases attributed to extensive recent transmission includes only cases in a plausible chain of transmission of six (6) or more cases (five secondary and one source case).

*Source*: USDHHS, CDC, TB Genotyping Information Management System (TB GIMS)

**Table 6. Genotype Clusters by Size—Tennessee, 2015 – 2019**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Year Reported** | **Two (2)-Person Cluster** | **Three (3)-Person Cluster** | **Four (4) – Nine (9)-Person Cluster** | **10+-Person Cluster** |
| 2015 | 2 | 2 | 1 | 0 |
| 2016 | 5 | 3 | 1 | 0 |
| 2017 | 3 | 4 | 1 | 0 |
| 2018 | 5 | 1 | 2 | 0 |
| 2019 | 4 | 1 | 0 | 0 |

*Source*: USDHHS, CDC, TB Genotyping Information Management System (TB GIMS)

**PROGRAM ACCOMPLISHMENTS/SUCCESSES**

1. Program Collaboration and Service Integration (PCSI)—In 2015, the Tennessee Department of Health (TDH) TB Elimination Program, HIV, STD, and Viral Hepatitis Program, Division of Laboratory Services, and the Tennessee Department of Correction (TDOC) began a collaborative initiative to test for TB infection (using QuantiFERON Gold In-Tube), HIV, syphilis, chlamydia and gonorrhea in all state inmates upon intake at the two (2) TDOC intake facilities in Tennessee. Labs are collected at each of the intake facilities and transported to the TDH state lab via a state lab courier. Results are available electronically and available to public health staff for monitoring. In 2017, this

collaboration was awarded a CDC U.S. TB Elimination Champions. In 2018, opt-out Hepatitis C virus (HCV) testing was added to the intake laboratory panel for all new intakes.

1. Revised Tennessee TB Elimination Program (TTBEP) TB manual—In 2015, the TTBEP completely revised the existing TB manual. The revised manual contains self-contained modules and standards of public health practice for each module. The standards of public health practice form the standards used during the program’s annual regional TB programmatic assessments that are conducted with each of the regional TB programs throughout the state.
2. Isoniazid-Rifapentine (3HP) short-course regimen for treatment of TB infection (TBI)—In 2015, the Tennessee TB Elimination Program began offering the 12-week 3HP regimen for the treatment of TB infection. A programmatic protocol was developed to include inclusion/exclusion criteria, dosage tables, monitoring, and medication delivery. Initially, all doses of 3HP were required to be given in person via directly observed therapy (DOT) at the local health department. However, after receiving feedback from regional TB program staff and patients regarding barriers to treatment with this regimen (i.e., in-person DOT), changes were made that allowed for DOT to be administered at sites other than the local health department and/or via electronic DOT (eDOT).
3. Addition of positive interferon gamma release assays (IGRA) and positive tuberculin skin test (TST) results to the Tennessee Reportable Conditions list—In 2017, positive IGRA results and positive TST results (for patients <18 years of age) were added to the

Tennessee Reportable Conditions list. Providers now submit reports of positive tests via fax or electronically through the state surveillance system. Data from these reports are

entered into a program-maintained database and provided to regional TB programs upon request.

1. TTBEP central office staff assisted with two (2) large contact investigations at a high school and a state prison. A total of 433 students and staff were tested at the high school with a 0.5% TB test for infection positivity rate. A total of 117 staff and inmates were tested at the prison with a TB test for infection positivity rate of 5.1%. Both contact investigations highlighted the successful collaboration between the TB elimination program and outside entities (i.e., public school system and Department of Correction).
2. Implementation of electronic directly observed therapy (eDOT)—In 2017, the Tennessee TB Elimination Program (TTBEP) developed guidance for the use of eDOT platforms of Skype and VSee that were approved by Tennessee Department of Health legal section. One (1) public health region elected to use a different service, Scopia; however, the use and parameters of use were dictated by the TTBEP Use of eDOT guidance document. In 2019, the TTBEP expanded use of eDOT to include those patients on the 3HP short-course regimen. In December 2019, a five-year contract was approved to purchase and use emocha Mobile Health asynchronous video DOT. A pilot project is expected to start in 2020.

**PROGRAM BARRIERS/CHALLENGES**

1. Staffing—Staff turnover, shortages, and retirements have plagued the statewide TB program throughout this grant cycle. Within central office, the nurse consultant manager with greater than 15 years of TB knowledge and experience retired in early 2019. In late 2019, the two largest metropolitan regions in Tennessee that account for greater than 50% of the statewide burden of TB, experienced significant staffing shortages that resulted in redistribution of workloads and changes to processes within the respective TB programs.
2. Implementation of electronic medical record—In 2015, implementation of a “statewide” public health electronic medical record (EMR) began in a low-burden TB clinic in the eastern part of the state. Since 2015, the EMR has been implemented in six (6) “rural” public health regions and two (2) metropolitan public health regions. Two (2) metropolitan public health regions elected not to implement the statewide system and use their own commercial product. The remaining public health regions have not implemented an electronic system at the time of this report. The disparate systems for maintaining health information on patients with active TB and TB infection create barriers for staff at central office and other regions needing to access patient information (e.g., for auditing, monitoring or if a patient transfers jurisdictions).

**Table 7. Strategies, Work Plan, and Activities**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Strategy** | **Task** | **Work Plan** | **Activities**  | **Overall Progress &****2018-2019 Progress** |
| **Strategy 1**: Improved Case Detection and Management | 1. Ensure case management and treatment of TB cases
 | Implementation of reviewed TTBEP Manual for all public health regions | Review TB Manual annually and revise as needed. Provide refresher training | The TB Manual was initially revised in 2015 (see “Program Accomplishments/Successes” section). A schedule for annual revisions was established. |
| Final revisions were made and the manual was made available in April 2018. |
| Final revisions were made and the manual was made available in March 2019. |
| 1. Assess adequacy and appropriateness of therapy
 | Review all drug regimens entered into surveillance system | In-depth chart review of patients not placed on standard four (4) drug therapy to determine rationale for alternative regimen. | For patients not starting on the standard four (4) - drug regimen, all charts were reviewed to determine the reason.  |
| In 2018, The most common reasons for not starting one of the drugs in the standard regimen were pregnancy (PZA) and patients’ age (EMB). In December 2018, the TTBEP issued a memo to all regional TB staff reminding that non-formulary medications used to treat TB required central office approval prior to issuance.  |
| In 2019, the most common reasons for not starting one or more of the drugs in the standard regimen include: pre-existing medical conditions that may be further complicated with one or more of the anti-TB drugs and patients’ age |
| Reiterate use of therapeutic drug monitoring (TDM) on patients with risk factors for malabsorption and provide guidance on use of TDM | Guidance for the use of TDM and examples of situations in which TDM should be useful were included in the TTBEP Manual. | In 2018 – 2019, the total percentage of patients that received TDMs with the following risk factors was:Diabetes mellitus: 71.1%Excessive alcohol use: 72.1%Immunosuppression: 46.2%Injecting drug use: 57.1%Non-injecting drug use: 67.7%HIV-positive: 63.6%End-stage renal disease: 50.0% |
| Regional notification to central office nurse consultants of patients placed on non-standard regimen | Standard IV-18 in the 2019 TTBEP Manual states: “For each patient with suspected or confirmed TB disease placed on a non-standard regimen, the regional TB program provides documentation of the TB clinician’s order and rationale to TTBEP Central Office (C.O.) within two (2) business days. | The TTBEP leadership has worked closely with the Tennessee Department of Health, Director of the Office of Pharmacy to ensure that if orders for non-standard regimens are placed that (a) the TTBEP is aware and (b) the medications are approved for use by the regional TB program. The TTBEP, in conjunction with the Director of Pharmacy, established a communication mechanism by which notification is received and approved/rejected for non-standard TB medication. |
| 1. Seek expert consultation
 | Clarify circumstances which warrant seeking expert consultation with state TB program, Southeastern National TB Center (SNTC), and CDC | The TTBEP medical director routinely reviews cases and determines if a consultation with SNTC is warranted.  | In 2018, the TTBEP had two (2) consultations with SNTC.  |
| In 2019, there were 29 consultations between the TTBEP and SNTC as of 10/28/19. |
| 1. Collaborate with HIV/AIDS programs
 | Provide cross-match of TB/HIV co-infected patients to HIV program semi-annually  | Epidemiologists in the TB and HIV programs coordinate on a semi-annual basis to perform cross-matches. The HIV program is provided with the TB state case number and site of disease for entry into the electronic HIV system (eHARS) | Cross matches of TB/HIV co-infected cases are provided to the HIV program on a quarterly basis to ensure that documentation of TB diagnosis is present in electronic HIV record. The electronic HIV database (eHARS) is referenced if HIV status is unknown for any TB patient. Discussions between the TB and HIV programs are ongoing about how best to ensure that TB diagnosis is recorded in the HIV record since TB is an AIDS-defining condition. |
|  | Solicit input from HIV program for topics to include in statewide conference calls and meetings | HIV program was included on initial statewide meeting and TB clinical symposium planning. | In 2018, a TB clinical symposium was held. A presentation was provided on TB/Hepatitis C co-infection and staff from the Tennessee Department of health HIV/STD/Viral Hepatitis Program attended the symposium. |
| 1. Collaborate with external partners
 | Identify a liaison to collaborate with partners that serve high-risk populations (e.g., corrections, community health centers, A&D facilities, homeless shelters, etc.) | The TTBEP medical director serves as liaison for CHCs, A&D facilities, TN Sheriff’s Association and TN Academy of Family Physicians. The TTBEP program manager serves as the liaison for corrections and A&D facilities. | In 2018, 4,687 QFTs were collected at the men’s intake facility (5.2% positivity), and 849 QFTs collected at the women’s intake facility (2.7% positivity).  |
| In 2019 |
|  |
| 1. Binational referral
 | Provide binational referral toolkit to all regional TB program managers | The program’s interjurisdictional point-of-contact also served as the binational point of contact. Guidelines for submitting binational referrals were included in the updated TTBEP Manual. | In 2018, the TTBEP made two (2) binational referrals.  |
| In 2019, six (6) binational referrals were made by the TTBEP. |
| 1. Partner with DGMQ
 | Clarify criteria for “Do Not Board” in updated TB Manual | Because the TTBEP central office (C.O.) staff work with DGMQ for all cases placed on the “Do Not Board” list, it was decided not to include this information for regional TB programs in the TB Manual. |
| 1. Evaluate case management
 | Perform systematic annual programmatic assessments of TB cases and TBI cases | All 13 regional TB programs received a programmatic assessment for cases of TB, cases of TBI, and program operations during 2018 and 2019 calendar years. | In 2018, a total of 46 public health standards were assessed for each of the 83 randomly selected case records for a total of 3,818 public health standards assessed. There were 167 findings (4.4%). |
| In 2019, a total of  |
| 1. TB elimination advisory committee
 | Establish a TB medical advisory committee | TB clinicians from the 13 public health regions were recruited to serve on a medical leadership team (MLT) workgroup to address/discuss TB activities across the state. Representation was from rural and metropolitan public health regions with high, medium, and low incidences of TB. | In 2018, a medical leadership team (MLT) workgroup was formed to discuss targeted TB testing in Tennessee. The cascade of care for TB infection (TBI) was discussed as well as issues and barriers to implementing targeted testing (See “Community Partnerships to End TB” in Program Accomplishments/Successes).  |
| In 2019, the MLT subcommittee began meeting to discuss new guidelines for screening and testing of healthcare personnel and guidance for staff working in public health departments across Tennessee. |
| **Strategy 2**: Surveillance of TB Cases and Case Reporting | 1. Report complete data on RVCT
 | Perform RVCT data quality assurance on all TB cases with a closed investigation | Prior to submission to CDC to include in the state’s morbidity count, review RVCT to ensure completeness. Complete follow-up 1 and 2 as access to data is available and ensure completeness prior to case closure. | See **Table 1** for progress toward completeness of the RVCT national objective. |
| 1. Complete follow-up 1 and 2 forms
 | Perform RVCT data quality assurance on all TB cases with a closed investigation |
| 1. Genotyping and linkage to surveillance data
 | Request access to TB GIMS for additional TTBEP central office and train on use and functionality  | A review of current Tennessee TB program TB GIMS standard and super users was performed as well as a programmatic review of the linking process between genotyping and surveillance data. | It was determined that no additional TTBEP central office staff needed access to TB GIMS. The current number of users was deemed sufficient to maintain the current linking processes. |
| **Strategy 2**: Surveillance of TB Cases and Case Reporting | 1. Notify CDC of large outbreaks
 | Review existing genotype clusters and work in a timely manner with CDC to identify large outbreaks | Utilize genotyping data and epidemiologically linked state case numbers on the RVCT to identify clustered cases that could represent large outbreaks and recent transmission. Utilize CDC’s definition of a large outbreak of ≥10 cases related by recent transmission in a 3-year period. | There was only one (1) large outbreak detected by CDC that occurred during 2014-2016 (GENType G01551. During 2018-2019, there were three (3) additional cases added to this cluster in the county of interest. A closeout repot for this large outbreak during the defined period was submitted to CDC in December 2019. The county’s response to this outbreak included establishing a once-weekly night clinic for the homeless to test and evaluate for active TB and TB infection.  |
| **Strategy 2**: Surveillance of TB Cases and Case Reporting | 1. Liaison with reporting sources
 | Identify reporting entities  | The following variables were added as locally defined fields (LDFs) to the state surveillance system: (a) Reporting Source Type, (b) Reporting Organization, and (c) Reporting Provider.Program-maintained databases also include ordering and reporting providers for positives tests for TB infection received and other reportable labs. | The program continues to work with the Surveillance Systems and Informatics (SSI) section to develop reports from the state surveillance system regarding reporting providers and entities.In 2017 – 2018, there were 1,084 positive tests for TB infection reported by 869 providers.  |
| 1. Active surveillance
 | Assess the feasibility of conducting active surveillance activities with reporting entities | Identify reporting entities and contact reporters with the largest burden of reports to inquire about the possibility of active surveillance. | The Tennessee Department of Health Communicable and Environmental Disease and Emergency Preparedness (CEDEP) program has access to ESSENCE (Electronic Surveillance System for the Early Notification of Community-based Epidemics) where near real-time data are monitored and an alert is indicated within the system anytime a query for a particular syndrome exceeds the expected value for the given time frame. Respiratory symptoms can be monitored and the program can be provided with diagnoses upon request. |
| **Strategy 2**: Surveillance of TB Cases and Case Reporting | 1. Complete, accurate, and timely reporting and counting of cases
 | Identify all TB cases that were reported by and outside provider (e.g., hospital, private physician office, correctional facility, etc.) | The following variables were added as locally defined fields (LDFs) to the state surveillance system: (a) Reporting Source Type, (b) Reporting Organization, and (c) Reporting Provider. | The program continues to work with the Surveillance Systems and Informatics (SSI) section to develop reports from the state surveillance system regarding reporting providers and entities. |
| 1. HIV testing for all TB cases
 | Review HIV status of all cases at time of case counting, and notify central office nurse consultants of any unknown HIV results | Implement “opt-out” HIV testing policy when testing for TB infection. | See **Table 1** for progress toward HIV NTIP objective. |
| 1. Data security and confidentiality
 | Implement data security and confidentiality guidelines according to NCHHSTP guidance | Include data security and confidentiality in TTBEP Manual. | The data security and confidentiality module was added to the TTBEP manual in 2015 and is reviewed and updated annually. The TTBEP has also established procedures for sending secure patient information via fax and email. |
| **Strategy 2**: Surveillance of TB Cases and Case Reporting | 1. Quality assurance
 | Provide training to central office staff on the *Quality Assurance for Tuberculosis Data* Guide and Toolkit | Review QA of TB data at each quarterly new case manager training held at central office. | In 2018, two (2) new case manager trainings were held with four (4) attendees where QA was reviewed. |
| In 2019, three (3) new case manager trainings were held with 13 attendees where data QA was reviewed. |
| Utilize NTSS and NTIP to identify missing and unknown (MUNK) data and cases not meeting indicators | Utilize NTSS for MUNK reports and NTIP line lists for cases not meeting indicators. | MUNK reports are sent to each regional TB program manager on a quarterly basis and updates are monitored by a TTBEP epidemiologist.  |
| **Strategy 3**: Contact Investigation | 1. Contact investigation activities are initiated and completed promptly
 | Implement revised contact investigation forms | Clarify when a contact investigation should be initiated and how to assign priority to contact investigation and contacts. | Algorithm included in the TB Manual regarding initiation of contact investigation and priority classification of contacts. |
| 1. Assess reasons for no contacts or low number of contacts
 | Meet benchmarks set forth in the TTBEP program evaluation plan | Review contact investigations during cohort reviews and programmatic assessments | The primary reason identified for low number of contacts is lack of willingness of the patient to identify contacts. Regional TB program staff have been encouraged to utilize different staff for repeat interviews and work with other programs within the health department (i.e., STD and HIV) if the patient is co-infected to solicit contacts. |
| 1. Submit ARPEs
 | Provide ARPE training for all new regional TB case managers and refresher training for existing staff | ARPE training is provided as part of the quarterly new case manager training. Individual ARPE forms are created by TTBEP central office for each case during the cohort period and provided to each regional TB program. | ARPE reports have consistently been uploaded into NTIP prior to the deadline on an annual basis.See **Table 1** for ARPE completion progress and progress toward the ARPE NTIP goal. |
| **Strategy 4**: Evaluation of Immigrants and Refugees with TB or TBI | 1. Immigrants and refugees are located promptly and evaluated and treated appropriately
 | Provide B-notification training to all new regional TB case managers and provide annual refresher training for existing staff | Train new case managers regarding B-notification evaluation and reporting process.Review B-notification module in TTBEP Manual annually and update as needed. | In 2015, a B-notification module was added to the TTBEP Manual and has been reviewed and updated (if needed) annually. |
| In 2018, two (2) new case manager trainings were held with four (4) attendees. |
| In 2019, three (3) new case manager trainings were held with 13 attendees. |
| Develop evaluation for TATs for B-notifications | Developed a state-maintained database for B-notifications received with corresponding dates notifications received and dates of evaluation initiation and completion. | In 2018, the TTBEP received 144 B-notifications. Of those, 77 (53.5%) initiated an evaluation within 30 days of receipt of notification. |
| Preliminary 2019 data show that the TTBEP received 200 B-notifications. Of those, 52 (26.0%) initiated an evaluation within 30 days of receipt of notification. |
| **Strategy 5**: Program Evaluation | See Program Evaluation section |
| **Strategy 6**: Human Resources Development | See Human Resources Development section |

**Table 8. Barriers and Challenges to Implementation of the Proposed Level Strategies/Activities**

|  |  |  |  |
| --- | --- | --- | --- |
| **Strategy** | **Task** | **Barriers and Challenges** | **Activities in Response to Barriers and Challenges** |
| **Strategy 1**: Improved Case Detection and Management | 1. Ensure case management and treatment of TB cases
 | * Staff retention and turnover
 | * Conduct quarterly new case manager training
 |
| * Lack of oversight and ongoing training and education
 | * Case management quality assurance provided by central office nurse consultants
 |
| 1. Assess adequacy and appropriateness of therapy
 | * Delays in notification to central office of non-standard anti-TB regimens
 | * Periodic reminders to regional TB program managers about notification of patients on non-standard regimens
 |
| 1. Seek expert consultation
 | * Clarification about what situations warrant expert consultation
 | * Issue addressed in TB Manual and standard physician consultation form developed and distributed
 |
| 1. Collaborate with HIV/AIDS programs
 | * Lack of clarification of responsibility to enter TB diagnosis into HIV system
 | * Meeting between TB program and HIV program leadership in early 2020 to define and streamline process
 |
| 1. Evaluate case management
 | * Turnover among regional TB program staff
 | * Increase frequency of new case manager training to quarterly
 |
| **Strategy 2:**Surveillance of TB Cases and Case Reporting | 1. Active surveillance
 | * Competing priorities and lack of staff
 | * May include active surveillance in TTBEP strategic planning
 |
| 1. HIV testing for all TB cases
 | * Comfort level of staff to approach HIV testing to young and older patients
 | * Reiterate HIV testing for all TB cases using “opt-out”
 |
| * HIV antibody test not available at state lab for patients <2 years of age
 | * Memo regarding HIV testing of patients <2 years of age—central office will complete required requisition
 |
| **Strategy 3:** Contact Investigation | 1. CI activities are initiated and completed promptly
 | * Some regions delayed initiating contact investigations until the clinician ordered a contact investigation in the medical record
 | * Clarify in the TB Manual that a clinician order to initiate a contact investigation was not requirement for initiation.
 |
| 1. Assess reasons for no contacts or low number of contacts
 | * Lack of willingness of patient to identify contacts
 | * Utilize different staff for repeat interviews
* Collaborate with other programs (i.e., STD and HIV) for co-infected patients to solicit contacts
 |
| **Strategy 4:** Evaluation of Immigrants and Refugees with TB or LTBI | 1. Immigrants and refugees are located promptly and evaluated and treated appropriately
 | * Delays in notification about immigrants and refugees that have arrived in Tennessee
 | * Periodic checks of EDN throughout the day to identify new notifications increase the TAT compared to waiting for the notifications to be sent via email.
 |
| * Access to travel to the health department for initial evaluation and follow-up appointments
 | * Use of incentives and enablers
 |

**PROGRAM EVALUATION**

**Table 9. Program Evaluations—Tennessee, 2015 – 2019**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Evaluation Years** | **Evaluation Topic** | **Objectives and Key Questions** | **Data Collection and Analysis** | **Conclusions and Discussion** |
| 2015 - 2017 | Contact Investigation (contacts to sputum AFB smear-positive patients)  | Objective 1: Revise current (2015) contact investigation (CI) index case and contact forms | Minor changes were made to the contact investigation forms. The revised CI forms were used as a template to create a contact tracing page in NBS. | With the addition of contact tracing page, contacts that develop TB infection (TB) or active TB disease are now linked to source cases within the NBS. |
| Objective 2: Implement statewide use of the 12-week isoniazid/rifapentine (3HP) regimen | The TTBEP developed a state-specific medication administration record (MAR) and maintains a database of all patients who initiate 3HP.  | 3HP for use for TB infection (TBI) started in Tennessee on April 1, 2015. Changes have been made to the TTBEP 3HP guidance document to allow for the use of off-site directly observed therapy (DOT) (i.e., non-health department site) and electronic DOT (eDOT). |
| Objective 3: Statewide implementation of revised contact investigation index case and contact forms | The CI contact form was implemented on January 1, 2015, and the CI index case record was implemented in April 2017. Completeness of randomly selected contact investigation forms are reviewed annually for each regional TB program. | Annual programmatic assessments of completeness and accuracy of contact investigation forms has increased annually since the implementation of the revised contact investigation forms and implementation of the contact tracing page. |
| Objective 4: Solicit input from regional TB program staff on revised contact investigation index case and contact forms | Regional input was solicited one (1) month after implementation of each of the CI forms. | Overall, regional input was positive regarding the revisions to the CI forms. |
| Key Questions: How many patients initiated the 3HP regimen? How many completed the 3HP regimen? How many stopped the 3HP regimen due to other reasons (e.g., adverse events)? | Regional TB programs submit and initial MAR when a patient starts 3HP and an “ending” MAR is sent when a patient stops 3HP for any reason. | See **Table 10.** Tennessee 12-Week Isoniazid/Rifapentine (3HP) Treatment Da**ta** |
| 2017 - 2018 | TB Infection (TBI) Cascade of Care | Objective 1: By January 1, 2019, identify those patients with positive QuantiFERON Gold In-Tube or QuantiFERON-Plus (QFT) test result performed at the Tennessee Department of Health (TDH) Division of Laboratory Services (TDH State Lab) | An extract was created from the state lab StarLIMS system of all QFT specimens processed for a determined time period.  | In 2018, there were 815 patients with a positive QFT result collected by a health department in Tennessee. Add 2019 data. |
| Objective 2: By February 2019, compile a dataset of individuals diagnosed with TB infection (TBI) at local and regional health departments in Tennessee. | A data extract was developed to extract TBI case information from the Tennessee TB surveillance system.  | In 2018, there were 1,146 TBI investigations for 1,138 patients. In 2019, there were 962 TBI investigations for 954 patients. |
| Objective 3: By June 2019, identify the patients that initiate treatment for TBI and identify regimens used by public health for treatment of TBI as well as the completion of treatment rates for the cohort on each regimen. | Use TBI data extract from surveillance system to identify patients confirmed by public health as TBI and stratify by type of regimen started and completed. | In 2018, 954 patients started treatment for TBI. Of those 954, 714 (74.8%) completed treatment. Due to limitations of the state surveillance system, the individual regimen for each patiently is not easily obtained through the extract that was developed. Additional work is continuing. |
| Objective 4: By December 2019, develop a brief survey that would be administered to patients that refuse treatment to identify the reason(s) why patients refuse treatment. | Due to staffing issues at the two largest metropolitan regions that account for a large number of patients with TBI, it was decided that administering a survey to patients would be an added burden and was not pursued. |
| Objective 5: By December 2019, develop a brief survey that would be administered to patients that chose to stop treatment of TBI prior to completion to determine reason(s) by they chose to stop. |
| Objective 6: By January 2020, begin outreach to private providers that have reported positive IGRA or positive TST results to evaluate TBI regimens used (if treating). | In 2017, positive IGRA results and positive TST results (for patients <18 years of age) were added to the Tennessee Reportable Conditions list. | Positive tests reported by year:2017: 5262018: 2252019: 566 |

**Table 10. Tennessee 12-Week Isoniazid/Rifapentine (3HP) Treatment Data**

|  |  |  |
| --- | --- | --- |
| **Year** | **Number Initiated 3HP** | **Reason Therapy Stopped** |
| **Completed Therapy (%)** | **Adverse Event (%)** | **Lost to Follow-up (%)** | **Moved (%)** | **Other (%)** |
| 2015\* | 74 | 62 (83.8) | 7 (9.5) | 0 (0.0) | 0 (0.0) | 5 (6.8) |
| 2016 | 432 | 351 (81.3) | 30 (6.9) | 20 (4.6) | 3 (0.7) | 28 (6.5) |
| 2017 | 500 | 398 (79.6) | 33 (6.6) | 27 (5.4) | 2 (0.4) | 40 (8.0) |
| 2018 | 360 | 286 (79.4) | 26 (7.2) | 20 (5.6) | 1 (0.3) | 27 (7.5) |
| 2019\*\* | 372 | 253 (68.0) | 15 (4.0) | 5 (1.3) | 5 (1.3) | 22 (5.9) |

\*Partial 2015 data (3HP was not implemented until spring 2015)

\*\*Data as of 1/2/2020. 72 (19.4%) remain on treatment at the time of this report.

*Source:* Tennessee TB Elimination Program 3HP Database

**HUMAN RESOURCES DEVELOPMENT**

**Table 11. Human Resources Development—Objectives, Work Plan, Activities, and Progress, 2018-2019**

|  |  |  |  |
| --- | --- | --- | --- |
| **Objective** | **Sub-objective** | **Work Plan** | **Activities and Progress** |
| **Objective 1: Establish an improve existing in-service TB training and human resource development** | TB education and training focal point provides central office and regional TB staff timely announcements of education and training opportunities offered by internal and external partners. Attendance records for staff will be maintained by TB education and training focal point. | Develop and distribute announcements for educational and training opportunities. | All relevant education and training opportunities were distributed within two (2) days of receipt by the TB training and education focal point |
| Course attendance records will be maintained by the TB education and training focal point and detailed in the Cooperative Agreement. | **2018 in-person trainings**: 21 events with 455 attendees for a total of 1,417 training hours (includes statewide meeting and clinical symposium)**2018 webinars and online courses**: 20 events with 146 participants for a total of 141 training hours**2019 in-person trainings**: Eight (8) events with 320 attendees for a total of 701.8 training hours (includes statewide meeting)**2019 webinars and online courses**: 20 events with 107 participants for a total of 162.1 training hours |
| Hold monthly statewide conference calls and an annual TTBEP statewide meeting to discuss TB topics including the TTBEP Manual for improved prevention, detection, and treatment of TB. | Monthly statewide conference calls for TTBEP staff planned with agenda and attendance records. | The decision was made in 2018 to have bi-monthly conference calls to accommodate staff. Per the schedule, six (6) conference calls were held in 2018 and six (6) were held in 2019. |
| **Object 2: Establish evaluation strategies to improve existing systems and to identify ongoing training and human resource needs** | TB education and training focal point will conduct an online survey of central office and regional TB staff to assess training and educational needs and preferred method(s) of delivery; suggestions will be explored to identify and promote opportunities throughout the following year. | Distribute online survey, tabulate results, and identify educational needs. | All 12 regional TB program managers responded to the survey in 2018 and 2019 and results were discussed on statewide conference calls. Results were communicated with the Southeastern National TB Center (SNTC) at their request to identify training needs for jurisdictions in the SNTC catchment area. Recurring themes from both surveys included requests for information and education on TB treatment and diagnostics. |
| Outcomes of surveys communicated on subsequent statewide conference calls and used to plan future statewide conference calls and annual statewide meeting. |
| **Objective 3: Establish and improve education and communications capacity within the program** | At least two (2) in-service training sessions (via webinar or in-person) will be identified, developed, and delivered to meet the needs identified by TTBEP central office and regional TB staff. | Access CDC and Center of Excellence (COE) websites to identify appropriate training materials; utilize regional TB staff expertise and invited guest speakers. | At the 2018 annual statewide meeting, five (5) regional or state TB staff presented at the meeting. The clinical symposium held that same year included speakers from two (2) academic-affiliated hospitals; state Medical Examiner’s office, SNTC, and regional TB programs. The 2019 statewide meeting included interactive discussions from all regional TB programs related to engaging community partners. |
| Deliver and evaluate training sessions. |
| **Objective 4: Coordinate training related to TB control with training for other disease control interventions such as HIV/AIDS, viral hepatitis, and STD** | Throughout the year, TB central office staff will provide education to and learn about other disease control program interventions (including HIV and STD programs) via participation in and presentations to programs. | Attend and present TB issues at a weekly communicable disease surveillance meeting that includes all programs within the Communicable and Environmental Disease and Emergency Preparedness (CEDEP) at the Tennessee Department of Health. | At least one (1) central office TB program attended the weekly CEDEP meetings to provide TB programmatic updates to the group. |
| Attend and present TB updates on a monthly CEDEP conference call that includes communicable disease program staff from all Tennessee public health regions. | At least one (1) central office TB program staff participated on the monthly CEDEP conference calls to provide TB programmatic updates. |
| Attend and present TB updates at the semi-annual statewide CEDEP meetings. | Central office TB program staff attended the semi-annual statewide CEDEP meetings in 2018 and 2019. In 2019, the TTBEP program manager presented on the TB program’s work with the Tennessee Department of Correction. |
| **Objective 5: Target other health care providers and organizations serving high-risk populations** | Every other year, TTBEP will host a clinical TB update for regional and local TB staff as well as medical providers throughout the state. | Program evaluations from participants are used to plan future clinical updates. | **2018**: A statewide TB Clinical Symposium was held on November 1, 2018. Number of participants and general affiliations were:Regional TB staff: 47State TB staff: 11TB staff from other states: 10SNTC: 3Other Tennessee agencies: 3Hospital/university: 11Other Tennessee Department of Health disease program: 1**2019**: In observance of World TB Day on March 24, 2019, the TB program displayed a poster in the lobby of the Department of Health building and held an “It’s Time to End TB” facts contest where the winner won a Fitbit Charge 3. The TTBEP medical director provided TB education as an exhibitor at the 71st Tennessee Scientific Academy of Family Physician Scientific Assembly meeting. |

**Table 12. Human Resources Development—Overview of Activities, 2015-2017**

|  |  |  |
| --- | --- | --- |
| **Year** | **Objectives** | **Activities** |
| 2015 | 1. Establish and improve existing in-service TB training and human resource development
2. Establish evaluation strategies to improve existing systems and to identify ongoing training and human resource needs
3. Establish and improve patient education and communications capacity within the program
4. Coordinate training related to TB control with training for other disease control interventions such as HIV/AIDS, viral hepatitis and STD
5. Target other health care providers and organizations serving high-risk populations
 | Statewide meeting: Meeting held October 29-30, 2015 with 43 state and regional TB program attendees.Trainings (in-person and webinar): 30 in-person trainings were held with 483 participants and 23 webinars were viewed by 83 participants.Educational Needs Survey: 26 regional TB staff from 12 regional TB program completed the annual educational needs surveyPresentations: Central office TB staff (medical director, program manager, nurse consultants, and epidemiologists) delivered 30 presentations statewide with 483 total attendees (total of 1,737 hours of in-service training) |
| 2016 | Revised “Welcome to Tennessee” letters for immigrants and refugees with a B-TB classification needing evaluation at the public health department to include the following languages: Arabic, Burmese, Chinese, Dzongkha, Russian, Somali, Spanish, Tagalog, and Vietnamese. |
| 2017 | Expanded “Welcome to Tennessee” letters for immigrants and refugees with a B-TB classification needing evaluation at the public health department. Letters provided in the following languages: Amharic, Arabic, Burmese, Dzongkha, French, Haitian Creole, Hindi, Nepali, Simplified Chinese, Somali, Spanish, Swahili, Tagalog, Traditional Chinese, and Vietnamese. Additional languages were added after an multi-year analysis of the most common countries of birth of immigrants and refugees entering Tennessee |

**LABORATORY STRENGTHENING**