

**Tuberculosis Elimination in Tennessee**

Tennessee Department of Health

Tuberculosis Elimination Program (TTBEP)

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# Executive Summary

Tuberculosis (TB) remains one of the top 10 causes of death. According to the World Health Organization’s Global Tuberculosis Report 2020, an estimated 10 million people were diagnosed with TB. As estimated 1.2 million people died from TB, making it the leading cause of death from a single infectious agent[[1]](#footnote-2). Tuberculosis is caused by the bacterium, *Mycobacterium tuberculosis*, and is spread when someone with active TB expels these bacteria into the air by coughing, singing, or talking. Approximately two (2) billion people worldwide are estimated to have TB infection (TBI) (i.e., infected with *Mycobacterium tuberculosis* but have not developed active TB disease. Without treatment, approximately 5-10% of those infected with *Mycobacterium tuberculosis* will develop active TB in their lifetime, and progression from untreated TBI accounts for approximately 80% of TB cases in the United States[[2]](#footnote-3).

The mission of the Tennessee Tuberculosis Elimination Program (TTBEP). Within the state, there are 12 regional TB programs that serve all 95 counties. All regional TB programs follow standards established in the TTBEP Manual that is updated annually.

In the past 50 years, the number of TB cases diagnosed in Tennessee have overall steadily declined. From 2010-2019, the average number of new diagnoses of TB in Tennessee is 143.2. During that same time period, there has been a net decrease in the number of persons diagnosed with active TB disease of 3.4% in Tennessee. In 2019, Tennessee reported 129 persons with active TB disease. Achieving the mission of the TTBEP is predicated on the implementation of three (3) priority strategies for controlling and preventing TB as recommended by the National Advisory Council for the Elimination of Tuberculosis (ACET)2:

1. Identification of and completion of treatment for persons with active TB disease to render their condition noninfectious
2. Finding and screening persons who have had contact with persons with active TB disease to determine: whether they have active TB themselves; whether they have been infected with *Mycobacterium tuberculosis*; or for children and other persons at high risk, whether they require window prophylaxis (preventive treatment of presumed TB infection during the time that it would normally would take for a tuberculin skin test [TST] or interferon gamma release assay [IGRA] to become positive after exposure) and whether to administer treatment
3. Screening, testing, and treatment of other selected persons and populations at high risk for TB infection (TBI) and subsequent active TB disease to detect persons who can most benefit from treatment for TBI, which is essential for TB elimination because of new immunosuppressive drugs and therapies used for different illnesses, immigration from areas where TB is endemic, and diminished knowledge and reduced recognition of TB by clinicians as a result of decreased incidence[[3]](#footnote-4).

The definition of TB elimination is 1.0 persons with active TB per one (1) million population. In 2019, the TB case rate in Tennessee was 19.1 per one (1) million population. Also, in 2019, 35 of Tennessee’s 95 counties (36.8%) had ≥1 resident diagnosed with active TB. Case rates in those counties ranged from 6.3 to 152.7 per one (1) million population. The TTBEP utilizes recent advances in testing and treatment such as: QuantiFERON®-TB Gold blood assay for the detection of *Mycobacterium tuberculosis* infection; CepheidGeneXpert® nucleic acid amplification test (NAAT) for the rapid confirmation of active TB diagnosis and rifampin resistance; utilization of electronic directly observed therapy (eDOT); and the 12-week treatment course of Isoniazid and Rifapentine for TB infection. These advances in technology have assisted with diagnosing both TB infection and active TB disease; however, factors such as co-morbid conditions, access to healthcare, and other risk factors that increase progression to active TB disease if infected, present challenges to eliminating TB statewide.

This report will focus on the three (3) priority strategies for controlling and preventing TB mentioned above. Goals and activities for each of the three (3) strategies are based on current TB epidemiology in Tennessee; the Centers for Disease Control and Prevention (CDC) Division of Tuberculosis Elimination (DTBE)’s National TB Indicators Project (NTIP); and the Healthy People 2030 objective for TB.

# Essential Components of a Public Health Tuberculosis Prevention, Control, and Elimination Program

The following are the 12 essential components of a TB prevention, control, and elimination program:

1. Role of public health departments
2. Overall planning and policy components
3. Surveillance and reporting of persons with suspected or confirmed TB disease
4. Data management, analysis, and use
5. Program evaluation and quality improvement
6. Laboratory and other testing
7. Identification, management, and treatment of persons with latent TB infection
8. Identification, management, and treatment of persons with TB disease
9. Epidemiologic investigation
10. Training and education
11. Partnerships and collaboration
12. Research

# Overview of Data

Between 2010-2019, Tennessee reported 1,454 active cases of TB.

## The data cohort used for this plan are persons with confirmed TB disease counted towards Tennessee’s morbidity count for MMWR years 2010-2019.

## TB Incidence

**Figure X** shows the TB incidence in Tennessee per one (1) million populations for years 2010 – 2019.

## Demographics

*Age*

The average age of persons diagnosed with TB in Tennessee between 2010 – 2019 has overall remained steady between 44 years and 50 years. **Figure X** shows the ages of the TB patients counted between 2010 – 2019 by age category. On average, approximately 4.4% of patients diagnosed with TB in Tennessee are <5 years of age and 2.9% are between the ages of 5 and 15 years.

**Figure X**

*Race and Ethnicity*

TB disproportionately affects minority groups in Tennessee

In Tennessee, TB disproportionately affects minority populations. **Figure X** shows that the case rate per 100,000 population in non-Hispanic Black persons is three (3) to six (6) times higher compared to non-Hispanic white persons. For non-Hispanic Asian persons, the case rate is 12-20 times higher when compared to non-Hispanic white persons.

**Figure X**

## Birth Status

Historically, the percentage of persons with active TB in Tennessee that were born in the United States nearly doubled that of persons born outside of the United States. More recently, the trend in Tennessee has mirrored the national trend with nearly as many non-U.S.-born persons diagnosed with TB as those born in the U.S.

The proportion of TB cases born outside of the U.S. has steadily increased since 2013.

**Figure X** shows the 10 most common countries of birth for persons in Tennessee diagnosed with active TB between 2011 and 2019. Between 2011 and 2019, 498 (40.2%) of persons with active TB were born outside of the United States. Of the 498, 40.8% were born in Asian countries; 33.7% in Central American countries; 21.3% in African countries; 1.4% in European countries; 1.2% in South American countries; and 0.8% in Middle Eastern countries and countries in the Caribbean, respectively.

**Figure X**

**Figure X**

## Risk Factors

**Figure X** shows the average percent of cases for 2010 – 2019 with the following risk factors

identified: HIV co-infection, homeless (within the past year from diagnosis), resident of a correctional facility (at the time of diagnosis), substance abuse (within the past year from diagnosis date) that includes excessive alcohol use, non-injecting and injected drug use, and diabetes mellitus. Substance abuse and diabetes mellitus were the most common risk factors identified among persons diagnosed with active TB in Tennessee between 2010 – 2019.

**Figure X**

## Refugee Data

## <http://www.tnrefugees.org/index.php/tor-reports-and-data/>

During fiscal years (FYs) 2010-2019, 13,614 refugees (includes both refugees and special immigrant visa [SIV]) arrived in Tennessee from 49 countries. **Figure X** shows the number of refugee and SIV arrivals to Tennessee. **Figure X** shows all countries that accounted for ≥1.00% of the total arrivals from 2010 – 2019. There were 36 countries that accounted for <1.00% of the total arrivals between 2010 – 2019.

**Figure X**

**Figure X.**

Of those 49 countries, 27 countries (55.1%) are designated as high-burden countries for TB, MDR-TB, TB/HIV or a combination of one or more of these categories by the World Health Organization (WHO) for 2016-2020. The following is the breakdown of these countries by WHO designation:

* High burden for TB only: 2.0%
* High burden for MDR-TB only: 12.2%
* High burden for TB/HIV only: 4.1%
* High burden for TB and MDR-TB: 12.2%
* High burden for TB and TB/HIV: 8.2%
* High burden for TB, MDR-TB, and TB/HIV: 16.3%

During FY 2010 - 2019, 71.82% of refugees that arrived were resettled in Nashville; 11.39% in Knoxville; 11.14% in Memphis; 5.63% in Chattanooga, and 0.03% were resettled remotely.

**Figure X**

# Identification of and Completion of Treatment for Persons with Active TB Disease to Render Their Condition Noninfectious

## Introduction

## Goal 1: Use of therapeutic drug monitoring (TDM)

**Activity 1**: Utilize therapeutic drug monitoring for patients with suspected or confirmed TB disease

 **Activity 2**: Develop a therapeutic drug monitoring (TDM) database that includes: medication regimen and dosages, microbiologic lab results, and risk factors

## Goal 2: Expand use of GeneXpert®

**Activity 1**: Perform GeneXpert® testing for all initial samples (first sample received) on persons with suspected or confirmed TB disease.

**Activity 2**: For patients placed on respiratory isolation with an initial negative Xpert result, perform a second (2nd) Xpert test to assess possibility of discontinuing respiratory isolation.

**Activity 3**: Validate Infinity 48 machine for testing and reporting of non-sputum specimens.

## Goal 3: Utilize CDC’s Molecular Detection of Drug Resistance (MDDR) lab services

**Activity 1**: Identify criteria that warrants sending specimens to CDC for molecular detection of drug resistance (MDDR)

## Goal 4: Utilize incentives and enablers early in a patient’s treatment course to facilitate compliance and completion of treatment

## Goal 5: Ensure treatment completion for those diagnosed with TB disease

**Activity 1**: Ensure treatment completion for patient eligible to complete treatment within 12 months

**Action Step**: Exclude patients who are not eligible to complete treatment within 12 months. This includes patients with any rifampin-resistance; patients with meningeal TB disease, patients with TB in the bone or skeletal system; patients with TB of the central nervous system; children aged ≤14 years with disseminated TB (i.e., evidence of military TB on a chest radiograph or a positive blood culture). Patients also excluded include: those patients who died within 366 days of initiating treatment and patients who moved out of the U.S. within 366 days of initiating treatment.

**Activity 2**: Expand the use of alternative methods of directly observed therapy (DOT) and directly observed preventive therapy (DOPT.

**Action Step**: Implement statewide use of synchronous and asynchronous DOT/DOTP

**Activity 3**: Utilize alternative treatment regimens that may shorten treatment course, when available.

**Activity 4**: Screen for diabetes mellitus for all persons with suspected or confirmed TB disease

**Activity 5**: Ensure HIV testing is performed for all patients with suspected or confirmed TB disease

**Action Step**: For patients with TB/HIV co-infection, ensure patient is linked to HIV care

# Finding and Screening Persons Who Have Had Contact with Persons with Active TB Disease

## Goal 1: Continue statewide use of QuantiFERON®-TB Gold Plus (QFT®-Plus) for testing for TB infection

**Activity 1**: Ensure that HIV testing is performed as part of the QFT collection process

## Goal 2: Use genotype information to assess contact investigations

**Activity 1**: Utilize estimates of recent transmission and extensive recent transmission for genotype clusters identified statewide.

## Goal 3: Ensure treatment completion for patients diagnosed with TBI at regional and local public health departments

**Activity 1**: Designate a case manager for each patient diagnosed with TBI by regional and local health departments.

**Activity 2**: Continue the use of the 12-week isoniazid/rifapentine “3HP” regimen

**Activity 3**: Expand the use of alternative methods of directly observed therapy (DOT) and directly observed preventive therapy (DOPT)

**Action Step**: Implement statewide use of synchronous and asynchronous DOT/DOPT

## Goal 4: Enhance TBI surveillance

**Activity 1**: Modify TBI page in state surveillance system to include all CDC’s TB Latent Infection Surveillance System (TBLISS) data elements

**Activity 2**: Submit cases of TB infection (TBI) to CDC via HL7 messaging.

## Goal 5: Ensure completeness of contact investigations

**Activity 1**: Utilize Aggregate Reports for Tuberculosis Evaluation (ARPE) to develop overall regional summary of contact investigation for years 2015-2019.

**Activity 2**: Review regional programmatic assessments to identify issues with contact investigation.

# Screening, Testing, and Treatment of Other Selected Persons at High Risk for TB Infection and Subsequent Active TB Disease to Detect Persons Who Can Most Benefit from Treatment for TB Infection

## Introduction

In 2016, the United States Preventive Services Task Force (USPSTF) issued a grade B recommendation for medical service providers to screen for latent TB infection among asymptomatic adults at risk for TB infection. This recommendation includes risk assessment, screening, and treatment and interventions. The full recommendation can be accessed at [**https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/latent-tuberculosis-infection-screening#fullrecommendationstart**](https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/latent-tuberculosis-infection-screening#fullrecommendationstart)

Placeholder

**Tables X** and **X** identify risk factors for *Mycobacterium tuberculosis* infection and risk factors for progression to active disease, if infected[[4]](#footnote-5).

**Table X. Risk Factors for *Mycobacterium tuberculosis* Infection**

|  |  |
| --- | --- |
| * Close contacts of persons known or suspected to have tuberculosis
 | * Foreign-born persons from areas that have a high incident of active tuberculosis (e.g., Africa, Asia, Eastern Europe, and Russia)
 |
| * Persons who visit areas with a high prevalence of active tuberculosis, especially if visits are frequent or prolonged
 | * Residents and employees of congregate settings whose clients are at increased risk for active tuberculosis (e.g., correctional facilities, long-term care facilities, and homeless shelters)
 |
| * Health-care workers who serve clients who are at increased risk for active tuberculosis
 | * Populations defined locally has having an increased incidence of latent *M. tuberculosis* infection or active tuberculosis, possibly including medically underserved, low-income populations, or persons who abuse drugs or alcohol
 |
| * Infants, children, and adolescents exposed to adults who are at increased risk for latent *M. tuberculosis* infection or active tuberculosis
 |  |

**Table X. Risk Factors for Progression of Infection to Active Tuberculosis**

|  |  |
| --- | --- |
| * Persons with human immunodeficiency virus (HIV) infection
 | * Infants and children aged <5 years
 |
| * Persons who are receiving immunosuppressive therapy such as tumor necrosis factor-alpha (TNF-α) antagonists, systemic corticosteroids equivalent to ≥15 mg of prednisone per day, or immunosuppressive drug therapy following organ transplantation
 | * Persons who were recently infected with *M. tuberculosis* (within the past 2 years)
 |
| * Persons with a history of untreated or inadequately treated active tuberculosis, including persons with fibrotic changes on chest radiographs consistent with prior active tuberculosis
 | * Persons with silicosis, diabetes mellitus, chronic renal failure, leukemia, lymphoma, or cancer of the head, neck, or lung
 |
| * Persons who have had a gastrectomy or jejunoileal bypass
 | * Persons who weigh <90% of their ideal body weight
 |
| * Cigarette smokers and persons who abuse drugs or alcohol
 | * Populations defined locally as having an increased incidence of active tuberculosis, possibly including medically underserved or low-income populations
 |

**Table X** outlines the risk factors and estimated risk for the development of active tuberculosis among those persons infected with *Mycobacterium tuberculosis* compared to persons with no risk factors[[5]](#footnote-6).

**Table X**

|  |  |
| --- | --- |
| **Risk Factor** | **Estimated Risk for TB Relative to Persons with No Known Risk Factor** |
| **High risk (testing and treatment for TBI recommended for all ages)** |
| AIDS (not on anti-HIV therapy) | 110-170 |
| HIV (not on anti-HIV therapy) | 50-110 |
| Transplantation (related to immunosuppressive therapy) | 20-74 |
| Silicosis | 30 |
| Chronic renal failure requiring hemodialysis | 10-25 |
| Carcinoma of head and neck | 16 |
| Recent TB infection (<2 years) | 15 |
| Abnormal chest X-ray with upper lobe fibronodular disease typical of healed TB infection | 6-19 |
| TNF-α inhibitors | 2-9 |
| **Moderate risk (testing and treatment for TBI recommended if age <65 years)** |
| Treatment with glucocorticoids | 5 |
| Diabetes mellitus (all types) | 2-4 |
| Young age when infection (0-4 years) | 2-5 |
| **Slightly increased risk (testing and treatment for TBI recommended if age <50 years)** |
| Underweight (<90% ideal body weight; for most persons, this is a BMI of 20) | 2-3 |
| Cigarette smoker (1 pack/day) | 2-3 |
| Abnormal chest X-ray—granuloma | 2 |
| **Low risk (testing and treatment for TBI recommended if age <35 years)** |
| Infected person, no known risk factor, normal chest X-ray (“low-risk reactor” | 1 |
| **Very low risk (treatment of TBI not usually recommended)** |
| Person with positive two-step (“boosting”, no other known risk factor, and normal chest X-ray | 0.5 |

## Goal 1: Identify populations within each public health region who are at high risk for TB infection

**Activity 1**: Create a regional TB and TBI profile and provide to regional TB program managers.

**Activity 2: Review reported positive test for TB infection received, create a summary report and provide report to regional TB program managers.**

***Goal 2: Ensure evaluation of new arrivals that would benefit from*** ***screening and testing for TB infection***

**Activity 1**: Ensure evaluation of new arrivals with a TB classification

**Action Step**: For those arrivals with a TB classification, ensure that evaluation is initiated within 30 days of receiving the notification of arrival to Tennessee

**Action Step**: For those arrivals with a TB classification, ensure that evaluation is completed within 90 days of receiving the notification of arrival to Tennessee

**Activity 2**: Ensure evaluation of new arrivals without a TB classification but from countries with a high burden of TB disease

## Goal 3: Address cascade of care

[**https://bmcinfectdis.biomedcentral.com/articles/10.1186/s12879-020-05311-0**](https://bmcinfectdis.biomedcentral.com/articles/10.1186/s12879-020-05311-0)

## Goal 4: Enhance TBI surveillance

**Activity 1**: Modify TBI page in state surveillance system to include all CDC’s TB Latent Infection Surveillance System (TBLISS) data elements

**Activity 2**: Submit cases of TB infection (TBI) to CDC via HL7 messaging.

## Goal 5: Develop communication strategy to populations at high risk for TB infection

## Goal 6: Identify external individuals/agencies who provide healthcare services to populations at high risk

# Collaborations

## Goal 1: Identify internal and external stakeholders

**Activity 1**: Develop database of internal stakeholders

**Activity 2**: Develop database of external stakeholders

List to include:

* Federally Qualified Health Centers (FQHCs)
* Community Health Centers (CHCs)
* Civil surgeons
* Refugee resettle agencies
	+ Catholic Charities of Tennessee, Inc. (Tennessee)
	+ Nashville International Center for Empowerment (NICE) (Nashville)
	+ World Relief (Memphis)
	+ Bridge Refugee Services (Chattanooga)
	+ Bridge Refugee Services (Knoxville)
* Healthcare facilities/providers that service high-risk populations
	+ Siloam Family Health Center (refugees)

## Goal 2: Partner with individuals/agencies serve populations at high risk for TB infection

**Activity 1**: Develop and implement outreach/education campaign targeted toward providers that report positive tests for TB infection

**Action Step**: Utilize database of reported positives tests for TB infection to develop summary of providers by region that are reporting positive tests for TB infection.

**Activity 2**: Identify external agencies that serve populations at high risk for TB infections.

## Goal 3: Create a Tennessee TB Elimination Task Force

**Activity 1**: Identify individuals (internal and external) to public health to serve on a Tennessee TB Elimination Task Force

## Public Health Workforce

## Goal 1: Support and strengthen existing TB public health workforce

**Activity 1**: Ensure access to education opportunities for regional and local public health department staff

1. Global tuberculosis report 2020. Geneva: World Health Organization; 2020. License: CC BY-NC-SA 3.0 IGO. [↑](#footnote-ref-2)
2. Sterling TR, Njie G, Zenner D, et al. Guidelines for the Treatment of Latent Tuberculosis Infection: Recommendations from the National Tuberculosis Controllers Association and CDC, 2020. MMWR Recomm Rep 2020;69(No. RR-1):1-11. DOI: http://dx.doi.org/10.15585/mmwr.rr6901a1 [↑](#footnote-ref-3)
3. Coe B, Nilsen DM, Will L, Etkind SC, Burgos M, Chorba T. Essential Components of a Public Health Prevention, Control, and Elimination Program: Recommendations of the Advisory Council for the Elimination of Tuberculosis and the National Tuberculosis Controllers Association. MMWR Recomm Rep 2020;69(No. RR-7):1-27. DOI: <http://dx.doi.org/10.15585/mmwr.rr6907a1> [↑](#footnote-ref-4)
4. Centers for Disease Control and Prevention. Updated Guidelines for Using Interferon Gamma Release Assays to Detect *Mycobacterium tuberculosis* Infection – United States, 2010. MMWR 2010:59(RR-5):[3]. [↑](#footnote-ref-5)
5. LoBue P, Menzies D. Treatment of latent tuberculosis infection: An update. Respirology 15:603-622. DOI: <https://doi.org/10.1111/j.1440-1843.2010.01751.x> [↑](#footnote-ref-6)