

TB Prevention and Care Program October 2023

2022 Annual Report



Indiana
Department
of
Health



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Executive Summary

The mission of the Indiana Tuberculosis Prevention and Care Program is to progress toward elimination of tuberculosis (TB) by conducting prevention activities through education, outreach, collaboration, and surveillance.

In 2022, 99 new cases of TB were reported to the Indiana Department of Health, a 7.6% increase from 2020. Although there were 127 cases of TB in 2021, this data should not be interpreted as a true representation of the disease burden in Indiana due to cases affiliated with a national TB outbreak that originated from a contaminated bone graft product and the presence of Afghan evacuees at Camp Atterbury. Marion County continued to have the most TB cases of any jurisdiction, with 38 cases reported in 2022 and a total of 428 cases within the past 10 years.

Differences in TB continue to be found among several populations, including by age group, race, ethnicity, gender, and U.S.-born status. The highest rates of TB occur in Hoosiers who are 25 to 64 years of age. More than half of Indiana cases in 2022 (67.7%) were among non-U.S.-born persons, which mirrors the differences seen at the national level.

There are several established risk factors for TB, including HIV infection, homelessness, drug and alcohol use, and residence in a correctional facility. In 2022, HIV status was known among 97.1% of TB cases aged 25 to 44, and 4% of all TB cases occurred among individuals who were HIV-positive. Diabetes was the most commonly reported risk factor, reported in 22.2% of all TB cases in Indiana.

Effective treatment of TB is essential to the control and elimination of the disease, and several treatment-related data measures are collected. In 2022, 94.8% of TB cases were started on the recommended initial therapy, and 90% of cases in 2021 completed their therapy within one year. Two cases of multi-drug-resistant TB were identified in 2022 in Indiana.

TB genotyping and contact investigation are tools used in TB to help prevent additional cases. Seven new genotype clusters were identified in 2022 in Indiana, with no clusters designated as an outbreak. In 2021, 100% of cases of TB with positive sputum smears had contacts identified, and 72.5% of those contacts were fully evaluated for infection and disease.

The vision of the Indiana Department of Health's TB Prevention and Care Program is: "a tuberculosis-free Indiana." To achieve this vision, we will need continued collaboration between state and local health departments and continued efforts to find, diagnose, and effectively treat every case of TB and latent TB infection in Indiana.

Program Indicators

TB Indicators	Indiana		Program Goals
	2022	2021	2025
Number of Tuberculosis Cases	99	127	
Tuberculosis Case Rate per 100,000 Population	1.5	1.9	
Number of Tuberculosis Deaths	7	15	
Laboratory Confirmation	76.8%	76.4%	
Pulmonary Site of Disease	66.6%	59.9%	
U.S.-Born Incidence Rate	0.5	0.9	0.4
Non-U.S.-Born Incidence Rate	17.7	20.1	8.8
Non-Hispanic White Incidence Rate	0.7	1.1	
Non-Hispanic Black Incidence Rate	3.4	2.8	
Non-Hispanic Asian Incidence Rate	18.5	19.4	
Hispanic/Latino Incidence Rate	4.8	4.1	
Male Incidence Rate	1.7	2.7	
Female Incidence Rate	1.2	1.1	
Known HIV Status 25-44 Years of Age	97.1%	100%	99.0%
HIV Comorbidity	4.0%	3.1%	
Resident of Correctional Facility	1.0%	3.1%	
History of Homelessness	5.1%	3.1%	
Resident of Long-Term Care Facility	0.0%	2.4%	
Injecting Drug Use	0.0%	0.8%	
Non-Injecting Drug Use	4.0%	7.9%	
Excess Alcohol Use	4.0%	11.0%	
Initial Four-Drug Therapy Regimen	94.8%	95.0%	94.0%
INH Resistance	6.1%	4.7%	
MDR	2.0%	0.0%	
Culture Conversion < 60 Days	65.5% (2021)	64.4% (2020)	73.0%
DOT Utilization	62.0% (2021)	70.7% (2020)	
Completion of Therapy <1 Year	90.0% (2021)	94.4% (2020)	95.0%

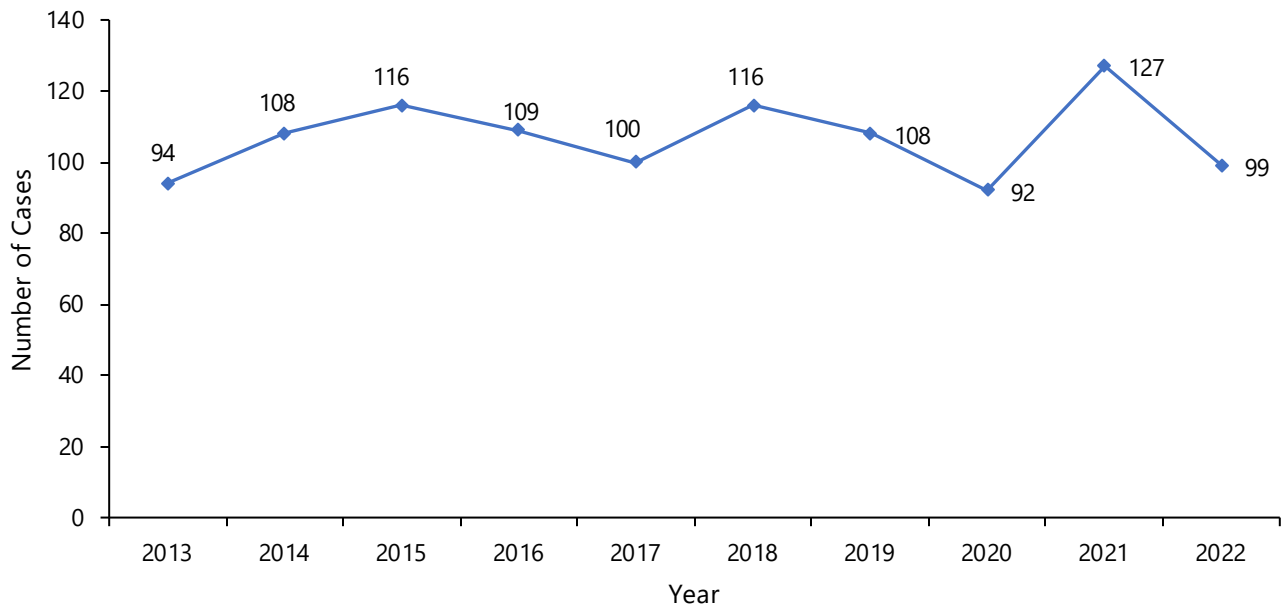
Tuberculosis in Indiana

Tuberculosis (TB) is an airborne disease caused by a group of bacteria called *Mycobacterium tuberculosis*. General symptoms may include a prolonged productive cough, blood-tinged sputum, night sweats, fever, fatigue, and weight loss. TB usually affects the lungs (pulmonary TB) but can also affect other parts of the body, such as the brain, kidneys, or spine (extrapulmonary TB).

TB bacteria are aerosolized when a person who has pulmonary TB or TB affecting the larynx coughs, sneezes, laughs, or sings. Other people may become infected if they inhale the droplet nuclei that are formed. Individuals who become infected but do not become ill are considered to have latent TB infection (LTBI) and cannot transmit the infection to others. Approximately 10% of immunocompetent individuals with LTBI will progress to TB disease at some point in their lives if they are not treated. Indiana requires reporting of all suspected and confirmed cases of TB disease. As of December 2015, LTBI is also a state-level reportable condition.

Burden and Trends

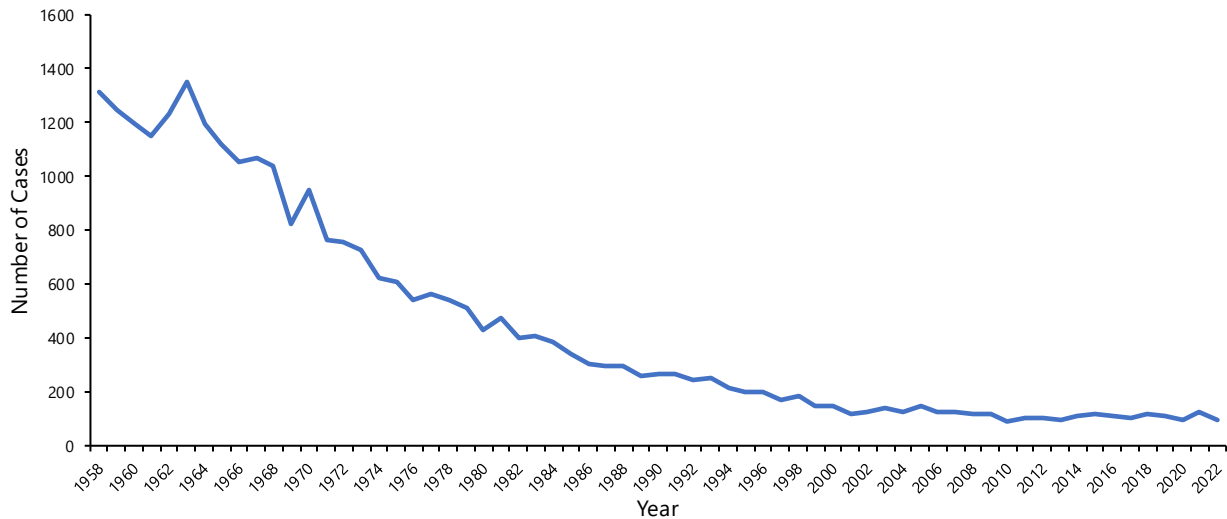
Figure 1. Tuberculosis Cases in Indiana, 2013 – 2022



In Indiana, 99 cases of TB were reported in 2022, a 7.6% increase from 2020. Reported cases of TB in 2021 were affected by cases associated with contaminated bone graft product and

Afghan evacuees from Camp Atterbury. The incidence rate of TB also slightly increased from 2020 to 2022, from 1.4 per 100,000 population to 1.5 per 100,000 population.

Figure 2. Historical Trend of Tuberculosis Cases in Indiana



In the past 10 years, the TB rate in Indiana has plateaued. This represents an end of the historical downward trend seen in Indiana since the 1950s. The latest national data from 2022 shows that Indiana remains under the national incidence rate (2.5 per 100,000) for TB in the United States.¹

Diagnosis of Tuberculosis

A diagnosis of TB disease is categorized as a laboratory, clinical or provider diagnosis, according to the criteria established by the Centers for Disease Control and Prevention (CDC) shown below.² Provider diagnosis is defined as a case that does not meet either the laboratory or clinical case definition, but the healthcare provider believes there is sufficient evidence for a diagnosis of TB based on the clinical evaluation.

Laboratory Criteria

- Isolation of *M. tuberculosis* from a clinical specimen, OR
- Demonstration of *M. tuberculosis* complex from a clinical specimen by nucleic acid amplification test, OR
- Demonstration of acid-fast bacilli in a clinical specimen when a culture has not been or cannot be obtained or is falsely negative or contaminated

Clinical Criteria

- A positive tuberculin skin test or positive interferon gamma release assay for *M. tuberculosis*
- Other signs and symptoms compatible with tuberculosis (e.g., abnormal chest radiograph, abnormal chest computerized tomography scan or other chest imaging study, or clinical evidence of current disease)
- Treatment with two or more anti-TB medications
- A completed diagnostic evaluation

Figure 3. Percentage of Tuberculosis Cases by Case Definition, Indiana, 2018-2022

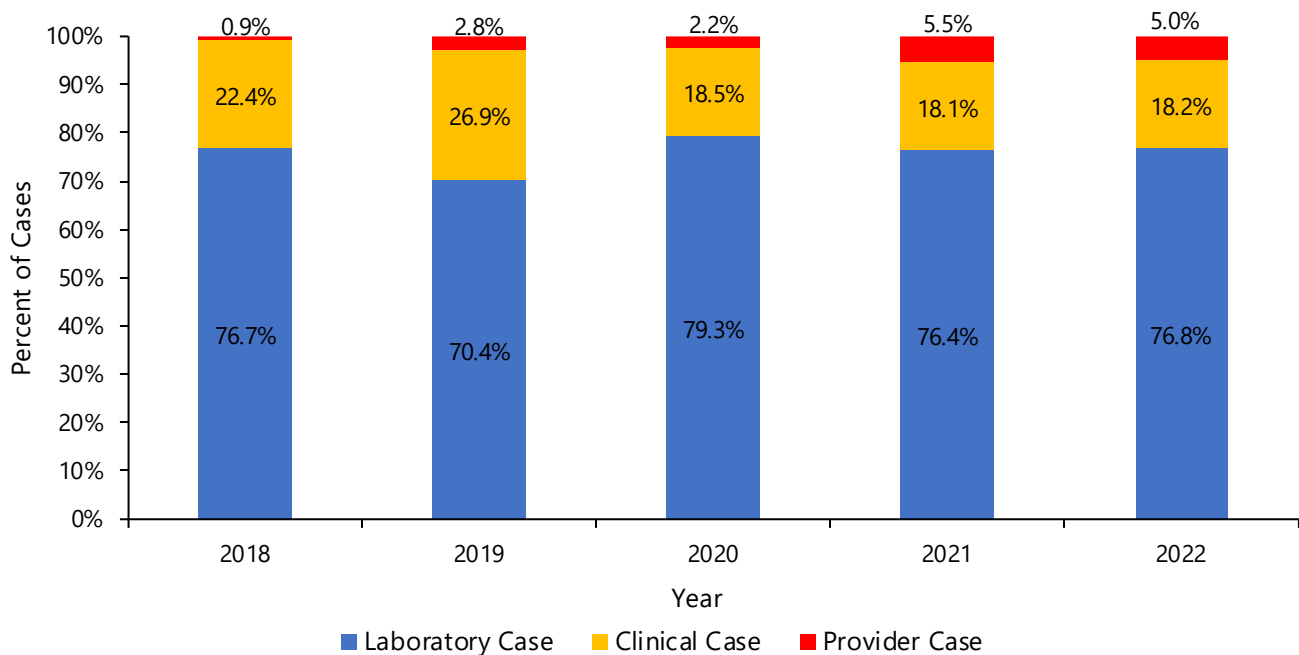
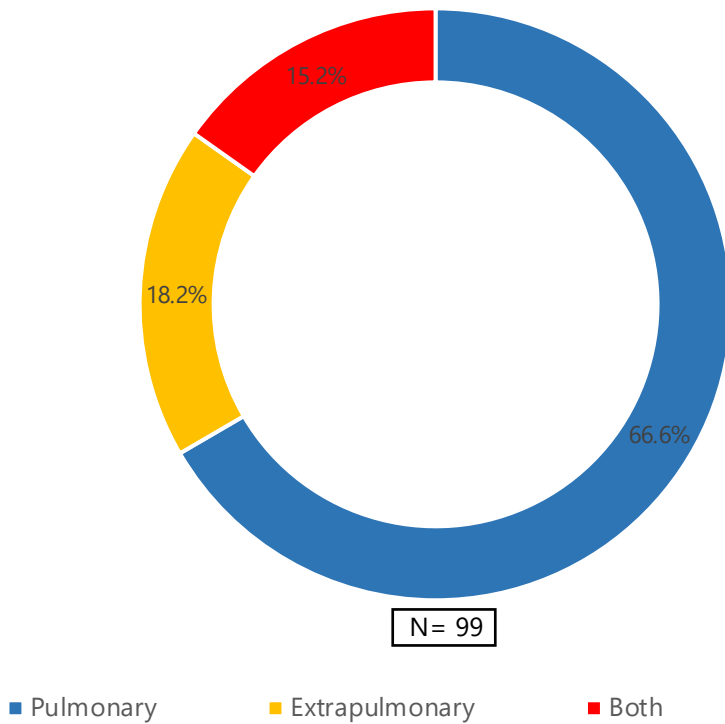


Figure 4. Percentage of Tuberculosis Cases by Site of Disease, Indiana, 2022



In 2022, 66.6% of TB cases in Indiana were exclusively pulmonary (n= 66). This proportion is an increase from 2021, which reported 59.9% percent of TB cases as pulmonary.

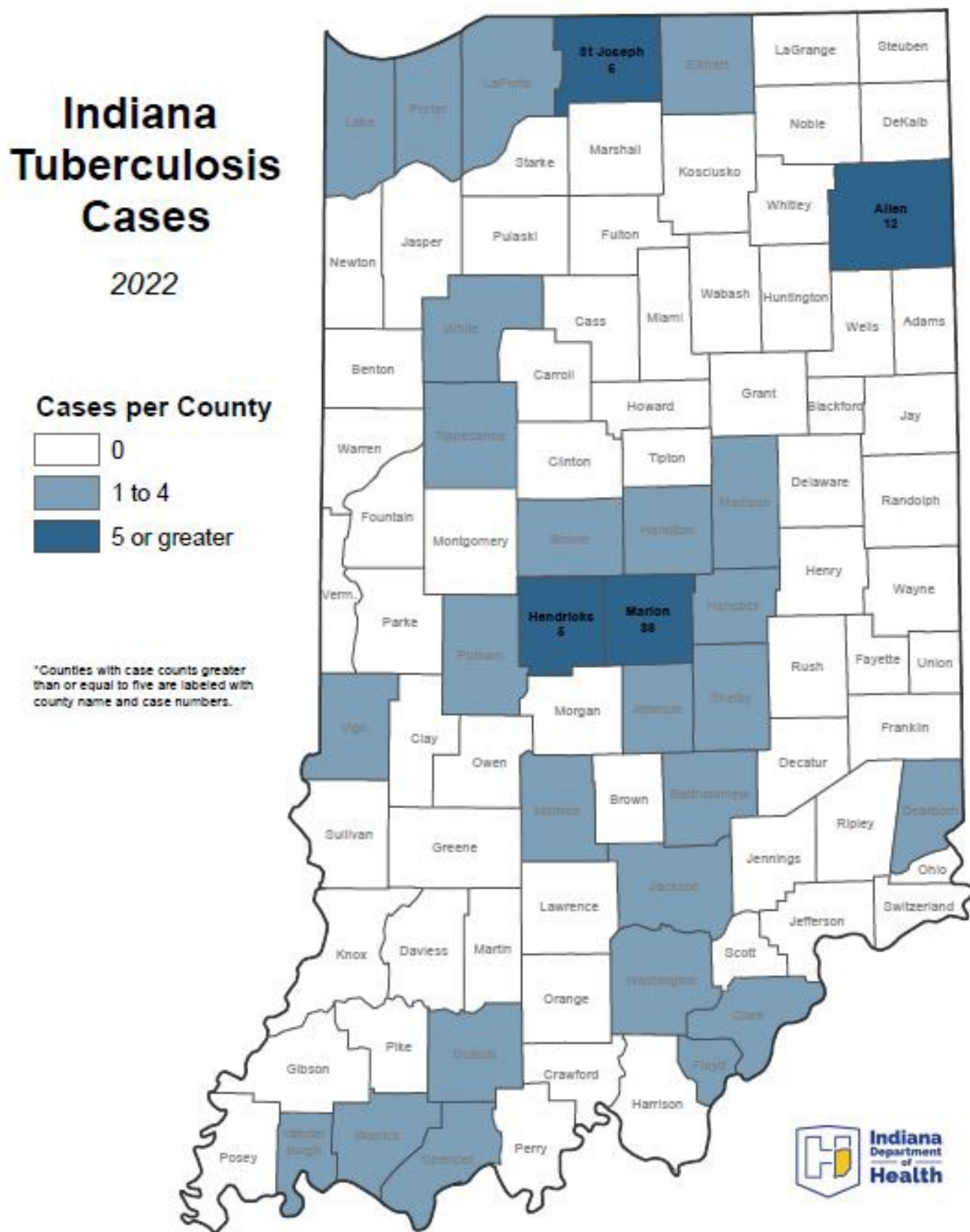
Extrapulmonary sites included lymphatic, pleural, meningeal, peritoneal, eye and/or ear, and other in 2022. Lymphatic system was the most reported site for extrapulmonary disease, accounting for 35% of extrapulmonary cases.

Geographic Distribution of TB

In total, 29 Indiana counties reported cases of TB in 2022. Of those counties, 17 reported an increase in TB cases, with four counties reporting increases of at least three or more cases compared to 2021. Marion County accounted for 38.4% of the total cases in 2022, while only having 14.3% of Indiana’s total population. Similarly, Marion County had the highest proportion of TB cases from 2013 to 2022, accounting for 40% of all cases in Indiana.

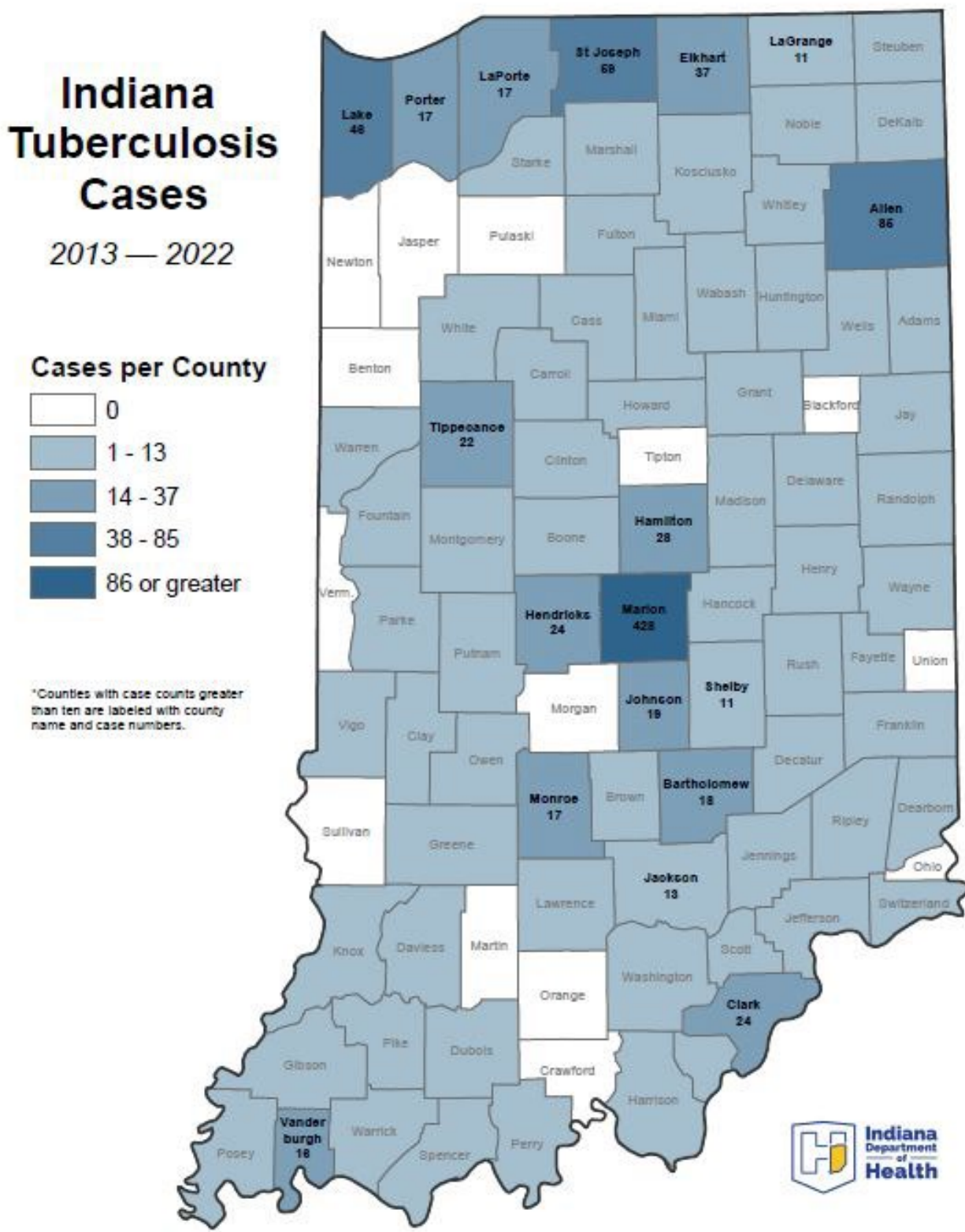
Top Indiana Counties by Number of TB Cases, 2022 (See Figure 5)	Top Indiana Counties by Number of TB Cases, 2013-2022 (See Figure 6)
<ul style="list-style-type: none"> • Marion: 38 cases • Allen: 12 cases • Hendricks and St. Joseph: five cases 	<ul style="list-style-type: none"> • Marion: 428 cases • Allen: 85 cases • St. Joseph: 59 cases • Lake: 46 cases • Elkhart: 37 cases

Figure 5. Number of TB Cases by County, Indiana, 2022



Data: Infectious Disease Epidemiology & Prevention
Map: IDH ODA PHG, 03/09/2023

Figure 6. Total Number of TB Cases by County, Indiana, 2013-2022

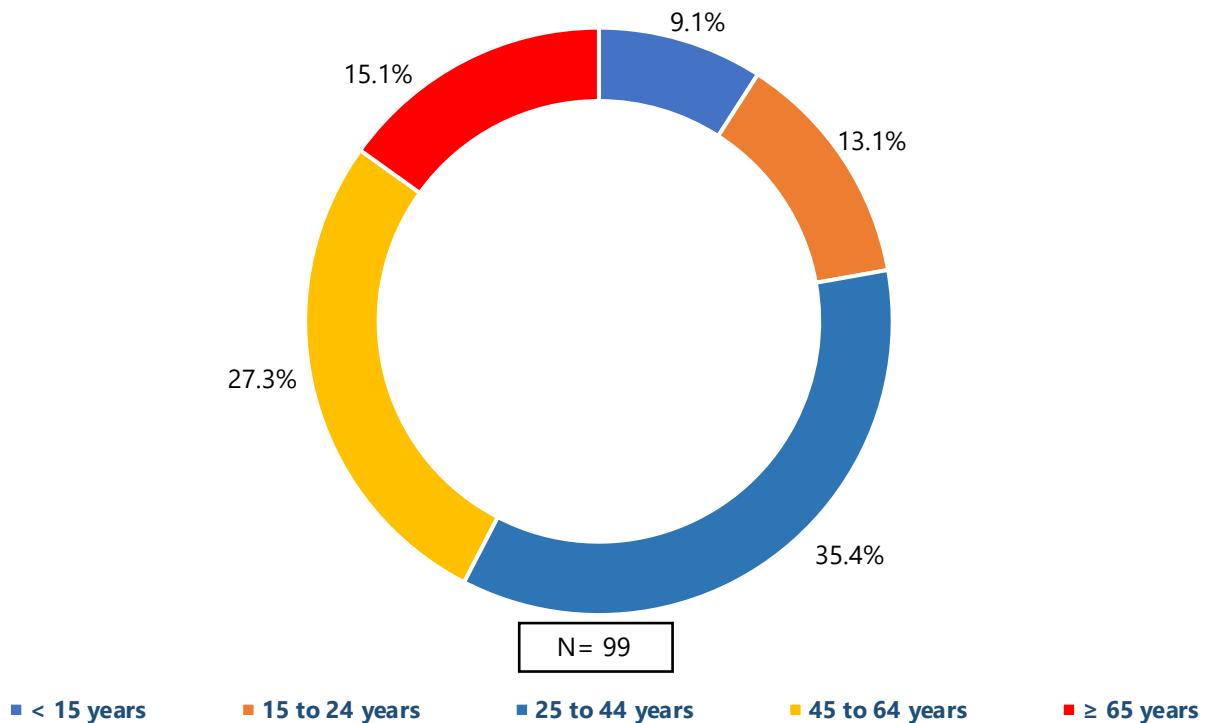


Data: Infectious Disease Epidemiology & Prevention
Map: IDOH ODA PHG, 03/08/2023

Demographics and Risk Factors

Despite prevention efforts, some groups of people are affected by TB more than others. Differences may occur by gender, race or ethnicity, income, comorbid medical conditions, or geographic location.³

Figure 7. Tuberculosis Cases by Age Group, Indiana, 2022



In 2022, 77.8% of Indiana’s TB cases occurred in adults aged 25 years or older (N=77), and 13.1% were among those 15 to 24 years old, which significantly increased from 2021 to 2022. The proportion of TB cases in those younger than 15 years old increased from 4.7% in 2021 to 9.1% in 2022. On the other hand, the proportion of TB cases in individuals older than 65 decreased from 24.4% in 2021 to 15.1% in 2022.

The incidence of TB from the last five years remains high in persons in the 25-44 years age group (Figure 8) compared to other groups. Compared to 2021, incidence rates decreased among people in the 45 and older age group in 2022.

The trend of reported pediatric cases (<15 years of age) has stayed stable since 2018 (Figure 9). There were nine pediatric TB cases reported in both 2020 and 2022, which is the highest within the five-year period. Pediatric TB is a public health concern of special significance because it is a marker for recent transmission of TB and is more likely to be life-threatening⁴.

Figure 8. Tuberculosis Case Rates by Age Group and Year, Indiana, 2018-2022

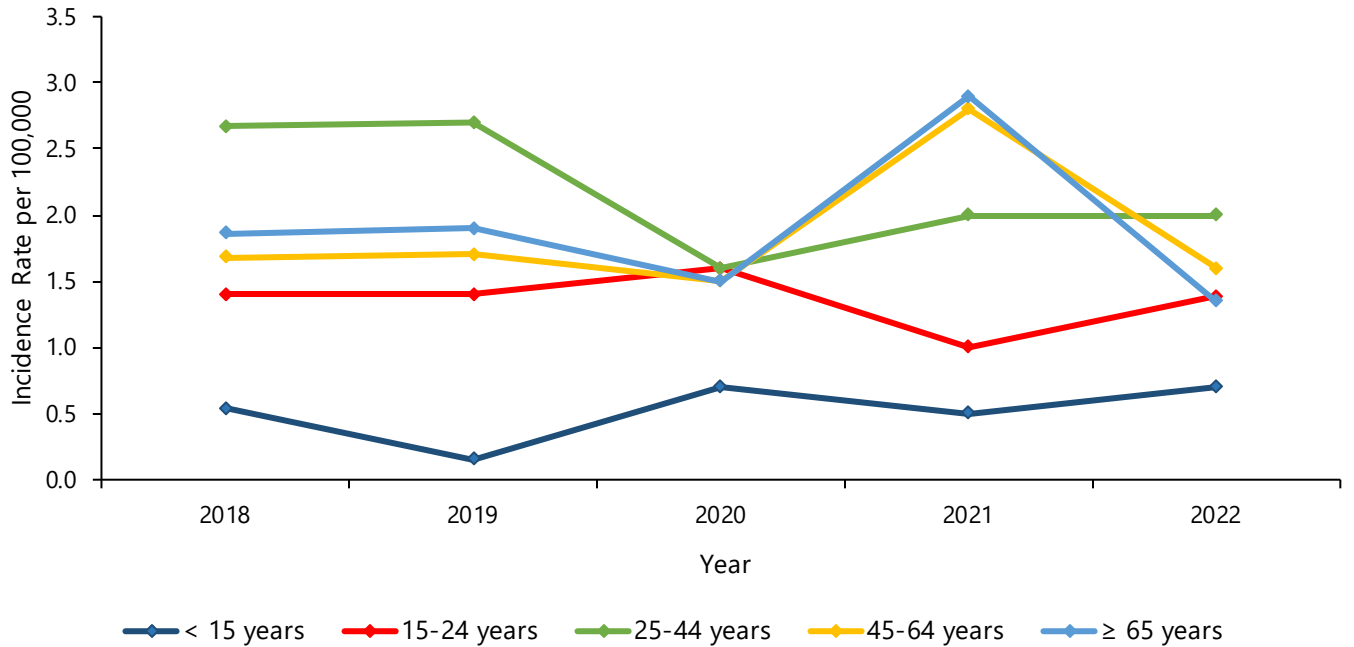


Figure 9. Pediatric TB Cases by Age Group, Indiana, 2018-2022

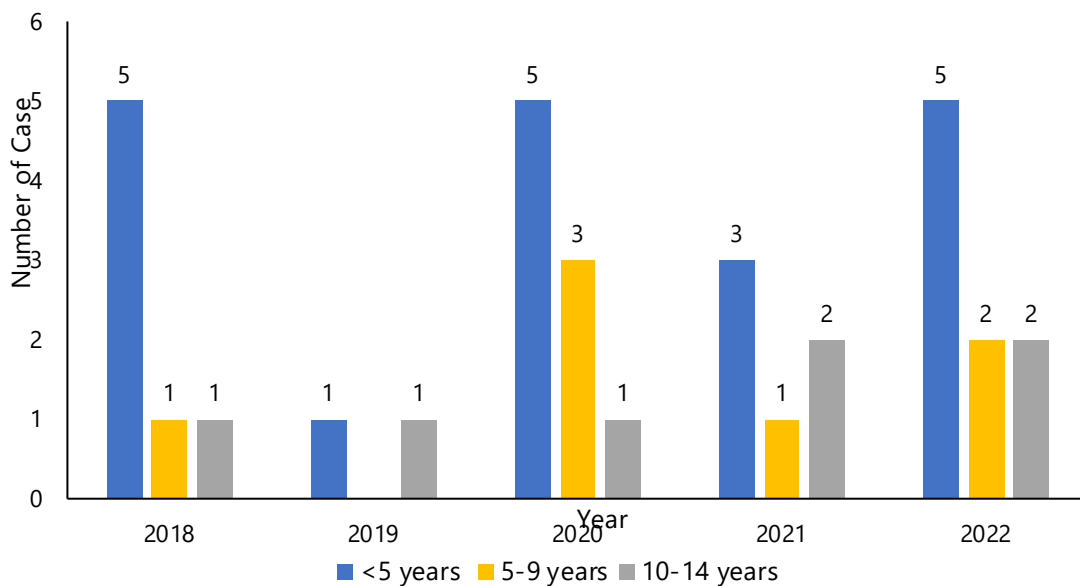
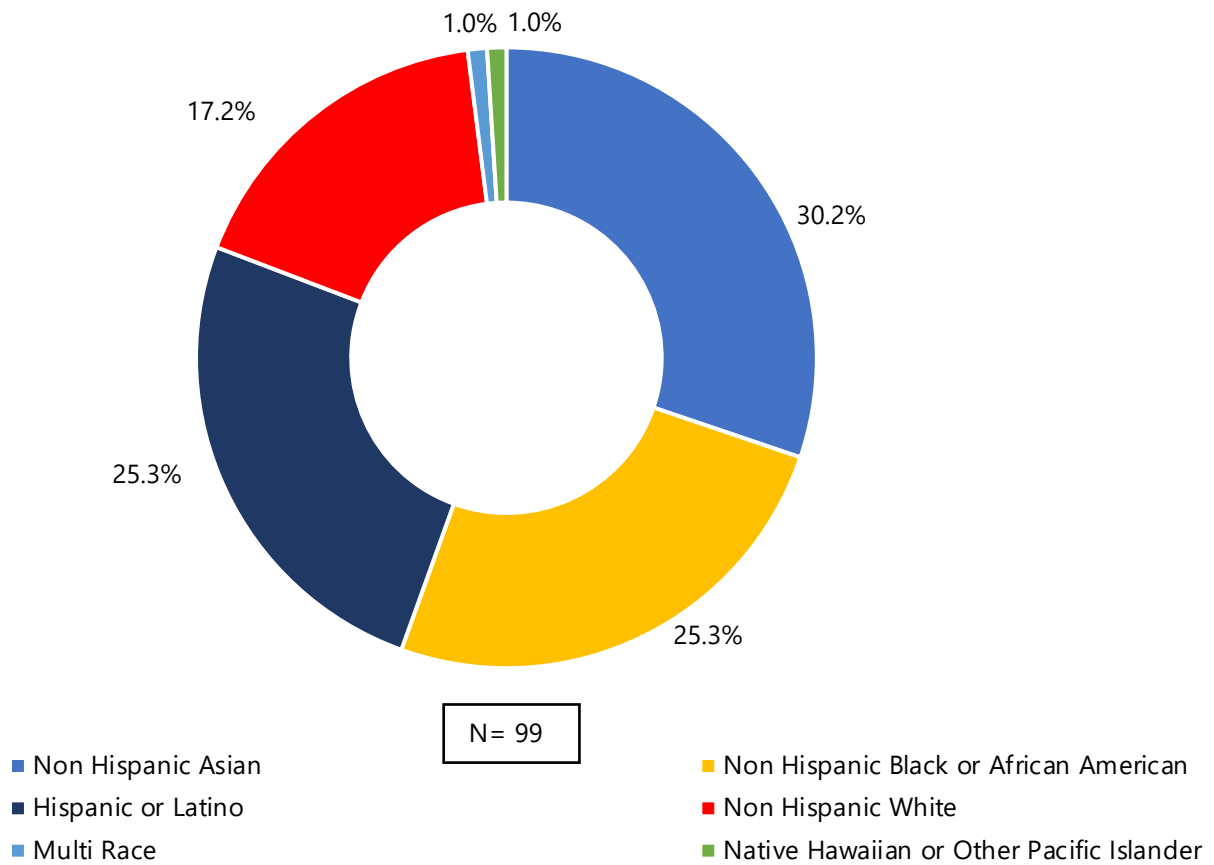


Figure 10. Percentage of TB Cases by Hispanic Ethnicity and Non-Hispanic Race, Indiana, 2022



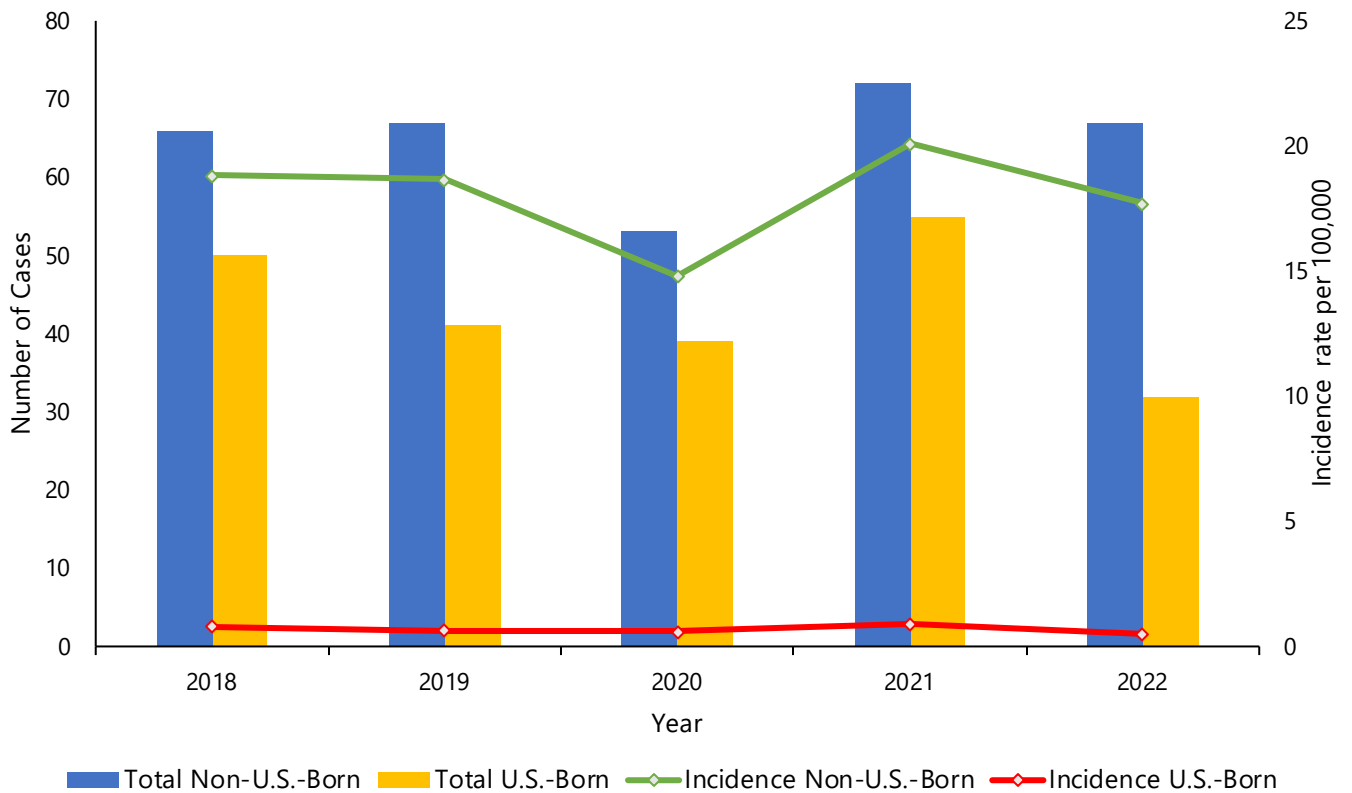
In 2021, Non-Hispanic Asians made up only 2.4% of Indiana’s total population⁵ but accounted for 30.2% of the cases, similar to 2021 data. Non-Hispanic Black or African American and Hispanic or Latino populations remain the second-highest proportion of cases by racial groups when compared to the population of that racial group in Indiana. In Indiana, 7.2% of the population identified as Hispanic/Latino⁵, yet 25.3% of TB cases in 2022 were seen in that population.

Incidence rates remain highest in Non-Hispanic Asians (18.5 per 100,000 population), Native Hawaiian or other Pacific Islanders (10.8 per 100,000 population), Hispanic/Latinos (4.8 per 100,000 population); and Non-Hispanic Black or African Americans (3.4 per 100,000 population), as compared to Non-Hispanic Whites (0.7 per 100,000 population).

Geographic Risk Factors

Globally, those who are born in high-burden countries have a higher risk of exposure to tuberculosis bacteria. TB continues to disproportionately affect individuals born in high-burden countries.⁶

Figure 11. TB Case Counts and Rates by Country of Birth, Indiana, 2018-2022



The proportion of U.S.-born cases decreased from 43.3% in 2021 to 32.3% in 2022. The incidence of TB cases in Indiana remains high in non-U.S.-born persons compared to U.S.-born persons. Persons born in Burma (aka Myanmar), India, Mexico, Haiti, Guatemala, and Philippines accounted for 40.5% of the Indiana cases born outside of the United States in 2022.

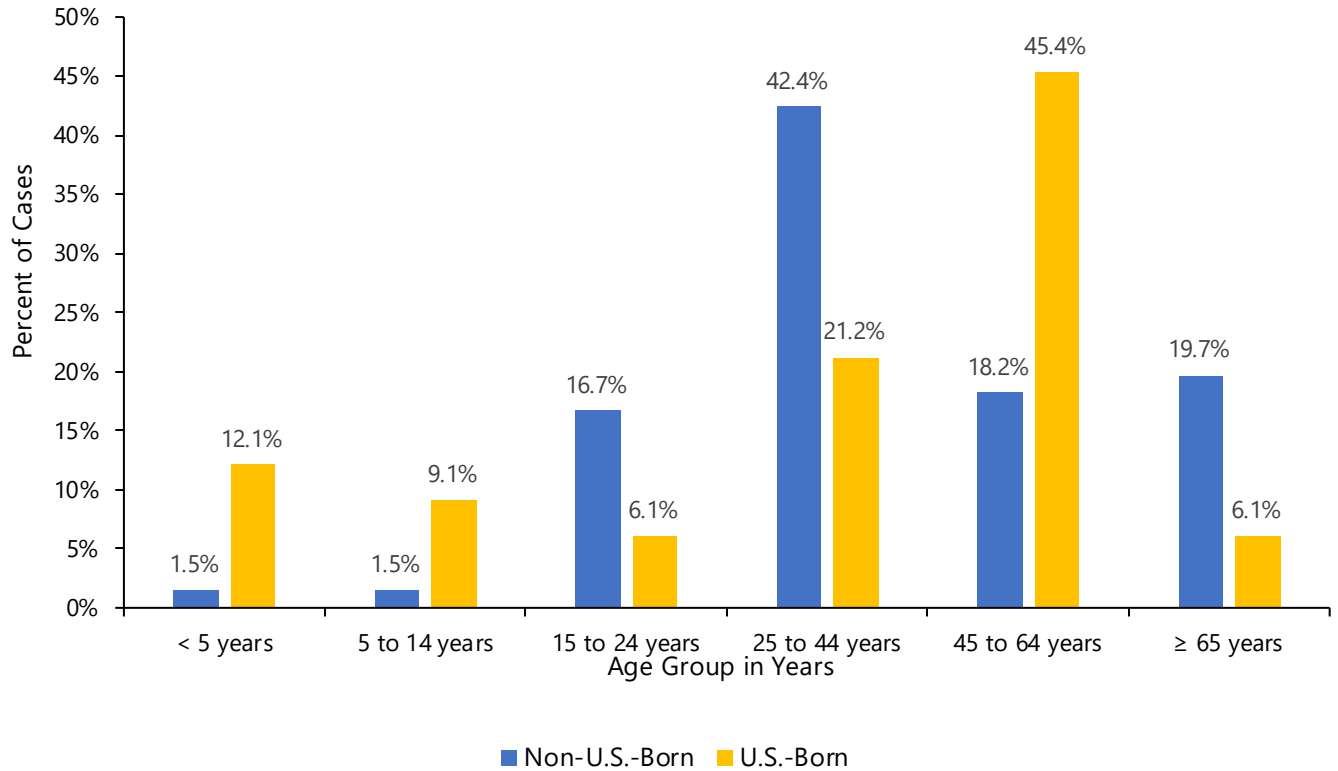
17.7
Per
100,000

Incidence rate in non-U.S.-born persons compared to 0.5 per 100,000 population in U.S.-born persons.

67.7%

Proportion of cases occurring in non-U.S.-born persons. They accounted for only 5.6% of Indiana's total population in 2021.⁵

Figure 12. Percentage of TB Cases by Country of Birth and Age Group, Indiana, 2022



Among non-U.S.-born persons, 80.3% of TB cases occurred in individuals ages 25 and above. Conversely, 66.6% of the cases in U.S.-born persons occurred in ages 25-64. Among pediatric cases, the number of TB disease cases is higher among U.S.-born persons.

HIV Coinfection Risk Factor

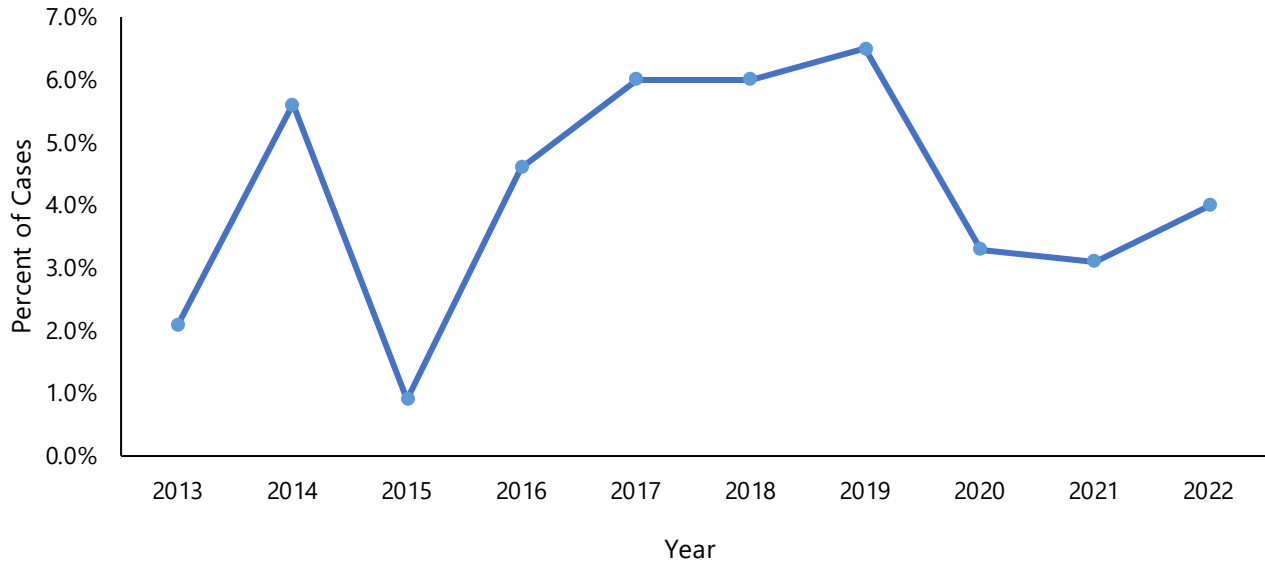
Someone with untreated latent TB infection and HIV infection is much more likely to develop TB disease during his or her lifetime than someone without HIV infection.⁷ Among people with latent TB infection, HIV infection is the strongest known risk factor for progressing to TB disease.⁷

Figure 13. HIV Testing for Cases ≥15 Years and 25-44 Years of Age, Indiana, 2022

Age Group	Test Results Known	Testing Not Offered	Refused Testing
≥ 15 Years	94.5%	2.2%	3.3%
25-44 Years	97.1%	0%	2.9%

It is a priority for the TB program that all patients are offered and tested for HIV because HIV is the most powerful known risk factor for the development of TB disease.

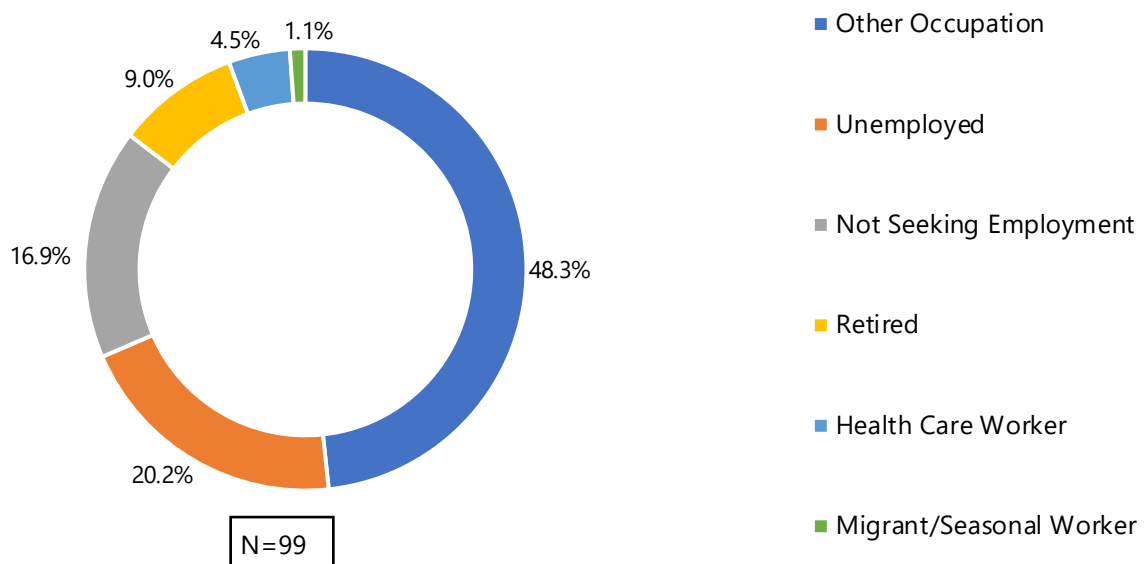
Figure 14. Percentage of Cases with HIV Comorbidity, Indiana, 2013 – 2022



The proportion of TB cases in Indiana with HIV comorbidity slightly increased from 2021 to 2022, with 4% of cases reporting HIV coinfection. Throughout the past 10 years, the proportion of TB cases with HIV coinfection in Indiana has not established a clear trend.

Occupational and Other Risk Factors

Figure 15. TB Cases by Occupation for Persons 16 Years or Older, Indiana, 2022



The percentage of TB cases age 16 years and older reporting being retired was 9.0% in 2022. This has decreased from 2021, which was reported as 20.8%, and was likely attributed to the cases associated with the bone graft contamination that occurred in 2021.

Figure 16. Most Commonly Reported Risk Factors, Indiana, 2022

Risk Factor	Percent
Diabetes Mellitus	22.2%
Contact of Infectious TB Patient	9.1%
Immunosuppression (not HIV/AIDS)	6.1%
End-Stage Renal Disease	5.1%
History of Homelessness	5.1%

In 2022, the five most common risk factors reported were diabetes mellitus, contact with an infectious TB patient, immunosuppression (not HIV/AIDS), end-stage renal disease, and history of homelessness. Diabetes continued to be the most common risk factor in Indiana from 2016 to 2022.

Other risk factors reported in 2022 included excess alcohol use, non-injection drug use, incomplete LTBI therapy, missed contact, residence in a correctional facility within the past two years, TNF- α therapy, and contact with MDR-TB patient.

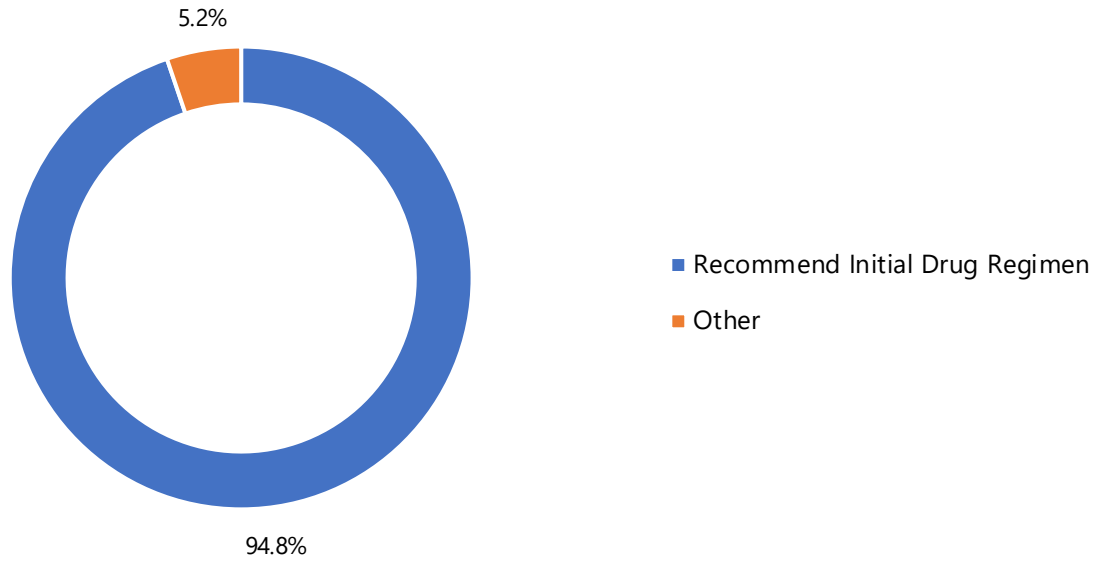
Treatment

TB disease can be treated by taking several medications for an average of six to nine months. There are 10 medications currently approved by the U.S. Food and Drug Administration (FDA) for treating TB. Of the approved medications, the first-line anti-TB agents that form the core of treatment regimens include:

- Isoniazid (INH)
- Rifampin (RIF)
- Ethambutol (EMB)
- Pyrazinamide (PZA)

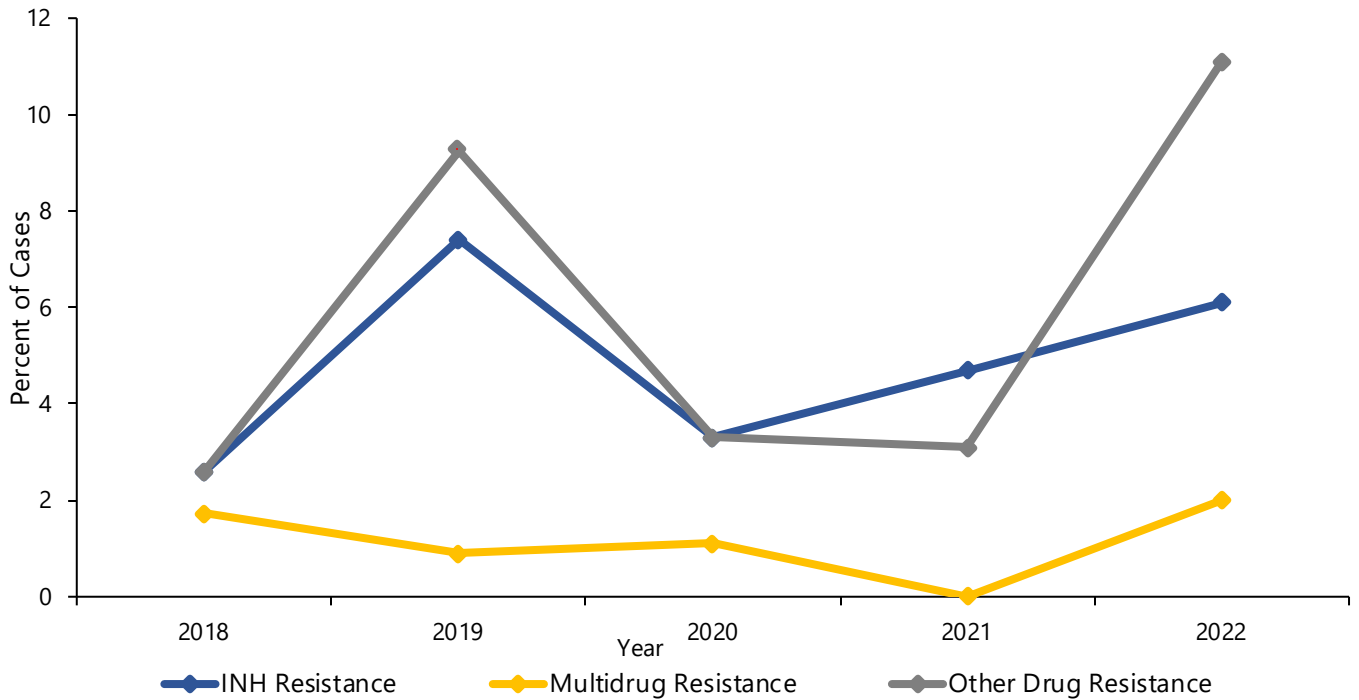
It is important that individuals who have TB disease finish the medicine, taking the drugs exactly as prescribed. If they stop taking the medication too soon, they can become sick again; if they do not take the medication correctly, the TB bacteria that are still alive may become resistant to those drugs. TB that is resistant to drugs is harder and more expensive to treat.⁸

Figure 17. Percentage of Cases with Recommended Initial Drug Regimen, Indiana, 2022



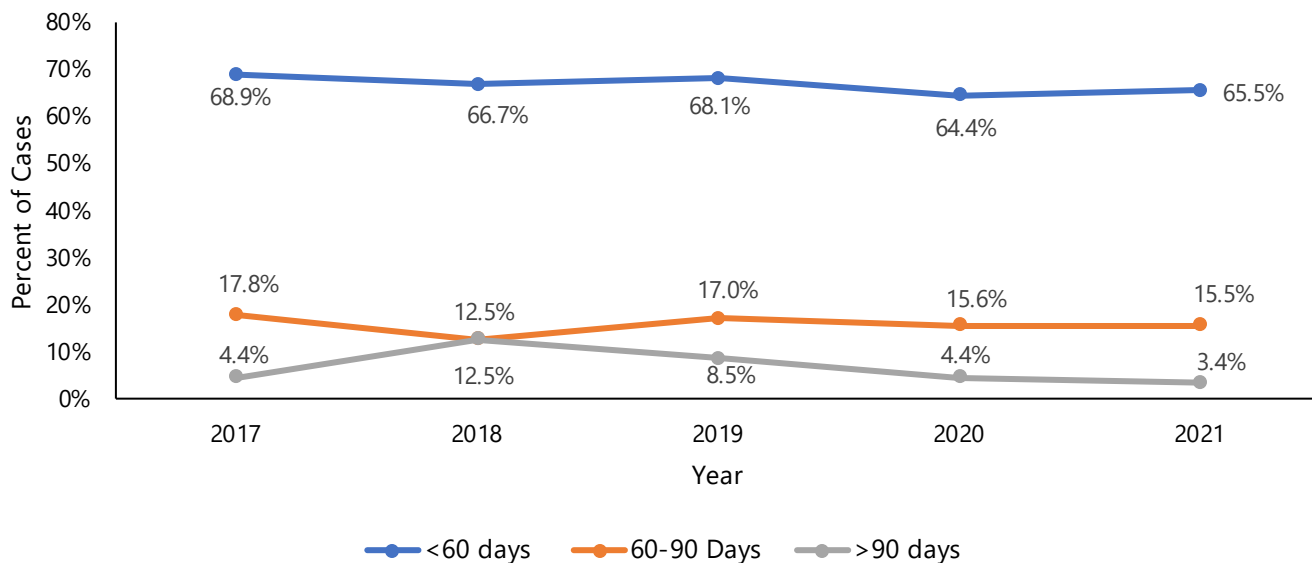
In 2022, 94.8% of TB cases were placed on the recommended initial drug regimen therapy.

Figure 18. Percentage of Cases with Reported Drug Resistance, Indiana, 2018-2022



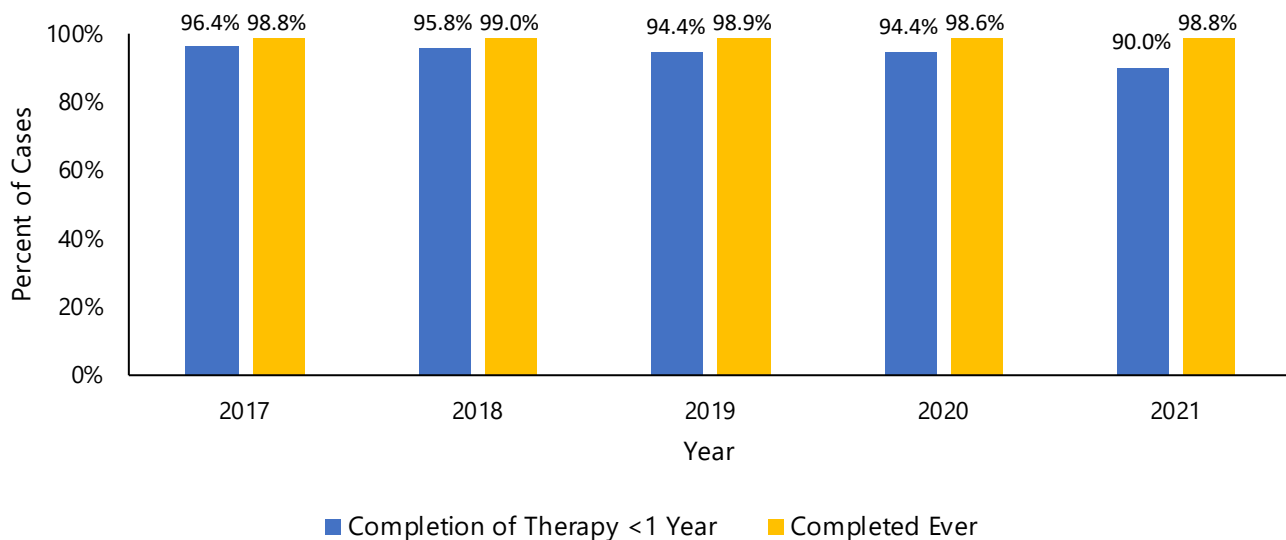
Of the 73 culture-positive TB cases in Indiana in 2022, drug susceptibility testing was performed on 100% of the isolates. All forms of drug resistance increased from 2021 to 2022.

Figure 19. Percentage of Culture-Converted Cases by Time to Conversion, Indiana, 2017-2021



Among eligible cases, 84.4% reported sputum culture conversion in 2021. Of those cases, 65.5% had documented conversion within two months of treatment. Conversion (from positive to negative) data are collected to measure response to therapy and to determine length of treatment.

Figure 20. Percentage of Cases by Therapy Completion, Indiana, 2017-2021



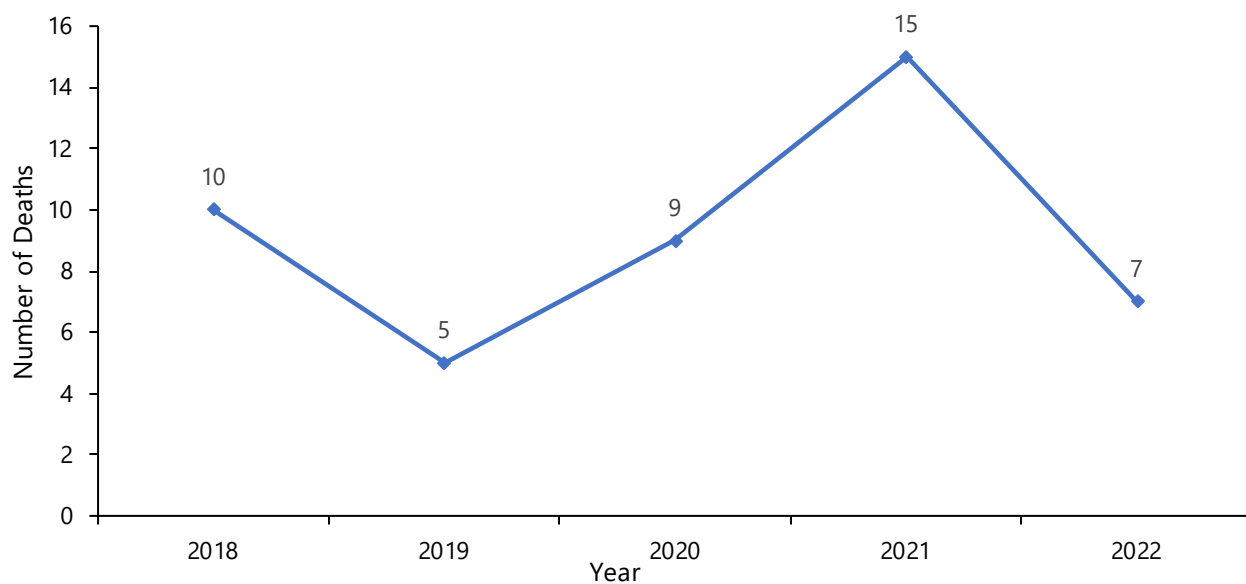
The proportion of eligible cases that completed treatment within one year remains steady in the five-year trend from 2017 to 2021. On average, 94.2% of eligible cases complete treatment within one year, and 98.8% completed treatment within this five-year period. Directly observed therapy (DOT) is the most effective way to ensure a patient complies with the prescribed

treatment regimen and does not acquire drug resistance. In 2021, 62% of TB cases received all treatment via DOT.

TB Mortality

Deaths attributed to TB disease are also monitored as part of surveillance. Collecting data on deaths can help public health experts understand risk factors associated with TB mortality. Nationally, the number of TB-related deaths has been declining in the United States. The latest data show that in 2020, the United States reported 600 deaths that were attributed to TB disease.⁹ The Indiana Department of Health uses data from death certificates to verify TB-related deaths in Indiana.

Figure 21. TB Deaths, Indiana, 2018-2022



In the last five years, the number of TB-related deaths has varied in Indiana. In 2022, seven deaths were reported as related to TB disease, which was a decrease from 2021.

**7
Days**

Average length of time patients received therapy among TB-related deaths in Indiana in 2022, compared to 217 for a person who was alive at the end of treatment completion in 2022 (n=39)

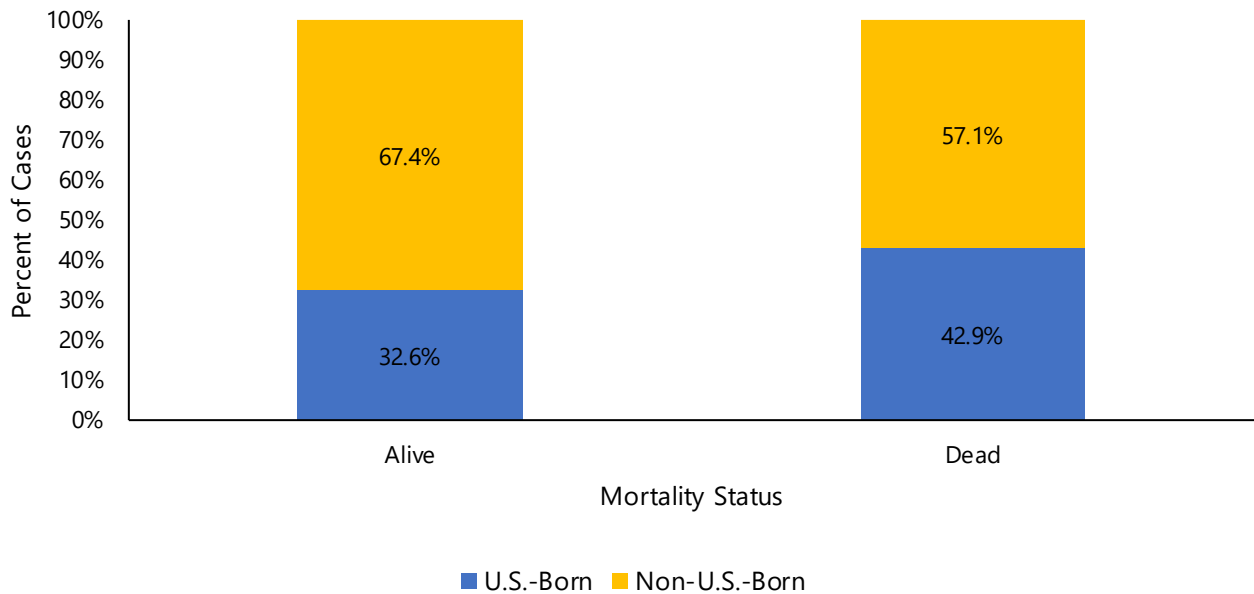
This demonstrates patients who die from TB have advanced disease at diagnosis and treatment initiation.

**55
Years**

Average age of persons who died from TB in Indiana in 2022

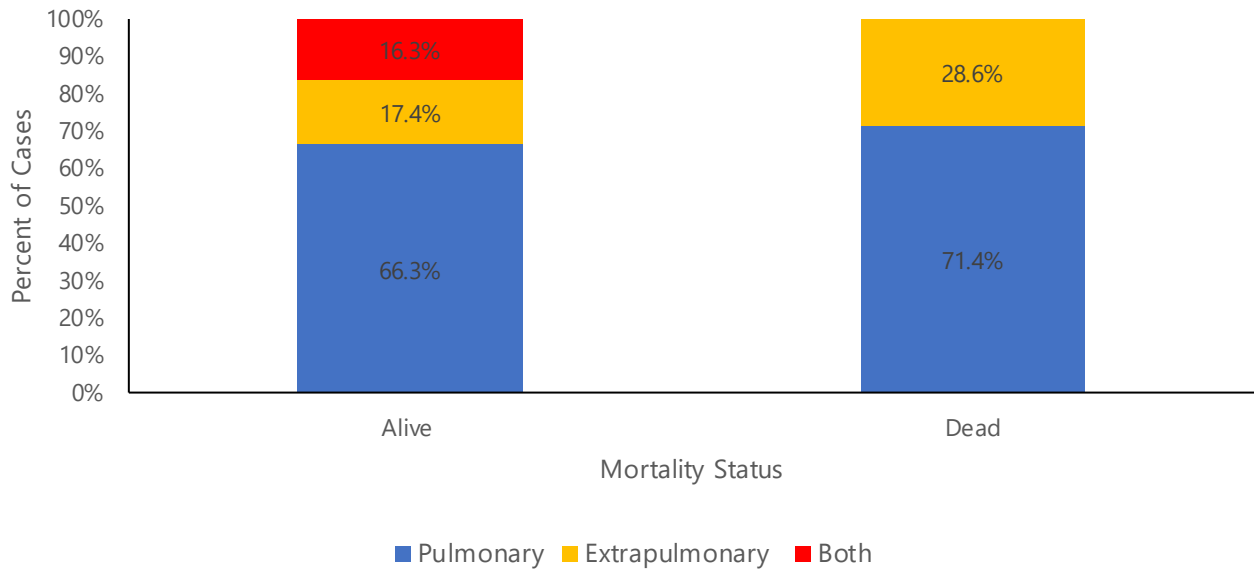
The average age of persons that did not die from TB disease was 39 years.

Figure 22. Percentage of TB Cases by Mortality Status and Country of Birth, Indiana, 2022



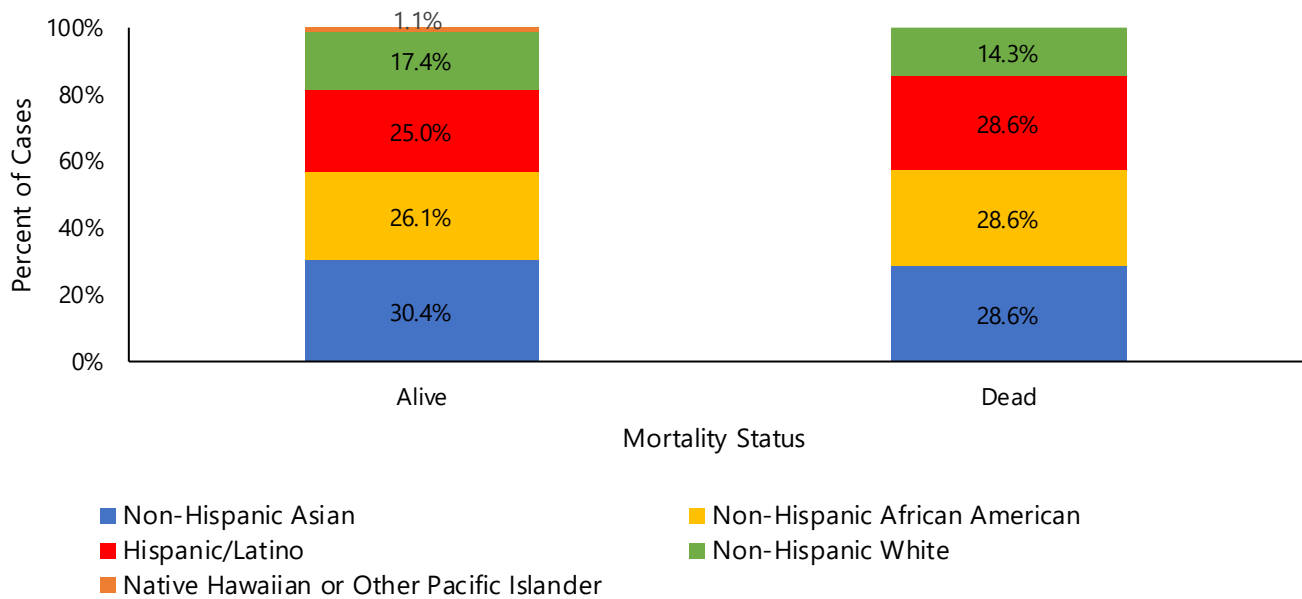
In 2022, 57.1% of TB deaths occurred in non-U.S.-born persons. This is markedly different from 2021, when 61.1% of TB deaths occurred in U.S.-born persons.

Figure 23. Percentage of TB Cases by Mortality Status and Site of Disease, Indiana, 2022



In 2022, individuals who died from TB had a higher proportion of extrapulmonary site of disease compared with individuals who were alive at the end of treatment. There were no TB deaths that came from patients who were diagnosed with both pulmonary and extrapulmonary sites of disease.

Figure 24. Percentage of TB Cases by Mortality Status and Hispanic Ethnicity and Non-Hispanic Race, Indiana, 2022



Most TB-related deaths occurred in Non-Hispanic Asians, Hispanic or Latino, and Non-Hispanic African Americans in 2022. Non-Hispanic Whites accounted for 14.3% of the TB deaths in 2022, which is lower than 2021, in which Non-Hispanic Whites accounted for 33.3% of TB deaths. This is likely due to the cases associated with contaminated bone graft product in 2021.

Genotyping

TB genotyping is a laboratory-based approach used to analyze the genetic material (e.g., DNA) of *Mycobacterium tuberculosis*. Specific sections of the *M. tuberculosis* genome form distinct genetic patterns that help distinguish different strains of *M. tuberculosis*. TB genotyping results, when combined with epidemiological data, help identify persons with TB disease involved in the same chain of recent transmission. In the same way, TB genotyping helps distinguish between persons whose TB disease is the result of TB infection that was acquired in the past, as compared to recently or newly acquired infection with development of TB disease.

When two or more *M. tuberculosis* isolates match by genotyping methods they are referred to as a genotype cluster. Patients who are members of the same genotype cluster are assumed to have the same strain, which may be a surrogate for recent transmission. However, genotyping information is only one piece of evidence used to determine transmission patterns. Genotyping information, epidemiologic linkages including spatial (geography) and temporal (time) associations and drug susceptibility results (phenotype) can help distinguish recent transmission from activation of latent TB infection.¹⁰

100% of culture positive TB cases were genotyped	32.9% of cases' genotypes were identified as part of a cluster	7 New clusters were identified	0 outbreaks reported in 2022.
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In 2022, 24 out of the 73 genotyped cases were identified as part of a cluster. Seven new genotype clusters were identified, with no outbreak reported in 2022. There were several clusters with newly added cases indicating prior or continued transmission within Indiana. Risk factors for these ongoing clusters associated with transmission include contact to an infectious TB patient, history of homelessness, drug and alcohol use, and history of incarceration.

Contact Investigation

Individuals who have been exposed to a case of infectious TB disease are known as TB contacts. A TB contact investigation is a public health strategy used to identify, find, and assess TB contacts and provide appropriate treatment for LTBI or TB disease, if needed. Effective contact investigations interrupt the spread of TB in communities and help prevent outbreaks of TB.¹¹ To help ensure contact investigations are being thoroughly completed, the Centers for Disease Control and Prevention (CDC) has set national objectives for contact investigation measures for programs to strive for.

Figure 25. 2025 National Objectives and Indiana Contact Investigation Measures by Year 2017 - 2021

Year	2017	2018	2019	2020	2021	2025 National Objective
Total number of cases	100	116	108	92	127	
Percentage of sputum AFB smear-positive TB cases with contacts identified	100%	97.7%	92.7%	95.2%	100%	95%
Percentage of contacts to sputum AFB smear-positive TB cases evaluated for infection and disease	83.5%	66.8%	77.1%	79.5%	72.5%	75%
Percentage of infected contacts who are started on treatment for latent TB that complete therapy	90.0%	92.2%	82.7%	91.4%	91.7%	97%

Appendices

A. Data Sources and Methods

All TB data for Indiana were pulled from the Indiana Department of Health's online database, National Electronic Disease Surveillance System Base System (NBS), and analyzed using SAS version 9.4. Historical data pre-dating NBS (prior to 2019) was pulled from the Statewide Investigation, Monitoring, and Surveillance System (SWIMSS) and the TB Information Management database (prior to 2009). All local health departments in Indiana are required to enter information regarding TB cases and their contact investigations into the NBS database, which is then used to transmit required information to the CDC through the Report of Verified Case of Tuberculosis (RVCT).

All population data presented and used to calculate rates within this report were obtained from the U.S. Census Bureau's American Community Survey. Population estimates used in 2022 rates are based on 2021 American Community Survey 1-Year Estimates⁵ as 2022 population had not been released at the time of publication.

The total number of TB cases is based on individuals whose primary residence was in Indiana at the time of diagnosis and who were verified as having TB disease in the given year. Persons counted in another state and immigrants and refugees who are diagnosed and begin treatment abroad are excluded. Foreign visitors (i.e. students, tourists, etc.) and certain other categories of non-U.S. citizens who are diagnosed in Indiana but remain in the United States for fewer than 90 days of treatment are also excluded.

Case counts fewer than five are suppressed at the county level to protect patient confidentiality.

Race is collected in six categories: Asian, Black or African American, Hispanic or Latino, Multi Race, Native Hawaiian or Other Pacific Islander and White. Only those racial groups with TB cases within the given time period are shown in this report.

Data for TB-related deaths are obtained from death certificates provided from the Vital Records Division at the Indiana Department of Health. The death certificate for any patient who dies during the course of treatment is reviewed by the TB Prevention and Care Program. If it is determined that the cause of death is from TB disease or a complication from TB, the program will count the case as a death that is attributed to TB disease.

Data measures relating to treatment (initial drug regimen, culture conversion, DOT utilization, and therapy completion) exclude cases that were deceased upon diagnosis. The completion of therapy measure only includes cases for whom 12 months of treatment or fewer are recommended, who were alive at diagnosis, and who initiated treatment with one or more

drugs. This excludes cases with any rifampin-resistant TB, meningeal TB, TB in the bone or skeletal system, TB in the central nervous system, or children ages 14 and younger with disseminated TB. This also excludes cases who died or moved out of the United States within 366 days of initiating treatment.

B. Glossary

Acid-fast bacilli: Bacteria that retain certain dyes after being washed in an acid solution. *M. Tuberculosis* belongs to this group.

Clinical case confirmation: A clinical diagnosis is confirmed when all the following criteria are met upon medical evaluation: (1) a positive tuberculin skin test (TST) or positive interferon-gamma release assay (IGRA) for *M. tuberculosis*; (2) other signs and symptoms compatible with TB (e.g., an abnormal chest X-ray or other clinical evidence of current disease); (3) current treatment with two or more anti-TB drugs; and (4) a completed diagnostic evaluation.

Cluster: A group of patients with LTBI or TB who are linked by epidemiologic, location or genotyping data. A genotyping cluster is two or more cases with isolates that have an identical genotyping pattern.

Comorbid: The coexistence of two or more disease processes

Contact: A person who has spent time with a person with infectious TB

Culture: Growth of microorganisms in the laboratory performed for detection and identification of TB in sputum or other body fluids and tissues

Culture conversion: Wherein sputum culture-positive results convert to sputum culture-negative

Directly observed therapy (DOT): Adherence-enhancing strategy in which a health-care worker or other trained person watches as a patient swallows each dose of medication. DOT is the standard care for all patients with TB disease and is a preferred option in certain circumstances for patients treated for LTBI.

Epidemiological link: Method to connect cases using data about person, place and time in addition to genotypical data, if available. These cases are suspected as being part of shared transmission.

Extrapulmonary TB: TB disease in any part of the body other than the lungs. The presence of extrapulmonary disease does not exclude pulmonary TB disease.

Genotype: The DNA pattern of *M. tuberculosis* used to discriminate different strains

Immunocompetent: Capable of developing an immune response; possessing a normal immune system

Incidence: The extent or rate of occurrence, especially the number of new cases of a disease in a population over a period of time

Interferon gamma release assay (IGRA): Whole-blood tests that can aid in diagnosing TB by measuring a person's immune reactivity to *M. tuberculosis*

Laboratory case confirmation: Laboratory diagnosis is confirmed when: (1) isolation of *M. tuberculosis* from a clinical specimen, or (2) demonstration of *M. tuberculosis* complex from a clinical specimen by nucleic acid amplification test, or (3) demonstration of acid-fast bacilli in a clinical specimen when a culture has not been or cannot be obtained or is falsely negative or contaminated.

Latent tuberculosis infection (LTBI): Infection with *M. tuberculosis* in which symptoms or signs of disease have not manifested

MIRU: Distinguishes the *M. tuberculosis* strains by the difference in the number of copies of tandem repeats at specific regions, or loci, of the *M. tuberculosis* genome

Multi-drug resistance: Strains of *M. tuberculosis* that are resistant to at least isoniazid and rifampin

Mycobacterium tuberculosis: The namesake member organism of the *M. tuberculosis* complex and the most common causative agent of TB disease in humans. In certain instances, the species name refers to the entire *M. tuberculosis* complex, which includes *M. bovis*, *M. africanum*, *M. microti*, *M. canettii*, *M. caprae* and *M. pinnipedii*.

Nucleic acid amplification test: A molecular technique used to detect a virus or bacterium, such as *M. tuberculosis*.

Outbreak: Unusually high occurrence of a disease or an illness in a population or area. Three or more cases are required for an occurrence of TB to be classified as an outbreak.

Provider diagnosis case confirmation: In which a case does not meet criteria for laboratory nor clinical confirmation but the TB Control Program counts it as a TB case based on physician assessment and as determined by the TB medical consultant and TB controller.

Pulmonary TB: TB disease that occurs in the lungs

Resistance: The ability of certain strains of mycobacteria, including *M. tuberculosis*, to grow and multiply in the presence of drugs that ordinarily kill or suppress them. Such strains are referred to as drug-resistant strains and cause drug-resistant TB disease.

Smear-positive: A positive test indicating the presence of TB bacteria in sputum done by smearing the sputum on a glass slide, staining it, and looking for bacteria.

Spoligotyping: Identifies the *M. tuberculosis* genotype based on presence or absence of spacer sequences found in a direct-repeat region of the *M. tuberculosis* genome where 43 identical sequences and 36 base pairs are interspersed by spacer sequences.

Sputum: Mucus containing secretions coughed up from inside the lungs. Sputum is different from saliva or nasal secretions, which are unsatisfactory for detecting TB disease.

Tuberculin skin test: A test done to detect TB infection by injecting liquid tuberculin under the skin and measuring the immune reaction

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