

# 2021 Annual Report



Indiana  
Department  
of  
Health



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## Executive Summary

The mission of the Tuberculosis Prevention and Care Program is to decrease tuberculosis (TB) incidence and make progress toward its elimination by conducting surveillance activities and case management oversight, developing public health policies, providing technical assistance, networking with local health departments and increasing the public's awareness of the disease.

Indiana had two unusual events in 2021. First, Indiana was heavily affected by the nationwide outbreak affiliated with contaminated bone graft product being implanted during surgery, resulting in TB disease among recipients. Second, as part of Operation Allies Welcome, Afghan evacuees were housed temporarily at Camp Atterbury. These evacuees underwent required immigration screening, and several were found to have TB disease, also affecting Indiana's 2021 TB case count.

In 2021, 127 new cases of tuberculosis were reported to the Indiana Department of Health, a 38% increase from 2020. This increase can be attributed to 30 cases affiliated with contaminated bone graft product and five Afghan evacuees from Camp Atterbury. If we exclude these 35 cases, we are left with 92 TB cases, which is even with 2020 cases. Similar to 2020, 2021 TB cases may still be falsely low due to impacts of the COVID-19 pandemic. Marion County continued to have the most TB cases of any jurisdiction, with 47 cases reported in 2021 and a total of 428 cases over the past 10 years.

Disparities in TB continue to be seen among several populations, including by age group, race, ethnicity, gender and U.S.-born status. Hoosiers ages 45 to 64 and individuals who are older than 65 had the highest TB rates in 2021, with a combined 2.8 cases per 100,000 population. However, it is worth noting the majority of the cases affiliated with contaminated bone graft product came from these two age groups. More than half of Indiana cases in 2021 (56.7%) were among non-U.S.-born persons, which mirrors the disparity 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 2021, HIV status was known for all TB cases aged 25 to 44, and 3.1% of all TB cases occurred among individuals who were HIV-positive. Diabetes was the most commonly reported risk factor, reported in 26.8% 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 2021, 95% of TB cases were started on the recommended initial therapy, and 94.4% of cases in 2020 completed their therapy within one year. Although no multidrug-resistant TB cases were identified in 2021, one case was resistant to both isoniazid and pyrazinamide.

TB genotyping and contact investigation are tools used in TB to help prevent additional cases. Fourteen new genotype clusters were identified in 2021 in Indiana, with one cluster deemed an outbreak. In 2020, 95.2% of cases of TB with positive sputum smears had contacts identified, and 79.5% of those contacts were fully evaluated for infection and disease.

## Program Indicators

TB Indicators	Indiana		Program Goals
	2021	2020	2025
Number of Tuberculosis Cases	127	92	
Tuberculosis Case Rate per 100,000 Population	1.9	1.4	
Number of Tuberculosis Deaths	15	9	
Laboratory Confirmation	76.4%	79.3%	
Pulmonary Site of Disease	59.9%	66.3%	
U.S.-Born Incidence Rate	0.9	0.6	0.4
Non-U.S.-Born Incidence Rate	20.1	14.8	8.8
Non-Hispanic White Incidence Rate	1.1	0.5	
Non-Hispanic Black Incidence Rate	2.8	4.4	
Non-Hispanic Asian Incidence Rate	19.4	19.4	
Hispanic/Latino Incidence Rate	4.1	2.1	
Male Incidence Rate	2.7	1.8	
Female Incidence Rate	1.1	0.9	
Known HIV Status 25-44 Years of Age	100.0%	96.3%	99.0%
HIV Comorbidity	3.1%	3.3%	
Resident of Correctional Facility	3.1%	3.3%	
Homelessness	3.1%	7.6%	
Resident of Long-Term Care Facility	2.4%	4.3%	
Injecting Drug Use	0.8%	2.2%	
Non-Injecting Drug Use	7.9%	4.3%	
Excess Alcohol Use	11.0%	6.5%	
Initial Four-Drug Therapy Regimen	95.0%	96.7%	94.0%
INH Resistance	4.7%	3.3%	
MDR	0.0%	1.1%	
Culture Conversion < 60 Days	64.4% (2020)	68.1% (2019)	73.0%
DOT Utilization	70.7% (2019)	69.4% (2019)	
Completion of Therapy <1 Year	94.4% (2020)	94.4% (2019)	95.0%

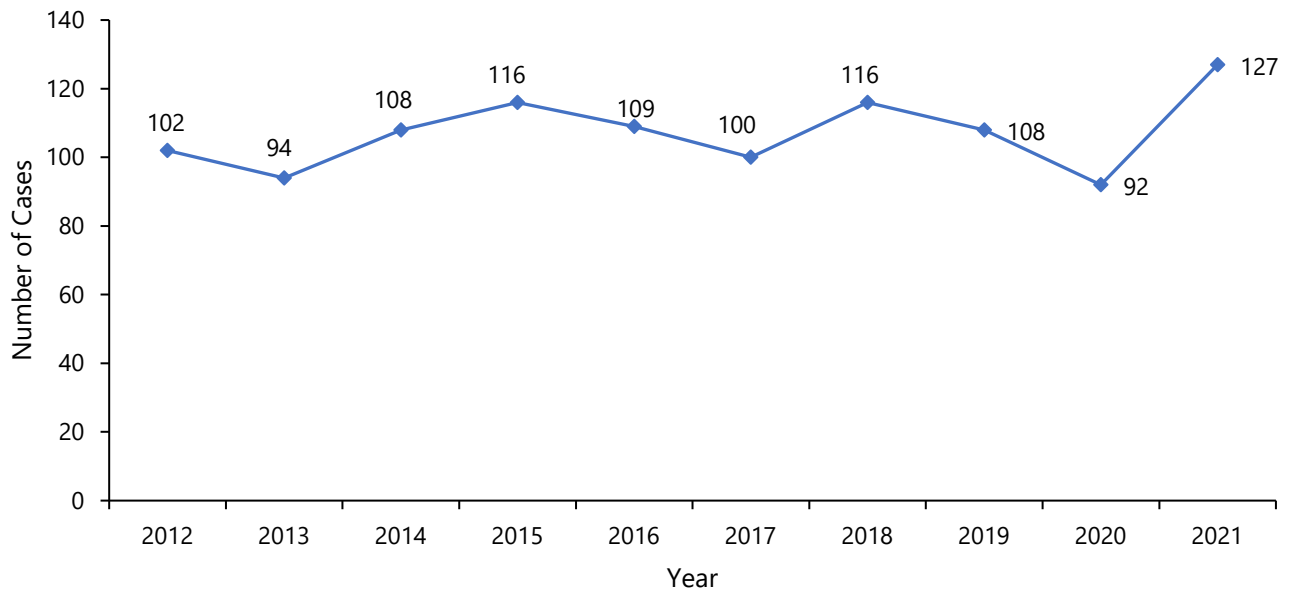
## Tuberculosis in Indiana

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.

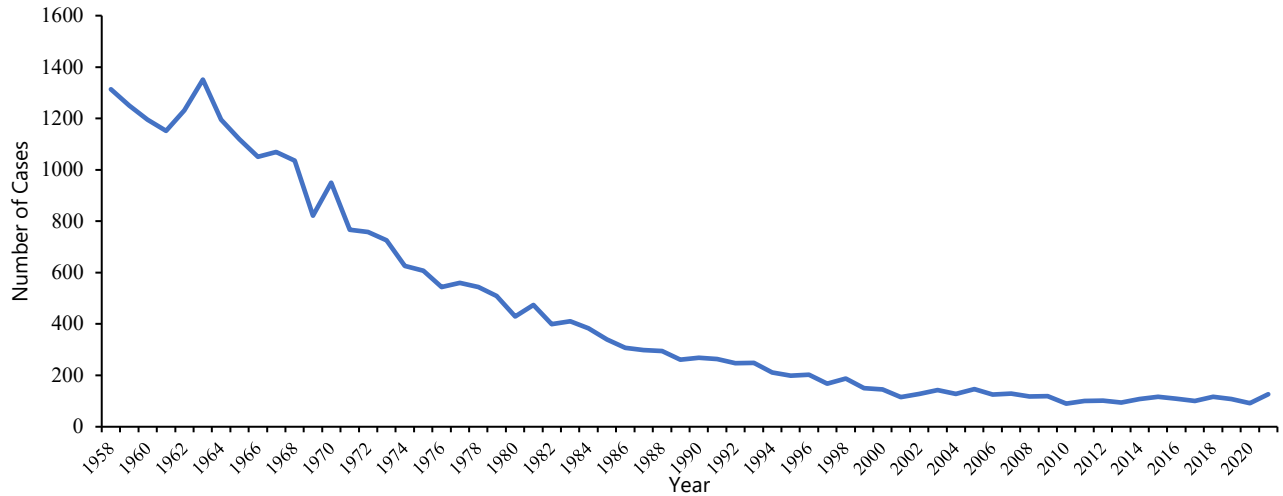
## Burden and Trends

**Figure 1.** Tuberculosis Cases in Indiana, 2012 – 2021



In Indiana, 127 cases of TB were reported in 2021, a 38% 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 increased from 2020 to 2021, from 1.4 per 100,000 population to 1.9 per 100,000 population.

**Figure 2.** Historical Trend of Tuberculosis Cases in Indiana



In the past ten 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 2020 shows that Indiana ranked 33<sup>rd</sup> out of the 50 states in incidence rate but remains under the national incidence rate (2.2 per 100,000) for TB in the United States.<sup>1</sup>

### 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.<sup>2</sup> 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

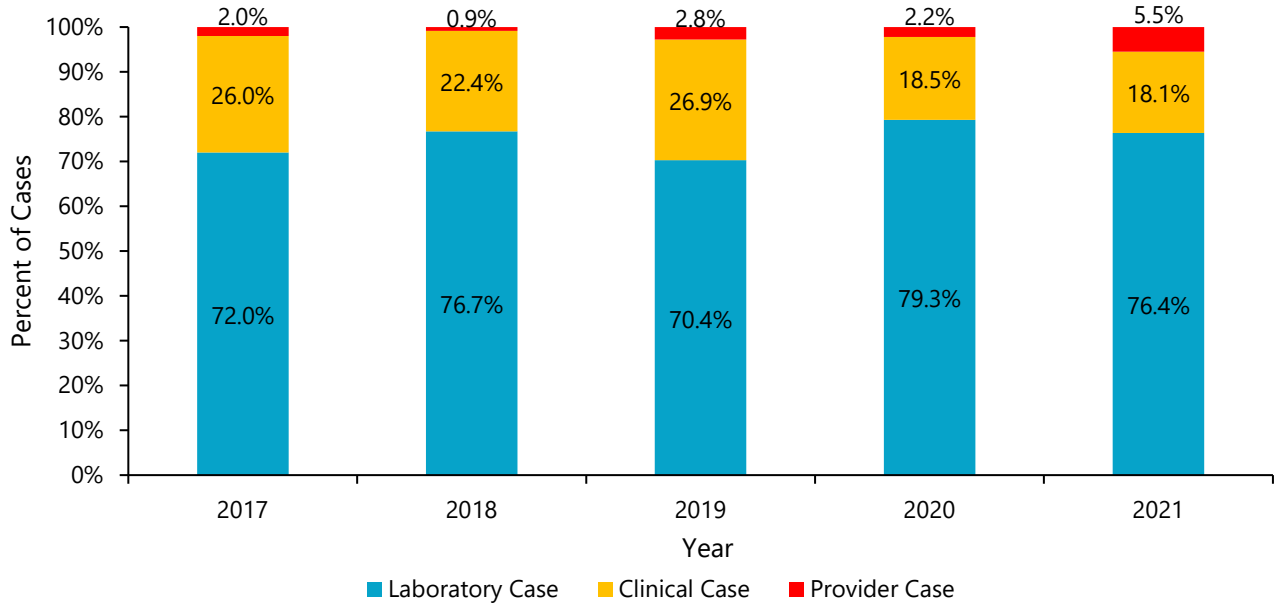
- Isolation of *M. tuberculosis* from a clinical specimen, OR
- Demonstration of *M. tuberculosis* complex from a clinical specimen by nucleic acid amplification test, OR
- Demonstration of acid-fast bacilli in a clinical specimen when a culture has not been or cannot be obtained or is falsely negative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

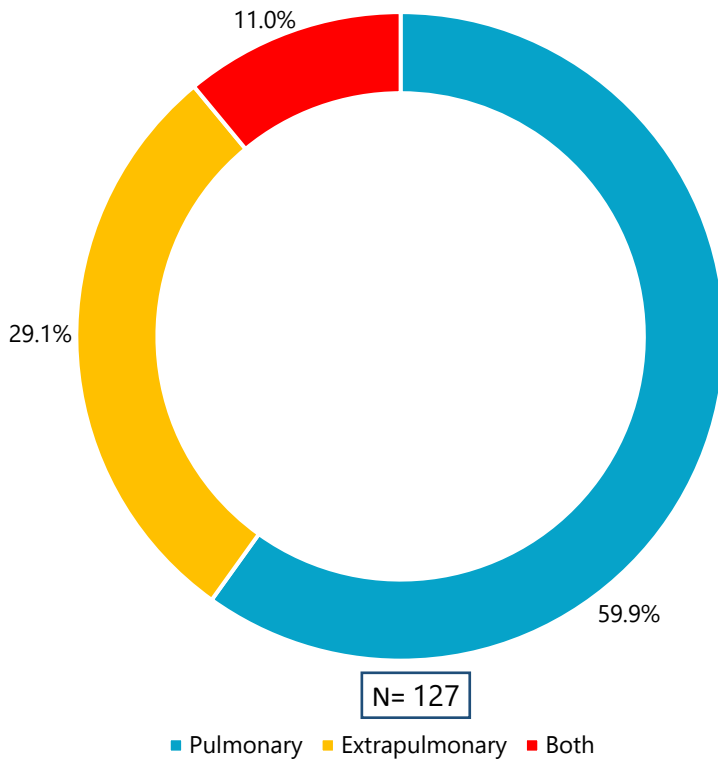


**Figure 3.** Percentage of Tuberculosis Cases by Case Definition, Indiana, 2017-2021



In 2021, 5.5% of TB cases were classified as provider diagnosis, a 3.3% increase from 2020. This increase is directly attributed to the cases affiliated with contaminated bone graft product.

**Figure 4.** Percentage of Tuberculosis Cases by Site of Disease, Indiana, 2021



In 2021, 59.9% of TB cases in Indiana were exclusively pulmonary (n=76). This proportion has decreased from 2020, which reported 66.3 percent of TB cases as pulmonary.

Extrapulmonary sites included bone and/or joint, lymphatic, pleural, peritoneal, eye and/or ear, meningeal, liver and other in 2021. Bone and/or joint was the most reported site for extrapulmonary disease, accounting for 57.1% of extrapulmonary cases. This high percentage is attributed to the 30 cases affiliated with contaminated bone graft product.

## Geographic Distribution of TB

In total, 35 Indiana counties reported cases of TB in 2021. Of those counties, 21 reported an increase in TB cases, with seven counties reporting increases of at least three or more cases compared to 2020. Marion County accounted for 37% of the total cases in 2021, while only having 14.3% of Indiana's total population. Similarly, Marion County had the highest proportion of TB cases from 2012 to 2021, accounting for 39.9% of all cases in Indiana.

### Top Indiana Counties by Number of TB Cases, 2021 (See Figure 5)

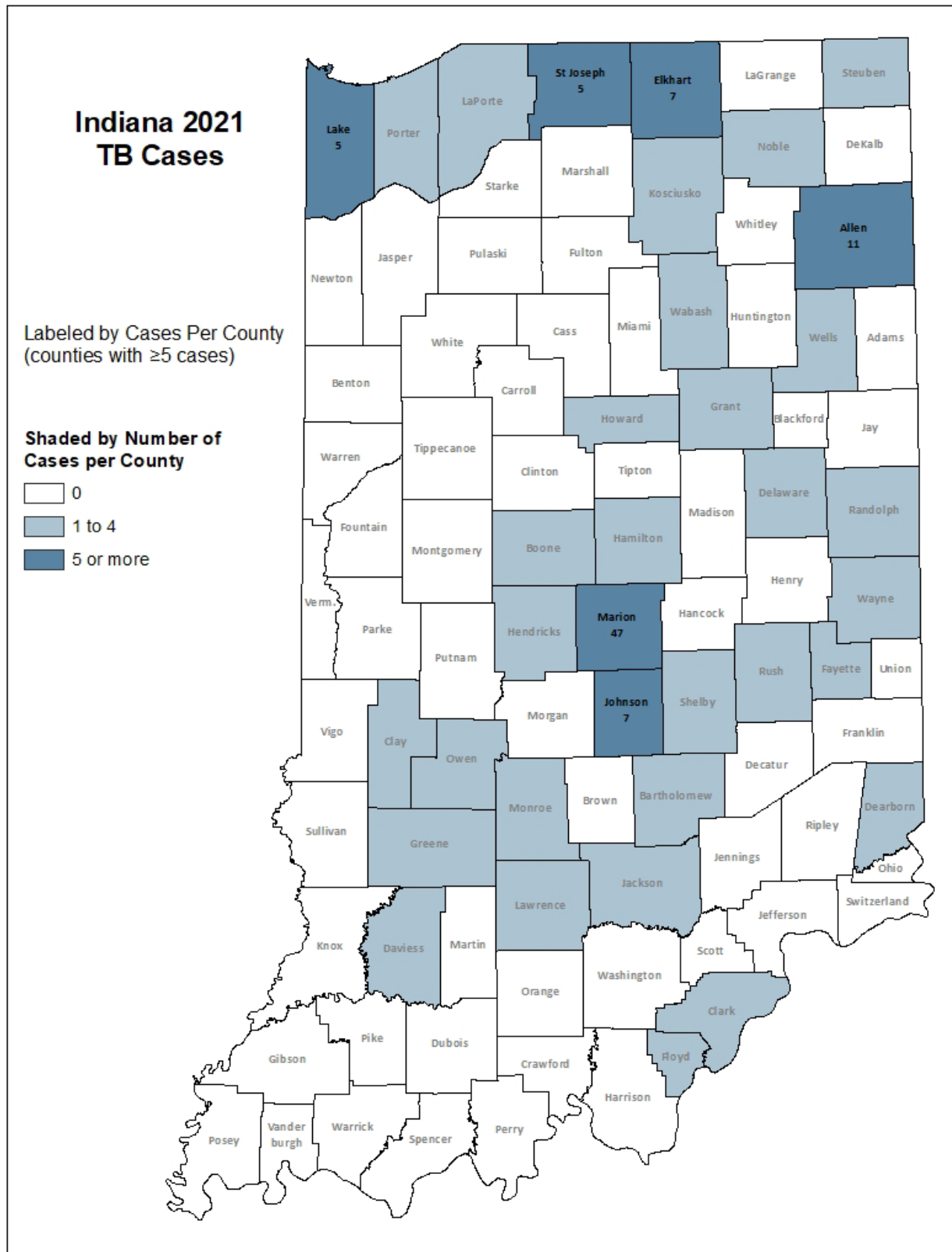
- Marion: 47 cases
- Allen: 11 cases
- Elkhart and Johnson: 7 cases
- Lake and St. Joseph: 5 cases

### Top Indiana Counties by Number of TB Cases, 2012-2021 (See Figure 6)

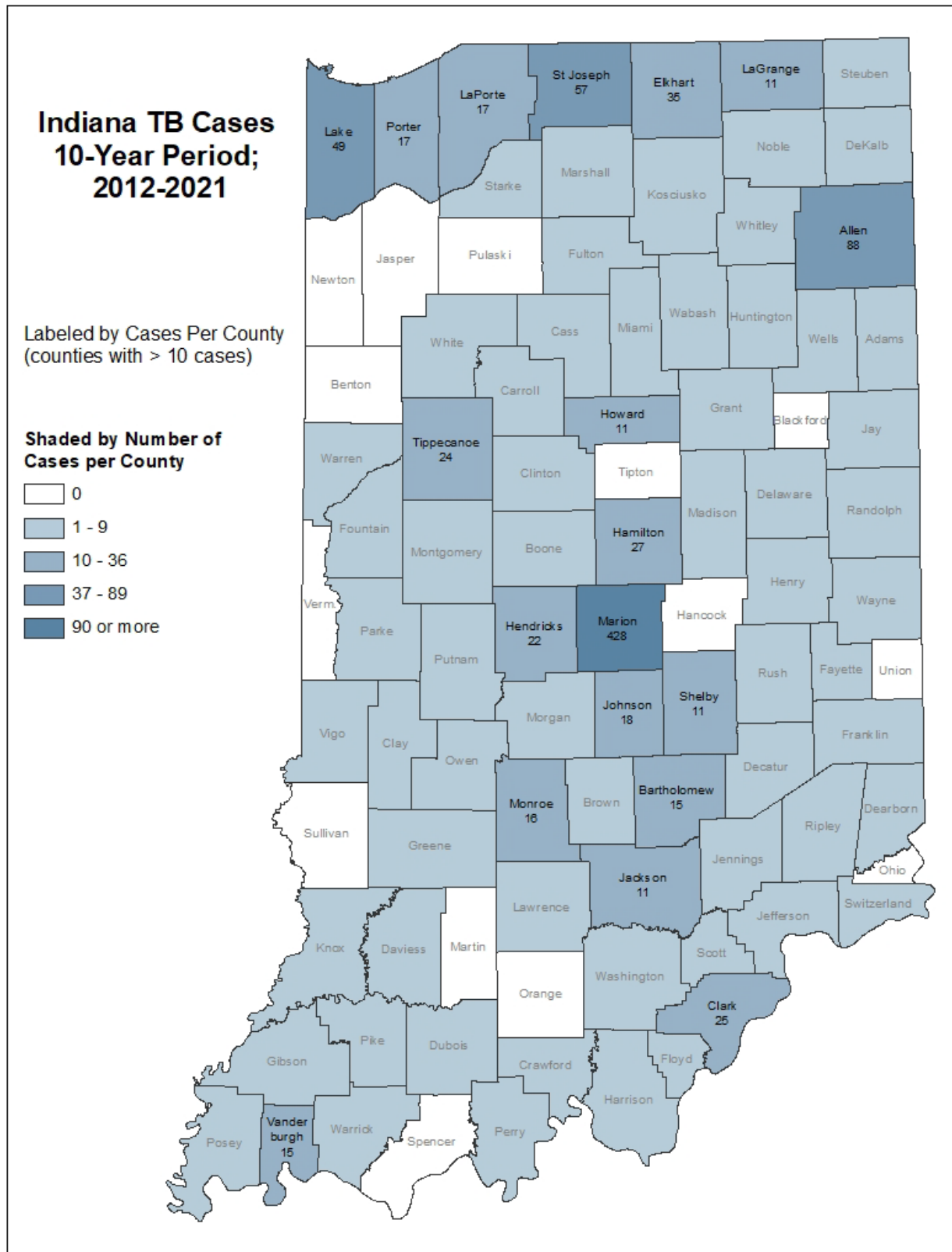
- Marion: 428 cases
- Allen: 88 cases
- St. Joseph: 57 cases
- Lake: 49 cases
- Elkhart: 35 cases



**Figure 5.** Number of TB Cases by County, Indiana, 2021



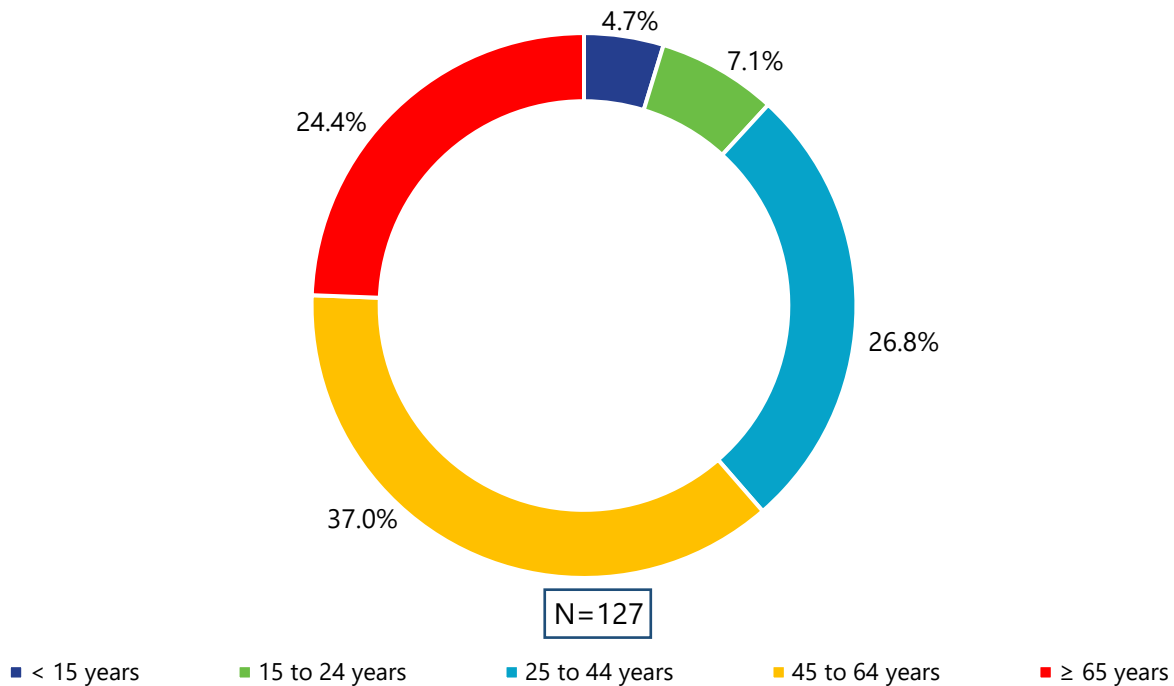
**Figure 6.** Total Number of TB Cases by County, Indiana, 2012-2021



## Demographics and Risk Factors

Despite prevention efforts, some groups of people are affected by TB more than others. The occurrence of TB at greater levels among certain population groups is called a health disparity. Differences may occur by gender, race or ethnicity, income, comorbid medical conditions, or geographic location.<sup>3</sup>

**Figure 7.** Tuberculosis Cases by Age Group, Indiana, 2021

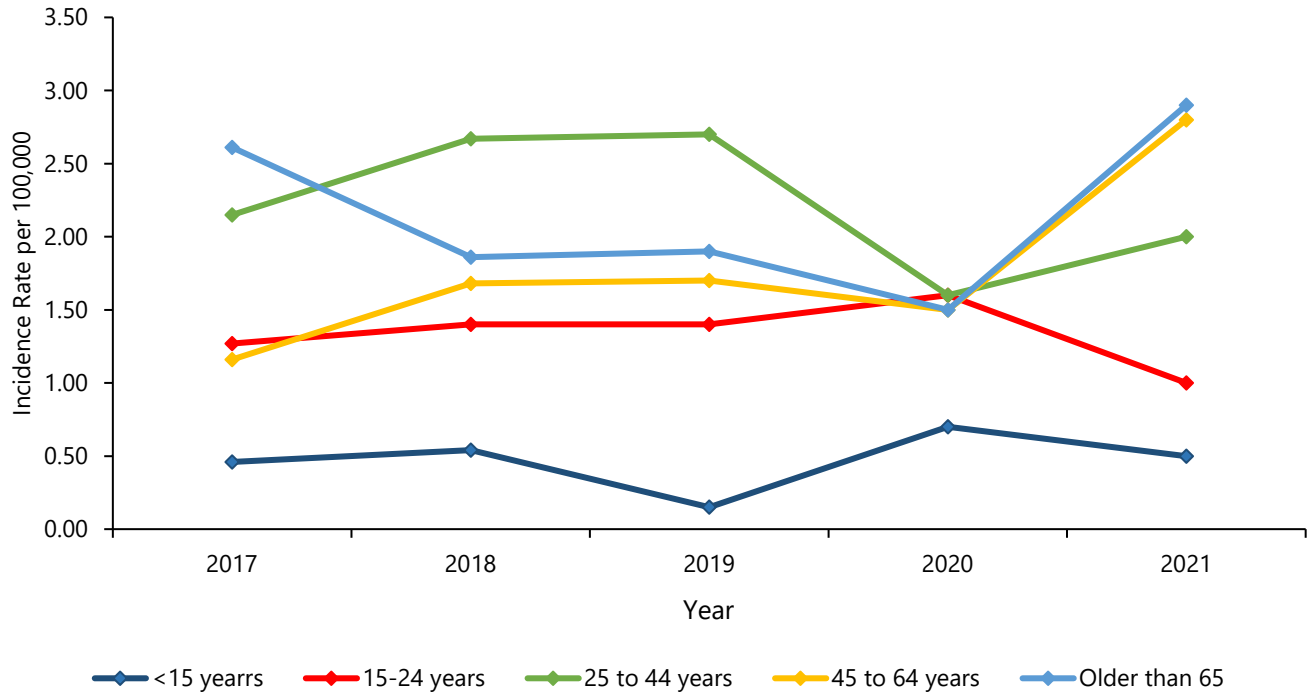


In 2021, 88.2% of Indiana's TB cases occurred in adults aged 25 years or older (N=112), and 7.1% were among those 15 - 24 years old, which has decreased from 2020 to 2021. The proportion of TB cases in those 45 - 64 years old increased from 27.2% in 2020 to 37% in 2021.

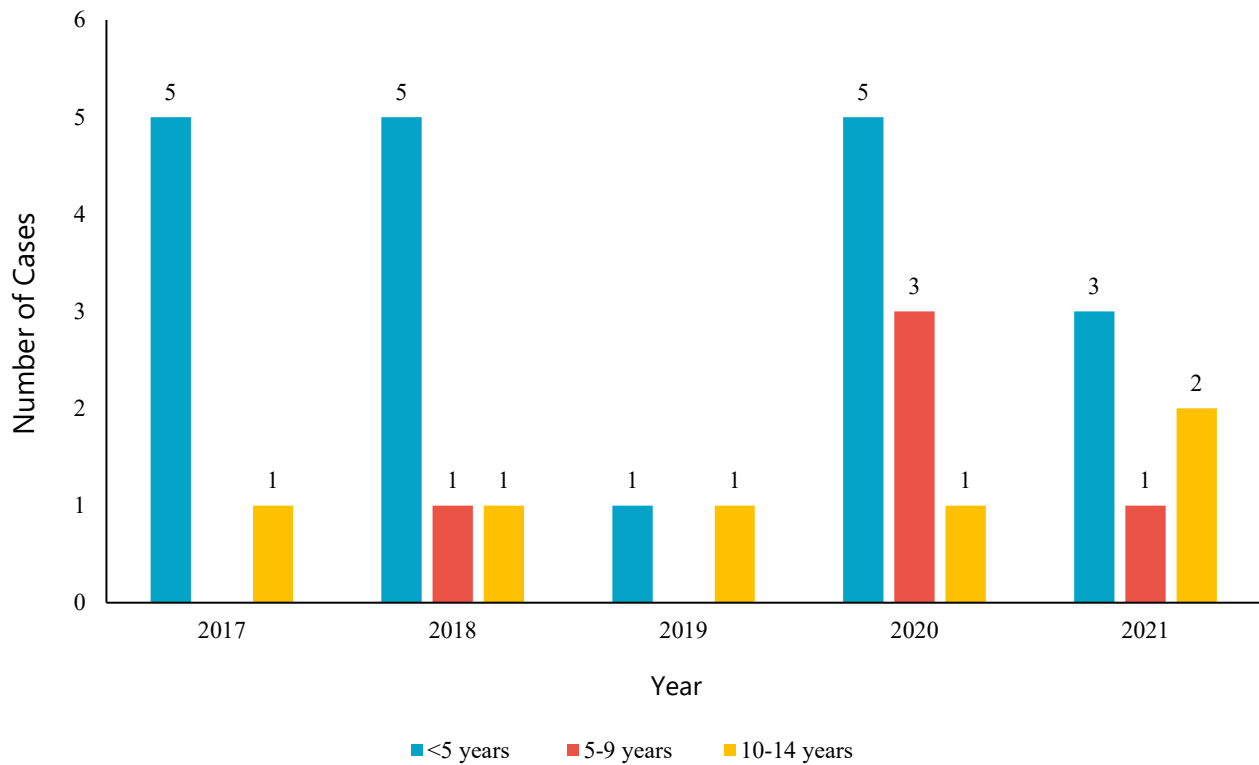
The incidence of TB from the last five years remains high in persons in the 25 - 44 years age group (Figure 8) compared to other groups. In 2021, incidence rates increased among cases 45 - 64 years and individuals older than 65 due to the cases affiliated with contaminated bone graft product.

The trend of reported pediatric cases (<15 years of age) has stayed stable since 2017 (Figure 9). In 2020, there were nine pediatric TB cases reported, 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-threatening.<sup>4</sup>

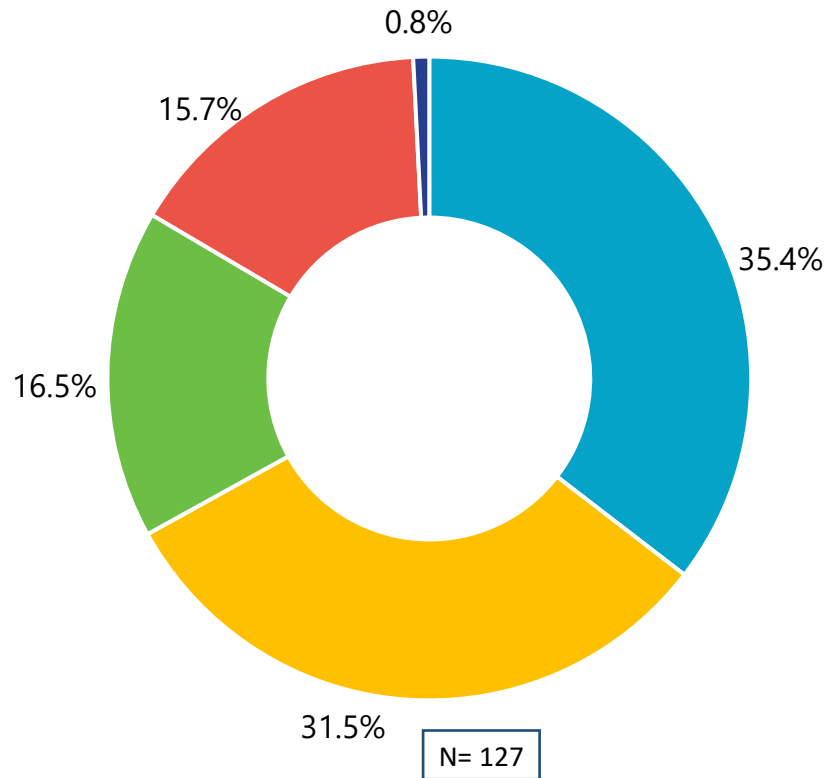
**Figure 8.** Tuberculosis Case Rates by Age Group and Year, Indiana, 2017-2021



**Figure 9.** Pediatric TB Cases by Age Group, Indiana, 2017-2021



**Figure 10.** Percentage of TB Cases by Hispanic Ethnicity and Non-Hispanic Race, Indiana, 2021



- Non-Hispanic White
- Non-Hispanic Black or African American
- Native Hawaiian or Other Pacific Islander
- Non-Hispanic Asian
- Hispanic or Latino

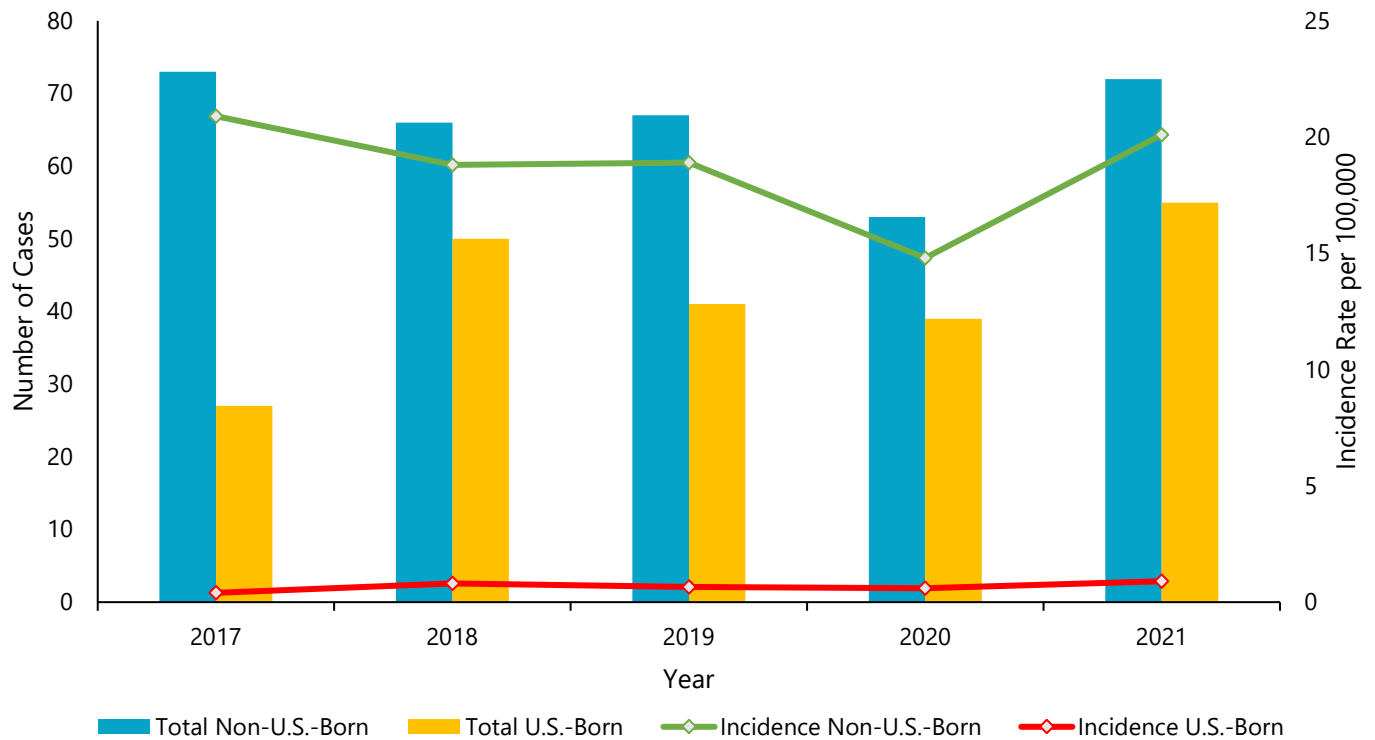
Among race and ethnicity groups, Non-Hispanic Whites had the largest burden of disease for the year 2021. This is different from prior years in which the highest burden of TB disease was seen among the Non-Hispanic Asian population. This is attributed to the cases affiliated with contaminated bone graft product. In 2021, Non-Hispanic Asians made up only 2.5% of Indiana’s total population<sup>5</sup> but accounted for 31.5% of the cases, a slight decrease from 35.9% of cases in 2020. In Indiana, 7.2% of the population identified as Hispanic/Latino<sup>5</sup>, yet 15.7% of TB cases in 2021 were seen in that population.

Incidence rates remain highest in Non-Hispanic Asians (19.4 per 100,000 population), Native Hawaiian or other Pacific Islanders (11.6 per 100,000 population), Hispanic/Latinos (4.1 per 100,000 population); and Non-Hispanic Black or African Americans (2.8 per 100,000 population), as compared to Non-Hispanic Whites (1.1 per 100,000 population).

## Geographic Risk Factors

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

**Figure 11.** TB Case Counts and Rates by Country of Birth, Indiana, 2017-2021



The proportion of U.S.-born cases increased from 42.4% in 2020 to 43.3% in 2021. The incidence of TB cases in Indiana remains high in persons born outside of the United States compared to those born in the United States. Persons born in Burma (aka Myanmar), India, Mexico, Philippines and Afghanistan accounted for 38.5% of the Indiana cases born outside of the United States in 2021.

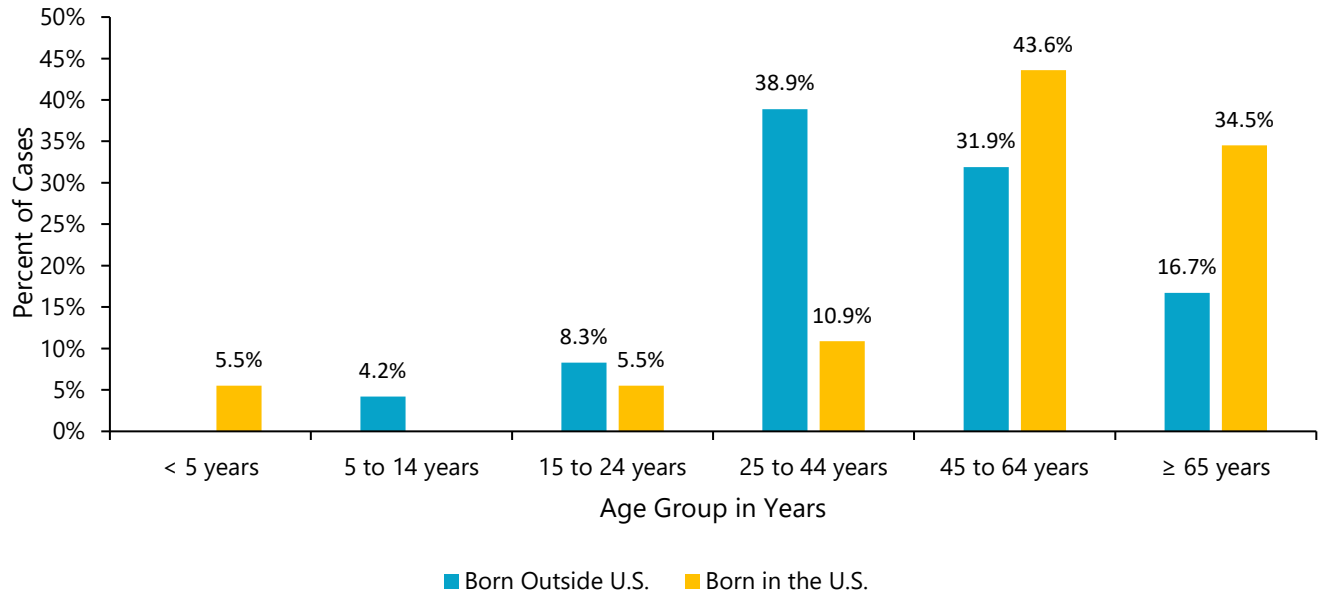
**20.1**  
**Per**  
**100,000**

Incidence rate in persons born outside of the U.S. compared to 0.9 per 100,000 population in persons born in the U.S.

**56.7%**

Proportion of cases occurring in persons born outside of the U.S. They accounted for only 5.3% of Indiana's total population in 2019.<sup>5</sup>

**Figure 12.** Percentage of TB Cases by Country of Birth and Age Group, Indiana, 2021



Among those born outside the United States, 70.8% of TB cases occurred in individuals ages 25-64. Conversely, 78.1% of the cases in people born in the United States occurred in ages 45 and above. This is due to cases affiliated with contaminated bone graft product.

### 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.<sup>7</sup> Among people with latent TB infection, HIV infection is the strongest known risk factor for progressing to TB disease.<sup>7</sup>

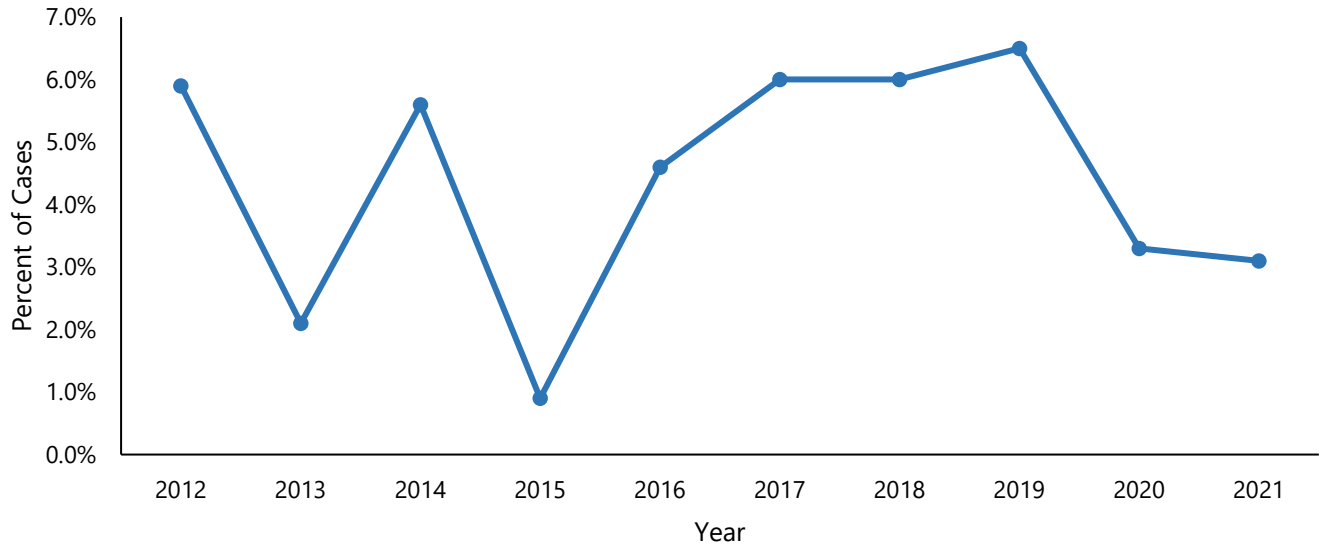
**Figure 13.** HIV Testing for Cases >15 Years and 25-44 Years of Age, Indiana, 2021

Age Group	Test Results Known	Testing Not Offered	Refused Testing
≥ 15 Years	94.2%	2.5%	3.3%
25-44 Years	100%	0%	0%

In 2021, 2.5% of TB patients ≥15 years old were not offered HIV testing and 3.3% refused testing. Among those 25-44 years old, all patients completed HIV testing.



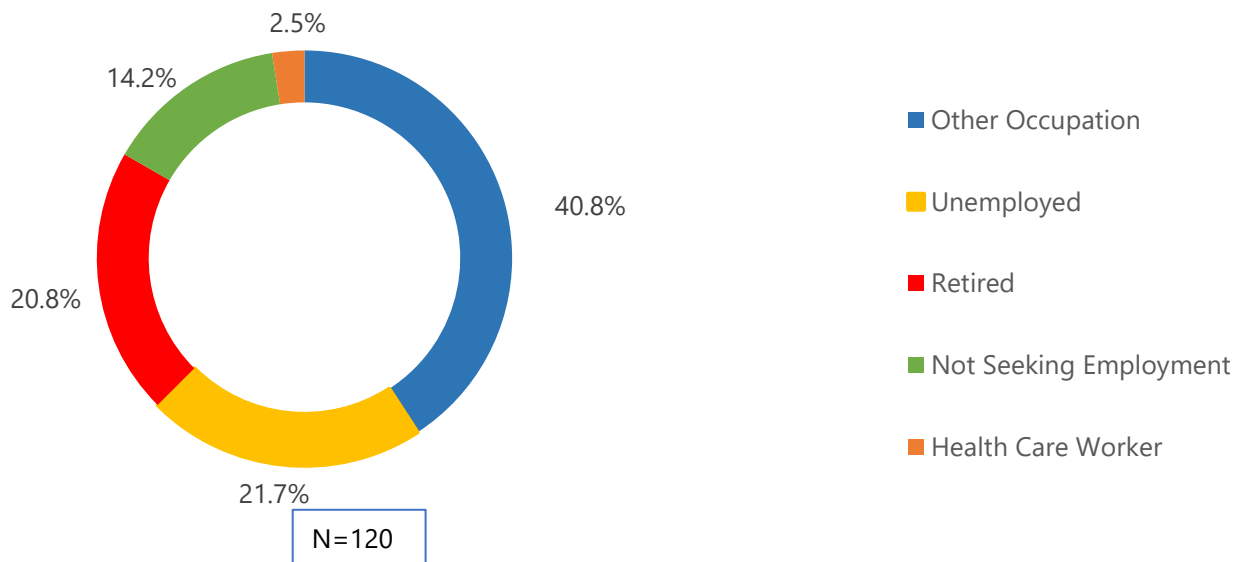
**Figure 14.** Percentage of Cases with HIV Comorbidity, Indiana, 2012 – 2021



The proportion of TB cases in Indiana with HIV comorbidity remained stable from 2020 to 2021, with 3.1% of cases reporting HIV coinfection. Over 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, 2021



The percentage of TB cases age 16 years and older reporting being unemployed was 21.3% in 2021. This has increased from 2020, which was reported as 17.1%

**Figure 16.** Most Common Reported Risk Factors, Indiana, 2021

Risk Factor	Percent
Diabetes Mellitus	26.8%
Receiving Contaminated Bone Graft Product	23.6%
Excess Alcohol Use (past year)	11.0%
Immunosuppression (not HIV/AIDS)	8.7%
Non-injection Drug Use (past year)	7.9%
Incomplete LTBI Therapy	7.9%

In 2021, the six most common risk factors reported were diabetes mellitus, receiving contaminated bone graft product, excess alcohol use, immunosuppression (not HIV/AIDS), non-injection drug use and incomplete LTBI therapy. Similarly, these were also the most common risk factors reported in 2020 other than receiving contaminated bone graft product and incomplete LTBI therapy. Diabetes continued to be the most common risk factor in Indiana from 2016 to 2021.

Other risk factors reported in 2021 included contact with an infectious TB patient, history of homelessness, residence in a correctional facility within the past two years, residence of a long-term care facility within the past two years, end-stage renal disease, TNF- $\alpha$  therapy and injection drug use.

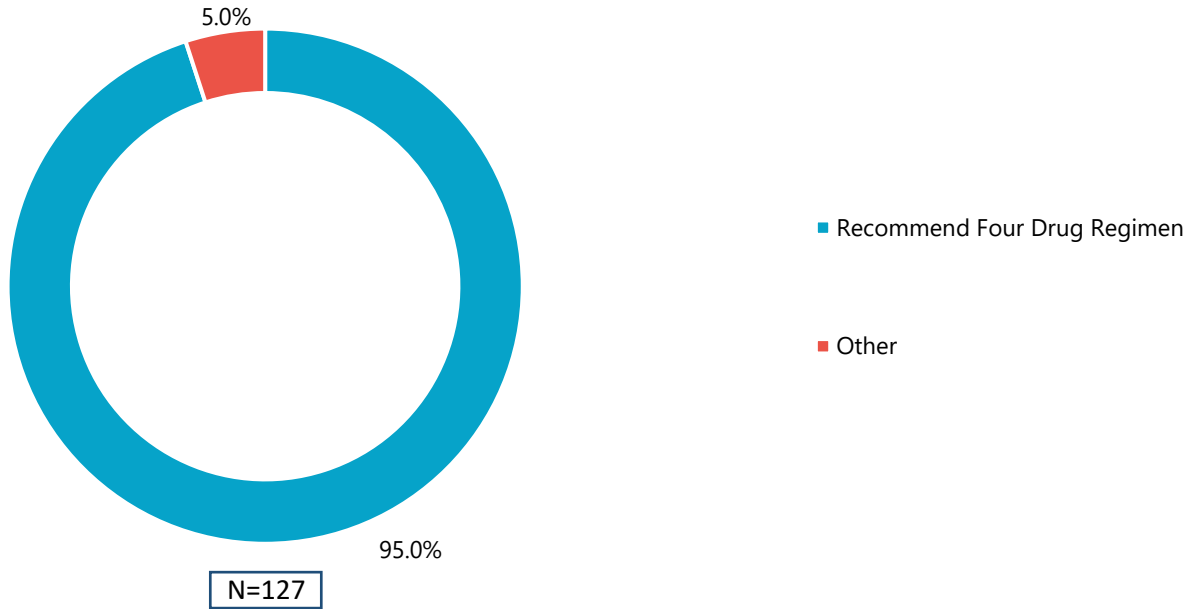
## Treatment

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)

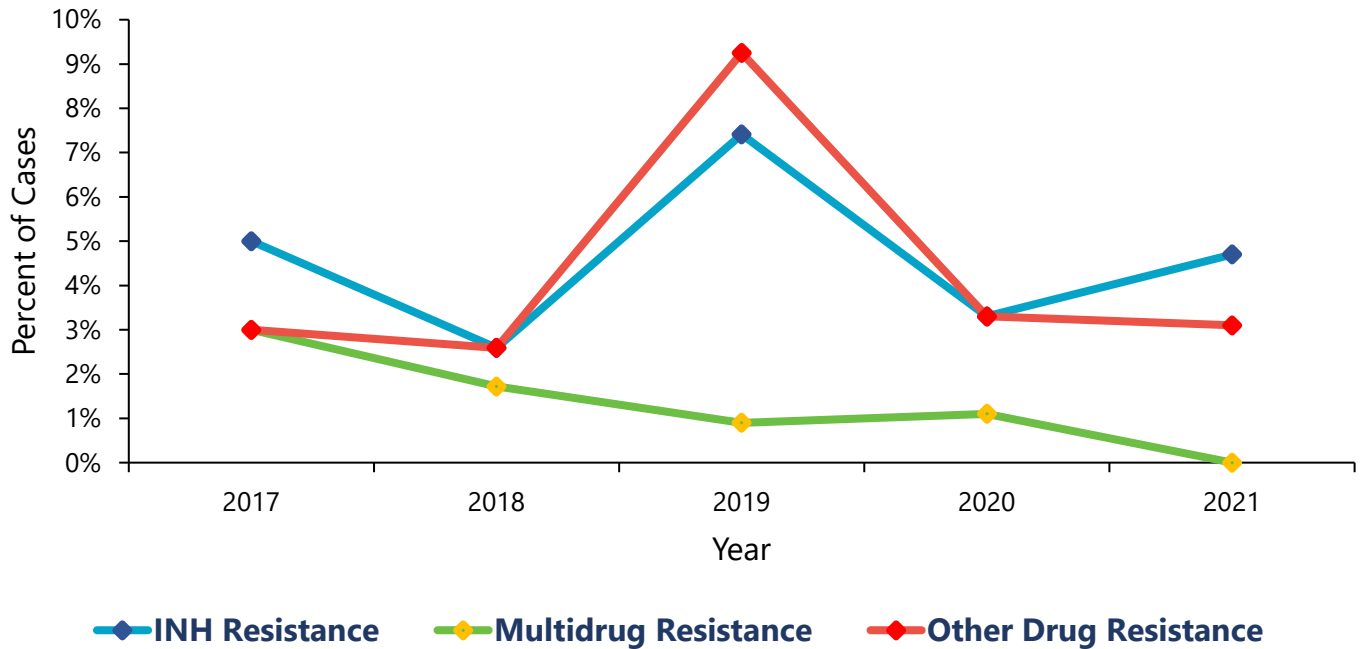
It is important that individuals who have TB disease finish the medicine, taking the drugs exactly as prescribed. If they stop taking the medication too soon, they can become sick again; if they do not take the medication correctly, the TB bacteria that are still alive may become resistant to those drugs.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

**Figure 17.** Percentage of Cases with Recommended Initial Drug Regimen, Indiana, 2021



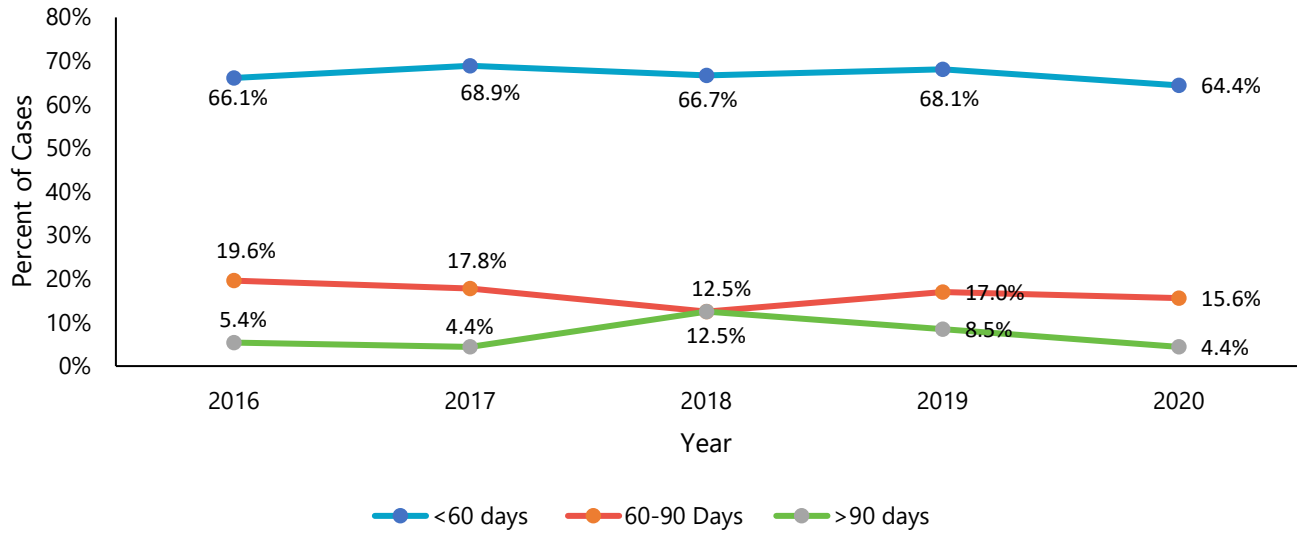
In 2021, 95.0% of TB cases were placed on the recommended initial four-drug therapy. That is lower than 2020, with 96.7%.

**Figure 18.** Percentage of Cases with Reported Drug Resistance, Indiana, 2017-2021



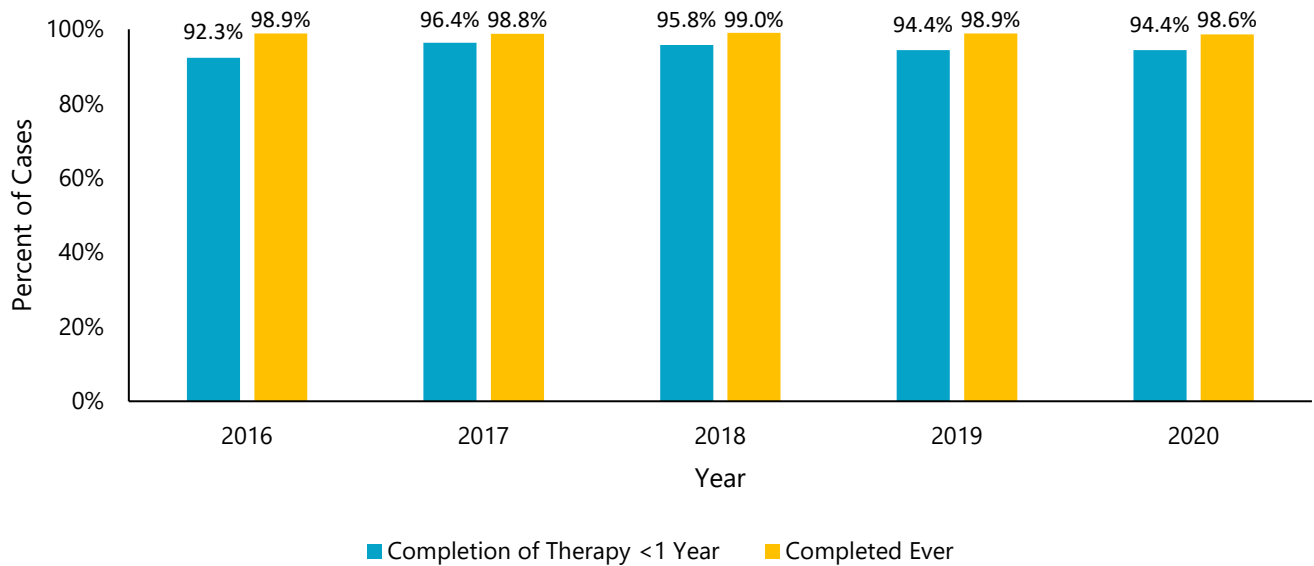
Of the 95 culture-positive TB cases in Indiana in 2021, drug susceptibility testing was performed on 100% of the isolates. INH and other drug resistance increased from 2018 to 2019, while multidrug resistance slightly decreased. In 2021, INH and other drug resistance slightly increased from 2020, while multidrug resistance dropped to zero percent.

**Figure 19.** Percentage of Culture-Converted Cases by Time to Conversion, Indiana, 2016-2020



Among eligible cases, 84.4% reported sputum culture conversion in 2020. Of those cases, 64.4% 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, 2016-2020

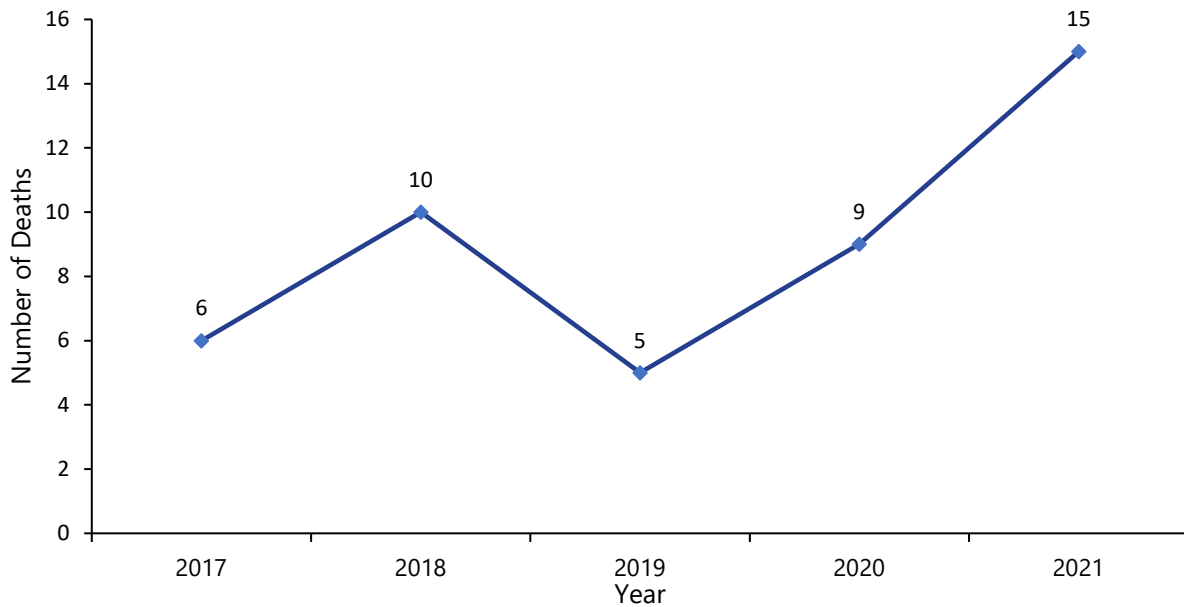


The proportion of eligible cases that completed treatment within one year remains steady in the five-year trend from 2016 to 2020. On average, 94.7% of eligible cases complete treatment within one year, and 98.8% completed treatment within this five-year period. Directly Observed Therapy (DOT) is the most effective way to ensure a patient complies with the prescribed treatment regimen and does not acquire drug resistance. In 2020, 70.7% 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 2019, the United States reported 526 deaths that were attributed to TB disease.<sup>9</sup> The Indiana Department of Health uses data from death certificates to verify TB related deaths in Indiana.

**Figure 21.** TB Deaths, Indiana, 2017-2021



In the last five years, the number of TB-related deaths has varied in Indiana. In 2021, 15 deaths were reported as related to TB disease, which was an increase from 2020. Anecdotally, we believe this may be attributed to COVID-19 and the contaminated bone graft product.

**40  
Days**

Average length patients were on therapy among the TB-related deaths in Indiana in 2020.

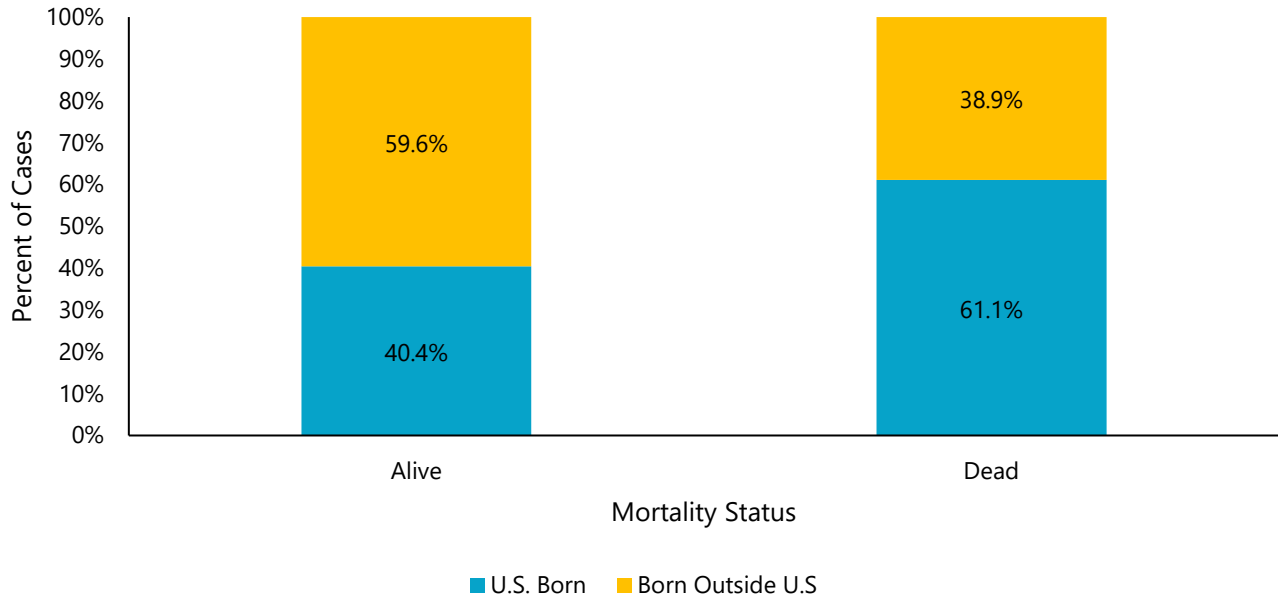
207 days was the average length for a person who was alive at the end of treatment completion in 2021 (n=34).

**67  
Years**

Average age of persons who died from TB in Indiana in 2020.

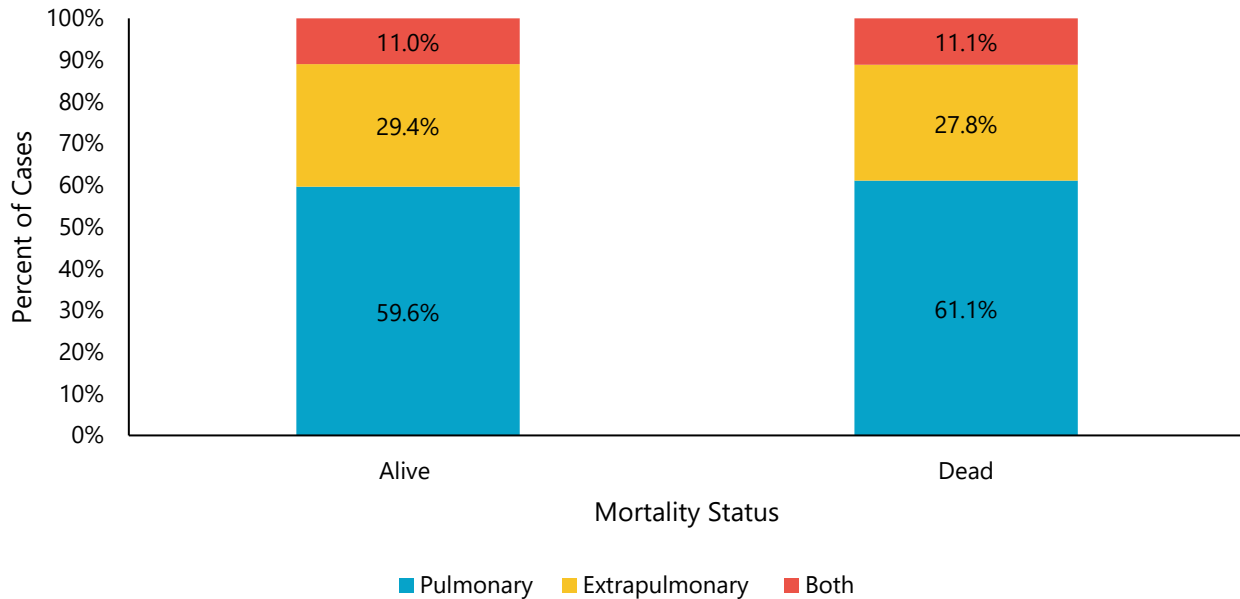
The average age of persons that did not die was 46 years.

**Figure 22.** Percentage of TB Cases by Mortality Status and Country of Birth, Indiana, 2021



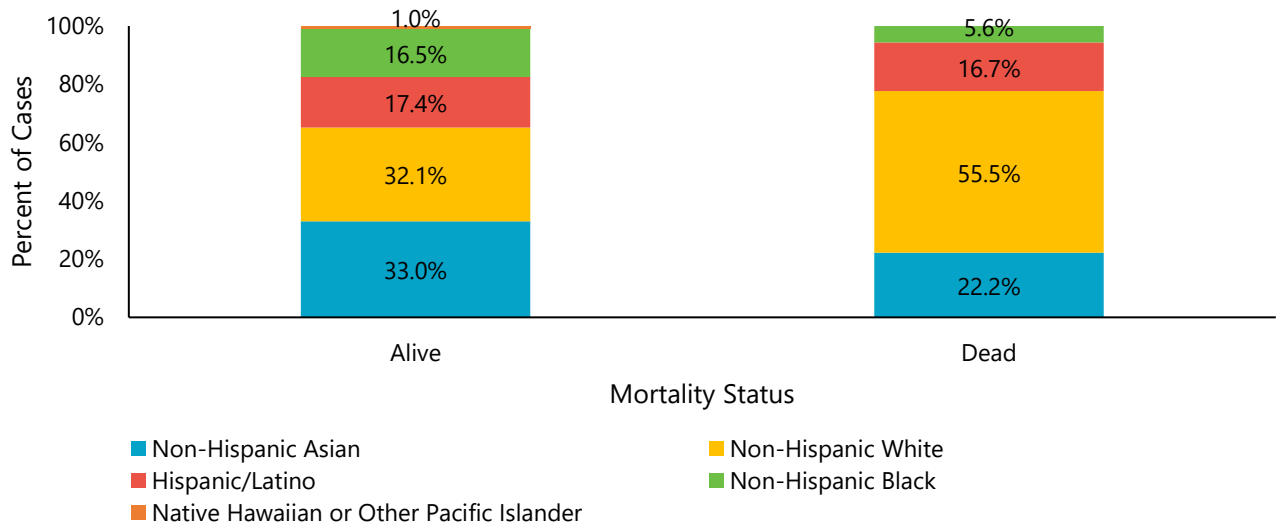
In 2021, 61.1% of TB deaths occurred in persons born in the United States, compared to just 40.4% of the cases who survive. This is markedly different from 2020, when 66.7% of TB deaths occurred in persons born outside of United States.

**Figure 23.** Percentage of TB Cases by Mortality Status and Site of Disease, Indiana, 2021



In 2021, site of disease was similar amongst TB cases who died and those who did not. The extrapulmonary sites were meningeal, bone and/or joint, bone marrow, liver, blood and peritoneal.

**Figure 24.** Percentage of TB Cases by Mortality Status and Hispanic Ethnicity and Non-Hispanic Race, Indiana, 2021



The majority of TB-related deaths occurred in Non-Hispanic Asians and Non-Hispanic Whites in 2021. The Non-Hispanic Whites accounted for 55.5% of the TB deaths in 2021. Among TB cases who were alive in 2021, Non-Hispanic Whites accounted for only 32.1% of those cases.

## 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 epidemiologic 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 (i.e., same spoligotype and MIRU patterns), 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.<sup>10</sup>

**100%**  
of culture positive  
TB cases were  
genotyped.

**57.9%**  
of cases' genotypes  
were identified as  
part of a cluster.

**14**  
New clusters were  
identified.

**1**  
outbreaks reported  
in 2021.



In 2021, 55 out of the 95 genotyped cases were identified as part of a cluster. Fourteen new genotype clusters were identified, with one outbreak reported in 2021. This outbreak refers to the aforementioned cluster of cases who received contaminated bone graft product. 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 TB infectious 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.<sup>11</sup> 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.

2020 National Objectives and Indiana Contact Investigation Measures by Year 2016 - 2020						
Year	2016	2017	2018	2019	2020	2025 National Objective
Total number of cases	109	100	100	108	92	
Percentage of sputum AFB smear-positive TB cases with contacts identified	100%	100%	97.7%	92.7%	95.2%	<b>95%</b>
Percentage of contacts to sputum AFB smear-positive TB cases evaluated for infection and disease	76%	83%	66.8%	77.3%	79.5%	<b>75%</b>
Percentage of infected contacts who are started on treatment for latent TB that complete therapy	91%	90%	92.2%	81.6%	91.4%	<b>97%</b>

## 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 2020 rates are based on 2019 American Community Survey 1-Year Estimates<sup>5</sup> as 2020 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.

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

Race is collected in five categories: American Indian or Alaskan Native, Asian, Black or African American, 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.

## C. Sources

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