TUBERCULOSIS IN UTAH 2014–2018

December 2019

Acknowledgments

The Utah Department of Health (UDOH) would like to recognize the efforts of local health department personnel throughout the state of Utah who play a critical role in the case management and contact investigation of tuberculosis cases in Utah.

Tuberculosis data for Utah are published by the Utah Department of Health (UDOH) Bureau of Epidemiology. Please direct questions or comments to:

Bureau of Epidemiology
Utah Department of Health
Box 142104
Salt Lake City, Utah 84114-2104
Phone: (801) 538-6191

Guide to Acronyms

AFB	Acid-fast bacilli
ARPE	Aggregate Report of Program Evaluation
CDC	Centers for Disease Control and Prevention
CXR	Chest x-ray
DOT	Directly observed therapy
DST	Drug susceptibility testing
DTBE	Division of Tuberculosis Elimination
EDN	Electronic Disease Notification
HIV	Human immunodeficiency virus
IBIS-PH	Indicator-based Information System for Public Health
INH	Isoniazid
LTBI	Latent tuberculosis infection
LHD	Local health department
MDR	Multidrug-resistant
MDR-TB	Multidrug-resistant tuberculosis
MOTT	Mycobacteria other than tuberculosis
NAAT	Nucleic acid amplification test
NCHS	National Center for Health Statistics
RIF	Rifampin
RVCT	Report of Verified Case of Tuberculosis
TB	Tuberculosis
TNF	Tumor necrosis factor
UDOH	Utah Department of Health
US	United States
USB	U.S.-born

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Report Highlights

- **Case counts and rates**: Between 2014 and 2018, Utah had an average of 27 cases of tuberculosis (TB) disease per year, resulting in a case rate of 0.9 per 100,000 population. This compares with the national TB rate in 2018 of 2.8 cases per 100,000 population (1).

- **Jurisdiction**: During the five-year period from 2014 to 2018, 11 of Utah's 13 local health districts had at least one case of TB reported. Seventy-four percent of those cases were reported in the Salt Lake County health district.

- **Age Groups**: From 2014 to 2018, adults aged ≥65 years in Utah had the highest TB case rate at 1.4 per 100,000 population. During this period, 13% of TB morbidity in Utah was among children <15 years; about half of these children were contacts to adults with infectious TB disease - including one child who was treated as the first pediatric multidrug-resistant (MDR) case in the state.

- **Race/Ethnicity**: Racial and ethnic minorities continued to have the highest rates of TB disease in Utah between 2014 and 2018:

RACE/ETHNICITY	RATE/100,000 POPULATION
Asian	9.1
Black/African American	7.9
Native Hawaiian/Other Pacific Islander	6.3
American Indian/Alaska Native	4.1
Hispanic	2.8
White	0.1

- **Origin of Birth**: During the 5-year period, 78% of Utah's TB cases were among non-U.S.-born persons, and 13% were among U.S.-born persons with a foreign connection.

- **Drug Susceptibility Testing and Results**: From 2014 to 2018, 73% of cases were confirmed by laboratory culture. Drug susceptibility testing was completed on 100% of the isolates of these TB cases. Of these isolates, 14% had resistance to one or more anti-TB medications, and 4% were multidrug-resistant TB (MDR-TB).

- **Directly Observed Therapy (DOT) Status**: From 2013 to 2017, 97% of persons who were treated for TB disease in Utah had all doses of their medications given by DOT.

- **TB Cases, Suspects, and Rule Outs**: In addition to confirmed cases, all persons suspected of having TB were entered into Utah's disease reporting and surveillance system, and TB was ruled out for the majority of persons. Between 2014 and 2018, a total of 1,568 persons were reported as either a confirmed or suspected case of TB, and 9% of persons suspected of having TB were diagnosed with TB disease and counted as a Utah TB case.

Introduction

Tuberculosis (TB) is caused by the bacterium *Mycobacterium tuberculosis* and is typically spread through the air when a person with active TB disease of the lungs or throat expels tiny airborne particles. People nearby may breathe in these particles and become infected, usually after prolonged sharing of airspace. People who are infected with TB bacteria but who do not have active TB disease—a condition known as latent TB infection—do not feel sick, do not have symptoms, and cannot spread TB. However, they may develop TB disease at some time in the future.

Like many other infectious diseases, TB is a challenge to control. Some of the obstacles include its airborne mode of transmission, failure of providers to "think TB" as TB morbidity declines, elevated rates in at-risk groups, and its prolonged treatment regimen of six months or longer.

TB is an Immediately Reportable Condition under the Utah Communicable Disease Rule, and all suspected and confirmed cases of TB must be reported to a local health department (LHD) or the Utah Department of Health (UDOH) Bureau of Epidemiology within 24 hours (2). Because early detection and appropriate treatment of TB are essential to control the spread of the disease and prevent outbreaks, public health programs throughout the state ensure persons suspected of having TB are thoroughly evaluated and started on TB treatment, when indicated. Since treatment adherence is not only important for effective therapy in patients but also to prevent an increase in drug-resistant TB cases, the Special Measures for the Control of TB Rule requires treatment for patients with TB disease be administered using directly observed therapy (DOT). The TB Rule also requires contact investigations be conducted for all persons suspected or confirmed of having infectious TB (3).

Tuberculosis in Utah, 2014-2018, is a five-year statistical review of TB disease in Utah from 2014 to 2018. Although some aspects of TB epidemiology in Utah mirror national trends, there are aspects of the local epidemiology that differ and must be considered in disease control efforts. The report consists of six sections. Four sections describe TB epidemiology by jurisdiction, demographic factors, risk factors, and clinical information. The fifth section on Program Evaluation compares the performance of the Utah TB Control Program with the 2020 national TB Program objectives and targets. The Tables section includes the data upon which the charts in the main section are based.

Technical Notes

Since 1993, reports of Utah's confirmed TB cases have been submitted to the Centers for Disease Control and Prevention (CDC) Division of TB Elimination (DTBE) using the Report of Verified Case of Tuberculosis (RVCT) form (4). The cases in this report are classified by the RVCT Count Date.

Both countable and non-countable TB cases, along with data regarding persons suspected of having TB, are entered into EpiTrax, a statewide disease surveillance system. Non-countable cases include cases where TB patients from other jurisdictions move into the state, where TB is recurrent (diagnosed within one year of completion of previous TB treatment), or when the TB diagnosis is reversed. All sections of this report, with the exception of the section on TB Cases, Suspects, and Rule Outs, refer to Utah's countable cases.

Tuberculosis in Utah, 2014-2018 includes rates calculated using population estimates published in the UDOH Indicator-based Information System for Public Health (IBIS-PH). Many rates are based on a small number of events, which have wide confidence intervals; therefore, caution should be exercised when interpreting these results. When comparing Utah with national statistics, the most recently available data were used.

TB treatment typically lasts at least six months but can be as long as 18-24 months or more. Due to the prolonged nature of treatment, TB cases are counted in the jurisdiction where the patient first resided for at least 90 days.

Finally, the term "U.S.-born" refers to persons who were born in the United States, born outside the United States to at least one parent who was a U.S. citizen, or born in a U.S. territory (American Samoa, Guam, Commonwealth of the Northern Mariana Islands, Puerto Rico, or the U.S. Virgin Islands). All other persons are "non-U.S.-born."

Tuberculosis (TB) by Jurisdiction

Cases in Utah

TB is an Immediately Reportable Condition in Utah, and much of our understanding of the occurrence of TB comes from case surveillance. Since 1993, reports of TB cases in Utah have been submitted to the CDC DTBE using the RVCT form. The cases in *Tuberculosis in Utah, 2014-2018,* are classified by the RVCT Count Date, the date when the case was verified as a case of TB and included in the official case count.

In 2018, 18 cases of TB disease were reported in Utah, the lowest ever reported case count. For the five-year period between 2014 to 2018, Utah had an average of 27 cases per year (Table 1).

The TB case count in Utah has fluctuated since 1993. Dividing this 26-year period in three, the number of TB cases decreased from an average of 48 cases per year from 1993 to 2000 to 34 cases per year from 2001 to 2009, followed by a decrease to 29 cases per year between 2010 and 2018 (Figure 1, Table 1).

Rates in Utah and the United States

In 2018, the TB rate in Utah was 0.6 cases per 100,000 population. For the five-year period from 2014 to 2018, Utah had an average TB rate of 0.9 cases per 100,000 population (Figure 2, Table 1).

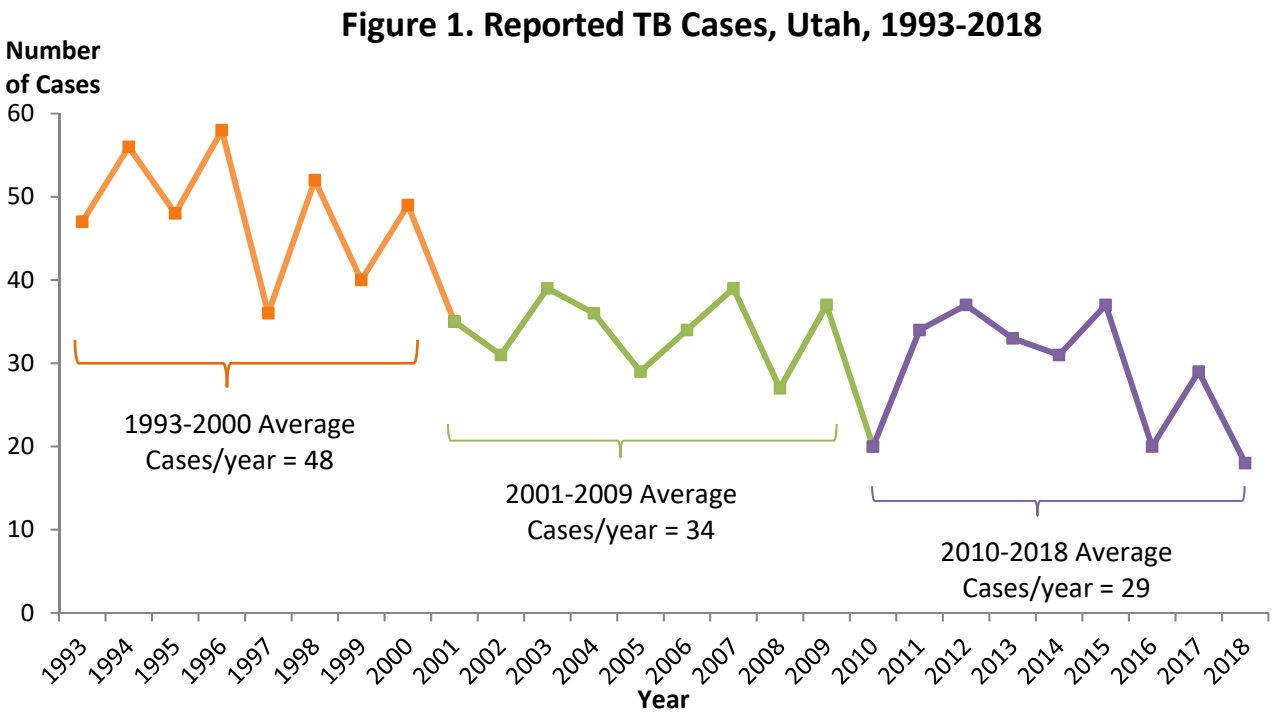
From 1993 to 2018, Utah's TB rate was, on average, about one-third of the national rate. The U.S. TB rate in 2018 was 2.8 cases per 100,000 population (Figure 2, Table 1) (1). Utah achieved the Healthy People 2020 goal of reducing the TB incidence rate to ≤1.0 case per 100,000 population in 2010 and 2016 to 2018 (5).

Local Health Districts

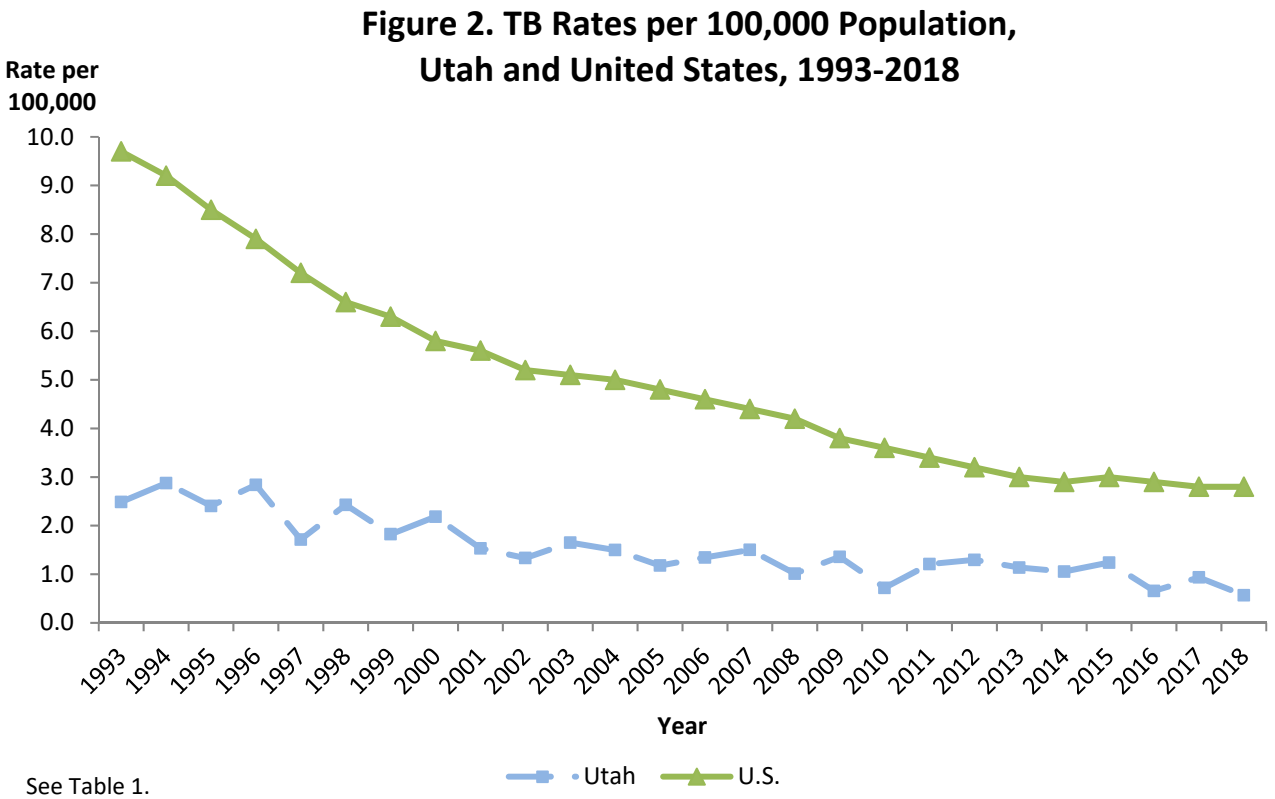
The majority of TB morbidity in Utah occurs in the Salt Lake County health district. In 2018, this district accounted for 50% of the reported TB cases in the state. For the rest of the state in 2018, four districts each had two cases each, one district had one case, and seven districts did not have a TB case in 2018 (Figure 3, Table 2).

From 2014 to 2018, the Salt Lake County health district accounted for 74% of the state's TB cases. The districts with the next highest burden of disease were in Utah County and the Southwest Public health districts with 6% and 5% of the cases, respectively (Figure 3, Table 2). San Juan Public Health and Salt Lake County health districts had the highest TB rates in Utah (Figure 3, Table 2).

Eleven of the 13 local health districts had at least one case of TB in the past five years; only Southeast and Tooele County health districts had zero cases during this time period. The UDOH TB Control Program works closely with local health partners to provide resources and expertise to ensure that TB cases are treated to completion.

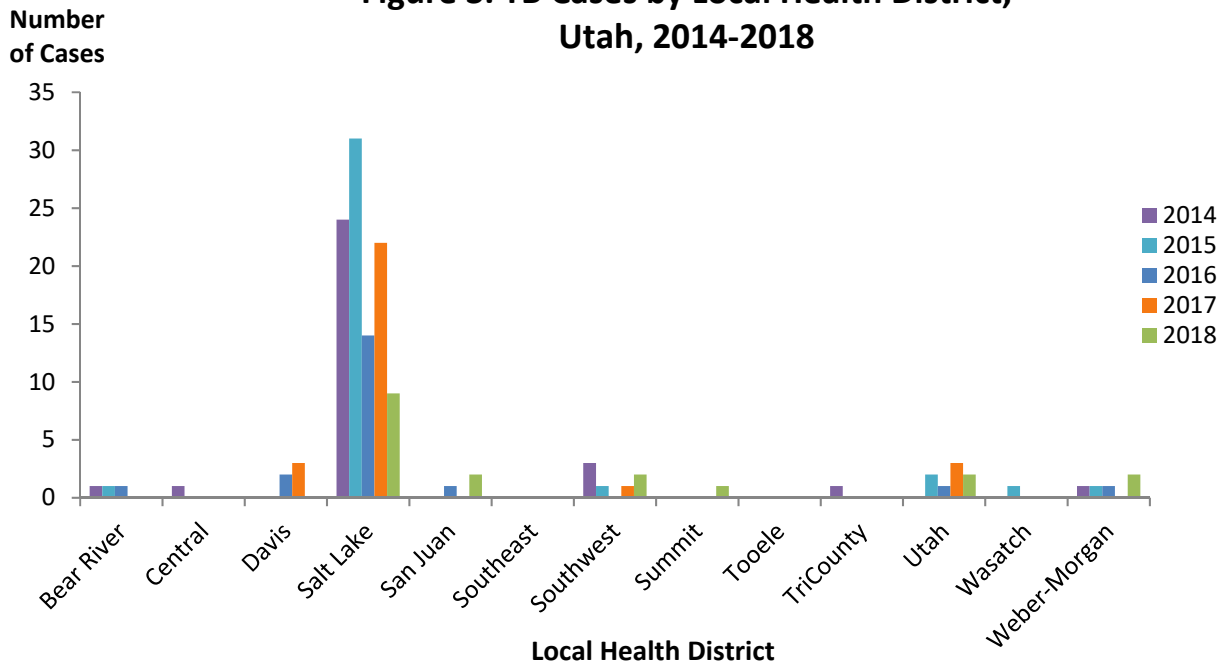


See Table 1.



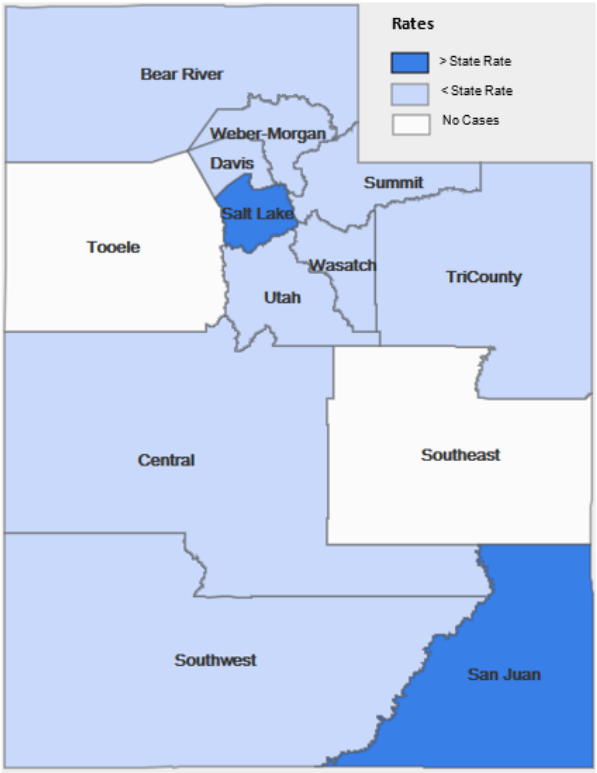
See Table 1.

Figure 3. TB Cases by Local Health District, Utah, 2014-2018



See Table 2.

Figure 4. TB Rates per 100,000 Population by Local Health District, Utah, 2014-2018



See Table 2.

TB by Demographic Characteristics

Sex

Between 2014 and 2018, males accounted for 47% of the morbidity with 75% of males being non-U.S.-born; and females accounted for 53% of the morbidity, with 80% being non-U.S.-born (Table 2). In contrast, the distribution of TB cases in the United States in 2018 showed that 61% of the cases were male and 39% were female (1).

Age

From 2014 to 2018, adults ages 65 and older had the highest TB rate in Utah at 1.4 cases per 100,000 population, followed by adults ages 45–64 and 25–44 years, at rates of 1.2 and 1.0 cases per 100,000 population, respectively. Children 0–4 years had the next highest rate at 0.8 cases per 100,000 population (Table 3). The majority of children were diagnosed with TB during a contact investigation of an adult case.

Nationally, persons ages 65 and older also had the highest TB rate at 4.5 cases per 100,000 population, followed by adults ages 45-64 and 25-44 years with rates of 3.2 and 3.1 cases per 100,000 population, respectively. These rates were three times higher than Utah's rate. The national rate among persons ages 15-24 years was 2.0 cases per 100,000 population compared with Utah's rate of 0.5. However, among pediatric cases, national rates were similar to that of Utah: 0.9 cases per 100,000 among children ages 0-4 years and 0.5 among children 5-14 years compared with Utah's rates of 0.8 and 0.3, respectively (Table 3). (1)

Children

Between 2014 and 2018, 13% of TB morbidity in Utah was among pediatric cases younger than 15 years of age (Figure 6, Table 3). Of the pediatric cases, 56% (10 of 18) were known contacts to adults with infectious TB disease, including two children who were initially reported as TB cases, with the source adult cases being subsequently identified.

One of the children diagnosed during this period was treated as the first pediatric multidrug-resistant TB (MDR-TB) case in Utah, which is extremely challenging since most of the medications for MDR-TB are not commonly used in children and can be quite toxic; total treatment is typically two years; and an IV line is required for at least six months. Another case involved a newborn who contracted TB disease from its mother and died before treatment could be initiated.

The remaining eight children were either recent arrivals to the United States, were U.S.-born children of non-U.S.-born parents, and/or had lived in a country with a high incidence of TB (Figure 6).

Race/Ethnicity

From 2014 to 2018, people who are Asians, Black/African Americans, and Native Hawaiian/Other Pacific Islanders had the highest TB rates in Utah with 9.1, 7.9, and 6.3 cases per 100,000 population, respectively. The next highest rates were reported among people who are American Indian/Alaska Natives and persons of Hispanic ethnicity, with TB rates of 4.1 and 2.8 cases per 100,000 population. People who are White had the lowest rate at 0.1 cases per 100,000 population and had a significantly lower TB rate than other race/ethnicities (Figure 7, Table 3).

Origin of birth was a major risk factor for TB, and during this period, >90% of the people who are Asian and Black/African American cases were non-U.S.-born. People who are of Hispanic ethnicity had the largest percentage of cases during this time frame at 44%, and people who are Asian had the second highest percentage at 24% (Figure 8, Table 3).

Nationally, people who are Native Hawaiian/Pacific Islanders and Asians had the highest TB rate in 2018 at 20.0 and 17.0 cases per 100,000 population, respectively. People who are Asian were the racial and ethnic group with the largest percentage of cases in the United States in 2018 with 35% of the cases, followed by people who are of Hispanic ethnicity at 29% (1).

Origin of Birth

From 2014 to 2018, non-U.S.-born persons[*] accounted for 78% of the TB cases in Utah. U.S.-born persons with a foreign connection accounted for 13% of the cases (Figure 9, Table 4). Persons with foreign connections included individuals who had lived in countries with a high incidence of TB or U.S.-born persons who were contacts of non-U.S.-born cases.

In the United States in 2018, 70% of all TB cases occurred in non-U.S.-born persons. Utah ranked 23 out of 50 states for its percentage of TB cases among non-U.S.-born persons (1). These numbers show the importance of effectively screening and treating individuals from high TB prevalence areas.

Country of Birth

The distribution of the countries of birth among persons reported with TB in Utah illustrates the truly global nature of the disease. From 2014 to 2018, individuals diagnosed with TB in Utah reported 34 different countries of birth.

Among persons born outside the United States, the top five countries—Mexico, India, Philippines, Peru, and Vietnam—accounted for 57% of cases. The top nine countries accounted for 70% of Utah's cases, and persons born in 25 other countries each accounted for less than two percent of the total but together accounted for 30% of persons born outside the United States who were reported with TB in Utah (Figures 10 and 11, Table 5).

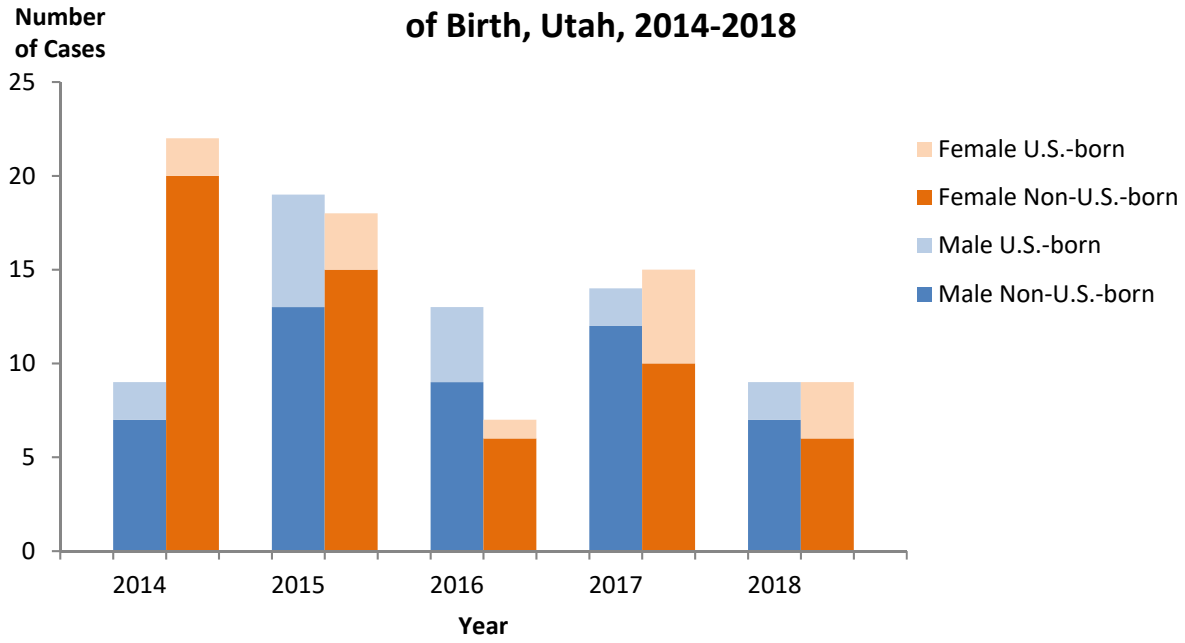
Immigration Status at First Entry among Non-U.S.-born Persons

TB screening is part of the medical examination process for individuals immigrating to the United States (immigrants, refugees, asylees, and parolees), a step not required for nonimmigrants (tourists, students, etc). Among non-U.S.-born TB cases in Utah from 2014 to 2018, 38% had immigration visas upon first entry into the United States; 23% were refugees; 6% had student visas; 3% had employment visas; 2% had tourist visas; and 1% each were asylees/parolees, had family/fiancé visas, or refused to answer the question; and 26% had other immigration status[†] (Figure 12, Table 4). The data suggest providers must continue to "Think TB" when evaluating patients from countries with a high incidence of TB, and targeted testing is recommended for persons from high-incidence countries. All persons diagnosed with latent TB infection (LTBI) should be encouraged to start and complete LTBI treatment.

[*] Non-U.S.-born persons were born outside the United States and its territories (American Samoa, Guam, Commonwealth of the Northern Mariana Islands, Puerto Rico, or the U.S. Virgin Islands) and did not have at least one parent who was a U.S. citizen.

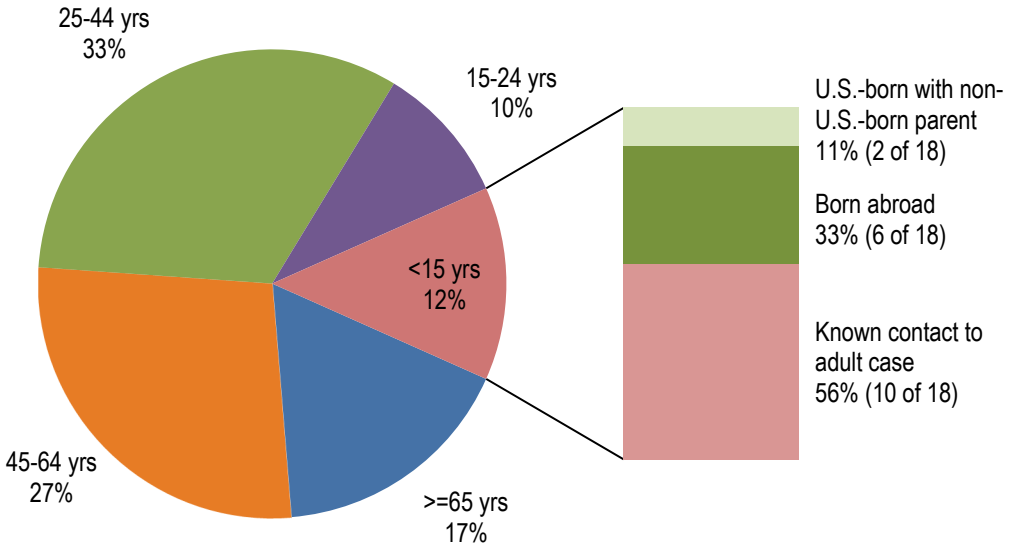
[†] Other immigration status includes (but is not limited to) non-U.S.-born persons who were not required to obtain a visa or persons with no official immigration status.

Figure 5. TB Cases by Sex and Origin of Birth, Utah, 2014-2018



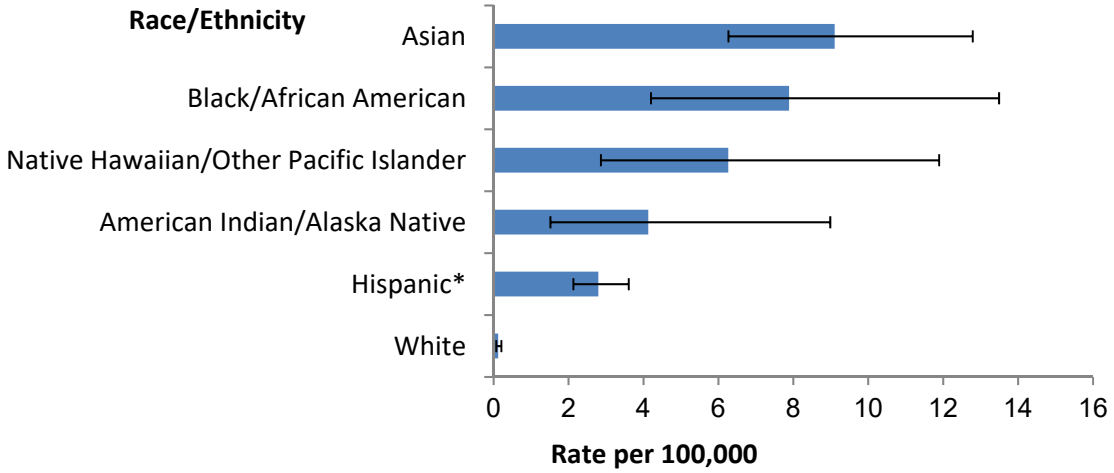
See Table 2.

Figure 6. Percent of TB Cases by Age Group and Characteristics of Pediatric Cases, Utah, 2014-2018



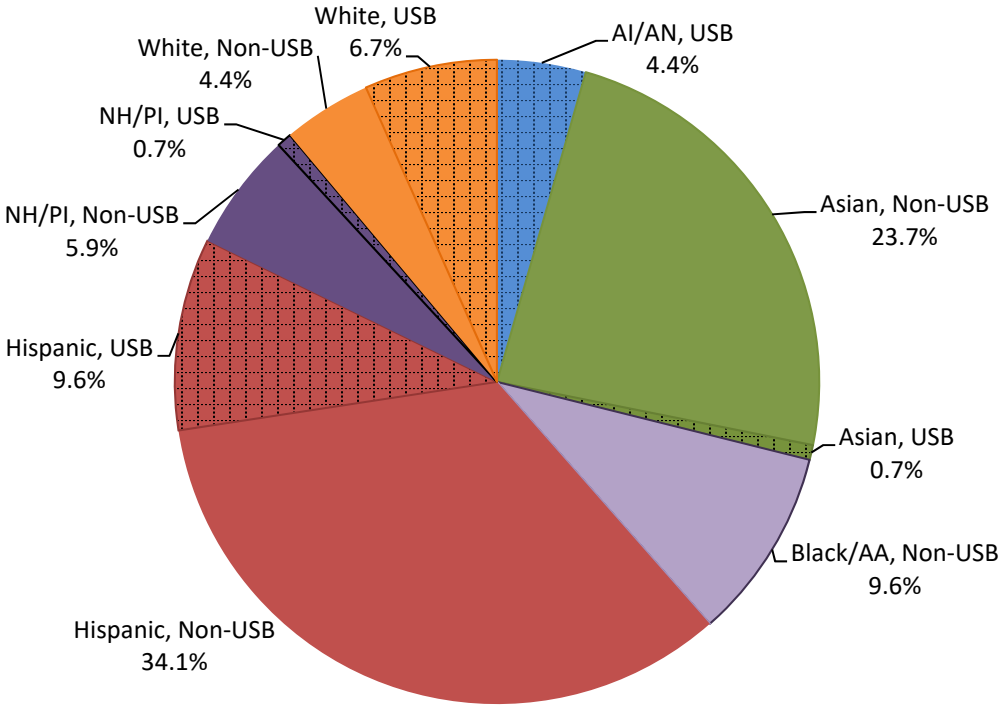
See Table 3.

Figure 7. TB Rates per 100,000 Population by Race/Ethnicity with 95% Confidence Intervals, Utah, 2014-2018



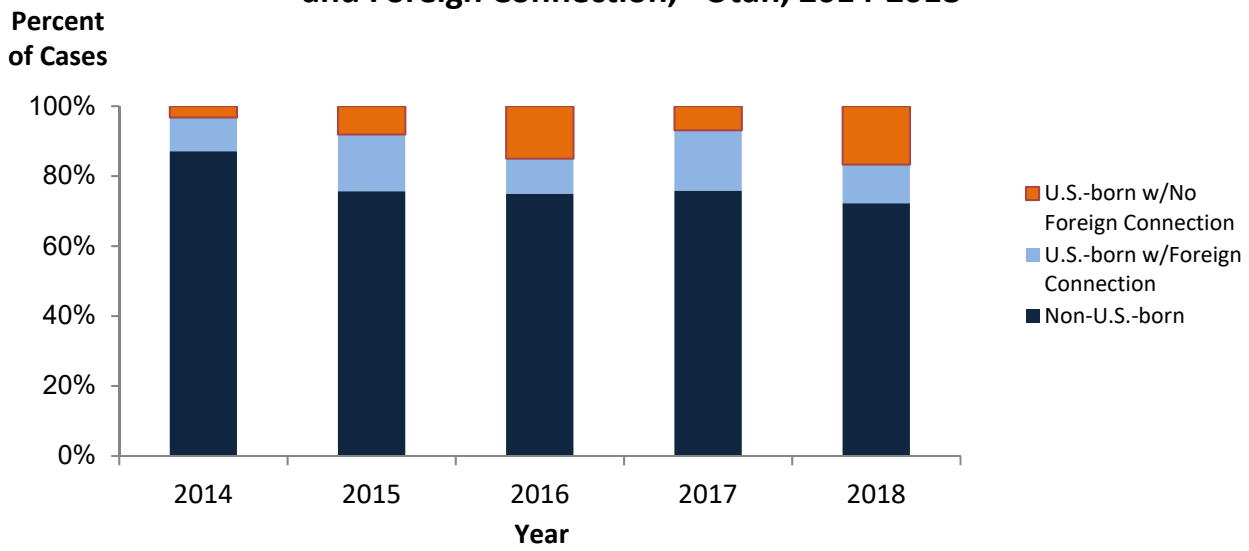
*Persons of Hispanic ethnicity can be of any race(s).
See Table 3.

Figure 8. Percent of TB Cases by Race/Ethnicity* and Origin of Birth†, Utah, 2014-2018



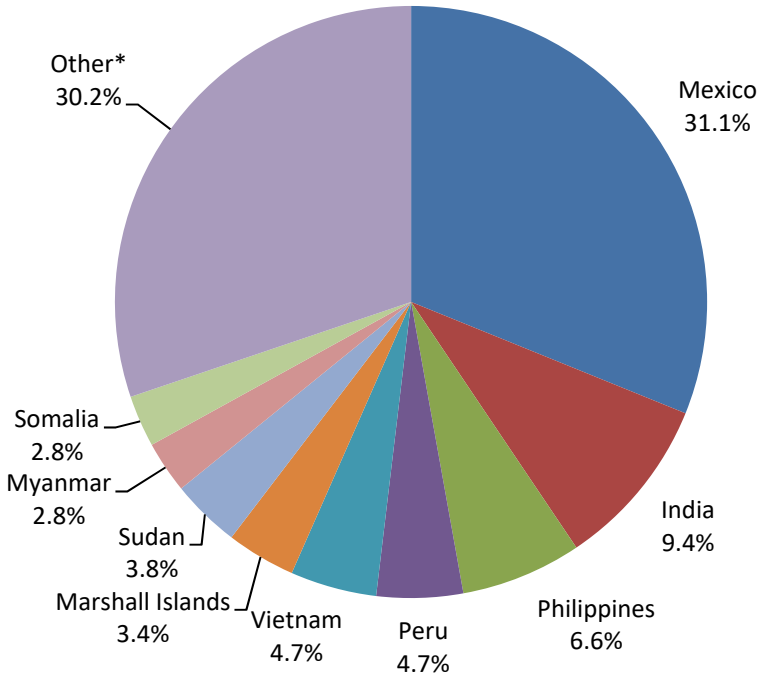
*AI/AN=American Indian/Alaska Native; Black/AA=Black/African American; NH/PI=Native Hawaiian/Other Pacific Islander; persons of Hispanic ethnicity can be of any race(s).
† USB=U.S.-born; Non-USB=Non-U.S.-born. U.S.-born persons were born in the United States, born outside the United States to at least one parent who was a U.S. citizen, or born in a U.S. territory. All other persons are non-U.S.-born.
See Table 3.

Figure 9. Percent of TB Cases by Origin of Birth and Foreign Connection,* Utah, 2014-2018



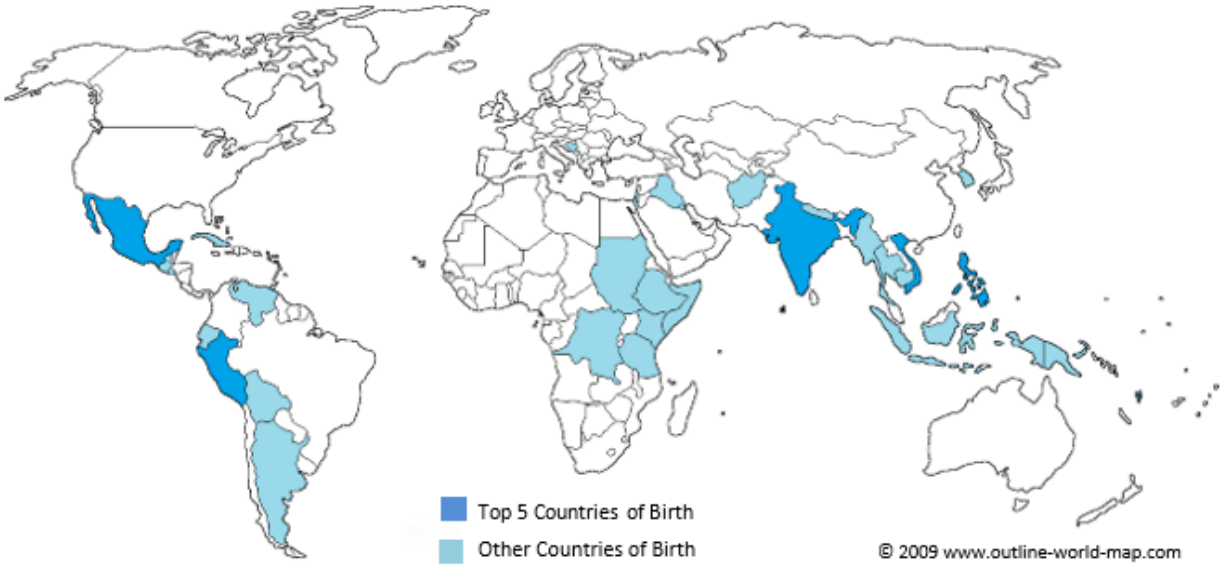
*Foreign connections include having lived in a country with a high incidence of TB or U.S.-born persons who were contacts of non-U.S.-born cases.
See Table 4.

Figure 10. Percent of TB Cases by Country of Birth Among Persons Born Outside the United States, Utah, 2014-2018



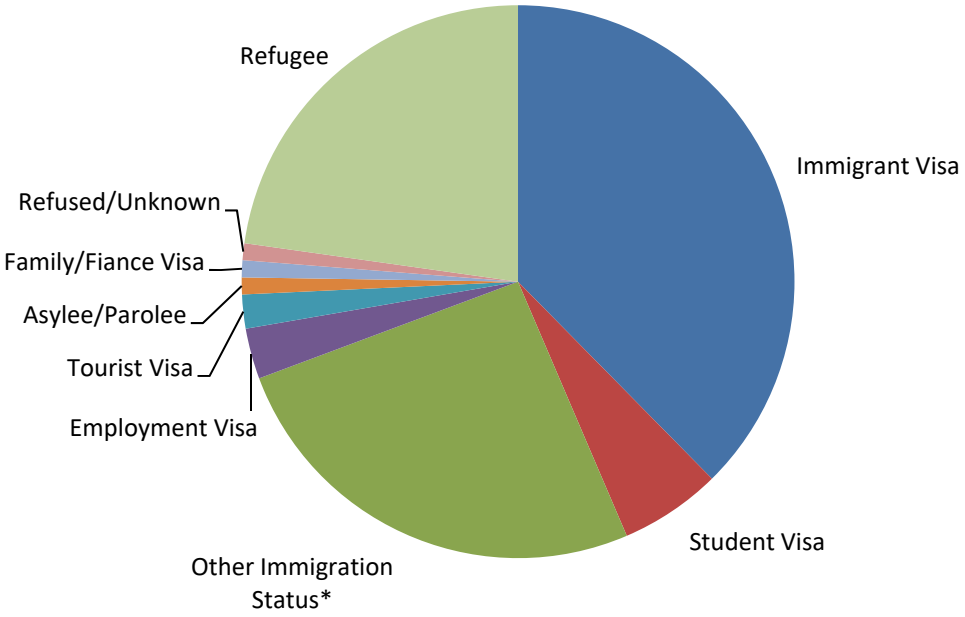
*Other countries include: Afghanistan, Argentina, Bolivia, Bosnia and Herzegovina, Cambodia, Congo-Democratic Republic of, Cuba, Ecuador, El Salvador, Ethiopia, Guatemala, Indonesia, Iraq, Israel, Kenya, Korea-Republic of, Kuwait, Nepal, Papua New Guinea, Tanzania, Thailand, Tonga, Vanuatu, Venezuela, and Yugoslavia.
See Table 5.

Figure 11. Countries of Birth Among TB Cases Born Outside the United States, Utah, 2014-2018



See Table 5.

Figure 12. Percent of Non-U.S.-born TB Cases by Immigration Status at First Entry to the United States, Utah, 2014-2018



*Includes (but is not limited to) non-U.S.-born persons who were not required to obtain a visa or persons with no official immigration status.
See Table 4.

TB by Risk Factor

HIV Testing and Coinfection

Knowledge of a TB patient's human immunodeficiency virus (HIV) status is critical to ensuring the optimal drug regimen is selected and for referring patients to HIV primary care if a positive result is newly detected. Therefore, all TB cases should be tested for HIV. Knowledge of a TB patient's HIV status also guides the conduct of contact investigations because persons infected with HIV have the greatest risk for progression to TB disease once they are infected with *Mycobacterium tuberculosis*.

Between 2014 and 2018, 99% (134 of 135) of persons with TB in Utah reported a positive or negative HIV test result. One person was not offered HIV testing as the person had died at the time of TB diagnosis (Figure 12, Table 6).

From 2014 to 2018, 5% of TB cases in Utah were coinfected with HIV (Table 6), which is similar to the national HIV coinfection percentage for patients for whom HIV test results were available in 2018 (1).

Additional Risk Factors

There are a number of additional conditions that increase the risk that a person infected with TB will progress to TB disease. From 2014 to 2018, diabetes was the most common risk factor among TB cases in Utah (19% of cases). The next most common risk factors were being a contact to an infectious TB case in the preceding two years (9%) and immunosuppression (4%). Fifty-six percent of cases did not report any risk factors (Figure 13, Table 6). This compares with the following 2018 proportion of TB cases in the United States reporting these risk factors: 20% had diabetes, 8% were contacts to an infectious TB case, and 7% were immunosuppressed (1).

Residence at Diagnosis

A number of factors determine the probability of TB transmission, including the infectiousness of the person with TB, the susceptibility of the exposed individual, environmental factors such as air circulation and size of a space, and the proximity, duration, and frequency of exposure. Congregate settings such as correctional facilities, nursing homes, and homeless shelters can have increased risk for TB transmission.

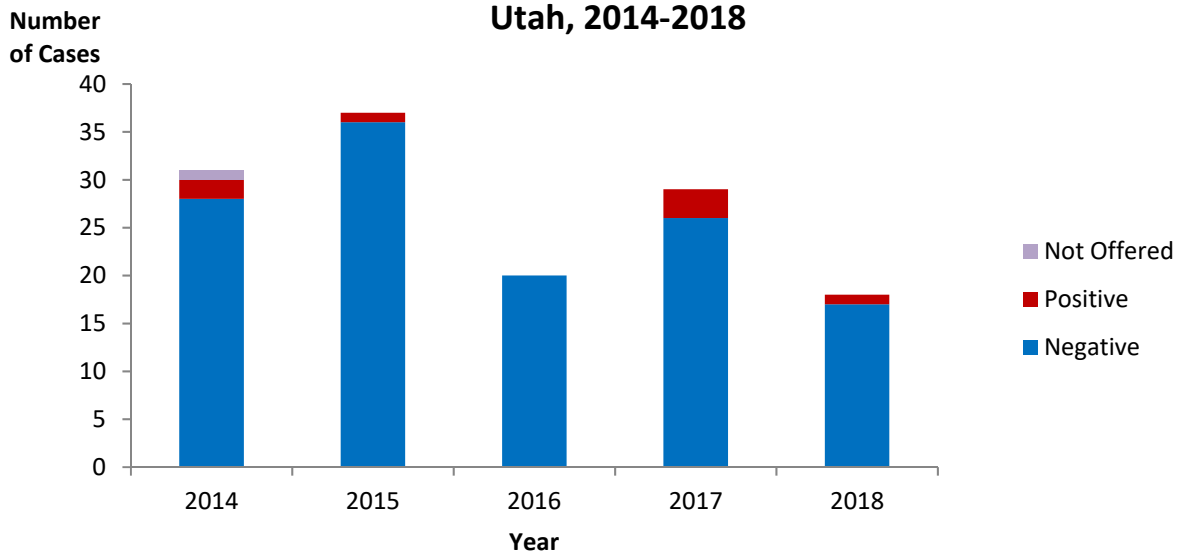
The majority of TB cases reported in Utah were among persons living in a private residence at the time of diagnosis. From 2014 to 2018, 93% of the TB cases in Utah were living in a private residence at the time of their diagnosis, 3% were homeless at the time of their TB diagnosis, and the remainder of the cases were either diagnosed in a correctional facility or long-term care facility (1 case each) or had other living arrangements (Table 6).

Adult Homelessness and Substance Abuse

Only a small percentage of the TB cases in Utah reported being homeless, abusing drugs, and/or abusing alcohol. From 2014 to 2018, 5% of adult cases (≥15 years) reported being homeless in the 12 months prior to their TB diagnosis. In terms of substance abuse in the 12 months prior to TB diagnosis for this five-year period, 9% reported excess alcohol use; 1% reported injection, and 2% reported non-injection drug use (Figure 14, Table 7).

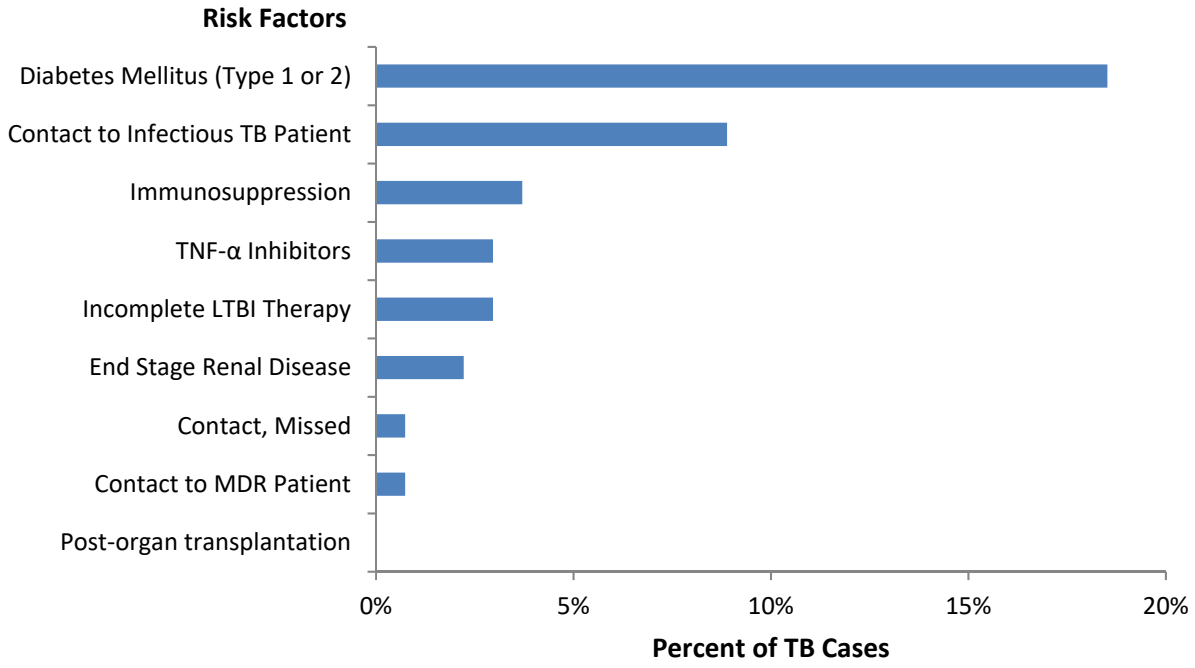
In the United States in 2018, the percentage of TB cases ages 15 years or older reporting homelessness and/or substance abuse in the 12 months prior to TB diagnosis was similar to that of Utah except for non-injecting drug use, where the national statistic was higher than that of Utah. Four percent of the national cases were homeless, 9% reported excess alcohol use, 7% reported non-injection drug use, and 1% reported injection drug use (1).

Figure 13. TB Cases by HIV Test Results*, Utah, 2014-2018



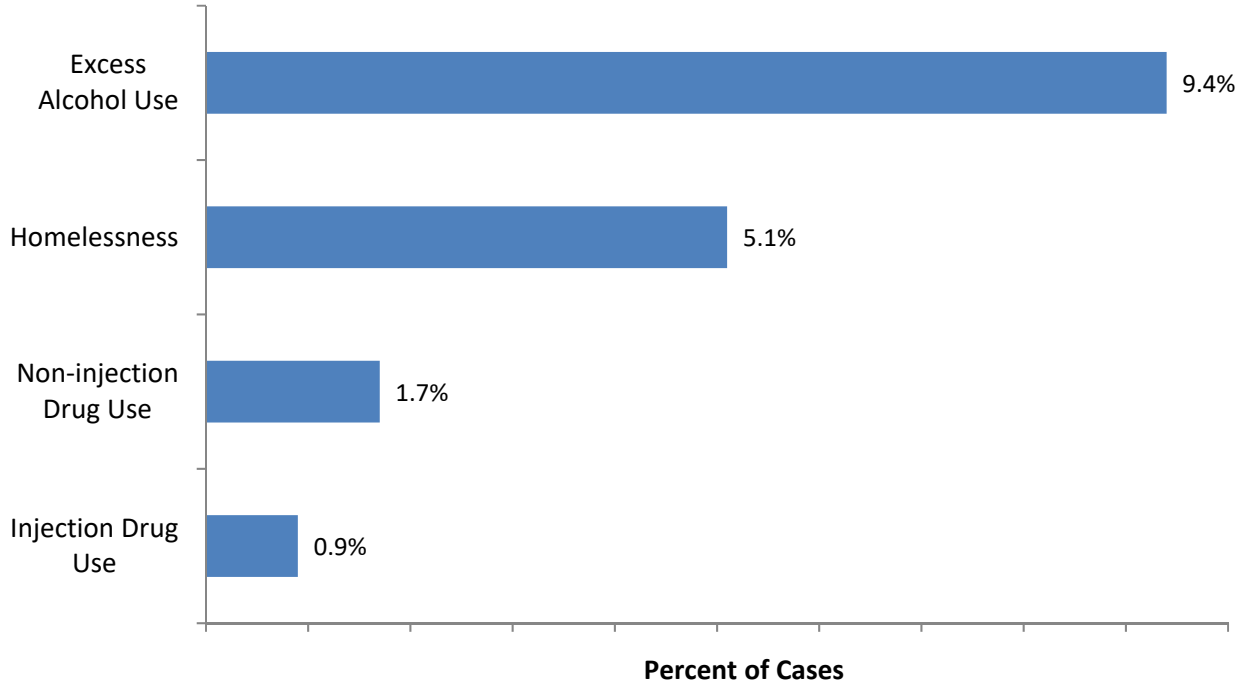
*No cases refused or had indeterminate results.
See Table 6.

Figure 14. Percent of TB Cases by Additional TB Risk Factors,* Utah, 2014-2018



* A single case may have more than one risk factor.
LTBI=Latent TB infection; TNF=Tumor necrosis factor; MDR=Multidrug-resistant.
See Table 6.

Figure 15. Percent of Homelessness and Substance Abuse* in TB Cases Ages ≥15 Years, Utah, 2014-2018



* Homelessness and substance abuse in the 12 months prior to TB diagnosis; categories are not mutually exclusive.
See Table 7.

TB by Clinical Information

Primary Reason for TB Evaluation

There are a variety of reasons that bring patients into the health care system resulting in their eventual TB diagnosis. From 2014 to 2018, 64% of the TB cases in Utah had TB symptoms as the primary reason for being evaluated for TB. Abnormal chest x-rays (13% of cases), contact investigations (8%), and incidental lab results (7%) were the next highest reasons for TB evaluation (Figure 15, Table 7). Nationally, these were also the most common primary reasons for TB evaluation in 2018, with 56% of cases having TB symptoms, 20% with abnormal chest x-rays, 11% with incidental lab results, and 4% as a result of a contact investigation (1).

Case Verification

Between 2014 and 2018, 73% of TB cases reported in Utah were confirmed by isolation of *M. tuberculosis* from a laboratory culture. During this time frame, 23% of the cases met the clinical case definition of TB and 2% were verified by provider diagnosis.[‡] Of the remaining cases, 1% each was verified by a positive nucleic acid amplification test or a sputum/tissue smear (Figure 16, Table 7).

The case verification in Utah compares with the following case verification in the United States in 2018: 78% of the cases were confirmed by laboratory culture, 14% by clinical case definition, 4% by provider diagnosis, 3% by positive NAAT, and fewer than 1% by positive smear/tissue (1).

Site of Disease

Although it is widely known as a pulmonary disease, TB can affect other parts of the body, including the lymphatic system, bones and/or joints, the meninges, and the genitourinary system. Between 2014 and 2018, 56% of the reported TB cases in Utah were pulmonary, 13% were pulmonary and extrapulmonary, and 32% were extrapulmonary alone (Figure 17, Table 8).

By comparison, 68% of the TB cases reported in the United States in 2018 were pulmonary, 11% were pulmonary and extrapulmonary, and 20% were extrapulmonary alone (1).

Of the extrapulmonary sites of disease reported in Utah during this five-year period, the most common site was pleura (19%), cervical lymph nodes (17%), eye and/or ear appendages (16%), and bones and/or joints (13%) (Table 8). A TB case may have more than one extrapulmonary site of disease.

Drug Susceptibility Testing and Results

Ensuring patients are given the correct treatment requires a specimen from each culture-confirmed TB case be tested for drug resistance, and the regimen adjusted accordingly. From 2014 to 2018, drug susceptibility testing was completed on 100% of the isolates of TB cases confirmed by laboratory culture. Of these isolates, 14% had resistance to one or more anti-TB medications, 10% had resistance to at least isoniazid (INH), and 4% were resistant to at least INH and rifampin (RIF), i.e., MDR-TB (Table 9). This is consistent with national trends; 9.4% of the reported cases in the United States in 2018 with reported drug susceptibility results were resistant to at least INH and 1.5% were confirmed with MDR-TB (1).

Directly Observed Therapy

Directly observed therapy (DOT) involves the visual observation by a health care provider or other reliable person of a patient's ingestion of medication. Because TB treatment is typically administered for a minimum of six months, DOT is necessary not only to ensure effective therapy and monitor for side effects but also to prevent acquired drug resistance. DOT can be accomplished either in person or by using electronic technologies to monitor patients remotely. In Utah, DOT is usually administered by LHD staff.

DOT figures are reported for the five-year period from 2013 to 2017 as many 2018 patients are still on treatment. During this time frame, 97% of

[‡] Clinical cases are defined as cases that have a positive TB skin test or interferon gamma release assay (IGRA) for *Mycobacterium tuberculosis*, have other signs and symptoms compatible with TB, are treated with two or more anti-TB medications, and have completed a diagnostic evaluation. When patients meet neither the laboratory nor clinical case definition, they may be verified TB cases based on provider diagnosis.

patients treated for TB in Utah had all doses of their medications given by DOT, and <3% completed their treatment utilizing a combination of directly observed and self-administered therapy (Table 10). Reasons for the combination of directly observed and self-administered therapy included patients moving out of state, non-compliance, and private providers not starting patients on DOT treatment. One case had all doses administered by a family member, which is considered self-administered treatment.

The percentage of cases utilizing DOT in Utah is higher than the national average. The most recent national statistics available regarding the percentage of cases given treatment by DOT are from 2016. In that year, 64% of the cases completed treatment using only DOT and 30% utilized both directly observed and self-administered therapy (1).

Completion of Treatment

Of the 150 TB cases reported in Utah between 2013 and 2017, 147 cases started TB treatment. Two cases were reported at death, and one patient did not start treatment as the patient entered hospice shortly after their TB diagnosis. Of the patients who started treatment, 95% completed therapy, 3% died, one patient was uncooperative or refused treatment, and one person moved out of the country (Table 10). Of the five patients who died, two died of causes unrelated to TB disease.

Utah completion of treatment compares with the following 2016 national distribution of completion of treatment reasons: 87% completed treatment, 7% died, 1% was lost, 1% refused, fewer than 1% had adverse events, and 4% unknown (1).

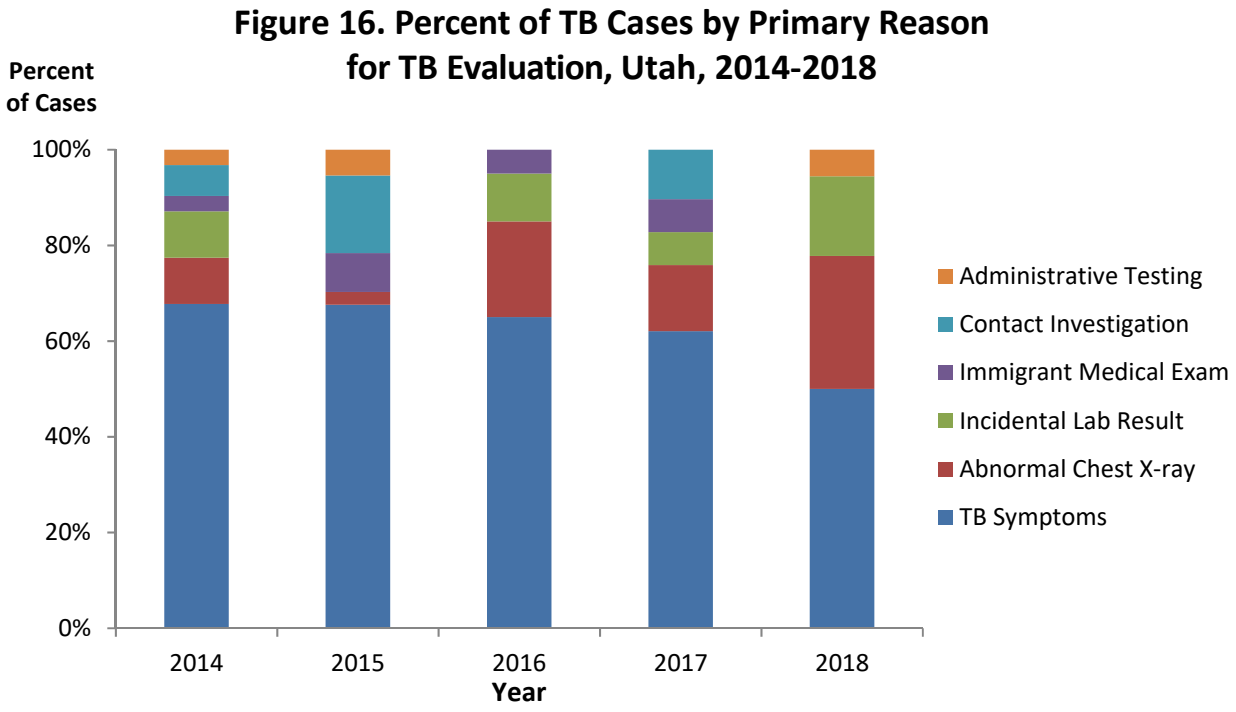
TB Cases, Suspects, and Rule Outs

In addition to managing counted TB cases, the Utah TB Control Program managed non-countable cases, including cases where TB was recurrent (diagnosed within a year of completion of treatment), where the TB diagnosis was reversed, and cases moving to Utah—whether from other states or countries. These interjurisdictional cases were provided TB medications using DOT during their residence in Utah.

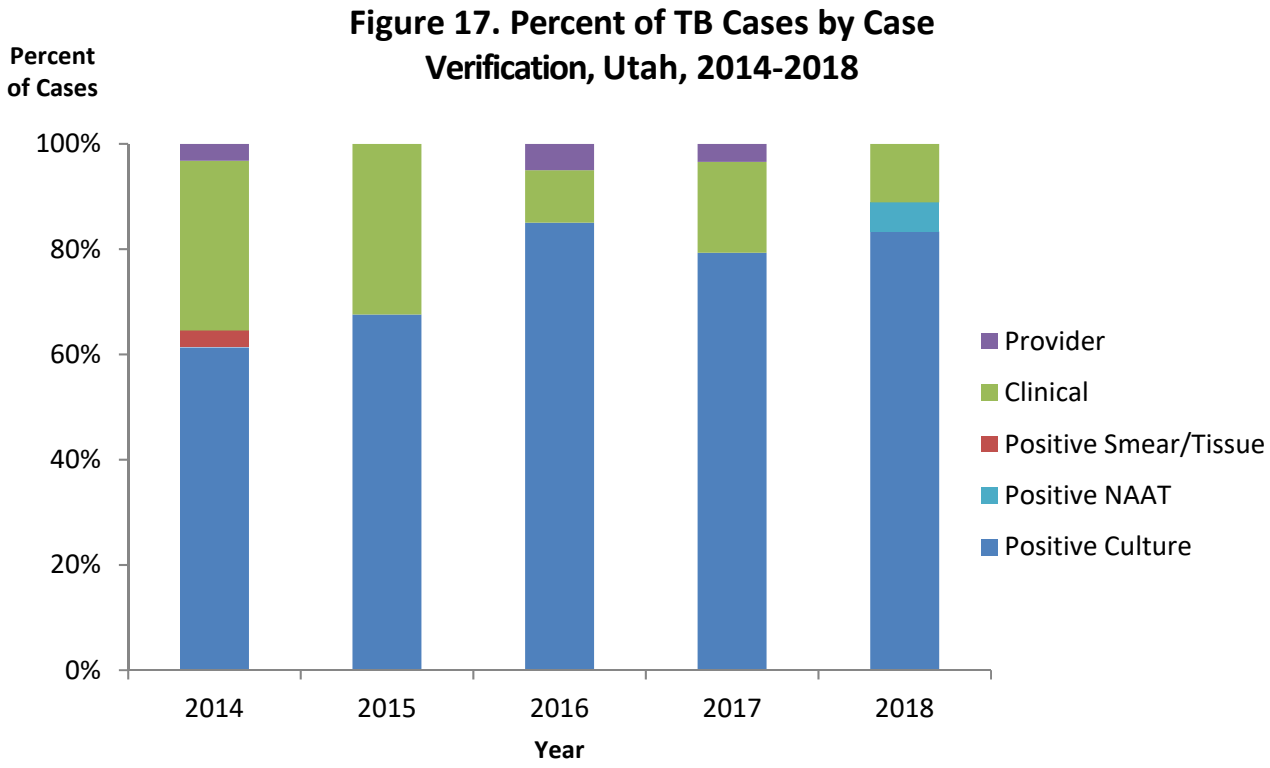
All persons suspected of having TB, including those with a positive acid-fast bacillus (AFB) smear and/or culture laboratory result, were entered into EpiTrax; TB was ruled out for many of these individuals. Mycobacterium other than tuberculosis (MOTT) laboratory results were also entered into EpiTrax, whether the results were a follow-up to a positive AFB culture or a direct rule-out of TB. Additionally, all immigrant and refugee arrivals with an abnormal chest x-ray abroad were also considered to be suspect for TB disease. Each person suspected of having TB was monitored by a public health agency to ensure the completion of a diagnostic evaluation for TB or to ensure an interjurisdictional referral was made for out-of-state suspect or confirmed cases of TB.

Between 2014 and 2018, a total of 1,568 people were reported as either confirmed or suspected of having TB in Utah. During this time frame, 9% (135 of 1,568) of persons suspected of having TB were diagnosed with TB disease and counted as a case in Utah. In addition, the Utah TB Control Program processed laboratory reports for an additional 243 persons where TB was ruled out with the first lab result received. The Program also provided case management for 13 incoming interjurisdictional transfer cases of persons diagnosed with TB disease (Figure 18, Table 11).

It is important for health care providers to consider TB as a possible diagnosis, even if an increase in suspect TB cases also means increased public health resources will be necessary to evaluate suspect cases. Due to its airborne mode of transmission, early detection and treatment of TB is essential to control the spread of the disease and to prevent outbreaks.

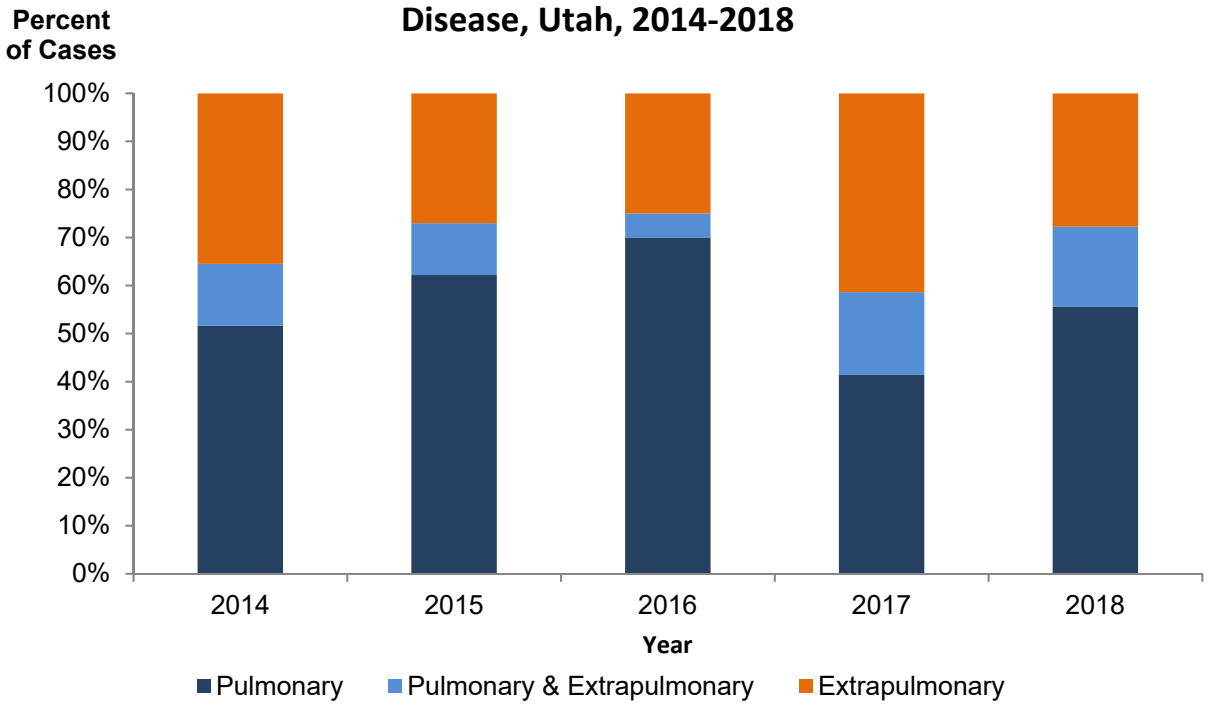


See Table 7.



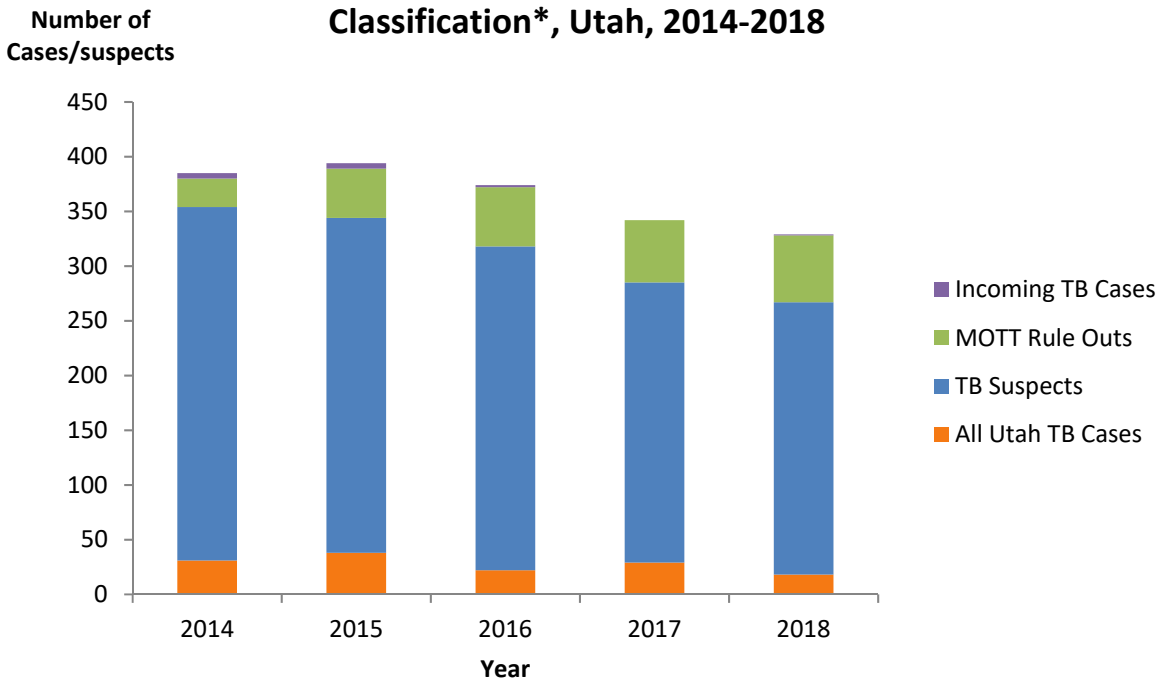
NAAT=Nucleic acid amplification test.
See Table 7.

Figure 18. Percent of TB Cases by Site of Disease, Utah, 2014-2018



See Table 8.

Figure 19. TB Cases and Suspects by Final Classification*, Utah, 2014-2018



*'All Utah TB cases' includes countable and non-countable cases.
MOTT=Mycobacterium other than TB.
See Table 11.

TB Program Evaluation

The CDC sets national TB program objectives and targets to assist TB control programs in evaluating their performance. The UDOH TB Control Program works together with LHDs throughout the state to meet the national targets. This section compares the performance of the Utah TB Control Program from 2014 to 2018 with the 2020 National TB Program Objectives (6). The table on page 20 summarizes the national objectives and Utah's performance.

TB Case Rates

Utah is a low-incidence TB state, and case rates among the populations identified in the national objectives are generally below target rates. Between 2014 and 2018, Utah met the 2020 national target rates for the statewide rate and the rate for U.S.-born persons. Among non-U.S.-born persons, Utah met the target except in 2015 when the rate was 11.4 per 100,000 population, which was slightly above the target rate of 11.1. Utah did not have any cases among U.S.-born people who are non-Hispanic Black/African Americans. Among children ages <5 years, Utah exceeded the target rate from 2014 to 2017, but only had one or two cases each year except in 2015 and 2017, when four and two children ages <5 years, respectively, were diagnosed with TB as part of contact investigations of infectious family members (Table 3).

TB Case Management/Lab Reporting

The most important strategy for TB control is to rapidly diagnose and treat to completion cases of TB disease. The eight national TB objectives related to case management and lab reporting ensure that TB patients are started on an appropriate treatment regimen as soon as possible, are monitored to ensure the regimen is effective, and complete treatment in a timely manner.

The Utah TB Control Program generally met or exceeded the 2015 National TB Program Objective targets, but the targets were all raised for 2020. The Program performed at 100% from 2014 to 2018 for the Known HIV Status, Treatment Initiation, and Drug-susceptibility Result and fell under the target for one out of five years for Sputum Culture Conversion and Universal Genotyping.

From 2014 to 2018, the Program did not meet the target for two of the five years for Completion of Treatment. In 2015, two patients did not complete treatment within 12 months; one refused to finish treatment and the other patient was a clinically-diagnosed patient who was a known contact to an MDR-TB case, requiring extended treatment. In 2016, one patient had treatment extended due to persistent lymph node enlargement.

Recommended Initial Therapy was one of the two objectives where the program did not consistently meet the national target. The objective measures whether patients initiated the 4-drug regimen of isoniazid, rifampin or rifabutin, pyrazinamide, and ethambutol (RIPE). Reasons for cases not starting RIPE included cases where drug resistance was already known or suspected, contacts of cases where the drug susceptibility results of the index case were known, or having medical reasons for not starting with the 4-drug regimen.

Sputum-culture Reported, which measures the percentage of TB patients 12 years or older with pleural or respiratory site of disease who had sputum culture results reported, was the other objective that was not consistently met. Utah cases not meeting the objective were either unable to produce sputum or did not have sputum collected. In the instances where sputum was not collected, one-on-one training was conducted with providers.

Contact Investigations

Conducting contact investigations is the second most important strategy for controlling TB in the United States, and the Utah TB Rule requires contact investigations be conducted by the patient's LHD for all suspected and confirmed cases of infectious TB (3). TB patients are interviewed to determine with whom they have been in contact, and these contacts are evaluated for TB infection and disease. Contacts are at a high risk for being infected with TB; and if recently infected, a contact is at a high risk of progressing from TB infection to TB disease. Therefore, it is critical to identify, evaluate, and treat TB contacts.

The national objectives evaluate program performance on contact investigations of sputum AFB smear-positive TB cases—the most infectious cases. The Utah TB Control Program has consistently met the objective related to the elicitation of contacts, which it did for 100% of cases during the five years. It has not consistently met the national targets for the examination, treatment initiation, and treatment completion of contacts newly diagnosed with TB infection.

In an effort to achieve the national targets, the UDOH TB Control Program selected the treatment initiation and completion of contacts newly diagnosed with TB infection as a focus area for improvement and has encouraged case managers to utilize short-course LTBI treatment regimens for contacts with newly-diagnosed LTBI. In addition, the policy that previously required contact investigations on all TB cases—including extrapulmonary and clinically-diagnosed cases—was changed in 2018 to align with the national guidelines that only require contact investigations for infectious cases. This change will allow LHDs to prioritize contact investigations and conduct them on non-infectious cases as time and resources allow.

Evaluation of Immigrants and Refugees

All refugees and U.S. immigrant visa applicants living outside the United States are required to undergo an overseas medical examination that includes evaluation for TB. Departure to the United States is postponed for persons found to have infectious TB. For persons with overseas abnormal chest x-rays suggestive of TB, follow-up is conducted upon arrival in the United States. The national TB objectives in this section measure whether the evaluation of the newly-arriving refugee or immigrant was initiated and completed within specified time frames, and if found to have latent TB infection, whether treatment was initiated and completed.

National targets were newly set for 2020 for the examination of immigrants and refugees. The Program continues to conduct data quality assurance and has focused this past year to enter missing data into CDC's Electronic Disease Notification (EDN) database on persons who have moved out-of-state. Utah's performance in the National TB Indicators Project database indicates that the state is below the national targets but consistently above the national average for the objectives in this section except for Treatment Initiation, where it was below the national average in 2014 and 2016. The Program will continue to strive to achieve the national targets by 2020.

Data Reporting

The CDC collects data on each case of TB from state and LHDs throughout the United States using the RVCT form. Aggregate data regarding TB contact investigations are reported using the Aggregate Report of Program Evaluation (ARPE) form. Lastly, data regarding the evaluation and treatment of newly-arriving refugees and immigrants with abnormal overseas chest x-rays suggestive of TB is reported using EDN.

Accurate and complete data is needed to determine local as well as national TB trends. Therefore, the national TB objectives include a section on data reporting, and the 2020 national TB objectives newly include a target for EDN data.

The Utah TB Control Program performed at 100% from 2014 to 2017 for RVCT and ARPE data reporting. The Program also met the target for EDN data reporting during this period. The Program will continue to work closely with Utah's LHDs that provide TB case management to collect the necessary information.

2020 National TB Program Objective Status, Utah, 2014-2018

National Objective	2020 Nt'l Target	2014	2015	2016	2017	2018
TB CASE RATES (rate per 100,000 population): Decrease the TB case rate in the following populations to below target rates.						
TB Incidence Rate	1.4	1.1	1.2	0.7	0.9	0.6
US-born persons	0.4	0.1	0.3	0.2	0.2	0.2
Non-US-born persons	11.1	10.7	11.4	6.0	8.1	4.8
US-born non-Hispanic Black/African Americans	1.5	0.0	0.0	0.0	0.0	0.0
Children <5 years of age	0.3	0.8	1.6	0.4	1.2	0.0
TB CASE MANAGEMENT AND TREATMENT (%):						
Known HIV Status: Increase the proportion of TB cases with positive or negative HIV test results reported.	98	100.0	100.0	100.0	100.0	100.0
Treatment Initiation: Increase the proportion of TB patients with positive acid-fast bacillus (AFB) sputum-smear results who initiate treatment within 7 days of specimen collection.	97	100.0	100.0	100.0	100.0	100.0
Recommended Initial Therapy: Increase the proportion of patients who are started on the recommended initial 4-drug regimen when suspected of having TB disease.	97	93.1	91.9	90.0	96.6	94.4
Sputum Culture Result Reported: Increase the proportion of TB cases with a pleural or respiratory site of disease in patients ages 12 years or older that have positive or negative sputum-culture result reported.	98	94.4	95.2	100.0	93.3	92.9
Sputum Culture Conversion: Increase the proportion of TB patients with positive sputum culture results who have documented conversion to sputum culture-negative within 60 days of treatment initiation.	73	66.7	86.7	92.3	75.0	90.0
Completion of Treatment: For patients with newly-diagnosed TB for whom 12 months or less of treatment is indicated, increase the proportion of patients who complete treatment within 12 months.	95	100.0	93.5	94.4	95.8	100.0
LAB REPORTING (%):						
Drug-susceptibility Result: Increase the proportion of culture-positive TB cases with initial drug-susceptibility result reported.	100	100.0	100.0	100.0	100.0	100.0
Universal Genotyping: Increase the proportion of culture-confirmed TB cases with a genotyping result reported.	100	100.0	96.0	100.0	100.0	100.0
CONTACT INVESTIGATIONS (%):						
Contact Elicitation: Increase the proportion of TB patients with positive AFB sputum-smear results who have contacts elicited.	100	100.0	100.0	100.0	100.0	100.0
Examination: Increase the proportion of contacts to sputum AFB smear-positive TB patients who are examined for infection and disease.	93	87.6	91.8	89.9	78.3	100.0
Treatment Initiation: Increase the proportion of contacts to sputum AFB smear-positive TB patients with newly diagnosed latent TB infection (LTBI) who start treatment.	91	73.0	96.8	81.3	75.6	75.0
Treatment Completion: For contacts to sputum AFB smear-positive TB patients who have started treatment for their newly diagnosed LTBI, increase the proportion who complete treatment.	81	80.4	75.4	88.5	82.4	—
EVALUATION OF IMMIGRANTS AND REFUGEES (%):						
Examination Initiation: For immigrants and refugees with abnormal chest x-rays (CXRs) read overseas as consistent with TB, increase the proportion who initiate medical examination within 30 days of notification	84	75.3	73.9	81.7	75.0	73.4
Examination Completion: For immigrants and refugees with abnormal CXRs read overseas as consistent with TB, increase the proportion who complete medical examination within 90 days of notification	76	75.3	83.8	76.0	71.6	77.2
Treatment Initiation: For immigrants and refugees with abnormal CXRs read overseas as consistent with TB and who are diagnosed with LTBI or have radiographic findings consistent with prior pulmonary TB during their examination in the US, increase the proportion who start treatment.	93	36.4	69.7	64.3	76.2	86.4
Treatment Completion: For immigrants and refugees with abnormal CXRs read overseas as consistent with TB, who are diagnosed with LTBI or have radiographic findings consistent with prior pulmonary TB during their examination in the US, and who start treatment, increase the proportion who complete LTBI treatment.	83	83.3	65.2	74.1	—	—
DATA REPORTING (%):						
RVCT: Increase the completeness of each core Report of Verified Case of Tuberculosis (RVCT) data item reported.	100	100.0	100.0	100.0	100.0	—
ARPEs: Increase the completeness of each core Aggregated Reports of Program Evaluation (ARPEs) data items reported.	100	100.0	100.0	100.0	100.0	—
EDN: Increase the completeness of each core Electronic Disease Notification (EDN) system data item reported.	93	94.5	94.4	95.5	93.8	—

Note: '—' =Data not yet available.
Source: CDC National TB Indicators Project.

TABLES

TABLE 1. TB Cases and Rates per 100,000 Population, Utah and United States, 1993-2018

Year	Utah		US
	Cases	Rate	Rate
1993	47	2.5	9.7
1994	56	2.9	9.2
1995	48	2.4	8.5
1996	58	2.8	7.9
1997	36	1.7	7.2
1998	52	2.4	6.6
1999	40	1.8	6.3
2000	49	2.2	5.8
2001	35	1.5	5.6
2002	31	1.3	5.2
2003	39	1.7	5.1
2004	36	1.5	5.0
2005	29	1.2	4.8
2006	34	1.3	4.6
2007	39	1.5	4.4
2008	27	1.0	4.2
2009	37	1.4	3.8
2010	20	0.7	3.6
2011	34	1.2	3.4
2012	37	1.3	3.2
2013	33	1.1	3.0
2014	31	1.1	2.9
2015	37	1.2	3.0
2016	20	0.7	2.9
2017	29	0.9	2.8
2018	18	0.6	2.8

Sources: Utah Cases - Utah Department of Health, Bureau of Epidemiology; US Case Rates - Centers for Disease Control and Prevention (CDC); Population Estimates - National Center for Health Statistics (NCHS) through a collaborative agreement with the U.S. Bureau of the Census.
See Figures 1 and 2.

Table 2. TB Cases, Percentages, and Rates per 100,000 Population by Local Health District*, Sex and Origin of Birth†, Utah, 2014-2018

	2014		2015		2016		2017		2018		2014-2018		
Variable	Cases	%	Cases	%	Cases	%	Cases	%	Cases	%	Cases	%	Rates‡
Local Health District													
Bear River	1	3.2	1	2.7	1	5.0	0	0.0	0	0.0	3	2.2	0.3
Central	1	3.2	0	0.0	0	0.0	0	0.0	0	0.0	1	0.7	0.3
Davis	0	0.0	0	0.0	2	10.0	3	10.3	0	0.0	5	3.7	0.3
Salt Lake	24	77.4	31	83.8	14	70.0	22	75.9	9	50.0	100	74.1	1.8
San Juan	0	0.0	0	0.0	1	5.0	0	0.0	2	11.1	3	2.2	3.9
Southeast	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.0
Southwest	3	9.7	1	2.7	0	0.0	1	3.4	2	11.1	7	5.2	0.6
Summit	0	0.0	0	0.0	0	0.0	0	0.0	1	5.6	1	0.7	0.5
Tooele	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.0
TriCounty	1	3.2	0	0.0	0	0.0	0	0.0	0	0.0	1	0.7	0.3
Utah	0	0.0	2	5.4	1	5.0	3	10.3	2	11.1	8	5.9	0.3
Wasatch	0	0.0	1	2.7	0	0.0	0	0.0	0	0.0	1	0.7	0.7
Weber-Morgan	1	3.2	1	2.7	1	5.0	0	0.0	2	11.1	5	3.7	0.4
Total	31	100.0	37	100.0	20	100.0	29	100.0	18	100.0	135	100.0	0.9
Sex / Origin of Birth													
Male	9	29.0	19	51.4	13	65.0	14	48.3	9	50.0	64	47.4	0.8
Non-U.S.-born	7	77.8	13	68.4	9	69.2	12	85.7	7	77.8	48	75.0	
U.S.-born	2	22.2	6	31.6	4	30.8	2	14.3	2	22.2	16	25.0	
Female	22	71.0	18	48.6	7	35.0	15	51.7	9	50.0	71	52.6	0.9
Non-U.S.-born	20	90.9	15	83.3	6	85.7	10	66.7	6	66.7	57	80.3	
U.S.-born	2	9.1	3	16.7	1	14.3	5	33.3	3	33.3	14	19.7	
Total	31	100.0	37	100.0	20	100.0	29	100.0	18	100.0	135	100.0	0.9

* In 2015, Southeastern Utah District Health Department divided into San Juan Health Department and Southeast Utah Health Department.
† U.S.-born persons were born in the United States, born outside the United States to at least one parent who was a U.S. citizen, or born in a U.S. territory. All other persons are non-U.S.-born.
‡ In low population areas, small case counts can result in high rates; therefore, these rates should be interpreted with caution.
Note: Percentages may not sum to 100 due to rounding.
Source: Cases – Utah Dept of Health, Bureau of Epidemiology, TB Control Pgm; Population Estimates – National Center for Health Statistics (NCHS) through a collaborative agreement with the U.S. Bureau of the Census.
See Figures 3, 4, and 5.

Table 3. TB Cases, Percentages, and Rates per 100,000 Population by Age Group*, Race/Ethnicity and Origin of Birth†, Utah, 2014-2018

	2014		2015		2016		2017		2018		2014-2018		
Variable	Cases	%	Cases	%	Cases	%	Cases	%	Cases	%	Cases	%	Rate
Age Group (in years)													
0-4	2	6.5	4	10.8	1	5.0	3	10.3	0	0.0	10	7.4	0.8
5-14	0	0.0	3	8.1	1	5.0	4	13.8	0	0.0	8	5.9	0.3
15-24	2	6.5	5	13.5	2	10.0	2	6.9	2	11.1	13	9.6	0.5
25-44	11	35.5	11	29.7	4	20.0	11	37.9	7	38.9	44	32.6	1.0
45-64	9	29.0	11	29.7	3	15.0	8	27.6	6	33.3	37	27.4	1.2
>=65	7	22.6	3	8.1	9	45.0	1	3.4	3	16.7	23	17.0	1.4
Total	31	100.0	37	100.0	20	100.0	29	100.0	18	100.0	135	100.0	0.9
Race and Ethnicity‡/Origin of Birth													
AI/AK Native	1	3.2	0	0.0	2	10.0	1	3.4	2	11.1	6	4.4	4.1
Non-U.S.-born	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	
U.S.-born	1	100.0	0	0.0	2	100.0	1	100.0	2	100.0	6	100.0	
Asian	8	25.8	10	32.3	4	20.0	5	17.2	6	33.3	33	24.4	9.1
Non-U.S.-born	8	100.0	9	90.0	4	100.0	5	100.0	6	100.0	32	97.0	
U.S.-born	0	0.0	1	10.0	0	0.0	0	0.0	0	0.0	1	3.0	
Black/African American	4	12.9	4	12.9	1	5.0	2	6.9	2	11.1	13	9.6	7.9
Non-U.S.-born	4	100.0	4	100.0	1	100.0	2	100.0	2	100.0	13	100.0	
U.S.-born	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	
Hispanic	13	41.9	18	58.1	8	40.0	15	51.7	5	27.8	59	43.7	2.8
Non-U.S.-born	12	92.3	12	66.7	7	87.5	11	73.3	4	80.0	46	78.0	
U.S.-born	1	7.7	6	33.3	1	12.5	4	26.7	1	20.0	13	22.0	
NH/PI	0	0.0	1	3.2	3	15.0	4	13.8	1	5.6	9	6.7	6.3
Non-U.S.-born	0	0.0	1	100.0	3	100.0	3	75.0	1	100.0	8	88.9	
U.S.-born	0	0.0	0	0.0	0	0.0	1	25.0	0	0.0	1	11.1	
White	5	16.1	4	12.9	2	10.0	2	6.9	2	11.1	15	11.1	0.1
Non-U.S.-born	3	60.0	2	50.0	0	0.0	1	50.0	0	0.0	6	40.0	
U.S.-born	2	40.0	2	50.0	2	100.0	1	50.0	2	100.0	9	60.0	
Total	31	100.0	31	119.4	20	100.0	29	100.0	18	100.0	135	100.0	0.9

*Age groups were based on age at report.
†U.S.-born persons were born in the United States, born outside the United States to at least one parent who was a U.S. citizen, or born in a U.S. territory (American Samoa, Guam, Commonwealth of the Northern Mariana Islands, Puerto Rico, US Virgin Islands). All other persons are non-U.S.-born.
‡AI/AK Native=American Indian/Alaska Native; NH/PI=Native Hawaiian/Other Pacific Islander; persons of Hispanic ethnicity can be of any race category.
Note: Percentages may not sum to 100 due to rounding.
Source: Cases – Utah Dept of Health, Bureau of Epidemiology, TB Control Pgm; Population Estimates – National Center for Health Statistics (NCHS) through a collaborative agreement with the U.S. Bureau of the Census.
See Figures 6, 7, and 8.

Table 4. TB Cases and Percentages by Origin of Birth and Immigration Status at First Entry to the United States, Utah, 2014-2018

	2014		2015		2016		2017		2018		2014-2018	
Variable	Cases	%	Cases	%	Cases	%	Cases	%	Cases	%	Cases	%
Origin at Birth												
Non-U.S.-born	27	87.1	28	75.7	15	75.0	22	75.9	13	72.2	105	77.8
USB with Foreign Connection	3	9.7	6	16.2	2	10.0	5	17.2	2	11.1	18	13.3
USB without Foreign Connection	1	3.2	3	8.1	3	15.0	2	6.9	3	16.7	12	8.9
Total	31	100.0	37	100.0	20	100.0	29	100.0	18	100.0	135	100.0
Immigration Status at First Entry to the United States												
Asylee or Parolee	1	3.7	0	0.0	0	0.0	0	0.0	0	0.0	1	1.0
Employment Visa	0	0.0	1	3.6	1	7.1	0	0.0	1	7.7	3	3.0
Family/Fiance Visa	0	0.0	0	0.0	0	0.0	1	0.0	0	0.0	1	1.0
Immigrant Visa	10	37.0	9	32.1	4	28.6	8	42.1	7	53.8	38	37.6
Refugee	7	25.9	6	21.4	3	21.4	5	26.3	2	15.4	23	22.8
Student Visa	3	11.1	1	3.6	1	7.1	0	0.0	1	7.7	6	5.9
Tourist Visa	1	3.7	0	0.0	0	0.0	1	5.3	0	0.0	2	2.0
Other Immigration Status†	5	18.5	10	35.7	5	35.7	4	21.1	2	15.4	26	25.7
Refused/Unknown	0	0.0	1	3.6	0	0.0	0	0.0	0	0.0	1	1.0
Total	27	100.0	28	100.0	14	100.0	19	94.7	13	100.0	101	100.0

* U.S.-born persons were born in the United States, born outside the United States to at least one parent who was a U.S. citizen, or born in a U.S. territory (American Samoa, Guam, Commonwealth of the Northern Mariana Islands, Puerto Rico, US Virgin Islands). All other persons are non-U.S.-born.
† Includes (but is not limited to) non-U.S.-born persons who were not required to obtain a visa or persons with no official immigration status.
Note: USB=U.S.-born. Percentages may not sum to 100 due to rounding.
Source: Utah Dept of Health, Bureau of Epidemiology.
See Figures 9 and 12.

Table 5. TB Cases and Percentages by Country of Birth Among Persons Born Outside the United States, Utah, 2014-2018

Country of Birth	Cases	%
Mexico	33	31.1
India	10	9.4
Philippines	7	6.6
Peru	5	4.7
Vietnam	5	4.7
Marshall Islands	4	3.8
Sudan	4	3.8
Myanmar	3	2.8
Somalia	3	2.8
Other*	32	30.2
Total	106	100.0

*Other countries include: Afghanistan, Argentina, Bolivia, Bosnia and Herzegovina, Cambodia, Congo-Democratic Republic of, Cuba, Ecuador, El Salvador, Ethiopia, Guatemala, Indonesia, Iraq, Israel, Kenya, Korea-Republic of, Kuwait, Nepal, Papua New Guinea, Tanzania, Thailand, Tonga, Vanuatu, Venezuela, and Yugoslavia.

Note: Percentages may not sum to 100 due to rounding.

Source: Utah Dept of Health, Bureau of Epidemiology.

See Figure 10 and 11.

Table 6. TB Cases and Percentages by HIV Test Results, Additional Risk Factors, and Residence at Time of Diagnosis, Utah, 2014-2018

	2014		2015		2016		2017		2018		2014-2018	
Variable	Cases	%	Cases	%	Cases	%	Cases	%	Cases	%	Cases	%
HIV Test Results												
Negative	28	90.3	36	97.3	20	100.0	26	89.7	17	94.4	127	94.1
Positive	2	6.5	1	2.7	0	0.0	3	10.3	1	5.6	7	5.2
Indeterminate	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Refused	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Not Offered	1	3.2	0	0.0	0	0.0	0	0.0	0	0.0	1	0.7
Total	31	100.0	37	100.0	20	100.0	29	100.0	18	100.0	135	100.0
Additional Risk Factors*												
Contact to Infectious TB Patient	2	6.5	5	13.5	1	5.0	4	13.8	0	0.0	12	8.9
Contact to MDR Patient	0	0.0	1	2.7	0	0.0	0	0.0	0	0.0	1	0.7
Contact, Missed	0	0.0	0	0.0	1	5.0	0	0.0	0	0.0	1	0.7
Diabetes Mellitus	3	9.7	8	21.6	7	35.0	4	13.8	3	16.7	25	18.5
End Stage Renal Disease	1	3.2	0	0.0	1	5.0	0	0.0	1	5.6	3	2.2
Immunosuppression	2	6.5	1	2.7	0	0.0	1	3.4	1	5.6	5	3.7
Incomplete LTBI Therapy	3	9.7	0	0.0	1	5.0	0	0.0	0	0.0	4	3.0
Post-organ transplantation	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
TNF-α Inhibitors	1	3.2	1	2.7	1	5.0	0	0.0	1	5.6	4	3.0
Other	4	12.9	2	5.4	1	5.0	1	3.4	3	16.7	11	8.1
None	17	54.8	19	51.4	10	50.0	19	65.5	10	55.6	75	55.6
Residence At Time of Diagnosis												
Private Residence	29	93.5	33	89.2	19	95.0	29	100.0	15	83.3	125	92.6
Homeless	0	0.0	2	5.4	0	0.0	0	0.0	2	11.1	4	3.0
Corrections	0	0.0	0	0.0	1	5.0	0	0.0	0	0.0	1	0.7
Long Term Care	1	3.2	0	0.0	0	0.0	0	0.0	0	0.0	1	0.7
Other	1	3.2	2	5.4	0	0.0	0	0.0	1	5.6	4	3.0
Total	31	100.0	37	100.0	20	100.0	29	100.0	18	100.0	135	100.0

*A single case may have more than one risk factor. MDR=Multidrug resistant; LTBI=Latent TB infection; TNF=Tumor necrosis factor.

Note: Percentages may not sum to 100 due to rounding.

Source: Utah Dept of Health, Bureau of Epidemiology.

See Figures 13 and 14.

Table 7. TB Cases and Percentages by Adult Homelessness and Substance Abuse, Primary Reason for TB Evaluation, and Case Verification, Utah, 2014-2018

	2014		2015		2016		2017		2018		2014-2018	
Variable	Cases	%	Cases	%	Cases	%	Cases	%	Cases	%	Cases	%
Adult Homelessness and Substance Abuse*												
Homelessness	1	3.4	2	6.7	1	5.6	0	0.0	2	11.1	6	5.1
Injection Drug Use	0	0.0	0	0.0	0	0.0	0	0.0	1	5.6	1	0.9
Non-injection Drug Use	0	0.0	0	0.0	0	0.0	0	0.0	2	11.1	2	1.7
Excess Alcohol Use	0	0.0	4	13.3	1	5.6	1	4.5	5	27.8	11	9.4
Total Number of Cases ≥15 years	29	N/A	30	N/A	18	N/A	22	N/A	18	N/A	117	N/A
Primary Reason for TB Evaluation												
TB Symptoms	21	67.7	25	67.6	13	65.0	18	62.1	9	50.0	86	63.7
Abnormal Chest X-ray	3	9.7	1	2.7	4	20.0	4	13.8	5	27.8	17	12.6
Incidental Lab Result	3	9.7	0	0.0	2	10.0	2	6.9	3	16.7	10	7.4
Immigrant Medical Exam	1	3.2	3	8.1	1	5.0	2	6.9	0	0.0	7	5.2
Contact Investigation	2	6.5	6	16.2	0	0.0	3	10.3	0	0.0	11	8.1
Administrative Testing	1	3.2	2	5.4	0	0.0	0	0.0	1	5.6	4	3.0
Health Care Worker	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Targeted Testing	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total	31	100.0	37	100.0	20	100.0	29	100.0	18	100.0	135	100.0
Case Verification												
Positive Culture	19	61.3	25	67.6	17	85.0	23	79.3	15	83.3	99	73.3
Positive NAAT†	0	0.0	0	0.0	0	0.0	0	0.0	1	5.6	1	0.7
Positive Smear/Tissue	1	3.2	0	0.0	0	0.0	0	0.0	0	0.0	1	0.7
Clinical	10	32.3	12	32.4	2	10.0	5	17.2	2	11.1	31	23.0
Provider Diagnosis	1	3.2	0	0.0	1	5.0	1	3.4	0	0.0	3	2.2
Total	31	100.0	37	100.0	20	100.0	29	100.0	18	100.0	135	100.0

*Homelessness and substance abuse in the 12 months prior to TB diagnosis; categories are not mutually exclusive.

†NAAT=Nucleic acid amplification test.

Note: Percentages may not sum to 100 due to rounding.

Source: Utah Dept of Health, Bureau of Epidemiology.

See Figures 15, 16, and 17.

Table 8. TB Cases and Percentages by Site of Disease and Extrapulmonary Sites of Disease, Utah, 2014-2018

	2014		2015		2016		2017		2018		2014-2018	
Variable	Cases	%	Cases	%	Cases	%	Cases	%	Cases	%	Cases	%
Site of Disease												
Pulmonary	16	51.6	23	62.2	14	70.0	12	41.4	10	55.6	75	55.6
Pulmonary and Extrapulmonary	4	12.9	4	10.8	1	5.0	5	17.2	3	16.7	17	12.6
Extrapulmonary	11	35.5	10	27.0	5	25.0	12	41.4	5	27.8	43	31.9
Total	31	100.0	37	100.0	20	100.0	29	100.0	18	100.0	135	100.0
Extrapulmonary Sites of Disease*												
Pleural	2	11.8	2	12.5	3	42.9	4	20.0	2	20.0	13	18.6
Lymph Cervical	2	11.8	2	12.5	1	14.3	6	30.0	1	10.0	12	17.1
Lymph Axillary	1	5.9	0	0.0	0	0.0	3	15.0	0	0.0	4	5.7
Lymph Intrathoracic	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Lymph Other	0	0.0	2	12.5	1	14.3	0	0.0	0	0.0	3	4.3
Bone and/or Joint	2	11.8	3	18.8	0	0.0	2	10.0	2	20.0	9	12.9
Genitourinary	2	11.8	1	6.3	0	0.0	0	0.0	0	0.0	3	4.3
Meningeal	3	17.6	1	6.3	0	0.0	1	5.0	1	10.0	6	8.6
Peritoneal	0	0.0	0	0.0	0	0.0	1	5.0	2	20.0	3	4.3
Laryngeal	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Eye and Ear Appendages	4	23.5	3	18.8	1	14.3	2	10.0	1	10.0	11	15.7
Other†	1	5.9	2	12.5	1	14.3	1	5.0	1	10.0	6	8.6
Total Extrapulmonary Sites	17	100.0	16	100.0	7	100.0	20	100.0	10	100.0	70	100.0

*A case may have more than one extrapulmonary site of disease.
†Other sites of diseases included: brain, breast, colon, ear and mastoid cells, liver, pericardium, spleen, subcutaneous tissue, tongue, and other sites of disease.
Note: Cases were classified by count date. Percentages may not sum to 100 due to rounding.
Source: Utah Dept of Health, Bureau of Epidemiology.
See Figure 18.

Table 9. Culture-positive TB Cases and Percentages by Drug Susceptibility Testing (DST) and Results, Utah, 2014-2018

Year	Culture Positive Cases	Cases with DST Results		Resistance*					
				>= 1 Drug		At Least INH		At Least INH & RIF	
		Cases	%	No.	%	No.	%	No.	%
2014	19	19	100.0	2	10.5	1	5.3	1	5.3
2015	25	25	100.0	5	20.0	4	16.0	1	4.0
2016	17	17	100.0	3	17.6	2	11.8	1	5.9
2017	23	23	100.0	2	8.7	1	4.3	0	0.0
2018	15	15	100.0	2	13.3	2	13.3	1	6.7
Total	99	99	100.0	14	14.1	10	10.1	4	4.0

*A single case can be reported in more than one category.
Note: Percentages may not sum to 100 due to rounding.
Source: Utah Dept of Health, Bureau of Epidemiology.

Table 10. TB Cases and Percentages by Directly Observed Therapy (DOT) and Completion of Treatment Status, Utah, 2013-2017

	2013		2014		2015		2016		2017		2013-2017	
Variable	Cases	%	Cases	%	Cases	%	Cases	%	Cases	%	Cases	%
Reported Cases	33		31		37		20		29		150	
Cases Starting Treatment	32		29		37		20		29		147	
Directly Observed Therapy (DOT)												
DOT	30	93.8	29	100.0	37	100.0	19	95.0	27	93.1	142	96.6
DOT & Self-administered	1	3.1	0	0.0	0	0.0	1	5.0	2	6.9	4	2.7
Self-administered	1	3.1	0	0.0	0	0.0	0	0.0	0	0.0	1	0.7
Total Number of Cases Treated	32	100.0	29	100.0	37	100.0	20	100.0	29	100.0	147	100.0
Completion of Treatment												
Completed	31	96.9	27	93.1	35	94.6	19	95.0	28	96.6	140	95.2
Died	1	3.1	2	6.9	1	2.7	0	0.0	1	3.4	5	3.4
Uncooperative or Refused	0	0.0	0	0.0	1	2.7	0	0.0	0	0.0	1	0.7
Adverse Event	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Lost	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Refused	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Other	0	0.0	0	0.0	0	0.0	1	5.0	0	0.0	1	0.7
Still on Treatment	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total	32	100.0	29	100.0	37	100.0	20	100.0	29	100.0	147	100.0

Note: Percentages may not sum to 100 due to rounding.
Source: Utah Dept of Health, Bureau of Epidemiology.

Table 11. TB Cases, Suspects, and Rule Outs by Final Classification, Utah, 2014-2018

Case / Suspect Category*	2014	2015	2016	2017	2018	2014-2018
TB Cases, Utah						
Counted	31	37	20	29	18	135
Noncountable: Recurrent TB	0	0	0	0	0	0
Noncountable: TB Diagnosis Reversed	0	1	2	0	0	3
Subtotal	31	38	22	29	18	138
TB Suspects, Evaluated in Utah						
TB Suspects: LTBI	50	47	47	47	33	224
TB Suspect: MOTT	145	122	121	85	115	588
TB Suspects: Not TB	109	123	116	104	89	541
TB Suspects: Out of State TB Cases	3	2	0	5	2	12
TB Suspects: Out of State TB Suspects	16	12	12	15	10	65
Subtotal	323	306	296	256	249	1,430
Total Cases and Suspects	354	344	318	285	267	1,568
MOTT: Rule Outs						
Total MOTT Rule Out	26	45	54	57	61	243
TB Cases, Interjurisdictional						
Burden: Transfer In, Interstate	4	4	2	0	1	11
Burden: Transfer In, Foreign	1	1	0	0	0	2
Total Burden Cases	5	5	2	0	1	13
Grand Total	385	394	374	342	329	1,824

*LTBI=Latent TB infection; MOTT=Mycobacterium other than tuberculosis.

Note: TB cases were classified by count date.

Source: Utah Department of Health, Bureau of Epidemiology.

See Figure 19.

References

1. CDC. Reported Tuberculosis in the United States, 2018.
https://www.cdc.gov/tb/statistics/reports/2018/default.htm

2. Utah Administrative Code. R386-702 Communicable Disease Rule.
https://rules.utah.gov/publicat/code/r386/r386-702.htm.

3. Utah Administrative Code. R388-804 Special Measures for the Control of Tuberculosis.
https://rules.utah.gov/publicat/code/r388/r388-804.htm.

4. CDC. Report of Verified Case of Tuberculosis (RVCT) form.
https://www.cdc.gov/tb/programs/rvct/RVCT-form.pdf.

5. US Department of Health and Human Services, Office of Disease Prevention and Health Promotion. Healthy People 2020 Immunization and Infectious Disease Objectives.
https://www.healthypeople.gov/2020/topics-objectives/topic/immunization-and-infectious-diseases/objectives

6. CDC. National TB Program Objectives and Performance Targets for 2020.
https://www.cdc.gov/tb/programs/evaluation/indicators/default.htm.