

**TUBERCULOSIS
IN
UTAH
2011-2015**

August 2016



UTAH DEPARTMENT OF
HEALTH
Bureau of Epidemiology

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.

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Report Highlights

- **Case counts and rates:** From 2011-2015, Utah had an average of 34 cases of tuberculosis (TB) disease per year, resulting in a case rate of 1.2 per 100,000 population. This compares with the national TB rate in 2015 of 3.0 cases per 100,000 population (CDC. *Leveling of Tuberculosis Incidence – United States, 2013-2015, 2015*).
- **Jurisdiction:** During the five-year period from 2011-2015, 12 of Utah’s 13 local health districts had at least one case of TB reported. Salt Lake County Health District accounted for 68% of the cases.
- **Age Groups:** From 2011-2015, adults ≥65 years in Utah had the highest TB case rate at 2.2 per 100,000 population. Fifteen children <15 years were diagnosed with TB during this period, nine of whom were contacts to adults with infectious TB disease - including one child who is being 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 from 2011-2015:

RACE/ETHNICITY	RATE/100,000 POPULATION
Asians	15.1
Blacks/African Americans	13.4
American Indians/Alaska Natives	5.7
Native Hawaiians/Other Pacific Islanders	5.4
Hispanics	3.3
Whites	0.2

- **Country of Birth:** From 2011-2015, 77% of Utah’s TB cases were among foreign-born persons, and 1% were among persons born in a US-affiliated island. In addition, US-born persons with a foreign connection accounted for 10% of the cases.¹
- **Drug Susceptibility Testing and Results:** During the five-year period 2011-2015, drug susceptibility testing was completed on 100% of the isolates of TB cases confirmed by laboratory culture. Of these isolates, 13% had resistance to one or more anti-TB medications, and 3% were multidrug-resistant TB (MDR-TB).
- **Directly Observed Therapy (DOT) Status:** Due to the prolonged treatment period, not all 2015 TB cases have completed treatment. During the five-year period 2010-2014, 91% 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:** Beginning in 2011, all persons suspected of having TB, in addition to cases, were entered into Utah’s disease reporting and surveillance system. From 2011 to 2015, a total of 1,720 persons were reported as either a confirmed or suspected case of TB, and 10% of persons suspected of having TB were diagnosed with TB disease and counted as a Utah TB case.

¹ Persons with foreign connections included individuals who had lived in countries with a high incidence of TB or US-born children who were contacts of foreign-born cases, had foreign-born parents, or were born abroad to at least one parent who was a US citizen.

Introduction

Tuberculosis (TB), like many other infectious diseases, is a challenge to control. Some of the obstacles include its airborne mode of transmission, failure of providers to “think TB” as morbidity declines, elevated rates in certain racial/ethnic groups and foreign-born persons, and its prolonged treatment regimen of six months or more.

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 that persons suspected of having TB are thoroughly evaluated and started on TB treatment, if 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 that treatment for patients with TB disease be administered using directly observed therapy (DOT). The TB Rule also requires that contact investigations be conducted for all confirmed TB patients and for persons suspected of having TB who may be infectious.³

Tuberculosis in Utah, 2011-2015, is a five-year statistical review of TB in Utah from 2011 to 2015. 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 to the 2015 national TB Program objectives and targets. Finally, the Tables section includes the data upon which the charts in the main section are based.

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

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

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) form⁴. The cases in this report are classified by the RVCT Count Date.

Both countable and noncountable TB cases, along with data regarding persons suspected of having TB, are entered into the Utah National Electronic Disease Surveillance System (UT-NEDSS), a secure statewide disease surveillance system; this database is the source for much of the data provided in this report. Noncountable cases include cases where TB patients from other jurisdictions move into the state, where TB is recurrent (diagnosed within a year of completion of previous TB treatment), or when the TB diagnosis is reversed. All sections with the exception of the section on TB Cases, Suspects, and Rule Outs refer to Utah’s countable cases.

Tuberculosis in Utah, 2011-2015 includes rates calculated using population estimates published in the UDOH Indicator-based Information System for Public Health for the years 2011 through 2014 and unpublished estimates for 2015. 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 to 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. Due to the prolonged nature of treatment, TB cases are counted in the jurisdiction where the patient first resided for at least 90 days.

In March 2015, a 13th local health department was formed in Utah. Southeastern Utah District Health Department, which had served Carbon, Emery, Grand, and San Juan counties, was divided into San Juan Public Health and Southeast Utah Health Department. Data in this report divides morbidity using this new public health structure in the state.

⁴ Centers for Disease Control and Prevention Report of Verified Case of Tuberculosis (RVCT) form. <http://www.cdc.gov/tb/programs/rvct/RVCT-form.pdf>.

Tuberculosis (TB) by Jurisdiction

Cases in Utah

Tuberculosis (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 Centers for Disease Control and Prevention (CDC), Division of TB Elimination (DTBE) using the Report of Verified Case of Tuberculosis (RVCT) form. The cases in *Tuberculosis in Utah, 2011-2015*, are classified by the RVCT Count Date.

In 2015, 37 cases of TB disease were reported in Utah. For the five-year period from 2011 to 2015, Utah had an average of 34 cases of TB reported per year (Figure 1, Table 1).

The TB case count in Utah has fluctuated since 1993. From 1993 to 2015, Utah had an average of 38 cases of TB reported per year (Figure 1, Table 1). Despite the periodic increases, there was a general declining trend in the number of reported TB cases in Utah during this time period.

Rates in Utah and the United States

In 2015, the TB rate in Utah was 1.2 cases per 100,000 population. For the five-year period from 2011 to 2015, Utah had an average TB rate of 1.2 cases per 100,000 population (Figure 2, Table 1).

From 1993 to 2015, Utah's TB rate was, on average, about one-third of the national rate. The US TB rate in 2015 was 3.0 cases per 100,000 population (CDC. *Leveling of Tuberculosis Incidence – United States, 2013-2015*) (Figure 2, Table 1). Utah achieved the Healthy People 2020 goal of reducing the TB incidence rate to 1.0 case per 100,000 population or less in 2010.⁵

Local Health Districts

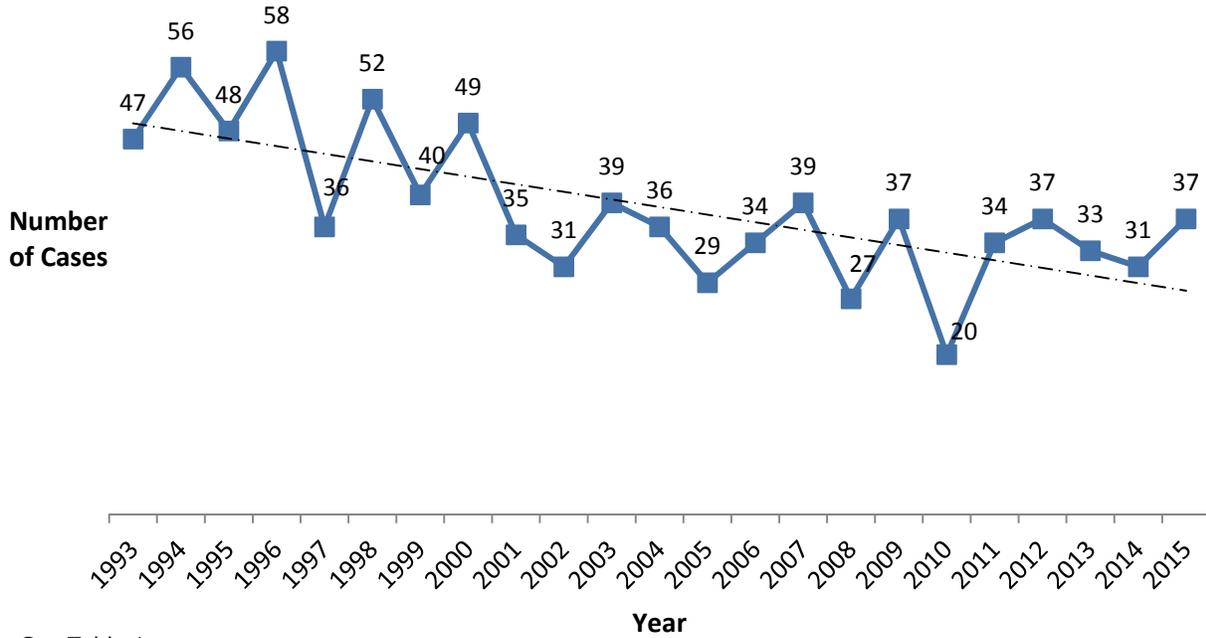
The majority of TB morbidity in Utah occurs in the Salt Lake County Health District. In 2015, this district accounted for 84% of the reported TB cases in the state. For the rest of the state, one district had two cases, four districts had one case each, and seven districts did not have a TB case in 2015 (Figure 3, Table 2).

From 2011 to 2015, Salt Lake County Health District accounted for 68% of the state's TB cases. The next highest district was Weber-Morgan Health District with 7% of the cases (Figure 3, Table 2). San Juan Public Health and Salt Lake County Health Districts had the highest case rates in Utah (Figure 4, Table 2).

The Utah Department of Health (UDOH) TB Control Program works closely with local health partners to provide resources and expertise to ensure that TB cases are treated to completion. Twelve of the 13 local health districts had at least one case of TB in the past five years; only Tooele County Health District had zero cases during this time period. With TB morbidity widely distributed throughout the state, involving rural as well as urban areas, there was concern regarding the possibility of TB cases being missed. In 2011, the UDOH TB Control Program initiated an active surveillance project where case reviews at local hospitals were conducted in participating jurisdictions. This project was completed in February 2012. Although no unreported cases of TB were identified, the project provided an opportunity to raise awareness of the need to "Think TB" and to open lines of communication among participating hospitals and the UDOH TB Control Program.

⁵ Healthy People 2020 [Immunization and Infectious Disease Objectives](http://www.healthypeople.gov/2020/topicsobjectives2020/objectiveslist.aspx?topicId=23).
<http://www.healthypeople.gov/2020/topicsobjectives2020/objectiveslist.aspx?topicId=23>.

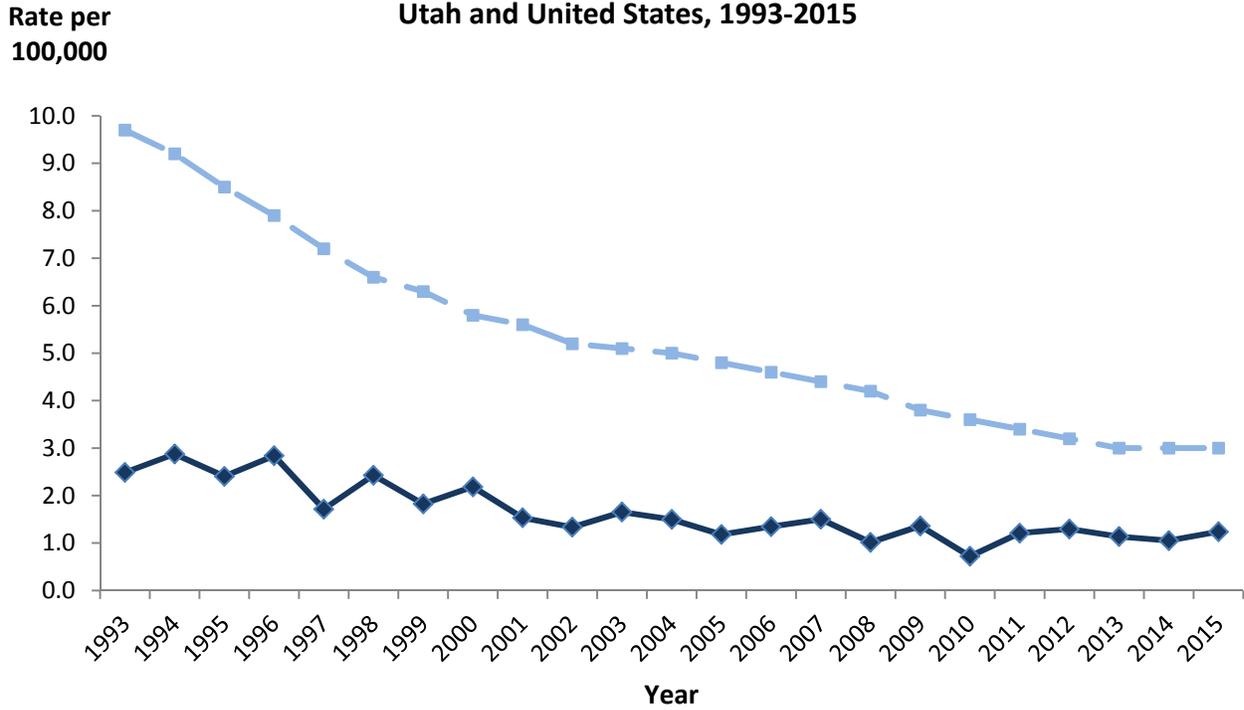
Figure 1. Reported TB Cases, Utah, 1993-2015



See Table 1.

■ Number of Cases - - - Trendline

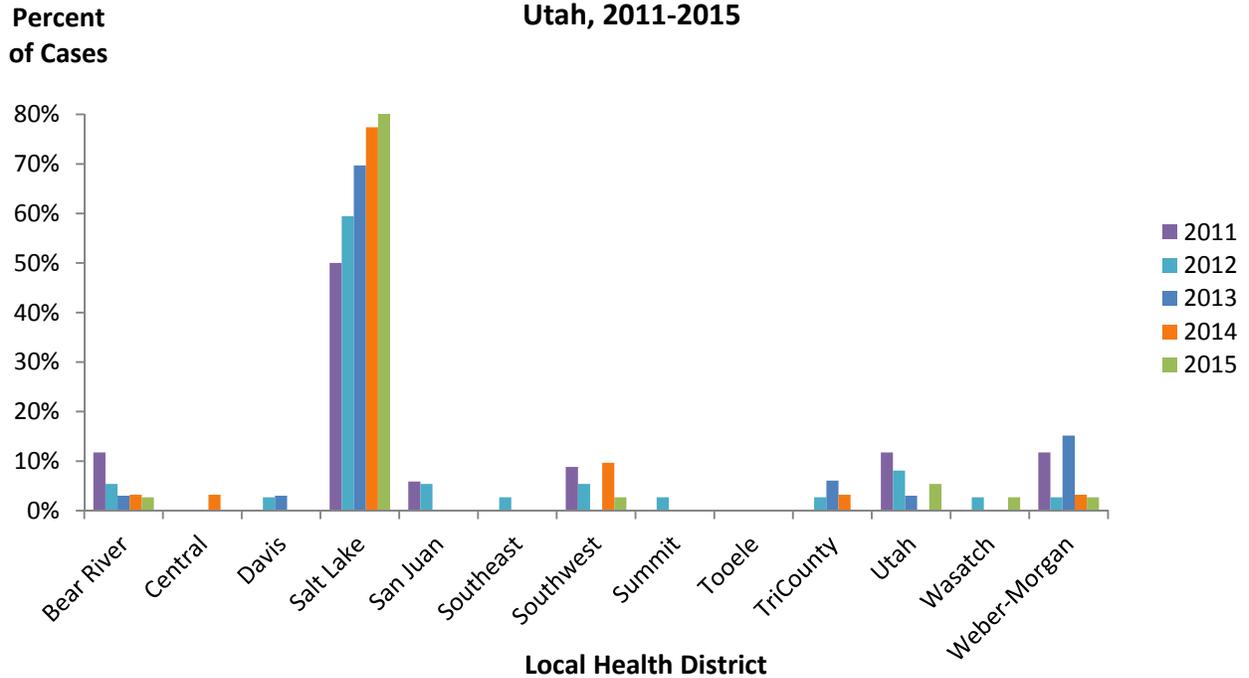
Figure 2. TB Rates per 100,000 Population, Utah and United States, 1993-2015



See Table 1.

◆ Utah □ US

Figure 3. Percent of TB Cases by Local Health District, Utah, 2011-2015



See Table 2.

Figure 4. TB Rates per 100,000 Population by Local Health District, Utah, 2011-2015



See Table 2.

Tuberculosis (TB) by Demographic Data

Sex

From 2011 to 2014, there was a steady increase in the percentage of TB cases among females in Utah – from 38% in 2011 to 71% in 2014; and the increase occurred among foreign-born women (Figure 5, Table 2). However, in 2015 and considering the five-year period overall, the number of female cases was about the same as men. In contrast, the distribution of TB cases in the United States in 2014 (the most recent year for which detailed national data are available) showed that 62% of the cases where sex was known were male and 38% were females. (CDC. *Reported Tuberculosis in the United States, 2014*).

Age

From 2011 to 2015, adults aged 65 and older had the highest TB rate in Utah at 2.2 cases per 100,000 population. The next highest rates were reported in adults aged 25 to 44 years and 45 to 64 years, both at 1.6 cases per 100,000 population. The lowest rate was reported among children 5 to 14 years at 0.2 cases per 100,000 population (Table 3).

Over this five-year period, the distribution of TB cases reported in Utah by age group was as follows: 6% of the cases were 0-4 years of age; 3% of the cases were 5-14 years; 10% were 15-24 years of age; 37% were 25-44 years of age; 26% were 45-64 years of age; and 18% were 65 years of age and older (Figure 6, Table 3). This compares to the following 2014 distribution of TB cases reported in the United States: 3% were 0-4 years of age; 2% were 5-14 years; 10% were 15-24 years of age; 30% were 25-44 years of age; 31% were 45-64 years of age; and 24% were 65 years of age and older. (CDC. *Reported Tuberculosis in the United States, 2014*).

Children

From 2011 to 2015, 9% of TB morbidity in Utah was among pediatric cases younger than 15 years of age (Figure 6, Table 3). Of the pediatric cases, 60% (9 of 15) were contacts to adults with infectious TB disease. One of these children is being treated as the first pediatric multidrug resistant TB (MDR-TB) case in Utah, which is extremely challenging since most of the medications 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 six children were either recent arrivals to the United States, were US-born children of foreign-born parents, and/or had lived in a country with a high incidence of TB (Figure 6).

Race/Ethnicity

From 2011 to 2015, Asians and Black/African Americans had the highest TB rates in Utah with 15.1 and 13.4 cases per 100,000 population, respectively. The next highest rates were reported among American Indian/Alaska Natives and Native Hawaiian/Other Pacific Islanders with rates of 5.7 and 5.4 cases per 100,000 population, respectively. Persons of Hispanic ethnicity had a TB rate of 3.3 cases per 100,000 population, and Whites had the lowest rate at 0.2 cases per 100,000 population (Figure 7, Table 3).

Hispanics had the largest percentage of cases during this time frame at 38%; Asians had the second highest percentage at 28%. During this period, 90% or more of the Asian and Black/African American cases were foreign-born (Figure 8, Table 3).

Nationally, Asians had the highest TB rate in 2014 at 17.8 cases per 100,000 population, followed by Native Hawaiian/Pacific Islanders at 16.9. Asians were the racial and ethnic group with the largest percentage of cases in the United States in 2014 with 32% of the cases,

followed by Hispanics at 29%. (CDC. *Reported Tuberculosis in the United States, 2014*).

Country of Origin

From 2011 to 2015, foreign-born persons accounted for 77% of the TB cases, and persons born in a US-affiliated island (UAI)⁶ accounted for 1% of the cases. US-born persons with a foreign connection accounted for 10% of the cases (Figure 9, Table 4). Persons with foreign connections included individuals who had lived in countries with a high incidence of TB, US-born children who were contacts of foreign-born cases, or US-born cases with foreign-born parents.

In the United States in 2014, 66% of all TB cases occurred in foreign-born persons. Utah ranked 2nd out of 50 states for its percentage of TB cases that were among foreign-born persons. (CDC. *Reported Tuberculosis in the United States, 2014*). These numbers show the importance of effectively screening and treating individuals from high TB prevalence areas.

Immigration Status at First Entry among Foreign-born Persons

Among foreign-born TB cases in Utah from 2011 to 2015, 38% had immigration visas upon first entry into the United States, 24% were refugees, 8% had student visas, 4% had employment visas, 1% were asylees/parolees, 1% had tourist visas, and 23% had other immigration status⁷ (Figure 10, Table 4). This compares to the following 2014 distribution of immigration status among foreign-born TB cases reported in the United States: 24% had immigrant visas; 6% were refugees; 3% had family/fiancé visas; 2% each had student, employment, or tourist visas; less than 1% were asylee/parolees; 24% had other immigration status; and 27% had an unknown

or missing immigration status. (CDC. *Reported Tuberculosis in the United States, 2014*).

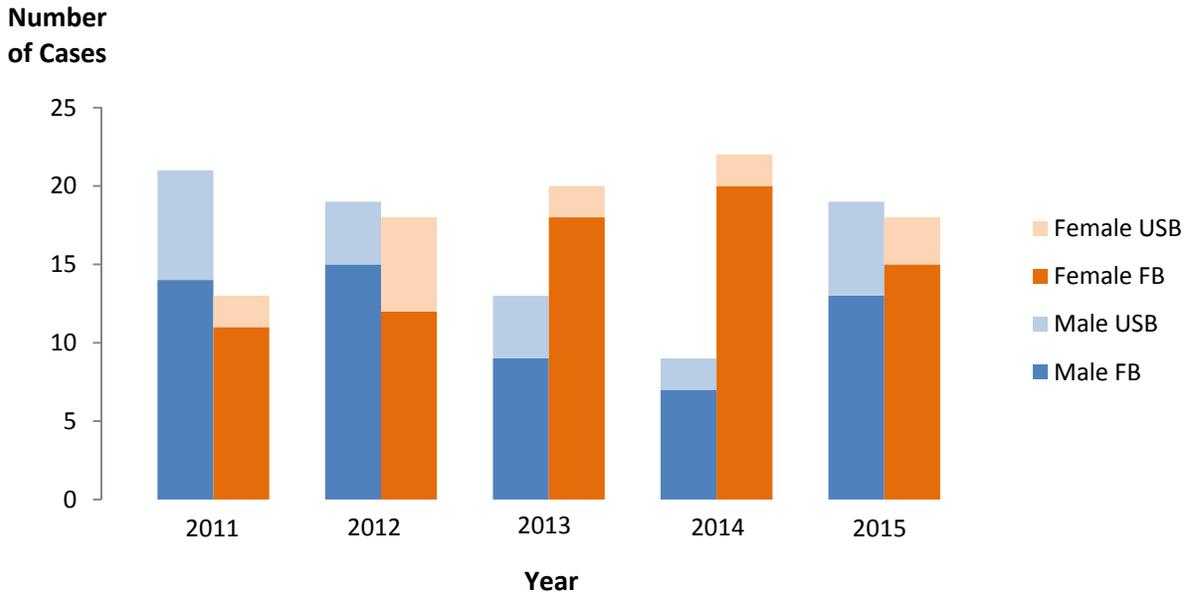
Country of Birth

The distribution of the countries of birth among foreign-born persons reported with TB in Utah from 2011 to 2015 illustrates the truly global nature of the disease. The top six countries - Mexico, India, Peru, the Philippines, Burma, and Somalia - span four continents and accounted for 62% of the total number of foreign-born cases. The top 12 countries accounted for 78% of the total number of foreign-born cases. Persons from 25 different countries each accounted for less than two percent of the total, but together accounted for 22% of foreign-born persons reported with TB in Utah (Figure 11, Table 5).

⁶ The UAIs include American Samoa, the Federated States of Micronesia, Guam, the Republic of the Marshall Islands, Midway Island, the Commonwealth of the Northern Mariana Islands, Puerto Rico, the Republic of Palau, the US Virgin Islands, and US minor and outlying Pacific Islands.

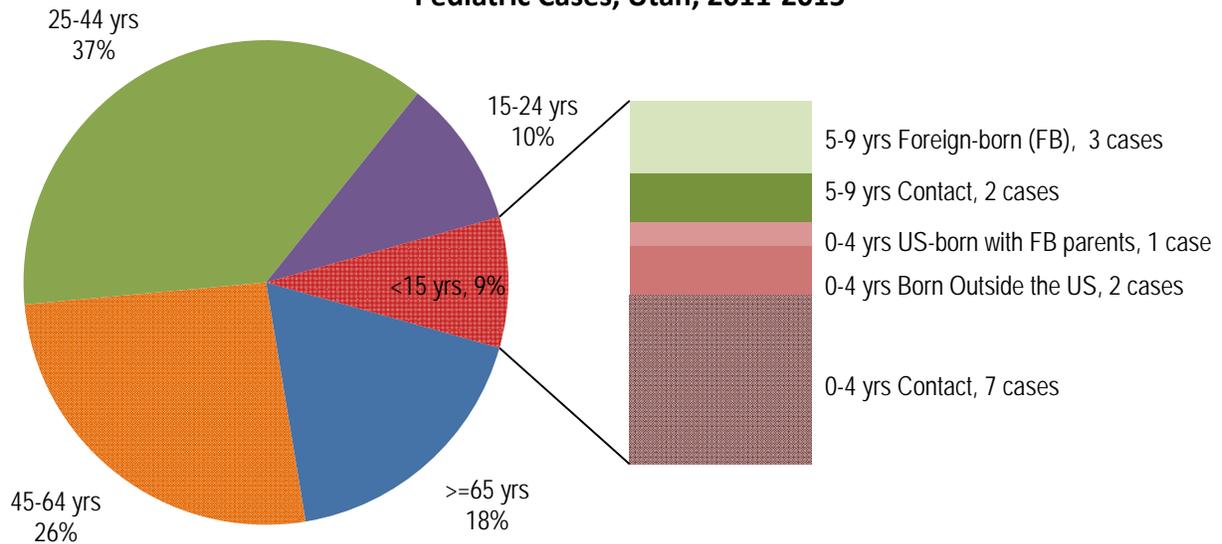
⁷ Other immigration status includes (but is not limited to) foreign-born persons who were not required to obtain a visa or persons with no official immigration status.

Figure 5. TB Cases by Sex and Origin*, Utah, 2011-2015



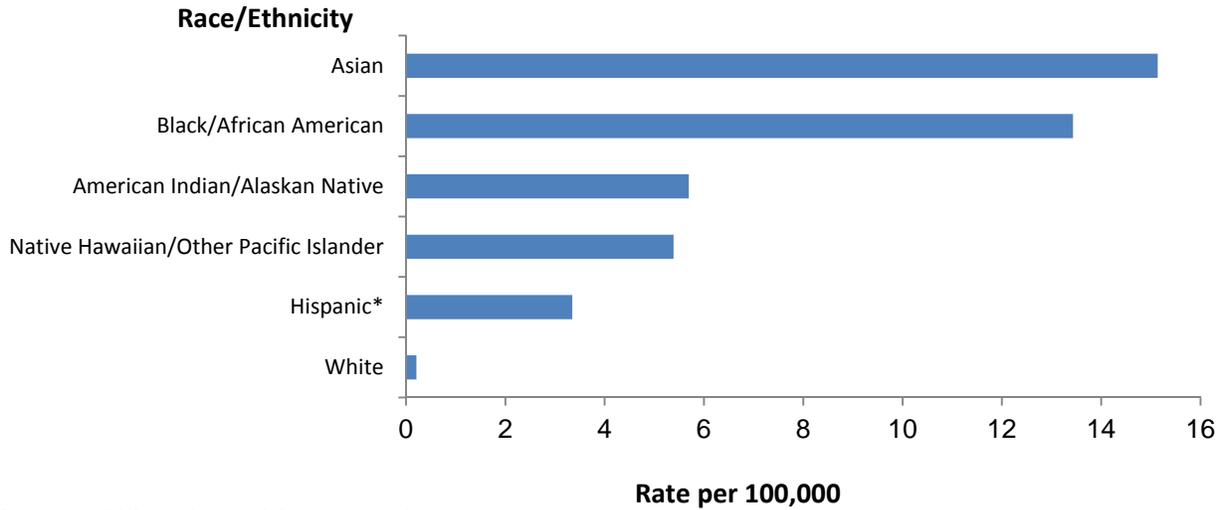
* FB=Foreign-born; USB=US-born. US-born persons were born in the United States, a US-affiliated Island (UAI), or born outside the US to at least one parent who was a US citizen. The UAIs include American Samoa, the Federated States of Micronesia, Guam, the Republic of the Marshall Islands, Midway Island, the Commonwealth of the Northern Mariana Islands, Puerto Rico, the Republic of Palau, the US Virgin Islands, and US minor and outlying Pacific Islands. See Table 2.

Figure 6. Percent of TB Cases by Age Group and Characteristics of Pediatric Cases, Utah, 2011-2015



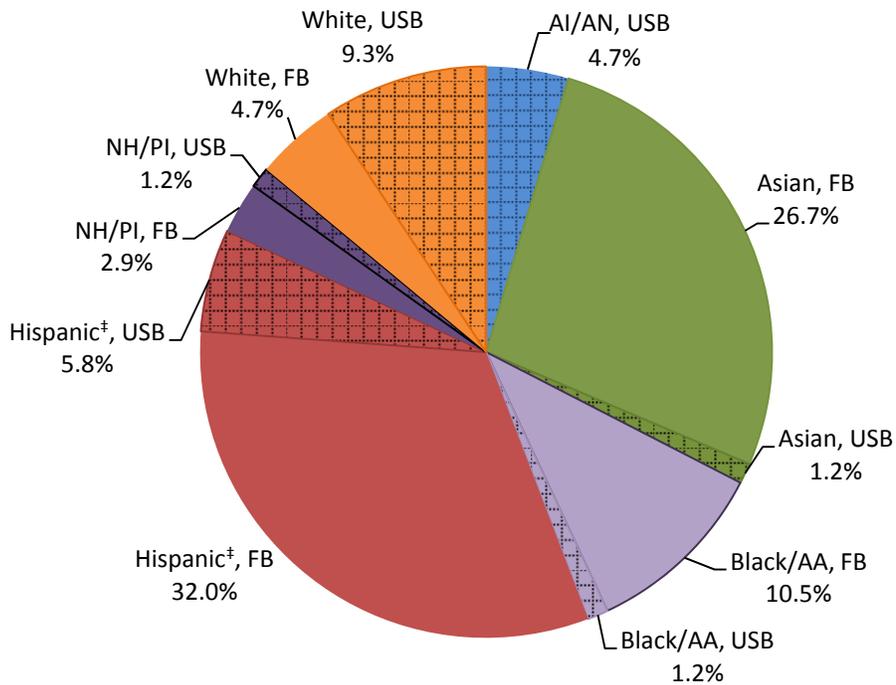
See Table 3.

Figure 7. TB Rates per 100,000 Population by Race/Ethnicity, Utah, 2011-2015



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

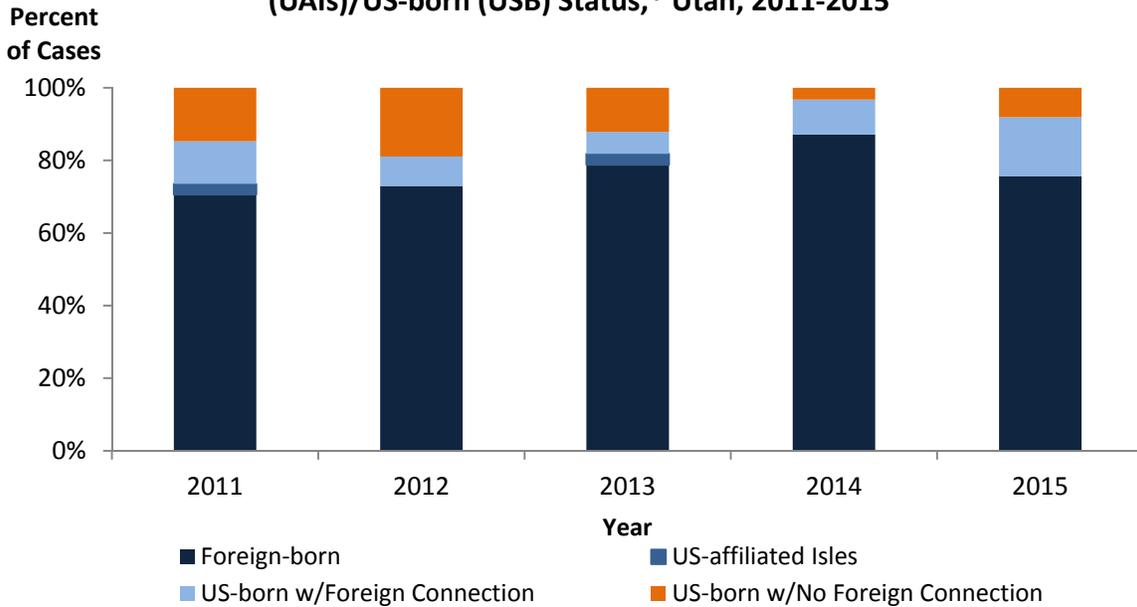
Figure 8. Percent of TB Cases by Race/Ethnicity* and Origin†, Utah, 2011-2015



*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).

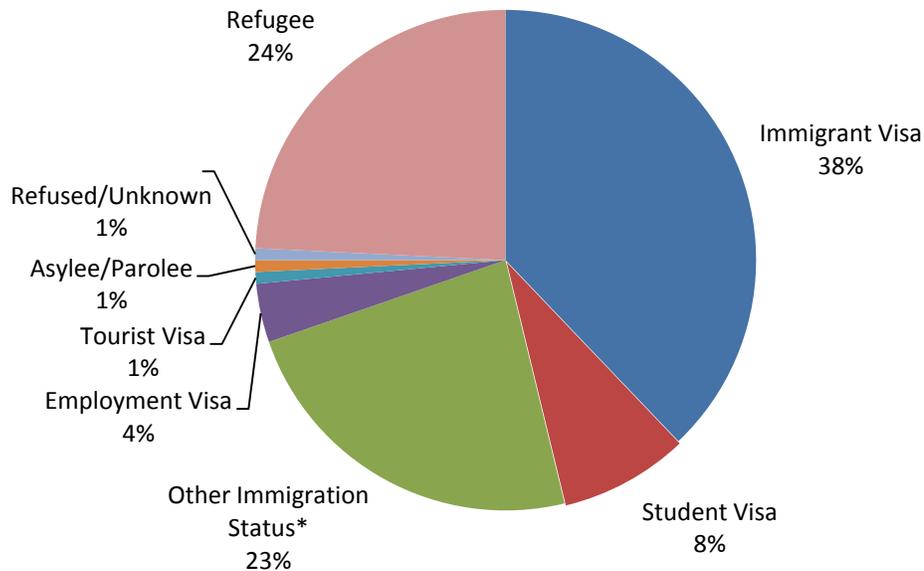
†FB=Foreign-born; USB=US-born. US-born persons were born in the United States, a US-affiliated Island (UAI), or born outside the US to at least one parent who was a US citizen. The UAIs include American Samoa, the Federated States of Micronesia, Guam, the Republic of the Marshall Islands, Midway Island, the Commonwealth of the Northern Mariana Islands, Puerto Rico, the Republic of Palau, the US Virgin Islands, and US minor and outlying Pacific Islands. See Table 3.

Figure 9. Percent of TB Cases by Foreign/US-affiliated Islands (UAI)/US-born (USB) Status,* Utah, 2011-2015



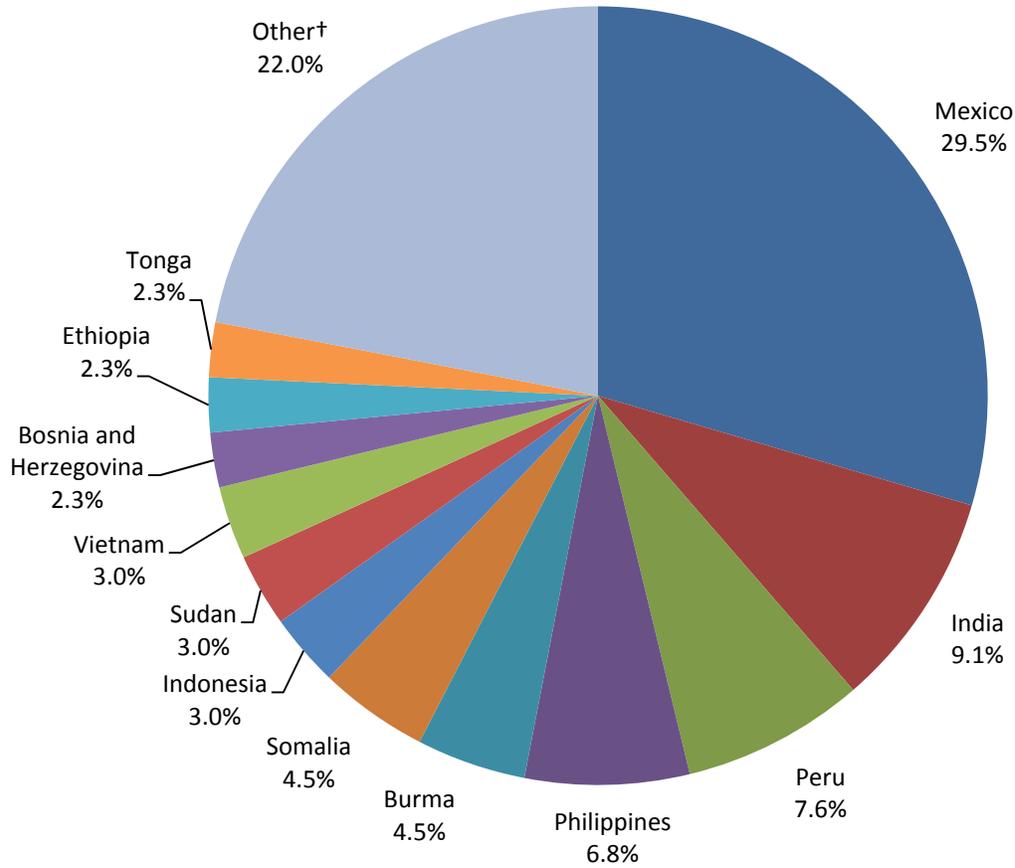
*US-born persons were born in the United States or born outside the US to at least one parent who was a US citizen. The UAI's include American Samoa, the Federated States of Micronesia, Guam, the Republic of the Marshall Islands, Midway Island, the Commonwealth of the Northern Mariana Islands, Puerto Rico, the Republic of Palau, the US Virgin Islands, and US minor and outlying Pacific Islands. See Table 4.

Figure 10. Percent of Foreign-born TB Cases by Immigration Status at First Entry, Utah, 2011-2015



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

Figure 11. Percent of Foreign-born* TB Cases by Country of Birth , Utah, 2011-2015



* Foreign-born persons were born outside the United States or US-affiliated islands (UAI) and did not have at least one parent who was a US citizen. The UAIs include American Samoa, the Federated States of Micronesia, Guam, the Republic of the Marshall Islands, Midway Island, the Commonwealth of the Northern Mariana Islands, Puerto Rico, the Republic of Palau, the US Virgin Islands, and US minor and outlying Pacific Islands.

† Other countries include: Afghanistan, Bhutan, Bolivia, Cambodia, China, Congo, Cuba, Dominican Republic, Egypt, El Salvador, Guatemala, Honduras, Iraq, Kenya, Republic of Korea, Laos, Nepal, Pakistan, Taiwan, Tanzania, Uganda, Uzbekistan, Vanuatu, Western Samoa, and Yugoslavia. See Table 5.

Tuberculosis (TB) by Risk Factor

HIV Testing and Coinfection

Knowledge of a TB patient's human immunodeficiency virus (HIV) status is critical to ensuring that 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*.

From 2011 to 2015, 96% (165 of 172) of persons with TB in Utah reported a positive or negative HIV test result. Testing was refused in two cases; one case involved an elderly patient who died during TB treatment. Five cases were not offered HIV testing; reasons for not offering the test included cases in pediatric and elderly patients (Figure 12, Table 6).

During 2011 to 2015, 4% of TB cases in Utah were coinfecting with HIV (Table 6). Utah's percentage of HIV coinfection in persons reported with TB compares to 6% in the United States in 2014. (CDC. *Reported Tuberculosis in the United States, 2014*).

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 2011 to 2015, diabetes was the most common risk factor among TB cases in Utah at 15% of the cases. The next most common risk factors were being a contact to an infectious TB case in the preceding two years (8%), immunosuppression (6%), and patients who did not complete treatment for TB infection (5%) (Figure 13, Table 6). This compares to the following 2014 proportion of TB cases in the United States reporting these risk factors: 16% had diabetes, 7% were contacts to an infectious TB case, 4% were immunosuppressed, and 3% had incomplete

treatment for TB infection. (CDC. *Reported Tuberculosis in the United States, 2014*).

Residence at Diagnosis

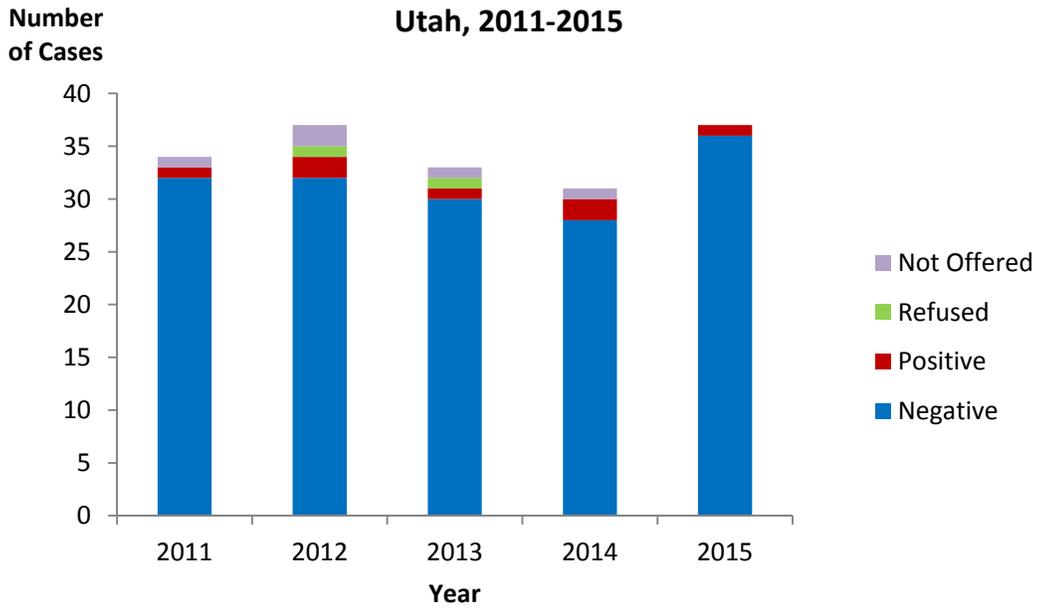
The majority of TB cases reported in Utah were among persons living in a private residence at the time of diagnosis. From 2011 to 2015, 94% of the TB cases in Utah were living in a private residence at the time of their diagnosis, 3% were homeless at the time of their TB diagnosis, and the remainder of the cases 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 2011 to 2015, 4% 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, 6% reported excess alcohol use and no cases reported injecting or noninjecting drug use (Figure 14, Table 7).

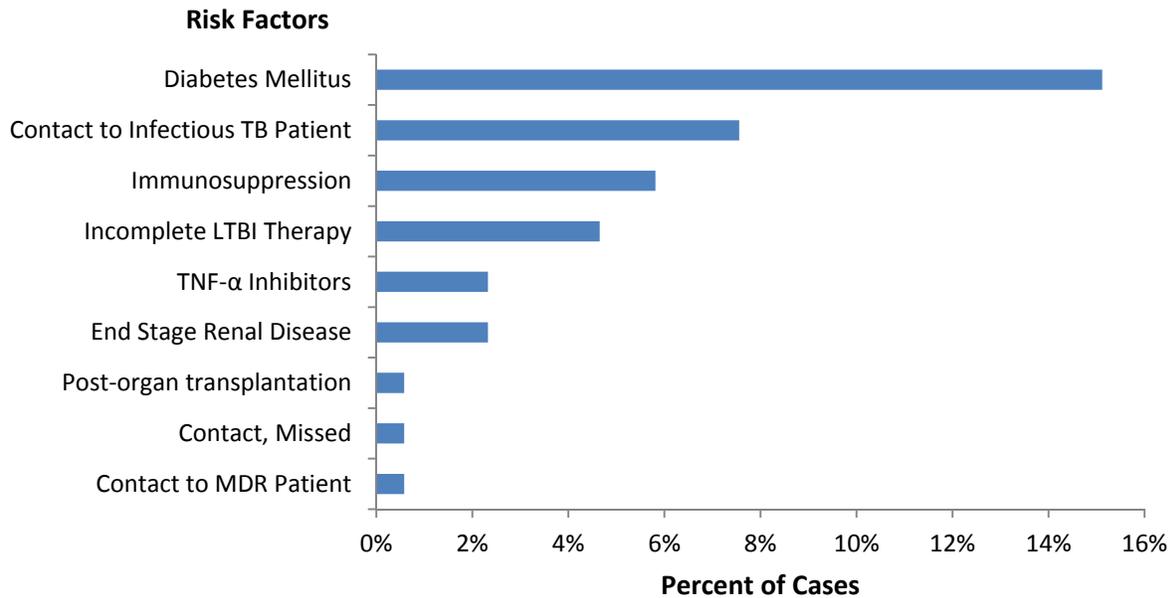
In the United States in 2014, the percentage of TB cases aged 15 years or older reporting homelessness and/or substance abuse in the 12 months prior to TB diagnosis, where this information was known, was higher than that of Utah; 6% of the national cases were homeless, 11% reported excess alcohol use, 7% reported noninjecting drug use, and 2% reported injecting drug use. (CDC. *Reported Tuberculosis in the United States, 2014*).

Figure 12. TB Cases by HIV Test Results*, Utah, 2011-2015



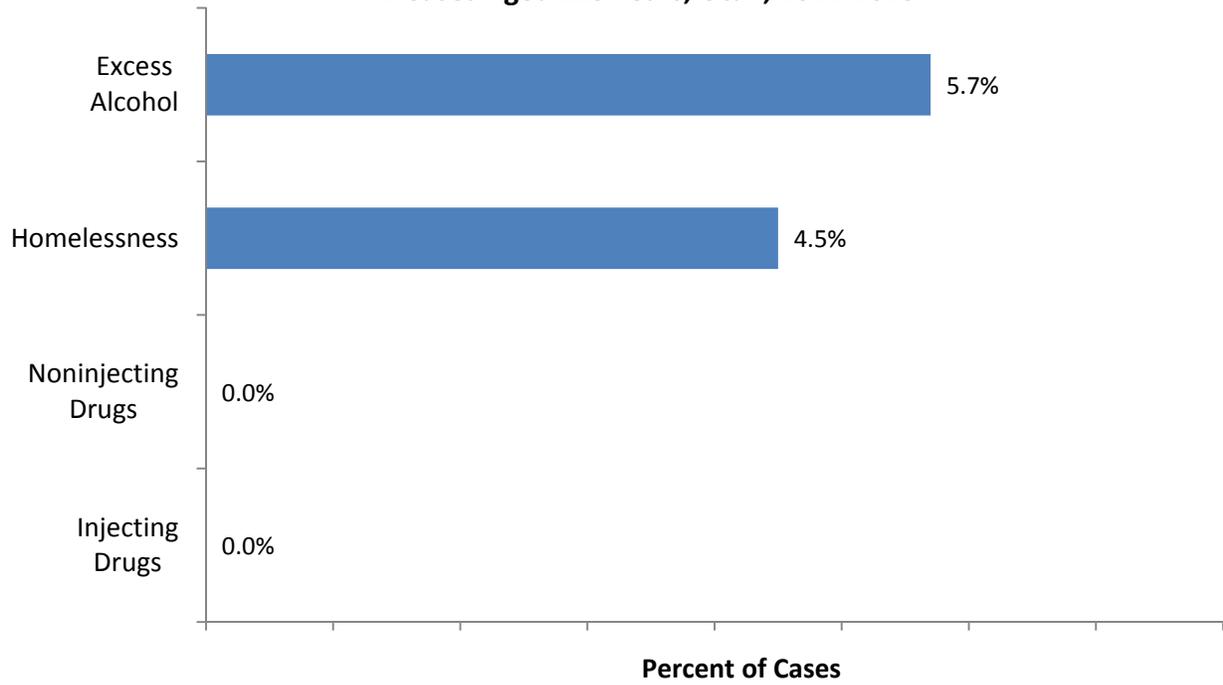
*No cases had indeterminate results. See Table 6.

Figure 13. Percent of TB Cases by Additional TB Risk Factors*, Utah, 2011-2015



* 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 14. Percent of Homelessness and Substance Abuse*
in TB Cases Aged ≥15 Years, Utah, 2011-2015**



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

Tuberculosis (TB) by Clinical Information

Primary Reason for TB Evaluation

There are a variety of reasons that bring patients into the health care system that result in their eventual TB diagnosis. From 2011 to 2015, 67% of the TB cases in Utah had TB symptoms as the primary reason for being evaluated for TB. Having abnormal chest x-rays (12% of cases) and incidental lab results (7%) were the next highest reasons for TB evaluation (Figure 15, Table 7). Nationally, these three reasons were also the most common primary reasons for TB evaluation, with 58% of cases having TB symptoms, 21% with abnormal chest x-rays, and 11% with incidental lab results. (CDC. *Reported Tuberculosis in the United States, 2014*).

Case Verification

From 2011 to 2015, 70% of TB cases reported in Utah were confirmed by isolation of *M. tuberculosis* from a laboratory culture. During this time frame, 26% of the cases met the clinical case definition of TB and 2% were verified by provider diagnosis.⁸ Three cases were verified by a positive sputum or tissue smear, and one case was verified by a positive nucleic acid amplification test (NAAT) (Figure 16, Table 7).

The case verification in Utah compares with the following case verification of cases in the United States in 2014: 77% of the cases were confirmed by laboratory culture, 2% by positive NAAT, less than 1% by positive smear/tissue, 16% by clinical case definition, and 5% by provider diagnosis. (CDC. *Reported Tuberculosis in the United States, 2014*).

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. From 2011 to 2015, 51% of the reported TB cases in Utah were pulmonary, 14% were pulmonary and extrapulmonary, and 35% were extrapulmonary alone (Figure 17, Table 8). As a comparison, 69% of the TB cases reported in the United States in 2014 were pulmonary, 10% were pulmonary and extrapulmonary, and 21% were extrapulmonary alone. (CDC. *Reported Tuberculosis in the United States, 2014*).

Of the extrapulmonary sites of disease that were reported in Utah during this five-year period, the most common site was cervical lymph nodes (19%), followed by pleural (15%), bones and/or joints (14%), and eye and/or ear appendages (11%) (Table 8). A TB case may have more than one extrapulmonary site of disease.

Drug Susceptibility Testing and Results

In order to ensure that patients are given the correct treatment, a specimen from each culture-confirmed TB case must be tested for drug resistance, and the regimen adjusted accordingly. From 2011 to 2015, drug susceptibility testing was completed on 100% of the isolates of TB cases confirmed by laboratory culture. Of these isolates, 13% had resistance to one or more anti-TB medications, 8% had resistance to at least isoniazid (INH), and 3% were resistant to at least INH and rifampin (RIF), i.e., multidrug-resistant TB (MDR-TB) (Table 9). As a comparison, 10% of the reported cases in the United States in 2014 with reported drug susceptibility results were resistant to at least INH and 1% were confirmed with MDR-TB. (CDC. *Reported Tuberculosis in the United States, 2014*).

Directly Observed Therapy

Directly observed therapy (DOT) involves the direct 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. In Utah, DOT is usually administered by local health department staff.

⁸ 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.

DOT figures are reported for the five-year period from 2010 to 2014 as many 2015 patients are still on treatment. During this time frame, 91% of patients treated for TB in Utah had all doses of their medications given by DOT, and 8% 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 returning to their country of origin, patients being permitted to travel out of state for employment but who did not follow through with out-of-state health departments as instructed, partner agencies not starting DOT, and patients moving out of state. 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 2012. In that year, 62% of the cases completed treatment using only DOT and 29% utilized both directly observed and self-administered therapy. (CDC. *Reported Tuberculosis in the United States, 2014*).

Completion of Treatment

Of the 155 TB cases reported in Utah between 2010 and 2014, 151 cases started TB treatment. Three 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, 93% completed therapy, 7% died, and one MDR-TB patient is still on therapy (Table 10). Of the 10 patients who died, half died of causes unrelated to TB disease. This compares with the following 2012 national distribution of completion of treatment reasons: 87% completed treatment, 6% died, 1% lost, 1% refused, less than 1% adverse event, and 4% unknown. (CDC. *Reported Tuberculosis in the United States, 2014*).

TB Cases, Suspects, and Rule Outs

In addition to managing counted TB cases, the TB Control Program managed noncountable 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.

Starting in 2011, all persons suspected of having TB, including those with a positive acid-fast bacillus (AFB) smear and/or culture laboratory result, were entered into UT-NEDSS. Mycobacterium other than tuberculosis (MOTT) laboratory results were also entered into UT-NEDSS, 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 that an interjurisdictional referral was made for out-of-state suspect or confirmed cases of TB.

From 2011 to 2015, a total of 1,720 people were reported as either confirmed or suspected of having TB in Utah. During this time frame, 10% (172 of 1,720) 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 results of an additional 180 persons where TB was directly ruled out and provided case management for 23 incoming interjurisdictional transfer cases (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.

Figure 15. Percent of TB Cases by Primary Reason for TB Evaluation, Utah, 2011-2015

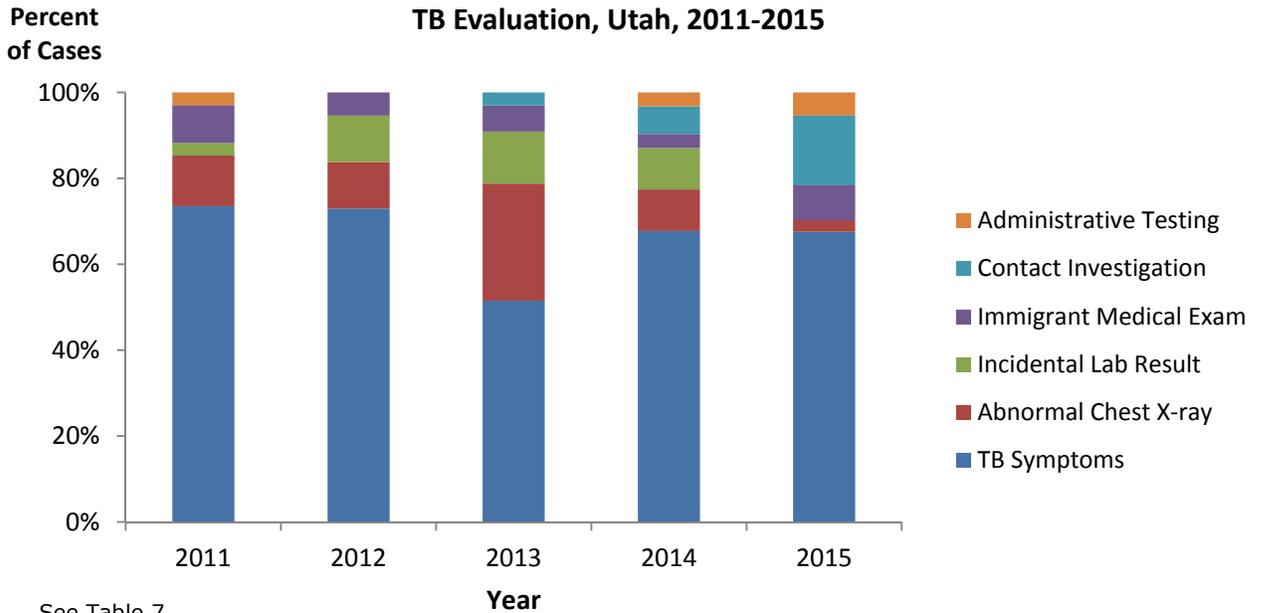
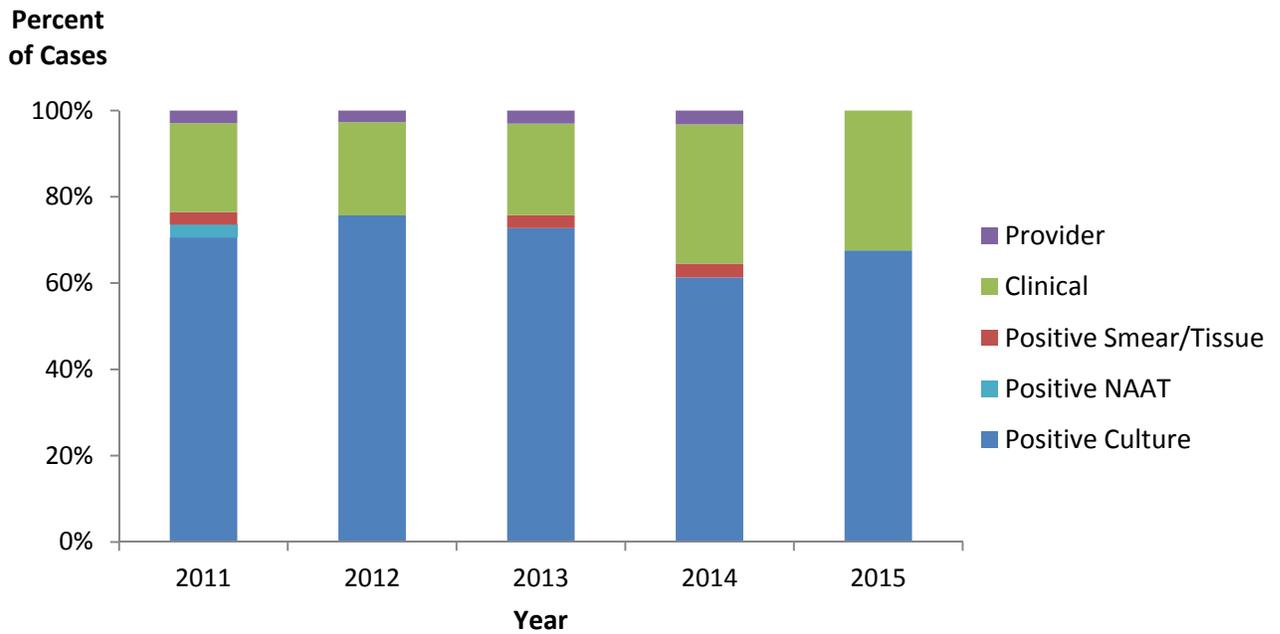


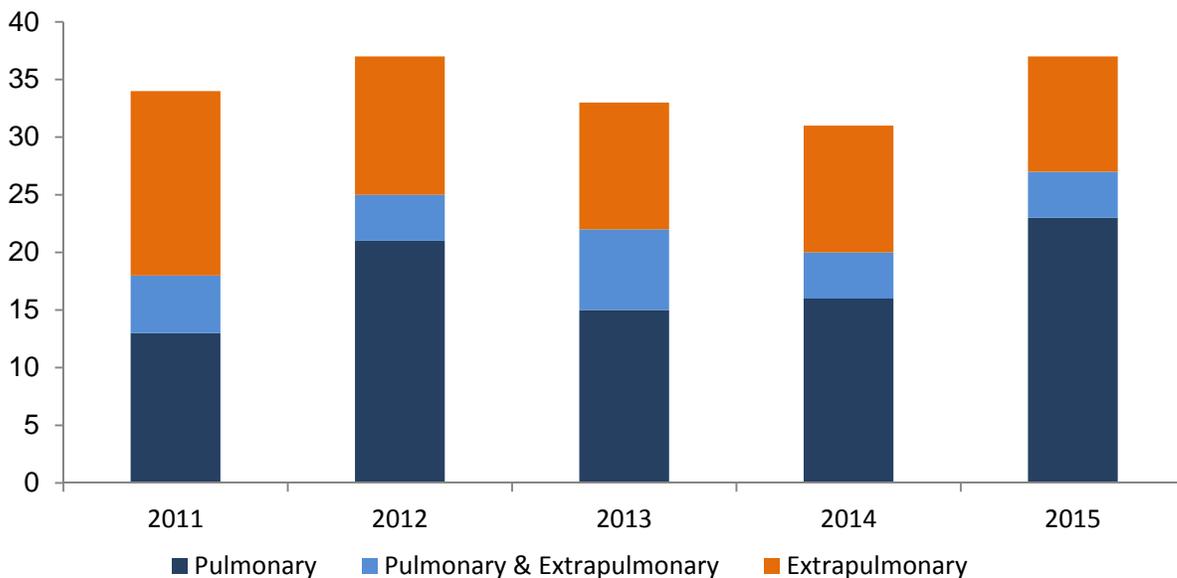
Figure 16. Percent of TB Cases by Case Verification, Utah, 2011-2015



**NAAT=Nucleic acid amplification test.
See Table 7.

Number of Cases

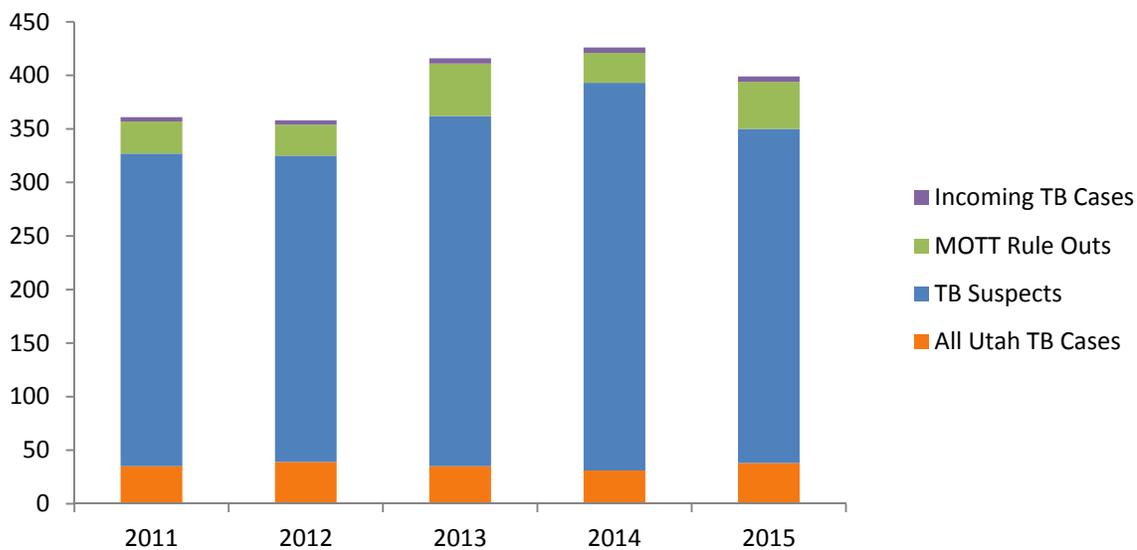
Figure 17. TB Cases by Site of Disease, Utah, 2011-2015



See Table 8.

Figure 18. TB Cases and Suspects by Final Classification*, Utah, 2011-2015

Number of Cases/suspects



*All Utah TB Cases includes countable and noncountable cases. MOTT=Mycobacterium other than TB. See Table 11.

Tuberculosis (TB) Program Evaluation

The CDC sets national TB Program objectives and targets to assist TB control programs to evaluate their performance. This section compares the performance of the Utah TB Programs from 2011 to 2015 to the 2015 National TB Program Objectives.⁹ 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. From 2011-2015, Utah met the 2015 national target rates for US-born and foreign-born persons. Among US-born non-Hispanic Black/African Americans, Utah had one case each year in 2011 and 2013, which resulted in rates exceeding the target rate due to the low population numbers. Among children <5 years, Utah exceeded the target rate in 2013 and 2014, when two children <5 years were diagnosed with TB each year; and in 2015, four children <5 years were diagnosed with TB as part of a contact investigation of an infectious family member.

TB Case Management

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 ensure that TB patients are started on an appropriate treatment regimen as soon as possible, are monitored to ensure that the regimen is effective, and complete treatment in a timely manner.

The Utah TB Control Program generally meets or exceeds the case management targets. The Program performed at 100% from 2011 to 2015 for the Drug-susceptibility Testing; and it

⁹ Centers for Disease Control and Prevention [National TB Program Objectives and Performance Targets for 2015](http://www.cdc.gov/tb/programs/evaluation/pdf/programobjectives.pdf).
<http://www.cdc.gov/tb/programs/evaluation/pdf/programobjectives.pdf>.

exceeded the national target each year for the following objectives: Known HIV Status; Universal Genotyping; Sputum Culture Conversion; and Completion of Treatment.

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. Cases not meeting this criterion included those starting treatment under the direction of a private provider; and the TB Control Program continued to provide one-on-one training on TB treatment as soon as these cases came to the Program's attention. Other cases not meeting this objective had legitimate reasons for not starting the 4-drug regimen, e.g. where drug resistance was already known, 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, did not have sputum collected, or expired before sputum specimens could be 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 that contact investigations be conducted by the patient's local health department for all confirmed TB patients and for persons suspected of having TB who may be infectious.¹⁰ Patients are interviewed about who they have been in contact with, and these contacts are evaluated

¹⁰ Utah Administrative Code R388-804-7 [Special Measures for the Control of Tuberculosis](http://www.rules.utah.gov/publicat/code/r388/r388-804.htm#T7).
<http://www.rules.utah.gov/publicat/code/r388/r388-804.htm#T7>.

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 evaluation, treatment initiation, and treatment completion. This has been a challenge for most TB control programs in the United States; and based on published figures, Utah exceeded the national average in the areas of contact treatment initiation and completion.¹¹ In an effort to achieve national targets, the Utah TB Control Program selected the treatment initiation and completion of contacts newly diagnosed with TB infection as a focus area for improvement.

Evaluation of Immigrants and Refugees

All refugees and US 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 abnormal chest x-rays read overseas, 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 for 2015 were not set for the evaluation of immigrants and refugees. Utah's reduced performance in the National TB Indicators Project database reflects a delay

and/or data not being entered into the Electronic Disease Notification (EDN) database – particularly treatment completion data. However, data from the Utah TB Control Program indicated that from 2011-2015, 90% of immigrants and refugees initiated a medical examination within 30 days of arrival; 85% completed medical evaluations within 90 days of arrival; 68% initiated LTBI treatment; and, for the years 2011-2014, 76% who initiated LTBI treatment completed treatment. The UDOH TB Control Program plans to enter missing data into the EDN system by the end of 2016.

Data Reporting

The CDC collects data on each case of TB from state and local health departments throughout the United States using the Report of Verified Case of Tuberculosis (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 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. The 2015 national TB objectives do not specify targets for EDN.

The Utah TB Control Program has consistently exceeded the national targets for data reporting for the RVCT and ARPE. The Program collaborates with Utah's local health departments that provide TB case management to collect the necessary information. Data quality assurance is conducted at least monthly.

¹¹ Centers for Disease Control and Prevention National Tuberculosis Indicators 2013 State Comparison. http://www.cdc.gov/tb/statistics/pdf/statetbindicators_2013statecomparison_final.pdf.

2015 National TB Program Objective Status, Utah, 2011-2015

National Objective	2015 Nt'l Target	Utah Performance				
		2011	2012	2013	2014	2015
TB CASE RATES (rate per 100,000 population): Decrease the TB case rate in the following populations to below target rates.						
<u>US-born persons</u>	0.7	0.4	0.4	0.3	0.1	0.3
<u>Foreign-born persons</u>	14.0	10.1	11.4	10.8	10.7	11.1
<u>US-born non-Hispanic Black/African Americans</u>	1.5	4.3	0.0	4.7	0.0	0.0
<u>Children <5 years of age</u>	0.4	0.4	0.4	0.8	0.8	1.6
TB CASE MANAGEMENT (%) :						
<u>Treatment Initiation</u> : Increase the proportion of TB patients with positive acid-fast bacillus (AFB) sputum-smear results who initiate treatment within 7 days of specimen collection.	N	100.0	100.0	85.7	100.0	100.0
<u>Recommended Initial Therapy</u> : Increase the proportion of patients who are started on the recommended initial 4-drug regimen when suspected of having TB disease.	93.4	85.3	91.7	96.9	93.1	89.2
<u>Known HIV Status</u> : Increase the proportion of TB cases with positive or negative HIV test results reported.	88.7	97.1	94.4	93.9	100.0	100.0
<u>Sputum-culture Reported</u> : 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.	95.7	95.0	91.7	90.5	94.4	95.2
<u>Drug-susceptibility Result</u> : Increase the proportion of culture-positive TB cases with initial drug-susceptibility result reported.	100.0	100.0	100.0	100.0	100.0	100.0
<u>Universal Genotyping</u> : Increase the proportion of culture-confirmed TB cases with a genotyping result reported.	94.0	100.0	100.0	100.0	100.0	96.0
<u>Sputum Culture Conversion</u> : 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.	61.5	77.8	68.8	92.9	66.7	86.7
<u>Completion of Treatment</u> : 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.	93.0	100.0	96.6	100.0	100.0	—
CONTACT INVESTIGATIONS (%) :						
<u>Contact Elicitation</u> : Increase the proportion of TB patients with positive AFB sputum-smear results who have contacts elicited.	100.0	100.0	100.0	100.0	100.0	100.0
<u>Evaluation</u> : Increase the proportion of contacts to sputum AFB smear-positive TB patients who are evaluated for infection and disease.	93.0	76.9	80.0	85.7	87.6	91.8
<u>Treatment Initiation</u> : Increase the proportion of contacts to sputum AFB smear-positive TB patients with newly diagnosed latent TB infection (LTBI) who start treatment.	88.0	94.1	79.3	95.0	73.0	96.8
<u>Treatment Completion</u> : For contacts to sputum AFB smear-positive TB patients who have started treatment for their newly diagnosed LTBI, increase the proportion who complete treatment.	79.0	87.5	67.4	89.5	80.4	—
EVALUATION OF IMMIGRANTS AND REFUGEES (%) :						
<u>Evaluation Initiation</u> : For immigrants and refugees with abnormal chest x-rays (CXRs) read overseas as consistent with TB, increase the proportion who initiate medical evaluation within 30 days of notification	N	89.3	78.5	79.0	74.0	56.2
<u>Evaluation Completion</u> : For immigrants and refugees with abnormal CXRs read overseas as consistent with TB, increase the proportion who complete medical evaluation within 90 days of notification	N	85.3	73.1	80.0	74.0	63.4
<u>Treatment Initiation</u> : For immigrants and refugees with abnormal CXRs read overseas as consistent with TB and who are diagnosed with LTBI during evaluation in the US, increase the proportion who start treatment.	N	80.8	87.2	78.8	48.3	81.0
<u>Treatment Completion</u> : For immigrants and refugees with abnormal CXRs read overseas as consistent with TB, and who are diagnosed with LTBI during evaluation in the US and started on treatment, increase the proportion who complete LTBI treatment.	N	9.5	0.0	23.1	57.1	—
DATA REPORTING (%) :						
<u>RVCT</u> : Increase the completeness of each core Report of Verified Case of Tuberculosis (RVCT) data item reported.	99.2	100.0	100.0	99.7	99.7	—
<u>ARPEs</u> : Increase the completeness of each core Aggregated Reports of Program Evaluation (ARPEs) data items reported.	100.0	100.0	100.0	100.0	100.0	—
<u>EDN</u> : Increase the completeness of each core Electronic Disease Notification (EDN) system data item reported.	N	87.2	79.7	88.2	89.1	—

Note: 'N'=National target not set. '—' =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 (US), 1993-2015

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	3.0
2015	37	1.2	3.0

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 US 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†, Utah, 2011-2015

Variable	2011		2012		2013		2014		2015		2011-2015		
	Cases	%	Cases	%	Rates‡								
Local Health District													
Bear River	4	11.8	2	5.4	1	3.0	1	3.2	1	2.7	9	5.2	1.1
Central	0	0.0	0	0.0	0	0.0	1	3.2	0	0.0	1	0.6	0.3
Davis	0	0.0	1	2.7	1	3.0	0	0.0	0	0.0	2	1.2	0.1
Salt Lake	17	50.0	22	59.5	23	69.7	24	77.4	31	83.8	117	68.0	2.2
San Juan	2	5.9	2	5.4	0	0.0	0	0.0	0	0.0	4	2.3	5.3
Southeast	0	0.0	1	2.7	0	0.0	0	0.0	0	0.0	1	0.6	0.5
Southwest	3	8.8	2	5.4	0	0.0	3	9.7	1	2.7	9	5.2	0.8
Summit	0	0.0	1	2.7	0	0.0	0	0.0	0	0.0	1	0.6	0.5
Tooele	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.0
TriCounty	0	0.0	1	2.7	2	6.1	1	3.2	0	0.0	4	2.3	1.4
Utah	4	11.8	3	8.1	1	3.0	0	0.0	2	5.4	10	5.8	0.4
Wasatch	0	0.0	1	2.7	0	0.0	0	0.0	1	2.7	2	1.2	1.5
Weber-Morgan	4	11.8	1	2.7	5	15.2	1	3.2	1	2.7	12	7.0	1.0
Total	34	100.0	37	100.0	33	100.0	31	100.0	37	100.0	172	100.0	1.2
Sex/Origin of Birth													
Male	21	61.8	19	51.4	13	39.4	9	29.0	19	51.4	81	49.7	1.1
Foreign-born	14	66.7	15	78.9	9	69.2	7	77.8	13	68.4	58	72.7	
US-born	7	33.3	4	21.1	4	30.8	2	22.2	6	31.6	23	27.3	
Female	13	38.2	18	48.6	20	60.6	22	71.0	18	48.6	91	50.3	1.3
Foreign-born	11	84.6	12	66.7	18	90.0	20	90.9	15	83.3	76	83.3	
US-born	2	15.4	6	33.3	2	10.0	2	9.1	3	16.7	15	16.7	
Total	34	100.0	37	100.0	33	100.0	31	100.0	37	100.0	172	200.0	1.2

* In 2015, Southeastern Utah District Health Department divided into San Juan Health Department and Southeast Utah Health Department.

†US-born persons were born in the United States (US), a US-affiliated Island (UAI), or born outside the US to at least one parent who was a US citizen. The UAIs include American Samoa, the Federated States of Micronesia, Guam, the Republic of the Marshall Islands, Midway Island, the Commonwealth of the Northern Mariana Islands, Puerto Rico, the Republic of Palau, the US Virgin Islands, and US minor and outlying Pacific Islands.

‡ 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 US 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†, Utah, 2011-2015

Variable	2011		2012		2013		2014		2015		2011-2015		
	Cases	%	Cases	%	Rate								
Age Group (in years)													
0-4	1	2.9	1	2.7	2	6.1	2	6.5	4	6.5	10	5.8	0.8
5-14	1	2.9	0	0.0	1	3.0	0	0.0	3	0.0	5	2.9	0.2
15-24	5	14.7	2	5.4	3	9.1	2	6.5	5	6.5	17	9.9	0.7
25-44	12	35.3	15	40.5	15	45.5	11	35.5	11	35.5	64	37.2	1.6
45-64	7	20.6	11	29.7	7	21.2	9	25.8	11	25.8	45	26.2	1.6
>=65	8	23.5	8	21.6	5	15.2	7	25.8	3	25.8	31	18.0	2.2
Total	34	100.0	37	100.0	33	100.0	31	100.0	37	100.0	172	100.0	1.2
Race and Ethnicity‡/Origin of Birth													
AI/AK Native	3	8.8	4	10.8	0	0.0	1	3.2	0	0.0	8	4.7	5.7
Foreign-born	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	
US-born	3	100.0	4	100.0	0	0.0	1	100.0	0	0.0	8	100.0	
Asian	11	32.4	11	29.7	8	24.2	8	25.8	10	27.0	48	27.9	15.1
Foreign-born	10	90.9	11	100.0	8	100.0	8	100.0	9	90.0	46	95.8	
US-born	1	9.1	0	0.0	0	0.0	0	0.0	1	10.0	2	4.2	
Black/African American	4	11.8	3	8.1	5	15.2	4	12.9	4	10.8	20	11.6	13.4
Foreign-born	3	75.0	3	100.0	4	80.0	4	100.0	4	100.0	18	90.0	
US-born	1	25.0	0	0.0	1	20.0	0	0.0	0	0.0	2	10.0	
Hispanic	10	29.4	11	29.7	13	39.4	13	41.9	18	48.6	65	37.8	3.3
Foreign-born	9	90.0	10	90.9	12	92.3	12	92.3	12	66.7	55	84.6	
US-born	1	10.0	1	9.1	1	7.7	1	7.7	6	33.3	10	15.4	
NH/PI	2	5.9	2	5.4	2	6.1	0	0.0	1	2.7	7	4.1	5.4
Foreign-born	1	50.0	2	100.0	1	50.0	0	0.0	1	100.0	5	71.4	
US-born	1	50.0	0	0.0	1	50.0	0	0.0	0	0.0	2	28.6	
White	4	11.8	6	16.2	5	15.2	5	16.1	4	10.8	24	14.0	0.2
Foreign-born	1	25.0	1	16.7	1	20.0	3	60.0	2	50.0	8	33.3	
US-born	3	75.0	5	83.3	4	80.0	2	40.0	2	50.0	16	66.7	
Total	34	100.0	37	100.0	33	100.0	31	100.0	37	100.0	172	100.0	1.2

*Age groups were based on age at report.

†US-born persons were born in the United States (US), a US-affiliated Island (UAI), or born outside the US to at least one parent who was a US citizen. The UAIs include American Samoa, the Federated States of Micronesia, Guam, the Republic of the Marshall Islands, Midway Island, the Commonwealth of the Northern Mariana Islands, Puerto Rico, the Republic of Palau, the US Virgin Islands, and US minor and outlying Pacific Islands.

‡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 Foreign/US-affiliated Islands (UAI)s/US-born (USB) Status, Immigration Status at First Entry in Foreign-born Persons, Utah, 2011-2015

Variable	2011		2012		2013		2014		2015		2011-2015	
	Cases	%	Cases	%								
Foreign, UAI *, or US-born Status												
Foreign-born	24	70.6	27	73.0	26	78.8	27	87.1	28	75.7	132	76.7
US-affiliated Islands	1	2.9	0	0.0	1	3.0	0	0.0	0	0.0	2	1.2
USB with Foreign/UAI Connection	4	11.8	3	8.1	2	6.1	3	9.7	6	16.2	18	10.5
USB without Foreign/UAI Connection	5	14.7	7	18.9	4	12.1	1	3.2	3	8.1	20	11.6
Total	34	100.0	37	100.0	33	100.0	31	100.0	37	100.0	172	100.0
Immigration Status at First Entry in Foreign-born Persons												
Asylee or Parolee	0	0.0	0	0.0	0	0.0	1	3.7	0	0.0	1	0.8
Employment Visa	1	4.2	1	3.7	2	7.7	0	0.0	1	3.6	5	3.8
Family/Fiance Visa	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Immigrant Visa	10	41.7	13	48.1	8	30.8	10	37.0	9	32.1	50	37.9
Refugee	5	20.8	7	25.9	7	26.9	7	25.9	6	21.4	32	24.2
Student Visa	3	12.5	1	3.7	3	11.5	3	11.1	1	3.6	11	8.3
Tourist Visa	0	0.0	0	0.0	0	0.0	1	3.7	0	0.0	1	0.8
Other Immigration Status [†]	5	20.8	5	18.5	6	23.1	5	18.5	10	35.7	31	23.5
Refused/Unknown	0	0.0	0	0.0	0	0.0	0	0.0	1	3.6	1	0.8
Total	24	100.0	27	100.0	26	100.0	27	100.0	28	100.0	132	100.0

* Includes persons born in American Samoa, the Federated State of Micronesia, Guam, the Republic of the Marshall Islands, Midway Island, the Commonwealth of the Northern Mariana Islands, Puerto Rico, the Republic of Palau, the U.S. Virgin Islands, and U.S. minor and outlying Pacific islands.

† Includes (but is not limited to) foreign-born persons who were not required to obtain a visa or persons with no official immigration status.

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

Source: Utah Dept of Health, Bureau of Epidemiology.

See Figures 9 and 10.

Table 5. Foreign-born* TB Cases and Percentages by Country of Birth, Utah, 2011-2015

Country of Origin	Cases	%
Mexico	39	29.5
India	12	9.1
Peru	10	7.6
Philippines	9	6.8
Burma	6	4.5
Somalia	6	4.5
Indonesia	4	3.0
Sudan	4	3.0
Vietnam	4	3.0
Bosnia and Herzegovina	3	2.3
Ethiopia	3	2.3
Tonga	3	2.3
Other [†]	29	22.0
Total	132	100.0

*Foreign-born persons were born outside the United States or US-affiliated islands (UAI) and did not have at least one parent who was a US citizen. The UAIs include American Samoa, the Federated States of Micronesia, Guam, the Republic of the Marshall Islands, Midway Island, the Commonwealth of the Northern Mariana Islands, Puerto Rico, the Republic of Palau, the US Virgin Islands, and US minor and outlying Pacific Islands.

[†]Other countries include: Afghanistan, Bhutan, Bolivia, Cambodia, China, Congo, Cuba, Dominican Republic, Egypt, El Salvador, Guatemala, Honduras, Iraq, Kenya, Republic of Korea, Laos, Nepal, Pakistan, Taiwan, Tanzania, Uganda, Uzbekistan, Vanuatu, Western Samoa, and Yugoslavia.

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

Source: Utah Dept of Health, Bureau of Epidemiology.

See Figure 11.

Table 6. TB Cases and Percentages by HIV Test Results, Additional Risk Factors, and Residence at Time of Diagnosis, Utah, 2011-2015

Variable	2011		2012		2013		2014		2015		2011-2015	
	Cases	%	Cases	%								
HIV Test Results												
Negative	32	94.1	32	86.5	30	90.9	28	90.3	36	97.3	158	91.9
Positive	1	2.9	2	5.4	1	3.0	2	6.5	1	2.7	7	4.1
Indeterminate	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Refused	0	0.0	1	2.7	1	3.0	0	0.0	0	0.0	2	1.2
Not Offered	1	2.9	2	5.4	1	3.0	1	3.2	0	0.0	5	2.9
Total	34	100.0	37	100.0	37	100.0	31	100.0	37	100.0	172	100.0
Additional Risk Factors*												
Contact to Infectious TB Patient	2	5.9	0	0.0	3	9.1	2	6.5	6	16.2	13	7.6
Contact to MDR Patient	0	0.0	0	0.0	0	0.0	0	0.0	1	2.7	1	0.6
Contact, Missed	1	2.9	0	0.0	0	0.0	0	0.0	0	0.0	1	0.6
Diabetes Mellitus	4	11.8	7	18.9	4	12.1	3	9.7	8	21.6	26	15.1
End Stage Renal Disease	0	0.0	1	2.7	2	6.1	1	3.2	0	0.0	4	2.3
Immunosuppression	1	2.9	3	8.1	3	9.1	2	6.5	1	2.7	10	5.8
Incomplete LTBI Therapy	3	8.8	1	2.7	1	3.0	3	9.7	0	0.0	8	4.7
Post-organ transplantation	0	0.0	0	0.0	1	3.0	0	0.0	0	0.0	1	0.6
TNF- α Inhibitors	1	2.9	1	2.7	0	0.0	1	3.2	1	2.7	4	2.3
Other	3	8.8	3	8.1	2	6.1	4	12.9	2	5.4	14	8.1
None	22	64.7	22	59.5	21	63.6	17	54.8	19	51.4	101	58.7
Residence At Time of Diagnosis												
Private Residence	31	91.2	36	97.3	32	97.0	29	96.8	33	89.2	161	93.6
Homeless	1	2.9	1	2.7	1	3.0	0	0.0	2	5.4	5	2.9
Corrections	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Long Term Care	0	0.0	0	0.0	0	0.0	1	3.2	0	0.0	1	0.6
Other	2	5.9	0	0.0	0	0.0	1	0.0	2	5.4	5	2.9
Total	34	100.0	37	100.0	33	100.0	31	100.0	37	100.0	172	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 12 and 13.

Table 7. TB Cases and Percentages by Adult Homelessness and Substance Abuse, Primary Reason for TB Evaluation, and Case Verification, Utah, 2011-2015

Variable	2011		2012		2013		2014		2015		2011-2015	
	Cases	%	Cases	%								
Adult Homelessness and Substance Abuse*												
Homelessness	2	6.3	1	2.8	1	3.4	1	3.4	2	6.7	7	4.5
Injecting Drugs	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Noninjecting Drugs	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Excess Alcohol	3	9.4	1	2.8	1	3.4	0	0.0	4	13.3	9	5.7
Total Number of Cases ≥15 years	32	N/A	36	N/A	30	N/A	29	N/A	30	N/A	157	N/A
Primary Reason for TB Evaluation												
TB Symptoms	25	73.5	27	73.0	17	51.5	21	67.7	25	67.6	115	66.9
Abnormal Chest X-ray	4	11.8	4	10.8	9	27.3	3	9.7	1	2.7	21	12.2
Incidental Lab Result	1	2.9	4	10.8	4	12.1	3	9.7	0	0.0	12	7.0
Immigrant Medical Exam	3	8.8	2	5.4	2	6.1	1	3.2	3	8.1	11	6.4
Contact Investigation	0	0.0	0	0.0	1	3.0	2	6.5	6	16.2	9	5.2
Administrative Testing	1	2.9	0	0.0	0	0.0	1	3.2	2	5.4	4	2.3
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	34	100.0	37	100.0	33	100.0	31	100.0	37	100.0	172	100.0
Case Verification												
Positive Culture	24	70.6	28	75.7	24	72.7	19	61.3	25	67.6	120	69.8
Positive NAAT**	1	2.9	0	0.0	0	0.0	0	0.0	0	0.0	1	0.6
Positive Smear/Tissue	1	2.9	0	0.0	1	3.0	1	3.2	0	0.0	3	1.7
Clinical	7	20.6	8	21.6	7	21.2	10	32.3	12	32.4	44	25.6
Provider Diagnosis	1	2.9	1	2.7	1	3.0	1	3.2	0	0.0	4	2.3
Total	34	100.0	37	100.0	33	100.0	31	100.0	37	100.0	172	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 14, 15, and 16.

Table 8. TB Cases and Percentages by Site of Disease and Extrapulmonary Sites of Disease, Utah, 2011-2015

Variable	2011		2012		2013		2014		2015		2011-2015	
	Cases	%	Cases	%								
Site of Disease												
Pulmonary	13	38.2	21	59.5	15	45.5	16	51.6	23	62.2	88	51.2
Pulmonary and Extrapulmonary	5	14.7	4	8.1	7	21.2	4	12.9	4	10.8	24	14.0
Extrapulmonary	16	47.1	12	32.4	11	33.3	11	35.5	10	27.0	60	34.9
Total	34	100.0	37	100.0	33	100.0	31	100.0	37	100.0	172	100.0
Extrapulmonary Sites of Disease*												
Pleural	5	16.7	2	11.8	4	20.0	2	11.8	2	12.5	15	15.2
Lymph Cervical	6	20.0	2	11.8	7	35.0	2	11.8	2	12.5	19	19.2
Lymph Axillary	1	3.3	0	0.0	0	0.0	1	5.9	0	0.0	2	2.0
Lymph Intrathoracic	4	13.3	0	0.0	1	5.0	0	0.0	0	0.0	5	5.1
Lymph Other	3	10.0	0	0.0	1	5.0	0	0.0	2	12.5	6	6.1
Bone and/or Joint	4	13.3	4	23.5	1	5.0	2	11.8	3	18.8	14	14.1
Genitourinary	1	3.3	1	5.9	1	5.0	2	11.8	1	6.3	6	6.1
Meningeal	2	6.7	0	0.0	0	0.0	3	17.6	1	6.3	6	6.1
Peritoneal	0	0.0	0	0.0	2	10.0	0	0.0	0	0.0	2	2.0
Laryngeal	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Eye and Ear Appendages	0	0.0	3	17.6	1	5.0	4	23.5	3	18.8	11	11.1
Other**	4	13.3	4	29.4	2	10.0	1	5.9	2	12.5	13	13.1
Total Extrapulmonary Sites	30	100.0	16	100.0	20	100.0	17	100.0	16	100.0	99	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 17.

Table 9. Culture-positive TB Cases and Percentages by Drug Susceptibility Testing (DST) and Results, Utah, 2011-2015

Year	Culture Positive Cases	Cases with DST Results		Resistance*					
				>= 1 Drug		At Least INH		At Least INH & RIF	
				No.	%	No.	%	No.	%
2011	24	24	100.0	4	16.7	3	12.5	1	4.2
2012	28	28	100.0	2	7.1	2	7.1	1	3.6
2013	24	24	100.0	3	15.8	0	0.0	0	0.0
2014	19	19	100.0	2	8.0	1	4.0	1	4.0
2015	25	25	100.0	5	20.0	4	16.0	1	4.0
Total	120	120	100.0	16	13.3	10	8.3	4	3.3

*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, 2010-2014

Variable	2010		2011		2012		2013		2014		2010-2014	
	Cases	%	Cases	%								
Reported Cases	20		34		37		33		31		155	
Cases Starting Treatment	20		34		36		32		29		151	
Directly Observed Therapy (DOT)												
DOT	17	85.0	27	79.4	35	97.2	30	93.8	29	100.0	138	91.4
DOT & Self-administered	3	15.0	7	20.6	1	2.8	1	3.1	0	0.0	12	7.9
Self-administered	0	0.0	0	0.0	0	0.0	1	3.1	0	0.0	1	0.7
Total Number of Cases ≥15 years	20	100.0	34	100.0	36	100.0	32	100.0	29	100.0	151	100.0
Completion of Treatment												
Completed	18	90.0	32	94.1	33	91.7	31	96.9	26	89.7	140	92.7
Died	2	10.0	2	5.9	3	8.3	1	3.1	2	6.9	10	6.6
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	0	0.0	0	0.0	0	0.0
Still on Treatment	0	0.0	0	0.0	0	0.0	0	0.0	1	3.4	1	0.7
Total	20	100.0	34	100.0	36	100.0	32	100.0	29	100.0	151	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, 2011-2015

Case/Suspect Category*	2011	2012	2013	2014	2015	2011-2015
TB Cases, Utah						
Counted	34	37	33	31	37	172
Noncountable: Recurrent TB	0	1	0	0	0	1
Noncountable: TB Diagnosis Reversed	1	1	2	0	1	5
Subtotal	35	39	35	31	38	178
TB Suspects, Evaluated in Utah						
TB Suspects: LTBI	38	51	70	50	48	257
TB Suspect: MOTT	138	121	123	147	131	660
TB Suspects: Not TB	101	91	113	110	121	536
TB Suspects: Out of State Active TB Cases	3	1	1	3	2	10
TB Suspects: Out of State TB Suspects	12	22	20	15	10	79
Subtotal	292	286	327	362	312	1,542
Total Cases and Suspects	327	325	362	393	350	1,720
MOTT: Rule Outs						
Total MOTT Rule Out	30	29	49	28	44	180
TB Cases, Interjurisdictional						
Burden: Transfer In, Interstate	2	3	4	4	4	17
Burden: Transfer In, Foreign	2	1	1	1	1	6
Total Burden Cases	4	4	5	5	5	23
Grand Total	361	358	416	426	399	1,923

*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.