

Annual Tuberculosis Surveillance Report Colorado 2014



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Colorado 2014 TB Surveillance Report

Summary

The state of Colorado documented 64 new cases of active tuberculosis (TB) disease during the 2014 calendar year. This represents a 13.5% decrease from the 74 cases reported in 2013. The largest change among demographic groups, was among the Hispanic population (from 24 cases in 2013 to 16 in 2014; a 33% decrease). Birth in one of the 22 countries with highest TB burden (accounting for 80% of all cases of active TB disease worldwide) remains the strongest risk factor for developing active TB disease (35.9% of all 2014 cases) followed by diabetes (18.7%). See **Table 1** for a more detailed demographic analysis.

Fifteen of the state's 64 counties reported at least one new case of active TB disease in 2014. Denver reported the most cases (23) of any single Colorado county. Tri-County Health Department which serves the citizens of Adams, Arapahoe, and Douglas Counties saw 22 new cases of TB in 2014 and Jefferson County saw four. Forty-two of Colorado's 64 counties have reported at least one case of active TB in the past ten years (2005-2014)—see **Table 3**.

The overall incidence rate for active TB disease in Colorado in 2014 decreased to 1.2 per 100,000 persons from 1.4 in 2013; as compared to the national rate in the United States of 3.0 per 100,000 according to the March 2014 TB report from the US Centers for Disease Control and Prevention (CDC). In 2014, the TB incidence rate in the foreign-born population living in Colorado was 10.5 per 100,000 persons, which is 52 times higher than that of the U.S.-born population (0.2 per 100,000). Since 2005, more than two-thirds (612 of 867 cases or 70.6%) of the cases of TB disease reported in Colorado were among foreign-born individuals (**Figure 8 and Figure 9**).

As observed nationally, an ethnic/racial disparity exists in Colorado specific to the distribution of TB disease. The number of reported cases of TB in Colorado for the last decade has been highest among racial and ethnic minorities. The distribution of cases in 2014 is consistent with recent trends. See **Figure 6 and Figure 7** for a full breakdown of race and ethnicity incidence.

In 2014, TB cases were reported among people ranging from >1 to 84 years of age. Over 29% of TB cases occurred among people 45-64 years old, followed by those aged 65+ years (28.1%) and 25-44 years (28.1%). Two cases of pediatric TB (<15 years of age) were reported in 2014. Active TB in children is particularly concerning, as it indicates ongoing transmission in the community as well as evidence of missed opportunities for preventive therapy. Of those two pediatric cases, both were younger than five years of age (**Figure 3**) and each was born or spent significant time in a high-TB-burden country.

In 2014, the usual TB gender disparity was less-pronounced than in some previous years with 33 males (51.2% of total; comparable with 58.1% in 2013) and 31 females.

Due to the length of time it takes to complete TB drug treatment, completion rates are pending for 2014. In 2013, (the most recent year where final completion data are available), one patient was dead at diagnosis; and eight patients died during therapy. Of the remaining 65 eligible cases, 62 completed therapy and two were

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uncooperative/refused therapy. All new cases counted in 2014, who were alive at diagnosis, have initiated treatment.

Immigrants and refugees who are traveling to the United States are evaluated for TB prior to arriving (as required by U.S. immigration law) and assigned a classification according to the status of their disease. An individual with a medical history, physical exam, or chest x-ray suggestive of pulmonary TB, but who has a negative acid-fast bacilli (AFB) smear and culture and not diagnosed with active TB *or* has been diagnosed with TB and completes treatment overseas is classified as a Class B1. Those with a positive tuberculin skin test (TST) aged fifteen years or younger, and those with a chest x-ray not suggestive of TB are classified as Class B2. The Division of Global Migration and Quarantine notifies CDPHE's TB Program of all class B1 and B2 individuals who are entering the state. The CDPHE TB Program forwards these referrals to the local health departments in the counties where the individual will reside. The local health departments provide medical evaluations and treatment for infection, whether active or latent. While data are still preliminary for 2014, there were 341 Class B notifications of which 322 were confirmed as arriving in Colorado. Of those 322 confirmed arrivals, 288 (89.4%) were evaluated. Four of those were found to have active TB disease. **Table 12** shows a breakdown of Class B data for 2010-2014 in Colorado.

There were markedly fewer instances of lab-confirmed drug resistance in both 2013 and 2014 compared to cases the three years previous. Of the 64 TB cases in 2014, 43 (67.2%) had a positive culture. And of those 43, five were resistant to one or more of the four (five including the oft-prescribed streptomycin) primary/first-line TB drugs: isoniazid, rifampin, pyrazinamide and ethambutol. Of those five cases; one was resistant to isoniazid alone, two were resistant to pyrazinamide alone; one was resistant to streptomycin alone; and one was resistant to isoniazid, rifampin, and pyrazinamide, which represented a multi-drug resistant TB (MDR) case. There was no extensively-drug resistant TB (XDR-TB) identified in 2014. See **Table 9** for a full break down of drug susceptibilities over the past five years.

While still preliminary, in 2013, 37 sputum smear positive or sputum smear negative/culture positive cases yielded 626 contacts. As a result of these investigations, two active cases of TB disease and 115 cases of TB infection were identified. Of those 115 LTBI cases, 79 have started LTBI treatment (68.7%) and 60 of those patients (76.0%) completed LTBI treatment. **Table 11** is a summary of contact investigations from 2004-2013.

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Table 1. Demographic Comparison of 2013 and 2014 Active TB Cases

	2013		2014	
	n	% of cases	n	% of cases
Age Group (years)				
<15	2	2.7	2	3.1
15-24	8	10.8	7	10.9
25-44	24	32.4	18	28.1
45-64	19	25.7	19	29.7
65+	21	28.4	18	28.1
TOTAL	74	100	64	100
Gender				
Male	43	58.1	33	51.6
Female	31	41.9	31	48.4
TOTAL	74	100	64	100
Race/Ethnicity				
White	10	13.5	7	10.9
Black	19	25.7	16	25.0
Hispanic	24	32.4	16	25.0
American Indian/Alaska native	0	0	0	0
Asian/Pacific Islander	21	28.4	25	39.0
Multiple race	0	0	0	0
TOTAL	74	100	64	100
Region				
Denver metro ^a	53	71.6	52	81.3
Outside Denver metro	21	28.4	12	18.7
TOTAL	74	100	64	100
Country of Origin (U.S.- vs. Foreign-born)				
United States	16	21.6	11	17.2
Mexico	19	25.7	14	21.9
Other countries	39	52.7	39	60.9
TOTAL	74	100	64	100
HIV Status				
HIV Negative	65	87.8	63	98.4
HIV Positive	7	9.5	0	0
Testing done, results unknown	0	0	0	0
Refused testing	0	0	0	0
Not offered	2	2.7	1	1.6
Unknown	0	0	0	0
TOTAL	74	100	64	100
Risk factors^b				
Birth in one of the 22 highest TB-burden countries ^c	22	29.7	23	35.9
Homeless within past year	6	8.1	1	1.6
Diabetes	12	16.2	12	18.7
Resident of correctional facility at diagnosis	2	2.7	0	0
Resident of long-term care facility	1	1.4	1	1.6
Injected drug use within past year	1	1.4	1	1.6
Non-injected drug use within past year	3	4.1	1	1.6
Excess alcohol use within past year	7	9.5	3	4.7
Health care worker within past year	2	2.7	4	6.2

Note: percentages may not equal 100 due to rounding.

a. Denver metro includes: Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas and Jefferson counties.

b. A case may have more than one risk factor indicated.

c. According to the World Health Organization's definition of 22 highest-burden countries

http://www.who.int/tb/publications/global_report/2007/annex_1_download/en/index.html

Tuberculosis in Colorado: A Summary of Active Cases Reported in 2014

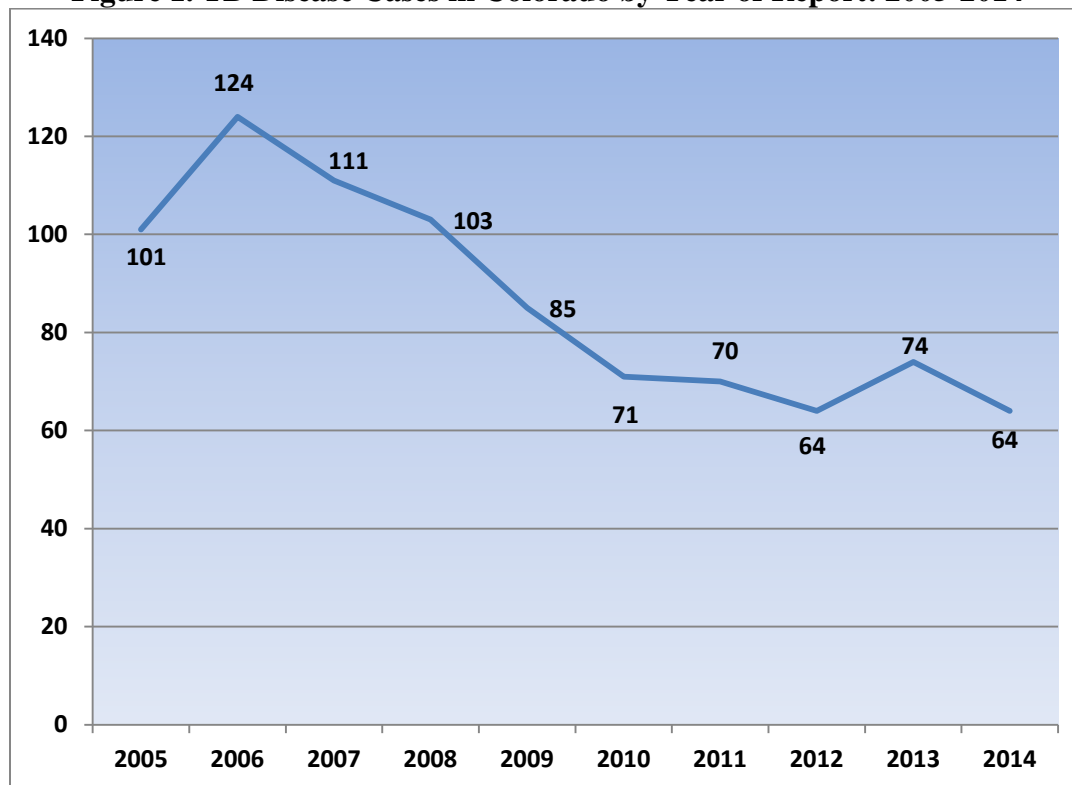
Tuberculosis Incidence

In 2014, a total of 64 active tuberculosis disease (TB) cases were reported in Colorado. As in most of the United States, Colorado has documented a slow decline in TB cases and the incidence rate of TB over the past 10 years (**Table 2**). Colorado's incidence rate has dropped from 2.6 per 100,000 in 2006 to 1.2 during 2014. **Table 2** reflects active TB disease in Colorado and the United States over the past decade and **Figure 1** shows the 10 year trend in Colorado.

Table 2. Tuberculosis Cases and Incidence Rates per 100,000 Persons, Colorado and United States, 2005-2014

	Colorado		United States	
Year	Cases	Rate	Cases	Rate
2005	101	2.1	13,998	4.8
2006	124	2.6	13,726	4.6
2007	111	2.3	13,280	4.4
2008	103	2.1	12,881	4.2
2009	85	1.7	11,518	3.8
2010	71	1.4	11,159	3.6
2011	70	1.4	10,505	3.4
2012	64	1.2	9,922	3.2
2013	74	1.4	9,561	3.0
2014	64	1.2	9,398	3.0

Figure 1. TB Disease Cases in Colorado by Year of Report: 2005-2014



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Table 3. TB in Colorado: Cases by County and Year of Report 2005-2014

County	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Adams*	6	17	14	14	4	7	12	7	7	7
Alamosa	1	0	0	0	0	0	0	0	0	0
Arapahoe*	17	22	17	14	11	17	5	11	14	14
Archuleta	0	0	0	0	0	0	0	0	1	0
Baca	0	0	0	0	0	0	0	0	1	0
Bent	0	0	1	0	0	0	0	0	0	0
Boulder	3	7	5	7	3	0	5	9	6	3
Broomfield	1	0	0	0	0	1	0	0	1	0
Clear Creek	0	0	0	0	1	0	0	0	0	0
Conejos	0	1	0	2	0	0	0	0	0	0
Delta	0	0	1	0	1	0	0	0	0	0
Denver	42	40	37	24	29	23	21	10	21	23
Douglas*	0	1	2	3	4	1	2	1	2	1
Eagle	1	0	0	1	2	0	0	1	0	1
El Paso	9	10	7	10	7	8	7	5	8	1
Fremont	1	0	1	0	1	1	0	0	0	0
Garfield	0	2	2	1	2	0	0	0	0	1
Grand	1	2	0	0	0	0	0	0	0	0
Gunnison	0	0	0	0	2	0	0	0	0	0
Huerfano	0	0	0	0	0	1	0	0	0	0
Jefferson	5	5	9	12	8	0	8	3	2	4
Kit Carson	0	0	0	0	0	1	0	0	0	0
La Plata	0	0	0	0	0	0	0	1	0	0
Lake	0	0	1	1	0	0	0	0	0	0
Larimer	2	4	2	3	2	5	2	4	3	1
Las Animas	0	0	2	1	2	0	0	0	0	0
Logan	1	0	0	1	0	0	0	0	0	1
Mesa	0	0	0	0	1	0	1	1	2	0
Moffat	1	0	0	0	0	0	0	0	0	0
Montezuma	0	0	1	0	0	0	0	0	0	0
Morgan	2	0	2	1	1	0	2	1	0	1
Otero	0	1	0	1	0	0	0	0	0	0
Phillips	1	0	0	0	0	0	0	0	0	0
Pitkin	1	2	0	0	0	0	0	0	0	1
Prowers	0	0	0	0	0	0	0	0	2	0
Pueblo	3	2	4	3	1	2	1	1	2	2
Rio Grande	0	0	1	0	0	1	0	0	0	0
Saguache	0	0	0	1	0	0	0	0	1	0
Summit	0	1	0	0	0	1	0	1	0	0
Teller	0	0	0	0	1	0	0	1	0	0
Weld	3	5	1	3	2	2	4	7	0	3
Yuma	0	2	1	0	0	0	0	0	1	0
TOTAL	101	124	111	103	85	71	70	64	74	64

Note: Only counties reporting an active case of TB (2005-2014) are included.

Note2: Highlighted counties reported at least one case of active TB in 2014.

* Tri-County Health Department comprises Adams, Arapahoe, and Douglas Counties.

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The county-specific five-year mean incidence rates are provided in **Table 4**. Fourteen counties (21.9% of all counties) have an average incidence rate equal to or greater than the average state incidence rate of 1.3 per 100,000 over the same five-year period, though several counties have too few cases for those mean incidence rates to be significant.

**Table 4. TB in Colorado: 2010-2014 Mean Incidence Rates* by County
(Reporting at least one case)**

						5-Year Incidence Rates 2010-2014
County	2010	2011	2012	2013	2014	
Adams	1.6	2.7	1.5	1.5	1.5	1.7
Arapahoe	2.9	0.9	1.9	2.3	2.3	2.0
Archuleta	0.0	0.0	0.0	8.0	0.0	1.6
Baca	0.0	0.0	0.0	26.8	0.0	5.3
Boulder	0.0	1.7	3.0	1.9	1.0	1.5
Broomfield	1.8	0.0	0.0	1.7	0.0	0.7
Denver	3.7	3.4	1.6	3.2	3.5	3.1
Douglas	0.3	0.7	0.3	0.7	0.3	0.5
Eagle	0.0	0.0	1.9	0.0	1.9	0.7
El Paso	1.3	1.1	0.8	1.2	0.2	0.9
Fremont	2.0	0.0	0.0	0.0	0.0	0.4
Garfield	0.0	0.0	0.0	0.0	1.7	0.3
Huerfano	14.4	0.0	0.0	0.0	0.0	3.0
Jefferson	0.0	1.5	0.6	0.4	0.7	0.6
Kit Carson	11.5	0.0	0.0	0.0	0.0	2.4
La Plata	0.0	0.0	1.9	0.0	0.0	0.4
Larimer	1.7	0.7	1.3	0.9	0.3	1.0
Logan	0.0	0.0	0.0	0.0	4.6	0.9
Mesa	0.0	0.7	0.7	1.3	0.0	0.5
Morgan	0.0	7.0	3.5	0.0	3.5	2.8
Pitkin	0.0	0.0	0.0	0.0	5.7	1.1
Prowers	0.0	0.0	0.0	16.0	0.0	3.2
Pueblo	1.2	0.6	0.6	1.2	1.2	1.0
Rio Grande	7.9	0.0	0.0	0.0	0.0	1.6
Saguache	0.0	0.0	0.0	15.4	0.0	3.1
Summit	3.4	0.0	3.5	0.0	0.0	1.4
Teller	0.0	0.0	4.3	0.0	0.0	0.9
Weld	0.8	1.5	2.7	0.0	1.1	1.2
Yuma	0.0	0.0	0.0	9.9	0.0	2.0
Colorado	1.4	1.4	1.2	1.4	1.2	1.3

*TB disease per 100,000 persons

Note: Denominators for computing the rate of tuberculosis throughout this report are from the Colorado Division of Local Government, State Demography Office.

Note 2: Incidence rates based on fewer than five health events are likely to be unstable and imprecise.

Tuberculosis by Age Group

In 2014, TB cases were reported among people ranging from >1 to 84 years of age. Over 29% of TB cases occurred among people 45-64 years old, followed by those aged 65+ years (28.1%) and 25-44 years (28.1%). Two cases of pediatric TB (<15 years of age) were reported in 2014. Active TB in children is particularly concerning, as it indicates ongoing transmission in the community as well as evidence of missed opportunities for preventive therapy. Of those two pediatric cases, both were younger than five years of age (**Figure 3**). One was foreign-born and was diagnosed upon arrival in the U.S. and the second was diagnosed after returning from an extended stay in a high-burden country.

Figure 3. 2014 Active TB Cases by Age Group (n=64)

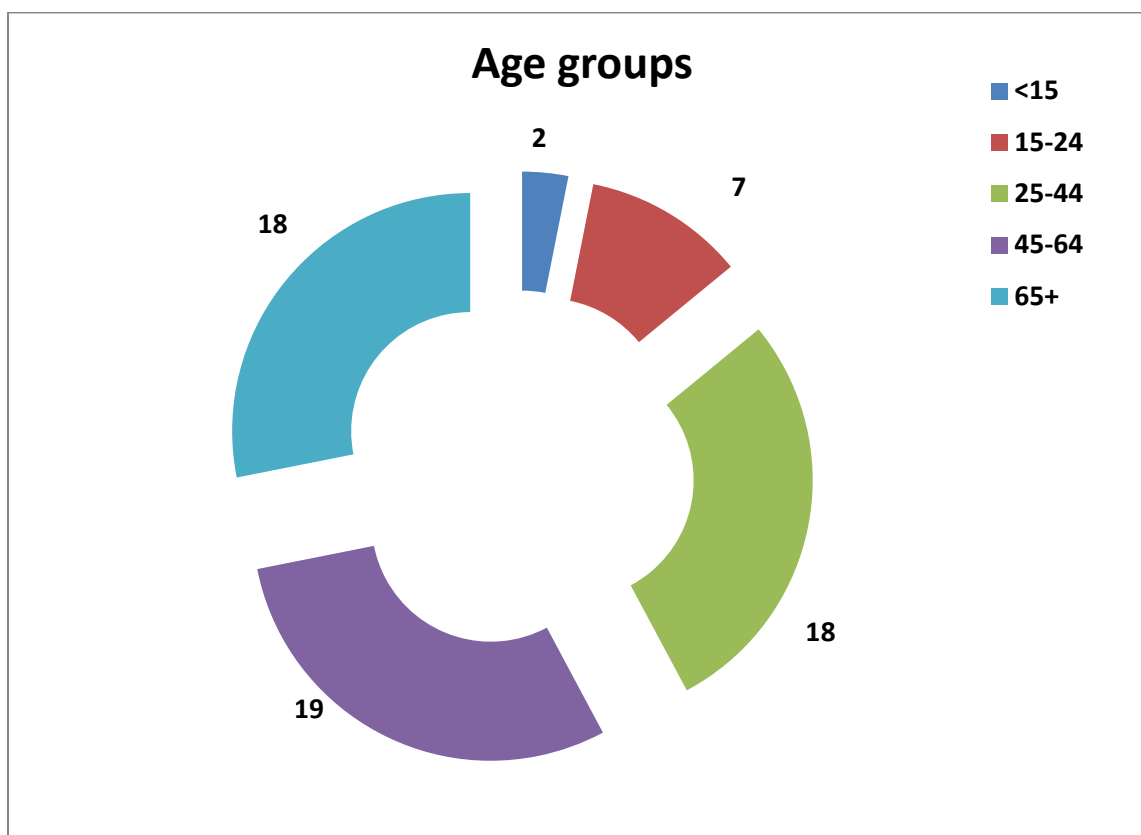


Table 5 shows that in 2014 the highest TB incidence rate was among persons 80-84 years of age (8.0 cases per 100,000) and lowest (among groups with at least one documented case) among those 45-49 years (0.3 cases per 100,000). **Table 6** shows the age groups relative to nativity (U.S.-born and foreign-born). As expected, the foreign-born population bears a disproportionate burden of TB disease given their small population compared to the U.S.-born cohort in the state. While less than ten percent of Colorado's population is foreign-born, foreign-born cases of TB make up almost 83% of all TB cases reported in the state in 2014.

Table 5. TB in Colorado: 2013 & 2014 Reported Cases by Gender and Age Group

Age Group	2013				2014			
	Male	Female	Total	Rate*	Male	Female	Total	Rate*
0 to 4	0	2	2	0.6	2	0	2	0.6
5 to 9	0	0	0	0	0	0	0	0
10 to 14	0	0	0	0	0	0	0	0
15 to 19	2	0	2	0.6	1	2	3	0.9
20 to 24	4	2	6	1.7	2	2	4	1.1
25 to 29	5	3	8	2.2	0	6	6	1.6
30 to 34	2	3	5	1.3	0	2	2	0.5
35 to 39	1	1	2	0.6	4	1	5	1.4
40 to 44	3	6	9	2.5	4	1	5	1.4
45 to 49	5	1	6	1.7	1	0	1	0.3
50 to 54	4	2	6	1.6	3	3	6	1.6
55 to 59	3	2	5	1.4	3	2	5	1.4
60 to 64	2	0	2	0.7	4	3	7	2.4
65 to 69	3	1	4	1.7	1	2	3	1.4
70 to 74	4	3	7	4.5	2	1	3	2.1
75 to 79	2	1	3	2.8	3	3	6	5.7
80 to 84	2	0	2	2.5	3	3	6	8.0
85+	1	4	5	6.3	0	0	0	0
TOTAL	43	31	74	1.4	33	31	64	1.2
Note: Incidence rates based on fewer than five health events are likely to be unstable and imprecise. *Rates per 100,000 persons.								

Table 6. TB in Colorado: 2013 & 2014 Case Comparison by Age Group and Patient Nativity

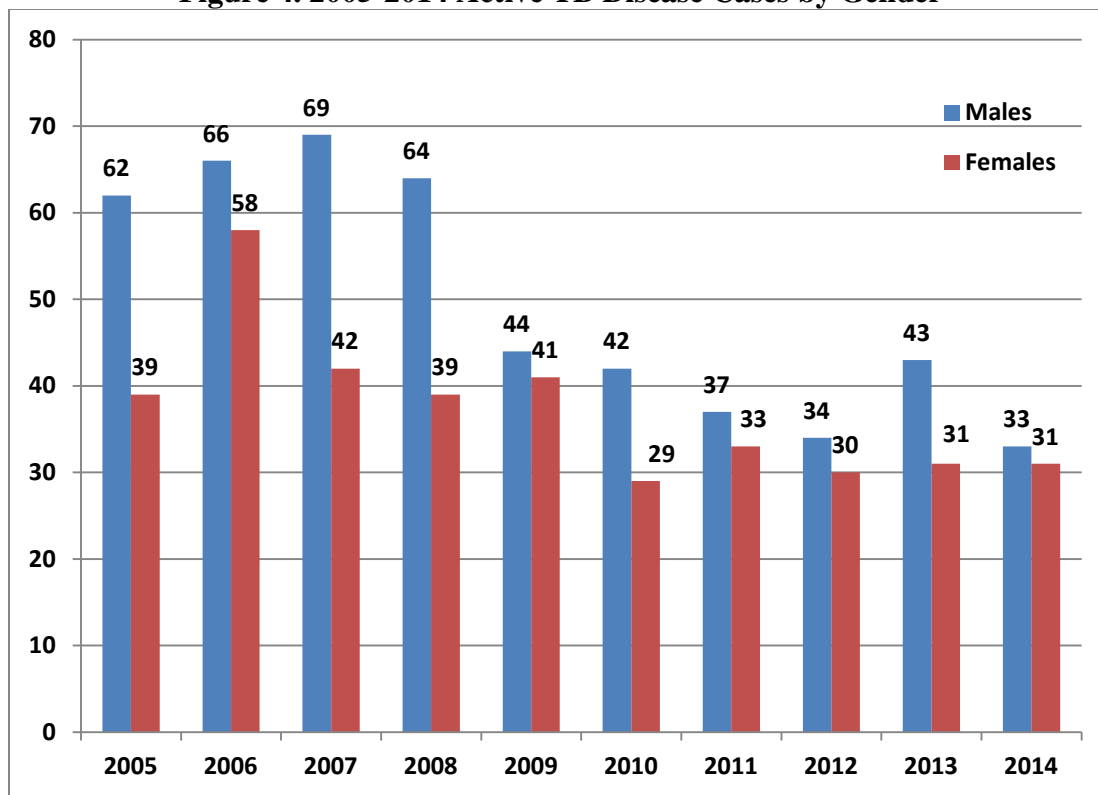
Age Group	2013			2014		
	U.S.-Born	Foreign-Born	Total	U.S.-Born	Foreign-Born	Total
0-4	1	1	2	1	1	2
5-14	0	0	0	0	0	0
15-24	1	7	8	2	5	7
25-34	1	12	13	0	8	8
35-44	3	8	11	3	7	10
45-54	3	9	12	0	7	7
55-64	3	4	7	4	8	12
65-74	3	8	11	0	6	6
75-84	0	5	5	1	11	12
85+	1	4	5	0	0	0
TOTAL	16	58	74	11	53	64

Tuberculosis by Gender

Tuberculosis tends to infect and lead to active TB disease in males more often than females. This finding may be due to disparities in access to health care, differing health-seeking behaviors, underlying biological susceptibility to TB and/or the distribution of risk factors such as substance abuse, incarceration (living in a congregate setting), and

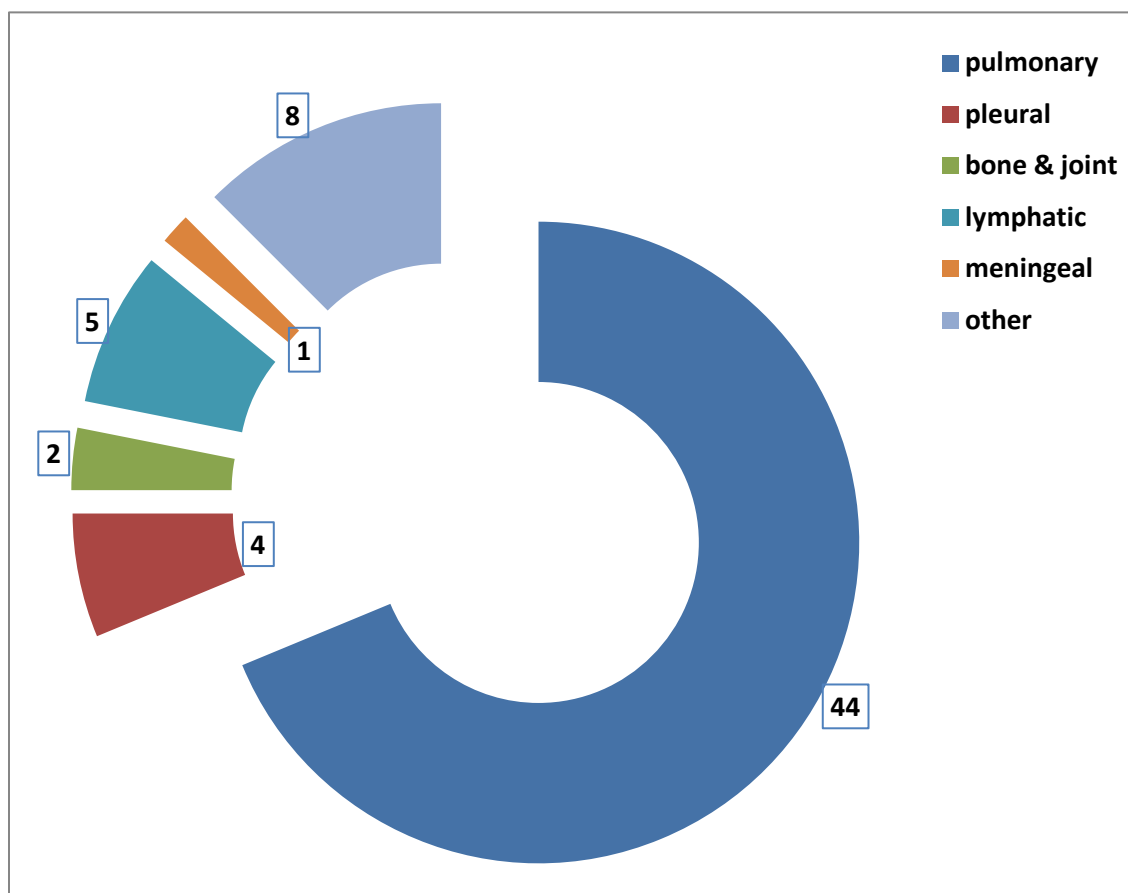
homelessness. Gender-specific cases over the last 10 years are found in **Figure 4**. In 2014, the usual TB gender disparity was less-pronounced than in some previous years with 33 males (51.2% of total; comparable with 58.1% in 2013) and 31 females.

Figure 4. 2005-2014 Active TB Disease Cases by Gender



Tuberculosis Cases by Major Site of Disease

Tuberculosis most often attacks the lungs (pulmonary TB), but may affect any part of the body (extrapulmonary TB), including the kidneys, spine or brain, lymph nodes, bones or joints, and genitourinary tract. In 2014, 44 of the 64 (68.8%) cases were pulmonary or had both a pulmonary and extrapulmonary site of disease, which is consistent with recent years' surveillance. The next most common site of infection in 2014 was the "other" category (1-endometrium, 1-pericardium, 2-ocular, 1-Potts Disease, 1-epidermis, and 2-peritonium), followed by the lymph system (cervical, intrathoracic or axillary) with 5 cases (7.8%). There were two cases of *M. bovis* infection and no instances of genitourinary sites of disease in 2014. **Figure 5** shows the major anatomical sites of TB disease among 2014 cases.

Figure 5. 2014 Sites of TB Disease (n=64)

Tuberculosis by Race/Ethnicity

The number of reported cases of TB in Colorado for the last decade has been highest among racial and ethnic minorities. The distribution of cases in 2014 is consistent with recent trends except 2012 which reflected some marked differences from past years. The biggest changes of note in 2014 were among Hispanics (decrease of 33%) and Asian/Pacific Islanders (increase of 19%). Among those self-identifying as White, cases decreased from 10 in 2013 to 7 in 2014; a decrease of 30%. As observed nationally, there also exists an ethnic/racial disparity in Colorado specific to the distribution of TB disease among racial and ethnic minorities. This is a major concern to the state of Colorado's TB Program. In 2014 for instance, Black/African American persons comprised roughly 4% of the total population of the state, yet represented 25.0% of all active TB cases. And most striking; Asian and Pacific Islanders comprise only 3% of the state's population but made up over 39% of the TB cases last year with an incidence rate (17.4/100,000) over 80 times higher than among whites (0.2/100,000). See **Figure 6** and **Figure 7** for a full breakdown of race and ethnicity incidence. There were no cases among American Indian/Alaska Natives or those self-identifying as of multiple races.

Figure 6. 2005-2014: TB Cases Self-Identifying as White vs. Non-White

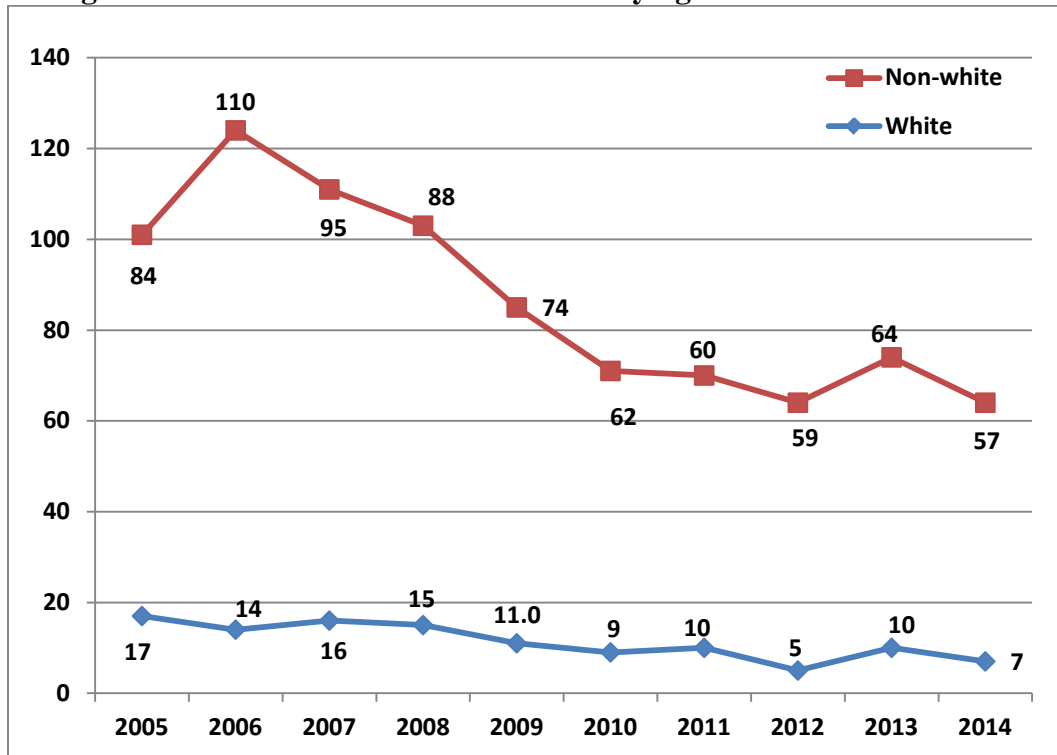
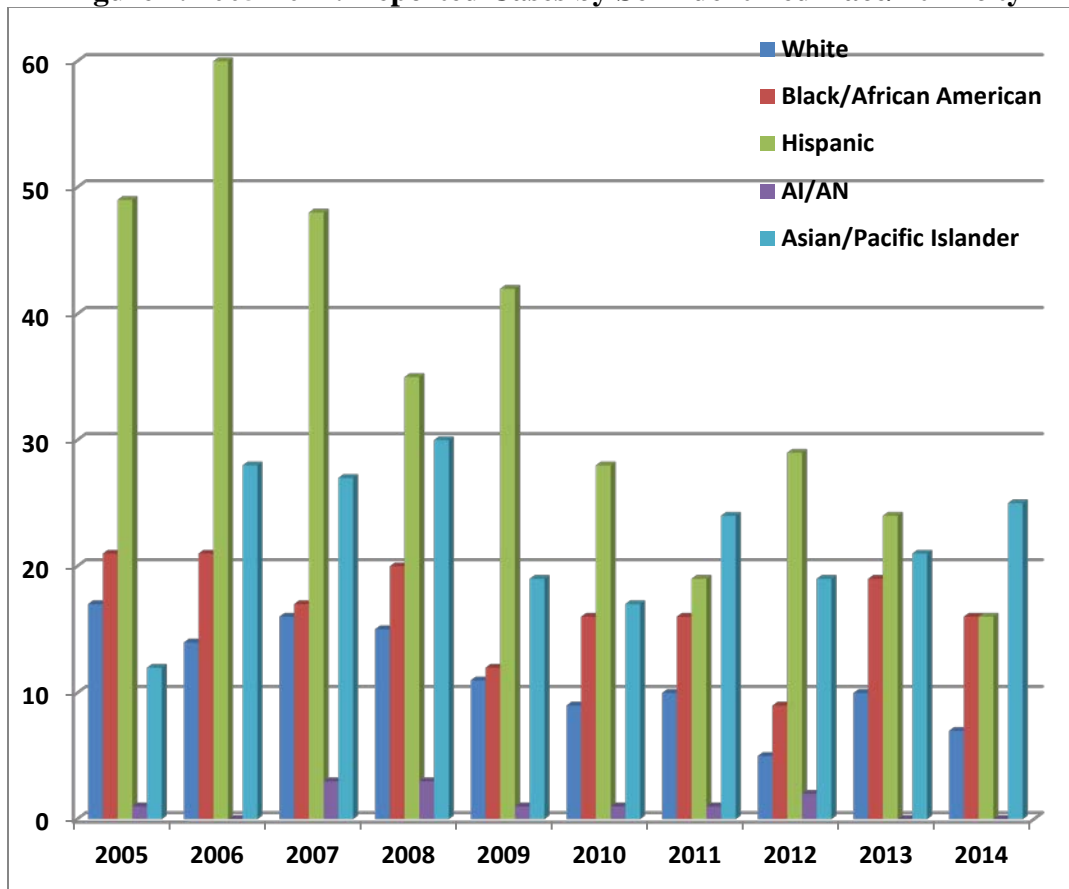


Figure 7. 2005-2014: Reported Cases by Self-Identified Race/Ethnicity



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The United States Centers for Disease Control and Prevention (CDC) considers Colorado a low-incidence state in relation to reportable TB disease (defined as an incidence rate less than 3.5 per 100,000 persons); however, incidence rates in the Black/African-American and Asian/Pacific Islander populations both exceeded the “low-incidence” threshold. **Table 7** compares race and ethnicity TB incidence rates from 2013 and 2014.

Table 7. TB in Colorado: 2013 and 2014 Cases by Race/Ethnicity

Race/ethnicity	2013		2014	
	Number of Cases (% of total)	Incidence Rate*	Number of Cases (% of total)	Incidence Rate*
White/Caucasian	10 (13.5)	0.2	7 (10.9)	0.2
Black/African-American	19 (25.7)	9.6	16 (25.0)	8.0
Hispanic	24 (32.4)	2.2	16 (25.0)	1.5
Asian/Pacific Islander	21 (28.4)	14.6	25 (39.1)	17.4
American Indian/AK native	0	0	0	0
TOTAL	74 (100)	1.4	64	1.2

*Per 100,000 persons

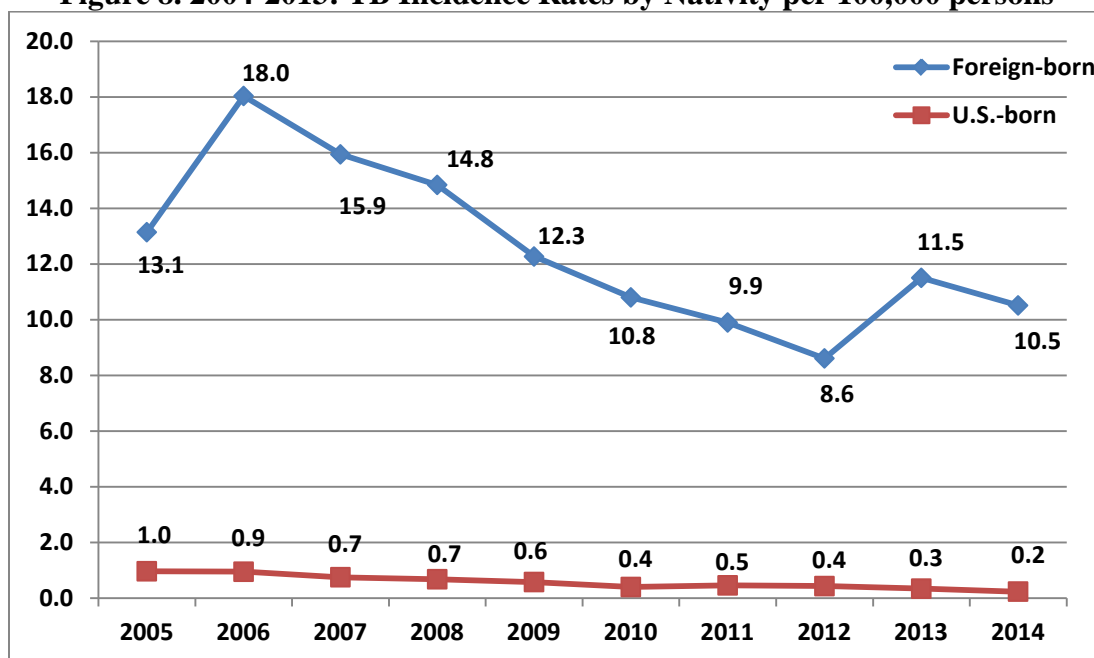
Note: Incidence rates based on fewer than five health events are likely to be unstable and imprecise.

Note2: percentages may not equal 100 due to rounding.

TB Incidence Rates by Nativity

In 2014, the TB incidence rate in the foreign-born population living in Colorado was 10.5 per 100,000 persons, which is 52 times higher than that of the U.S.-born population (0.2 per 100,000). Since 2005, more than two-thirds (612 of 867 cases or 70.6%) of the cases of TB disease reported in Colorado were among foreign-born individuals (**Figure 8** and **Figure 9**). The U.S.-born rate remains low over the past ten years with a steady decline.

Figure 8. 2004-2013: TB Incidence Rates by Nativity per 100,000 persons



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In 2014, 53 foreign-born cases of TB disease were reported in Colorado, representing 82.8% of all cases for the year, up from 78.3 % in 2013 and 70.3% in 2012. Those 53 cases originated from 22 different countries. The largest single foreign-born cohort, as is the case each year, came from Mexico with 14 cases. **Table 8** shows a breakdown of the countries of origin for all active cases of TB disease from 2010-2014. The 2014 cases are highlighted. Of those foreign-born cases, 22 (34.4% of all foreign-born cases) came from one of the top 22 highest-burdened countries that comprise 80% of all global cases of active TB disease according to the World Health Organization.

Figure 9. 2005-2014: Reported TB Cases U.S.- vs. Foreign-born

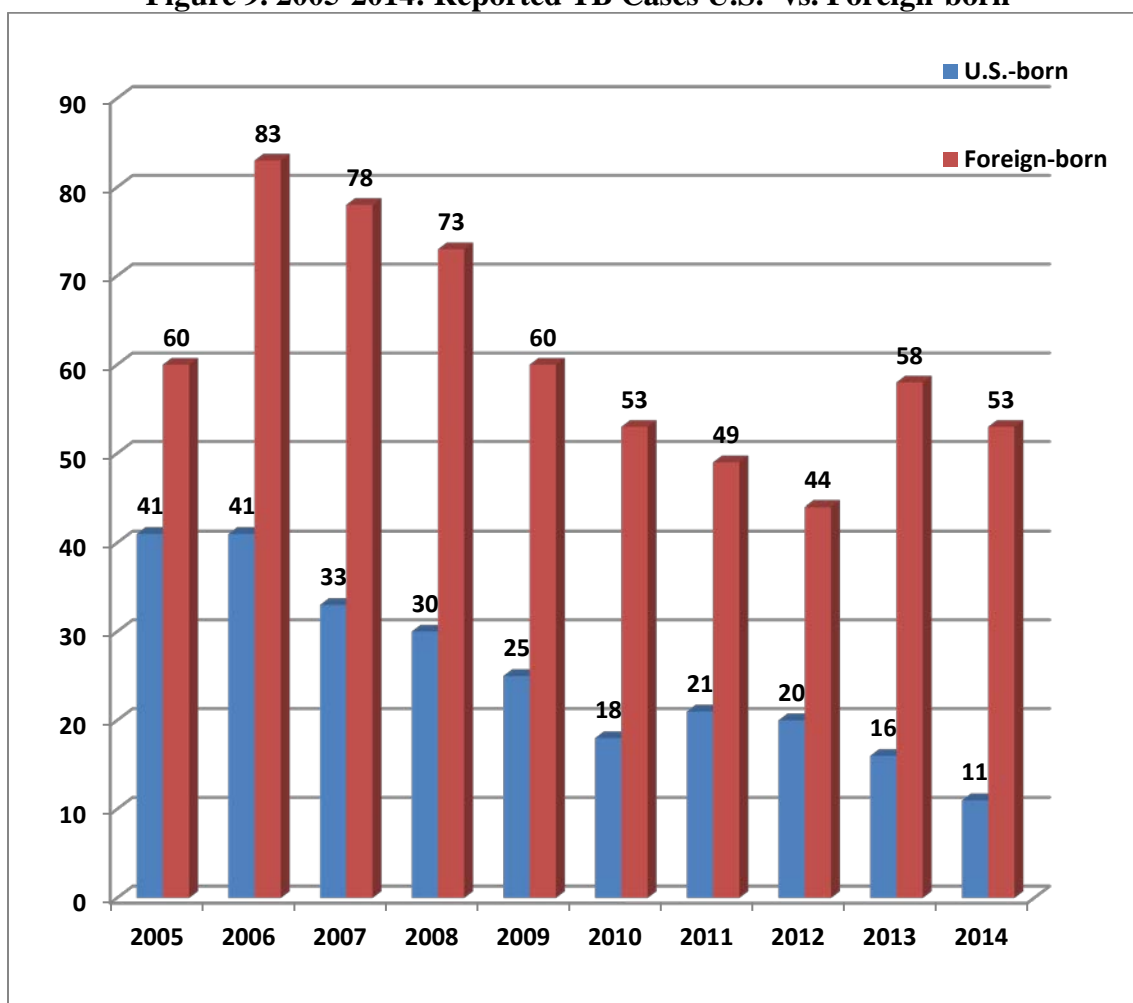


Table 8. Comparison of Colorado TB Cases by Country of Origin, 2010-2014

Country	2010	2011	2012	2013	2014
Afghanistan*	0	0	0	2	0
Angola	0	0	0	0	1
Bangladesh*	2	0	0	0	1
Bhutan	1	1	2	2	3
Burma/Myanmar*	2	1	0	3	1
Burundi	0	0	1	0	0
Cambodia	0	0	0	0	1
Canada	1	0	0	0	1
China*	1	1	2	2	2
Cote D'Ivoire	0	0	0	0	1
Democratic Rep. of Congo*	0	1	0	2	2
Eritrea	1	2	0	2	0
Ethiopia*	4	2	3	6	6
Fiji	0	1	0	0	0
Germany	1	0	0	0	0
Ghana	0	0	0	1	1
Greece	0	0	0	1	0
Guam	1	0	0	0	0
Haiti	0	0	1	0	0
Honduras	0	1	1	0	0
India*	1	4	3	3	4
Indonesia*	2	1	1	1	0
Ireland	0	0	0	0	1
Italy	0	1	0	0	0
Jamaica	1	0	0	0	0
Kenya*	0	2	1	0	0
South Korea	1	2	0	1	2
Laos	0	1	2	2	1
Liberia	1	0	0	0	0
Mexico	22	12	18	19	14
Micronesia	0	0	1	0	2
Mongolia	0	0	0	0	1
Nepal	0	3	4	2	0
Pakistan*	0	1	0	0	0
Palau	1	0	0	0	0
Peru	1	0	1	1	1
Philippines*	3	2	2	1	3
Poland	0	0	0	1	0
Russian Federation*	0	0	0	1	0
Rwanda	1	0	0	0	0
Senegal	1	0	0	0	0
Somalia	4	5	0	1	3
Sudan	0	0	0	2	0
Taiwan	0	1	0	0	0
Thailand*	0	0	0	2	0
Tonga	0	1	0	0	0
U.S.	16	21	19	16	9
Viet Nam*	2	3	2	0	3
Total cases	71	70	64	74	64

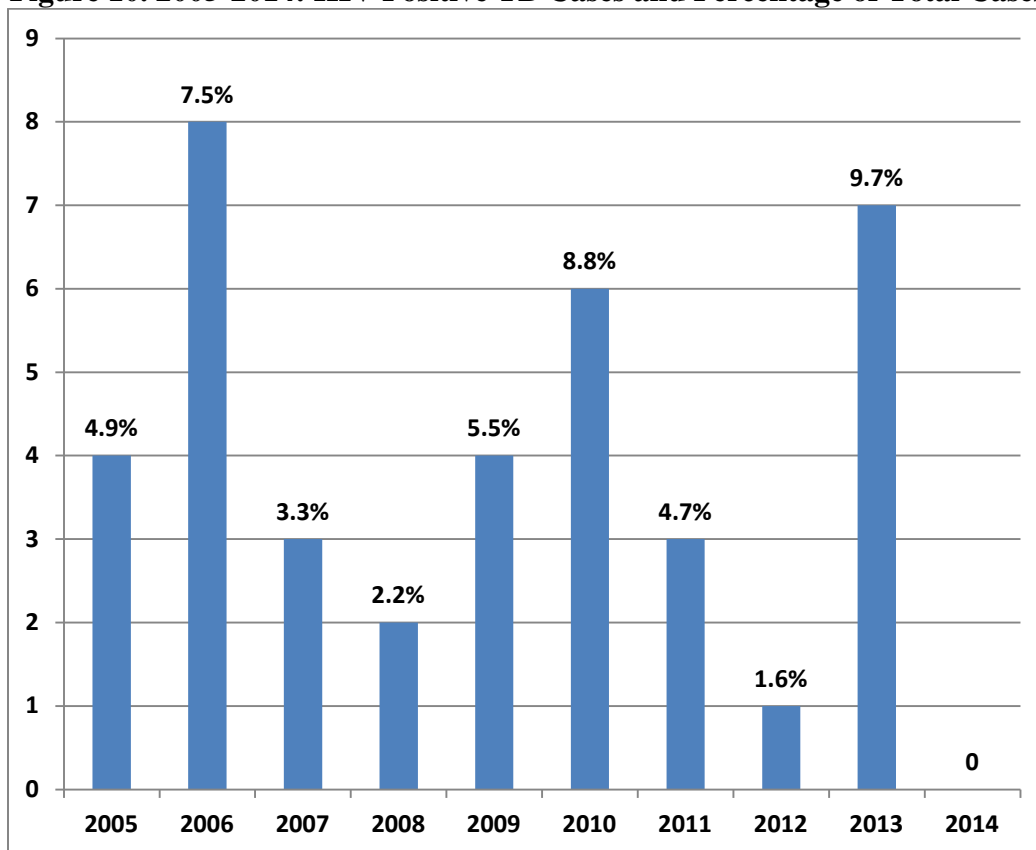
Note: only 2014 cases and corresponding countries of origin are highlighted

*Denotes one of the 22 highest-TB burden countries that constitute ~80% of global TB cases

HIV Co-infection

Worldwide, one in four people with HIV who die of AIDS-defining conditions do so as a result of TB disease. HIV-infected people with latent TB infection (LTBI) are at higher risk of active TB since HIV weakens the immune system, greatly increasing the likelihood of progression from TB infection to active TB disease. Of the 64 cases of TB in 2014, recent test results for HIV were available for 63 (98.4% of total cases). Of those 63, none were found to be co-infected with HIV. This is the first year that there were no cases of TB/HIV co-infection among the state's TB cases since positive HIV test results became reportable. The one patient without a test result was not offered an HIV test while hospitalized and left the country upon release and was lost to follow-up. Zero cases are difficult to analyze after 2013 recorded the highest percentage of HIV+ TB patients in the past ten years (9.7% of all cases). **Figure 10** shows the total number of HIV cases among TB patients over the last 10 years, as well as the percentage of the annual cases with HIV/TB co-morbidity.

Figure 10. 2005-2014: HIV Positive TB Cases and Percentage of Total Cases



Drug Resistance and TB

There were markedly fewer instances of lab-confirmed drug resistance in both 2013 and 2014 compared to cases the three years previous. Of the 64 TB cases in 2014, 43 (67.2%) had a positive culture. And of those 43, five were resistant to one or more of the four (five including the oft-prescribed streptomycin) primary/first-line TB drugs: isoniazid, rifampin, pyrazinamide and ethambutol. Of those five cases; one was resistant to isoniazid alone, two were resistant to pyrazinamide alone; one was resistant to

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streptomycin alone; and one was resistant to isoniazid, rifampin, and pyrazinamide, which represented a multi-drug resistant TB (MDR) case. There was no extensively-drug resistant TB (XDR-TB) identified in 2014. See **Table 9** for a full break down of drug susceptibilities over the past five years.

Table 9. TB in Colorado: 2010-2014 Drug Susceptibilities

	2010	2011	2012	2013	2014
TB Drug(s)	Number Resistant	Number Resistant	Number Resistant	Number Resistant	Number Resistant
isoniazid only	5	4	0	1	1
pyrazinamide only	2	4	3	1	2
ethambutol only	0	1	0	0	0
isoniazid & streptomycin	0	1	1	1	0
isoniazid & rifampin	0	0	1	0	0
pyrazinamide and streptomycin	0	0	0	0	0
streptomycin only	1	1	2	0	1
streptomycin & ethionamide	0	0	0	0	0
isoniazid, streptomycin & ethambutol	0	1	0	0	0
isoniazid, streptomycin & ethionamide	0	0	0	0	0
isoniazid, rifampin, ethambutol, pyrazinamide & streptomycin	1	1	0	0	0
rifampin, ethambutol & streptomycin	0	0	1	0	0
isoniazid, rifampin, & pyrazinamide	0	0	0	0	1
Total	9	13	8	3	5

Directly Observed Therapy (DOT)

Directly observed therapy (DOT) is the standard of care for administering TB medications to patients with active TB disease. Directly observed therapy is required for all pulmonary cases of TB in Colorado and involves health care workers observing the patient taking his/her medications to ensure compliance with, and completion of, the treatment regimen. During 2013 (the most recent year with complete data), there were 72 patients who were treated for active TB disease; two others was dead at TB diagnosis. All 72 received TB treatment through DOT, self-administered treatment or a combination of both. To date in 2014, DOT data is available for 19 patients; of those, one was SAT only, three were DOT and SAT, and 15 were DOT only. **Table 10** presents the number and percentage of cases receiving DOT in 2011, 2012, and 2013 along with preliminary 2014 data.

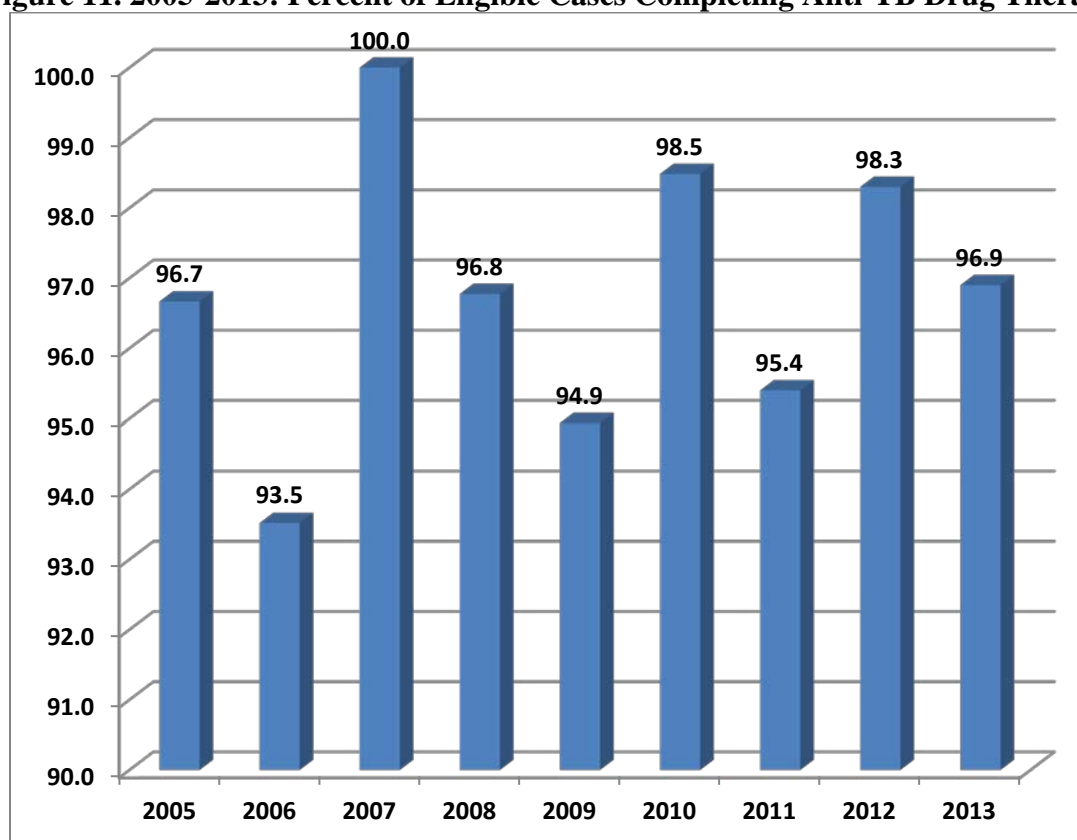
Table 10. Number & Percentage of Patients Receiving DOT and/or SAT: 2011-2014

	2011		2012		2013		2014*	
	N	%	N	%	N	%	N	%
DOT only	59	84.3	51	79.7	59	81.9	15	23.4
DOT + self administered	6	8.6	8	12.5	7	9.7	3	4.7
Self administered only	3	4.3	3	4.7	5	6.9	1	1.6
Dead at diagnosis	2	2.9	2	3.1	1	1.4	0	0
TOTAL	70	100	64	100	72	100	64	n/a

*2014 data are preliminary; 45 of 64 cases have pending DOT data

Completion of TB Treatment

The standard treatment for active TB disease is six months using isoniazid, rifampin, ethambutol and pyrazinamide. In 2013, (the most recent year where final completion data are available), one patient's treatment completion is pending after he moved to Mexico; one patient was dead at diagnosis; and eight patients died during therapy. Of the remaining 65 eligible cases, 63 completed therapy and two were uncooperative/refused therapy. All new cases counted in 2014, who were alive at diagnosis, have initiated treatment. Treatment completion data for 2014 will be analyzed in more detail in the 2015 surveillance report when these data will be more complete. **Figure 11** includes updated 2013 treatment completion data, along with complete data for the previous eight years.

Figure 11. 2005-2013: Percent of Eligible Cases Completing Anti-TB Drug Therapy

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Contact Investigations

The Colorado Department of Public Health and Environment's TB Program is responsible for TB control throughout the state of Colorado, which includes the public health imperative to conduct contact investigations on all cases of infectious (pulmonary, pleural and laryngeal) TB. Contacts to infectious TB patients are 75 times more likely to be infected with TB than the general public, making it critical to locate, evaluate, and treat infected contacts. **Table 11** is a summary of contact investigations from 2004-2013 (2013 data is preliminary and preliminary data for 2014 will be available when the 2015 surveillance report is completed.) While still preliminary, in 2013, 37 sputum smear positive or sputum smear negative/culture positive cases yielded 626 contacts. As a result of these investigations, two active cases of TB disease and 115 cases of TB infection were identified. Of those 115 LTBI cases, 79 have started LTBI treatment (68.7%) and 60 of those patients (76.0%) completed LTBI treatment.

**Table 11. Follow-up and
Treatment for Contacts to Active Tuberculosis Cases, 2004-2013**

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013*
Number of sputum smear positive or sputum smear negative, culture positive cases	48	44	64	40	44	41	34	38	32	37
Total contacts	1,462	1,317	1,523	594	1,185	490	602	493	1802	626
Average contacts per infectious case	30.5	29.9	23.7	14.8	26.9	11.9	17.8	13.0	56.3	16.9
Number (%) of contacts evaluated*	1,170 (80%)	1,113 (85%)	1,290 (85%)	432 (73%)	998 (84%)	447 (91%)	560 (93%)	388 (79%)	1617 (90%)	568 (91%)
Number (%) of contacts with latent TB infection	351 (30%)	220 (20%)	274 (21%)	127 (29%)	160 (16%)	176 (39%)	138 (25%)	84 (22%)	255 (16%)	115 (20%)
Number (%) of infected contacts starting treatment	276 (79%)	179 (81%)	217 (79%)	101 (79%)	128 (80%)	149 (85%)	131 (95%)	67 (80%)	248 (97%)	79 (67%)
Number (%) of contacts starting treatment who completed treatment	187 (68%)	129 (72%)	146 (67%)	83 (82%)	82 (63%)	108 (72%)	106 (81%)	61 (91%)	227 (92%)	60 (76%)
Number (%) of contacts with active TB disease	16 (1%)	7 (<1%)	9 (<1%)	3 (<1%)	2 (<1%)	2 (<1%)	6 (1.1%)	3 (<1%)	4 (<1%)	2 (<1%)

Note: Evaluated = symptom check and tuberculin skin test/IGRA, chest x-ray, sputum studies as indicated.

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*2013 data are preliminary; preliminary 2014 data is forthcoming in the 2015 Surveillance Report.

Class B Evaluations

Immigrants and refugees who are traveling to the United States are evaluated for TB prior to arriving (as required by U.S. immigration law) and assigned a classification according to the status of their disease. An individual with a medical history, physical exam, or chest x-ray suggestive of pulmonary TB, but who has a negative acid-fast bacilli (AFB) smear and culture and not diagnosed with active TB *or* has been diagnosed with TB and completes treatment overseas is classified as a Class B1. Those with a positive tuberculin skin test (TST) aged fifteen years or younger, and those with a chest x-ray not suggestive of TB are classified as Class B2. The Division of Global Migration and Quarantine notifies CDPHE's TB Program of all class B1 and B2 individuals who are entering the state. The CDPHE TB Program forwards these referrals to the local health departments in the counties where the individual will reside. The local health departments provide medical evaluations and treatment for infection, whether active or latent. While data are still preliminary for 2014, there were 341 Class B notifications of which 322 were confirmed as arriving in Colorado. Of those 322 confirmed arrivals, 288 (89.4%) were evaluated. Four of those were found to have active TB disease. **Table 12** shows a breakdown of Class B data for 2010-2014 in Colorado.

Table 12. Colorado Class BTB Data 2010-2014

	2010		2011		2012		2013		2014*	
	n	%	n	%	n	%	n	%	n	%
Class B notifications	325		303		412		335		341	
Moved prior to evaluation	25	7.7%	24	7.9%	19	4.6%	13	3.9%	19	5.6%
Arrivals	300	92.3%	279	92.1%	393	95.4%	322	96.1%	322	94.4%
Evaluated	259	86.3%	260	93.2%	372	94.7%	295	91.6%	288	89.4%
TB disease	5	1.9%	2	0.8%	3	0.8%	6	2.0%	4	1.4%
INH recommended	102	39.4%	102	39.2%	125	33.6%	93	31.5%	68	23.6%
Start treatment	83	81.4%	85	83.3%	93	74.4%	76	81.7%	52	76.5%
Complete treatment	73	88.0%	77	90.6%	83	89.2%	65	85.5%	33	63.5%
On treatment	0	0.0%	0	0.0%	0	0.0%	0	0.0%	15	28.8%

*preliminary data

Moving Forward

The Colorado Department of Public Health and Environment's TB Program maintains close working partnerships with local health departments, regional states' TB programs, as well as federal agencies in collaborative efforts to prevent, screen for, and treat TB in Colorado. While cases of TB plateau or even decline, the importance of tracking and ensuring treatment completion will remain paramount. Emphasis on completion of treatment requires close collaboration with local health departments and other partners to prevent both the further spread of the disease and the emergence of drug-resistant TB due to incomplete or interrupted drug treatment regimens. An emphasis on 100% HIV testing compliance among persons with active TB disease will continue for well-documented reasons; it should be noted that HIV testing rates are outstanding over the last several years in Colorado and all recent efforts suggest that will continue. Colorado's TB

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Program will actively seek and advocate for close collaboration with community stakeholders throughout the state as well as other CDPHE disease prevention programs including the HIV/STI and Viral Hepatitis Programs.

Moving forward, the Colorado's TB Program is working alongside state partners to draft and eventually implement a dynamic and well-conceived TB Elimination Plan for Colorado. We are in the early phases of recruiting interested parties and seeking their input on the scope and breadth of the plan that we hope to unveil on World TB Day 2016. The plan will run from 2016-2026 with hopes of reaching a 1/1 million TB case rate for the state where the current rate is 1.2/100,000. While details of the plan have yet to be reached, it will include improved TB testing diagnostics (IGRAs), partnering with staff working in co-morbid conditions including HIV and diabetes, and utilizing recent improvements in laboratory diagnostics including genotyping to find epi-links, pyrosequencing for ID and drug resistance and use of other rapid identification testes to expedite confirmation of TB that can also hasten the release from isolation of pulmonary and pleural TB patients.