Annual Tuberculosis Surveillance Report Colorado 2009

Colorado Department of Public Health and Environment

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Summary

Colorado documented 85 new cases of active tuberculosis (TB disease) during the 2009 calendar year. This represents a 17.5 percent decrease from the number of cases reported in 2008 (103). The largest decrease was seen among the Asian/Pacific Islander population (from 30 cases in 2008 down to 19 in 2009; a 37 percent decrease). There was an increase in some areas, with the largest in white Hispanics (from 35 cases in 2008 to 42 in 2009; a 20 percent increase). Birth in a country with high TB burden remains the strongest risk factor for developing active TB (55.3 percent of cases) followed by excess alcohol use (9.4 percent).

Twenty of the state's 64 counties reported at least one new case of TB in 2009. As in previous years, Denver County reported the most cases (29) of any Colorado county. Forty-seven of Colorado's 64 counties have reported at least one case of active TB in the past ten years (2000-2009).

The overall case rate for TB in Colorado is 1.7 per 100,000 persons, as compared to the overall rate in the United States of 3.8 per 100,000. The rate in the foreign-born population in Colorado (12.3 per 100,000) was 20 times that of the U.S.-born population (0.6 per 100,000). Seventy-one percent of reported cases were foreign-born in both 2008 and 2009.

The rate in the minority population (5.3 per 100,000) was approximately 18 times the rate in the majority (non-Hispanic white/Caucasian) population (0.3 per 100,000). While minorities made up 27.4 percent of the state's total population in 2009, 87 percent of new TB cases occurred in racial and ethnic minorities.

The age of persons reported with active TB in 2009 ranged from 12 months to 84 years. In 2009, the majority of cases occurred in adults ≥25. The 25- to 44-year-old group represented the largest percentage of cases (39 percent), and the 45- to 64-year-old group ranked second, with 28 percent of the cases.

During 2008, 101 patients received treatment for TB (two cases were diagnosed after the time of death). Ninety-four of the 101 patients completed treatment through directly observed therapy (DOT), self-administered therapy or a combination of both. The treatment completion data for 2009 are preliminary, since five patients remain on treatment. To date, 79 patients have received treatment in 2009 with 70 completing it via directly observed therapy, self-administered therapy or a combination. One patient was diagnosed post mortem.

In 2008, the CDPHE's TB Control Program received 252 notifications for immigrants and refugees designated as B1 (medical history or chest X-ray suggestive of active TB disease, but sputum smears/cultures are negative,) and B2 (tuberculin skin test ≥10 mm but otherwise has a negative evaluation for tuberculosis, suggestive of latent TB infection), of which 84.5 percent were evaluated. Of those evaluated, five immigrants or refugees were diagnosed with active TB disease. In 2009, there were 307 Class B1 and B2 notifications of which 301 were confirmed as arriving in Colorado. Of those 301 arrivals, 207 (69 percent) were evaluated, and two were found to have active TB disease.

Sixty-five of the 85 cases in 2009 were culture positive and tested for drug susceptibilities. Of the 65 TB cases in 2009, 11 (17.5 percent) were resistant to at least one TB drug. Six of the 11 resistant cases were resistant to one of the four primary "first line" TB drugs: isoniazid (INH), rifampin (RIF), pyrazinamide (PZA) and ethambutol (EMB). Three of those cases were resistant to INH alone, and three were resistant to PZA alone. One of the 11 was resistant to streptomycin alone. Three cases were resistant to both INH and streptomycin, and another case was resistant to both PZA and streptomycin. There were no cases of multi- or extensively-drug resistant TB identified in 2009. In 2008 there were 16 cases identified with resistance to at least one TB drug. Of those 16, seven were resistant to INH alone, followed by four cases resistant to PZA alone, and five others had second-line drug resistance.

The standard treatment for TB is six months in duration and utilizes the four "first line" TB drugs: isoniazid, rifampin, pyrazinamide and ethambutol. Of the 93 eligible cases reported in 2008 (the most current year for which treatment completion data is available), 86 patients (92.5 percent) completed treatment within 12 months. Another four cases completed therapy beyond the 12-month period for a total of 90 (96.7 percent), exceeding the national goal of 93 percent. Treatment completion for 2009 will be described in the 2010 surveillance report when these data will be complete.

In 2008, 44 sputum smear positive or sputum smear negative/culture positive cases yielded 998 contacts identified. As a result of these investigations, two active cases of TB and 160 cases of latent TB infection were identified. The 2009 data are incomplete, but preliminary findings indicate 41 sputum smear positive and 11 sputum smear negative/culture positive cases were identified. These led to 489 contacts identified. Of those, two cases of active TB disease were identified, and treatment was initiated. **Table 1** shows a comparison between 2008 and 2009 active cases of TB disease.

Table 1. Tuberculosis in Colorado: Comparison of 2008 and 2009 Cases

	2008		2009	
	n	%	n	%
Age Group (years)				
<15	10	9.8	11	13.0
15-24	13	12.6	7	8.2
25-44	33	32.0	33	38.8
45-64	28	27.2	24	28.2
65+	19	18.4	10	11.8
TOTAL	103	100	85	100
Gender				
Male	64	62.1	44	51.8
Female	39	37.9	41	48.2
TOTAL	103	100	85	100
Race/Ethnicity				
White	15	14.6	11	12.9
Black	20	19.4	12	14.1
White Hispanic	35	34.0	42	49.4
American Indian/Alaska native	3	2.9	1	1.2
Asian/Pacific Islander	30	29.1	19	22.4
Multiple race	0	0.0	0	0.0
TOTAL	103	100	85	100
Region				
Denver metro[a]	75	72.8	59	69.4
Other than Denver metro	28	27.2	26	30.6
TOTAL	103	100	85	100
Country of Origin (U.S. vs. Other)				
United States	30	29.1	25	30.6
Mexico	22	21.4	26	29.4
Other countries	51	49.5	34	40.0
TOTAL	103	100	85	100
HIV Status				
HIV Negative	86	83.5	69	81.2
HIV Positive	2	1.9	4	4.7
Testing done, results unknown	3	2.9	1	1.2
Refused testing	1	1.0	1	1.2
Not offered	9	8.7	10	11.7
Unknown	2	1.9	0	0.0
TOTAL	103	100	85	100
Risk factors[b]				
Birth in a high-TB-burden country[c]	46	44.7	47	55.3
Homeless within past year	7	6.8	5	5.9
Resident of correctional facility at diagnosis	4	3.8	2	2.4
Resident of long-term care facility	2	1.9	0	0.0
Injected drug use within past year	2	1.9	1	1.2
Non-injected drug use within past year	9	8.7	6	7.0
Excess alcohol use within past year	12	11.6	8	9.4
Health care worker within past 2 years	1	0.9	3	3.5

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 Cases Reported in 2009

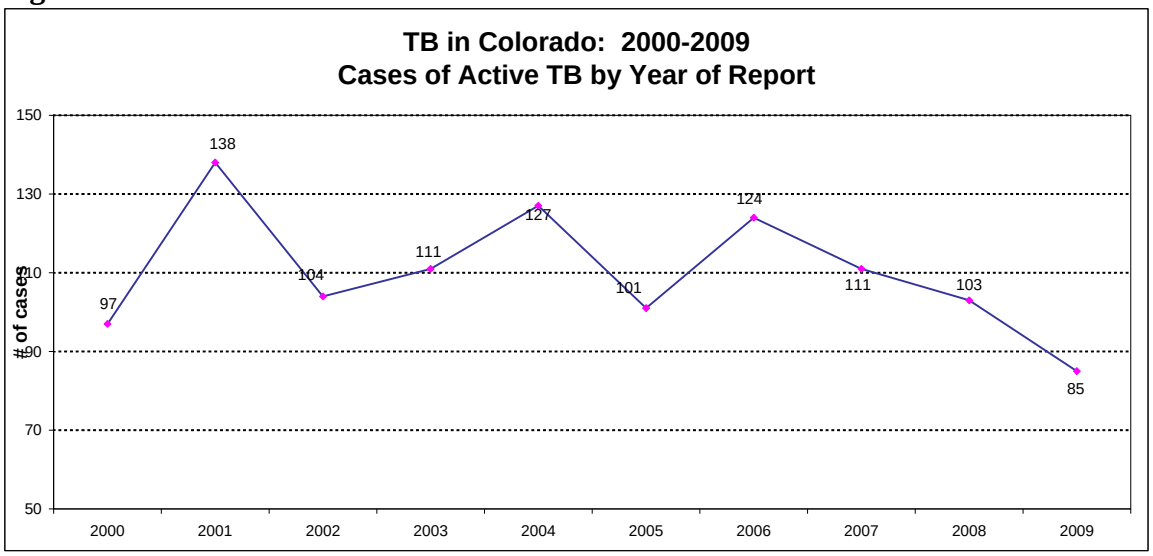
Tuberculosis Incidence

In 2009, a total of 85 incident tuberculosis (TB) cases were reported in Colorado. The United States has seen a slow decline in the number and rate of TB cases over the past 10 years (**Table 2**). Colorado has experienced a similar decline in the number and rate of cases over the past four years, from 2.6 cases per 100,000 in 2006 to 1.7 per 100,000 in 2009. **Table 2 and Figure 1** reflect TB disease in Colorado and the United States over the past decade.

Table 2. Tuberculosis Cases and Case Rates per 100,000 Persons, Colorado and United States, 2000-2009

	Colorado		United States	
Year	**Cases**	**Rate**	**Cases**	**Rate**
2000	97	2.2	16,377	5.8
2001	138	3.1	15,989	5.6
2002	104	2.3	15,078	5.2
2003	111	2.4	14,871	5.1
2004	127	2.7	14,511	4.9
2005	101	2.1	14,093	4.8
2006	124	2.6	13,767	4.6
2007	111	2.3	13,293	4.4
2008	103	2.1	12,898	4.2
2009	85	1.7	11,483	3.8

Figure 1



Tuberculosis Cases by County

Twenty of the state's 64 counties reported a new case of TB in 2009. Denver County had 29 cases, followed by Tri-County which comprises Arapahoe (11), Adams (4) and Douglas (4) counties, totaling 19 cases **(Figure 2, Table 3).**

Figure 2. TB in Colorado – 2009 TB Cases by County

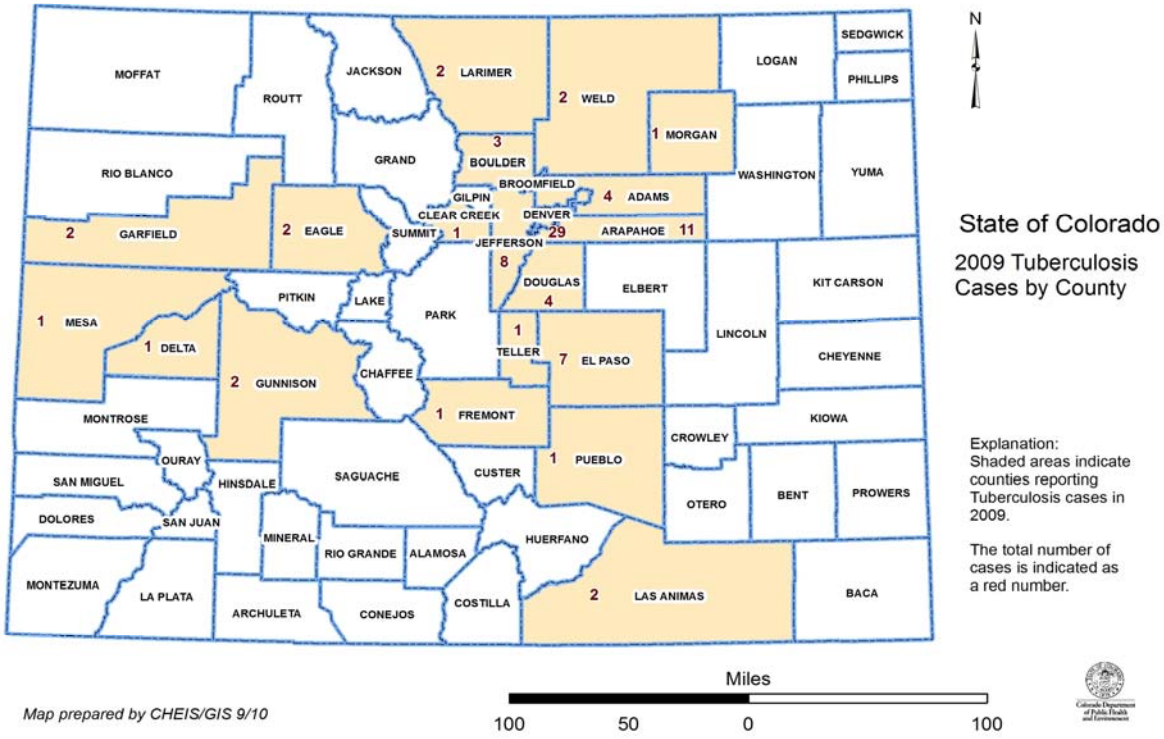


Table 3. Tuberculosis in Colorado: 2000 – 2009 Cases by County and Year of Report

NOTE: Only counties with at least one case in the last 10 years are listed. Counties with 2009 case/s are highlighted in green.

County	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Adams	4	15	11	9	13	6	17	14	14	4
Alamosa	0	0	0	0	0	1	0	0	0	0
Arapahoe	11	11	20	20	18	17	22	17	14	11
Archuleta	0	0	0	1	0	0	0	0	0	0
Bent	0	0	0	0	0	0	0	1	0	0
Boulder	6	5	5	13	2	3	7	5	7	3
Broomfield*		1	0	0	0	1	0	0	0	0
Chaffee	0	0	0	1	0	0	0	0	0	0
Clear Creek	0	0	0	0	0	0	0	0	0	1
Conejos	0	0	0	1	0	0	1	0	2	0
Costilla	0	1	0	0	0	0	0	0	0	0
Crowley	0	0	0	0	1	0	0	0	0	0
Delta	2	1	0	0	0	0	0	1	0	1
Denver	42	55	38	38	47	42	40	37	24	29
Douglas	0	0	2	0	3	0	1	2	3	4
Eagle	2	0	1	2	0	1	0	0	1	2
El Paso	7	7	5	4	9	9	10	7	10	7
Elbert	0	1	0	1	0	0	0	0	0	0
Fremont	0	0	0	2	0	1	0	1	0	1
Garfield	0	0	1	0	0	0	2	2	1	2
Grand	0	0	0	0	2	1	2	0	0	0
Gunnison	0	2	0	0	0	0	0	0	0	2
Jefferson	6	9	4	7	10	5	5	9	12	8
La Plata	1	1	1	0	1	0	0	0	0	0
Lake	0	0	0	0	0	0	0	1	1	0
Larimer	2	3	3	3	2	2	4	2	3	2
Las Animas	0	1	0	0	0	0	0	2	1	2
Lincoln	0	0	0	0	0	0	0	0	0	0
Logan	0	0	0	0	0	1	0	0	1	0
Mesa	2	4	2	2	0	0	0	0	0	1
Moffat	0	0	0	0	0	1	0	0	0	0
Montezuma	1	0	0	0	2	0	0	1	0	0
Montrose	2	1	0	0	0	0	0	0	0	0
Morgan	1	0	1	1	1	2	0	2	1	1
Otero	1	3	0	0	0	0	1	0	1	0
Phillips	0	0	0	0	0	1	0	0	0	0
Pitkin	1	1	0	0	0	1	2	0	0	0
Pueblo	0	3	6	2	3	3	2	4	3	1
Rio Blanco	0	0	0	1	1	0	0	0	0	0
Rio Grande	0	1	0	0	0	0	0	1	0	0
Routt	0	0	0	0	0	0	0	0	0	0
Saguache	0	2	0	0	0	0	0	0	1	0
Sedgwick	0	0	0	0	1	0	0	0	0	0
Summit	2	0	0	0	2	0	1	0	0	0
Teller	0	0	0	0	0	0	0	0	0	1
Weld	4	10	4	2	9	3	5	1	3	2
Yuma	0	0	0	1	0	0	2	1	0	0
Total Cases	**97**	**138**	**104**	**111**	**127**	**101**	**124**	**111**	**103**	**85**

*There were no data reported for Broomfield County for the year 2000.

The county-specific five-year average TB incidence rates are provided in **Table 4**. Seventeen counties (26.5 percent) have an average case rate equal to or greater than the average state case rate of 2.1 per 100,000 over the same five-year period.

Table 4.

Tuberculosis in Colorado: 2005-2009 Mean Case Rates* by County (Reporting at least one case)

County	2005	2006	2007	2008	2009	5-Year Incidence Rates 2005-2009
Adams	1.5	4.1	3.3	3.2	0.9	2.6
Alamosa	6.4	0.0	0.0	0.0	0.0	1.3
Arapahoe	3.2	4.1	3.1	2.5	1.9	2.9
Bent	0.0	0.0	17.0	0.0	0.0	3.2
Boulder	1.0	2.4	1.7	2.3	1.0	1.7
Broomfield	2.1	0.0	0.0	0.0	0.0	0.4
Clear Creek	0.0	0.0	0.0	0.0	10.9	2.1
Conejos	0.0	11.9	0.0	24.0	0.0	7.2
Delta	0.0	0.0	3.2	0.0	3.1	1.3
Denver	7.3	6.9	6.3	4.0	4.7	5.8
Douglas	0.0	0.4	0.7	1.1	1.4	0.7
Eagle	2.0	0.0	0.0	1.9	3.7	1.5
El Paso	1.6	1.7	1.2	1.7	1.2	1.5
Fremont	2.1	0.0	2.1	0.0	2.1	1.2
Garfield	0.0	3.8	3.7	1.8	3.5	2.6
Grand	7.2	14.2	0.0	0.0	0.0	4.2
Gunnison	0.0	0.0	0.0	0.0	13.0	2.7
Jefferson	0.9	0.9	1.7	2.2	1.5	1.4
Lake	0.0	0.0	12.3	12.1	0.0	4.9
Larimer	0.7	1.4	0.7	1.0	0.7	0.9
Las Animas	0.0	0.0	12.2	6.1	12.1	6.1
Logan	4.6	0.0	0.0	4.7	0.0	1.9
Mesa	0.0	0.0	0.0	0.0	0.7	0.1
Moffat	7.5	0.0	0.0	0.0	0.0	1.4
Montezuma	0.0	0.0	3.9	0.0	0.0	0.8
Morgan	7.1	0.0	7.1	3.6	3.5	4.2
Otero	0.0	5.2	0.0	5.3	0.0	2.1
Phillips	21.8	0.0	0.0	0.0	0.0	4.4
Pitkin	6.1	12.2	0.0	0.0	0.0	3.6
Pueblo	2.0	1.3	2.6	1.9	0.6	1.7
Rio Grande	0.0	0.0	7.9	0.0	0.0	1.6
Saguache	0.0	0.0	0.0	14.3	0.0	2.9
Summit	0.0	3.6	0.0	0.0	0.0	0.7
Teller	0.0	0.0	0.0	0.0	4.4	0.9
Weld	1.3	2.1	0.4	1.2	0.8	1.2
Yuma	0.0	20.2	10.1	0.0	0.0	6.1
Colorado	**2.1**	**2.6**	**2.3**	**2.1**	**1.7**	**2.1**

*TB disease per 100,000 persons

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

Note 2: Case rates based on fewer than five health events are likely to be unstable and imprecise. (See **Table 3.**)

Tuberculosis by Age Group

In 2009, TB cases were reported among people ranging from 12 months to 84 years of age. Almost 39 percent of TB cases occurred among people ages 25-44 years, followed by those ages 45-64 and <15 (28 percent and 13 percent, respectively).

Eleven cases of pediatric TB (<15 years of age) were reported in 2009. Three of the 11 pediatric cases were among foreign-born children. Active TB in young children is particularly concerning, as it is indicative of ongoing transmission in the community as well as missed opportunities for preventive therapy. Of the 11 cases, eight were among children less than 5 years of age **(Figure 3).**

Figure 3. TB in Colorado: 2009
Reported cases by age group (n=85)

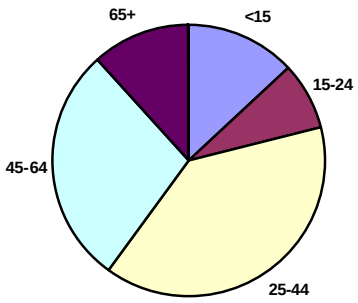


Table 5 shows that in 2008, the highest TB incidence was among persons 75-79 years of age (5.9 cases per 100,000) and lowest (0.6 cases per 100,000) among children ages 5-9 and young adults ages 15-19. In 2009, the highest incidence rate was found in persons 80-84 years of age, with the lowest (among groups with at least one documented case) in the 5- to 9-year-old group (0.3 cases per 100,000). **Table 6** shows the age groups relative to nativity (U.S.-born and foreign-born).

Table 5. TB in Colorado – Comparison of 2008 & 2009 Reported Cases by Age Group

Age Group	2008				2009			
	Male	Female	Total	Rate*	Male	Female	Total	Rate*
0 to 4	2	3	5	1.4	4	4	8	2.2
5 to 9	0	2	2	0.6	1	0	1	0.3
10 to 14	1	2	3	0.9	2	0	2	0.6
15 to 19	1	1	2	0.6	2	0	2	0.5
20 to 24	10	1	11	2.9	0	5	5	1.3
25 to 29	4	1	5	1.6	4	3	7	2.1
30 to 34	2	5	7	2.0	3	5	8	2.4
35 to 39	9	5	14	3.7	5	4	9	2.4
40 to 44	6	1	7	1.9	6	3	9	2.5
45 to 49	8	1	9	2.3	3	2	5	1.3
50 to 54	5	3	8	2.2	3	2	5	1.3
55 to 59	4	0	4	1.3	2	3	5	1.5
60 to 64	4	3	7	2.9	4	5	9	3.4
65 to 69	4	3	7	4.8	1	0	1	0.7
70 to 74	1	1	2	1.6	0	2	2	1.6
75 to 79	1	5	6	5.9	2	1	3	2.8
80 to 84	1	1	2	2.9	2	2	4	5.7
85+	1	1	2	3.5	0	0	0	0
TOTAL	**64**	**39**	**103**	**2.1**	**44**	**41**	**85**	**1.7**

Note: Case rates based on fewer than five health events are likely to be unstable and imprecise.
*Rates are per 100,000 persons.

Table 6. Tuberculosis in Colorado – 2008-2009 Comparison of Reported Cases by Age Group and Patient Nativity: Foreign- and U.S.-Born

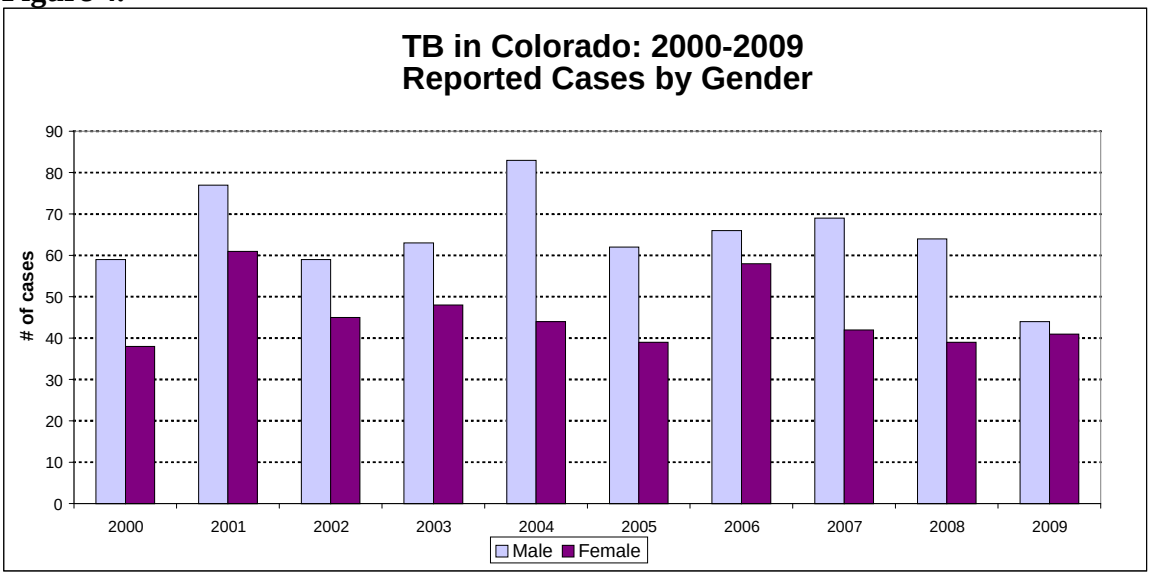
Age Group	2008			2009		
	U.S.-Born	Foreign-Born	Total	U.S.-Born	Foreign-Born	Total
0-4	3	2	5	8	0	8
5-14	2	3	5	0	3	3
15-24	1	12	13	2	5	7
25-34	0	12	12	1	14	15
35-44	4	17	21	4	14	18
45-54	9	8	17	2	8	10
55-64	3	8	11	6	8	14
65-74	4	5	9	0	3	3
75-84	4	4	8	2	5	7
85+	0	2	2	0	0	0
TOTAL	**30**	**73**	**103**	**25**	**60**	**85**

Tuberculosis by Gender

In 2008, males represented 67 percent (64) of all TB cases in Colorado **(Figure 4)**. In 2009, the gender disparity was almost nonexistent, with 44 males and 41 females. The predominance of TB among males also has been seen in the United States and globally. This finding may be due to differences in access to care, health-seeking behaviors,

underlying susceptibility to TB or the distribution of risk factors such as substance abuse and homelessness.

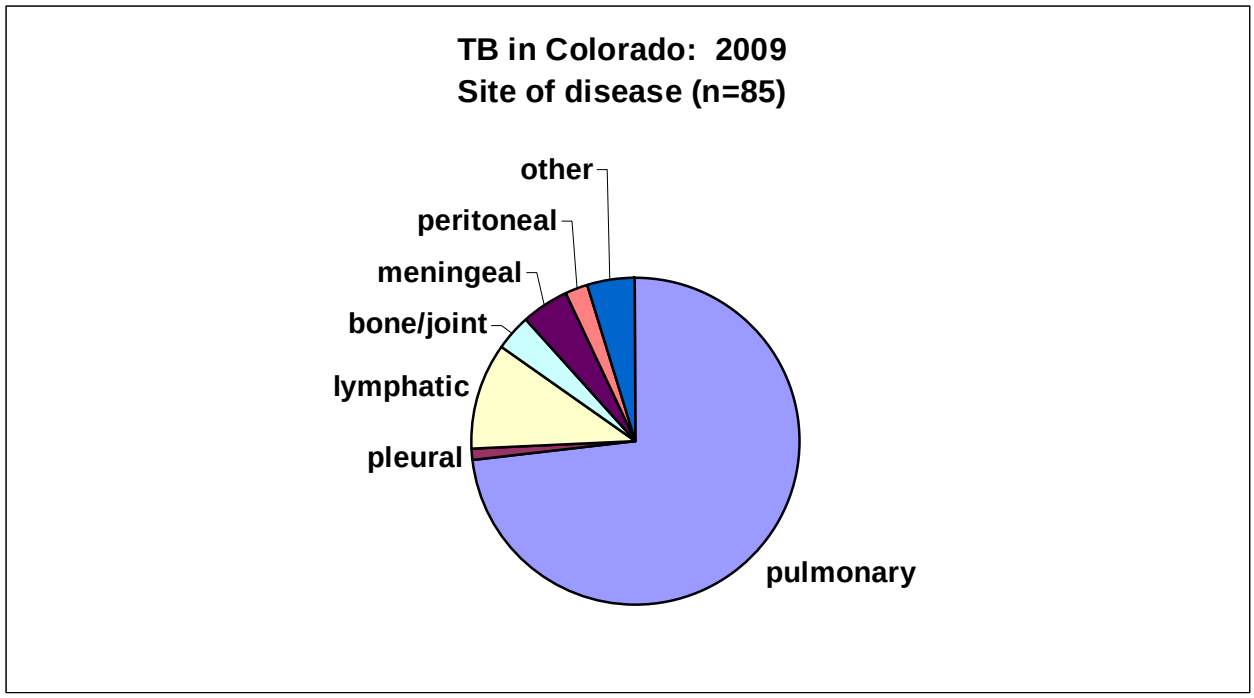
Figure 4.



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, lymph nodes, bones and brain. In 2009, 62 of the 85 (73 percent) cases were pulmonary. The second most-common site of infection was the lymph system (cervical, intrathoracic or axillary) with nine cases (10.6 percent). **Figure 5** shows major sites of TB infection among 2009 cases.

Figure 5.



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. In 2008, 85 percent of the total number of reported cases occurred among people who identify as ethnic or racial minorities: Hispanic (34 percent), Asian/Pacific Islander (29 percent), Black/African-American (19 percent) or American Indian/Alaskan Native (3 percent). The distribution of cases in 2009 was similar to that seen in 2008, with Hispanics representing 49 percent; Black/African-Americans, 14 percent; Asian/Pacific Islanders, 22 percent; and American Indian/Alaska Natives, a little more than 1 percent **(Figure 6 and Figure 7)**. This ethnic/racial disparity specific to the burden of TB disease remains a major concern to the state of Colorado.

Figure 6.

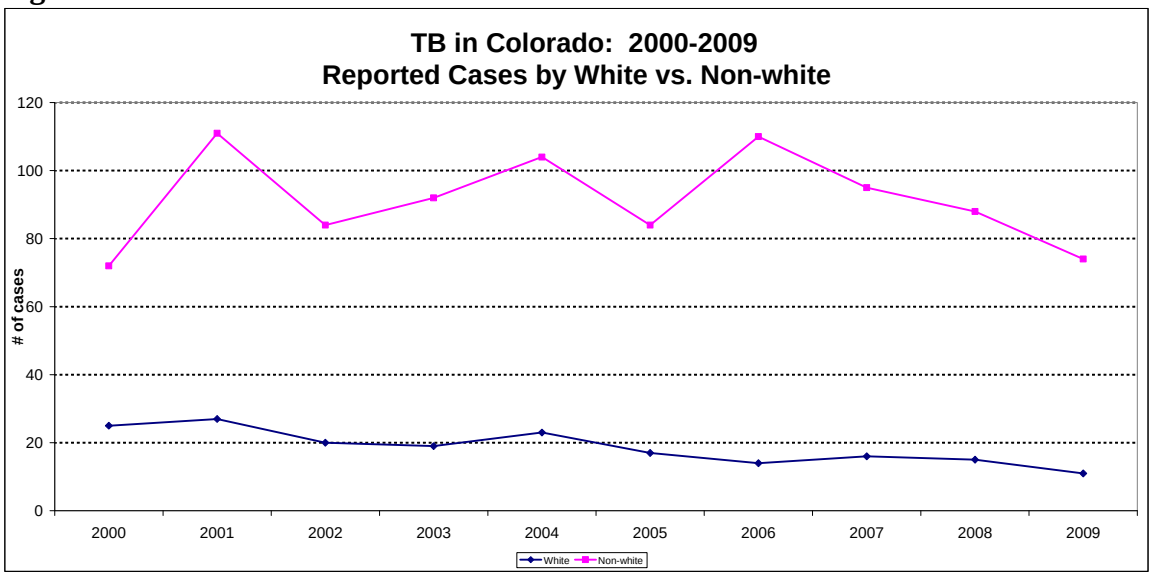
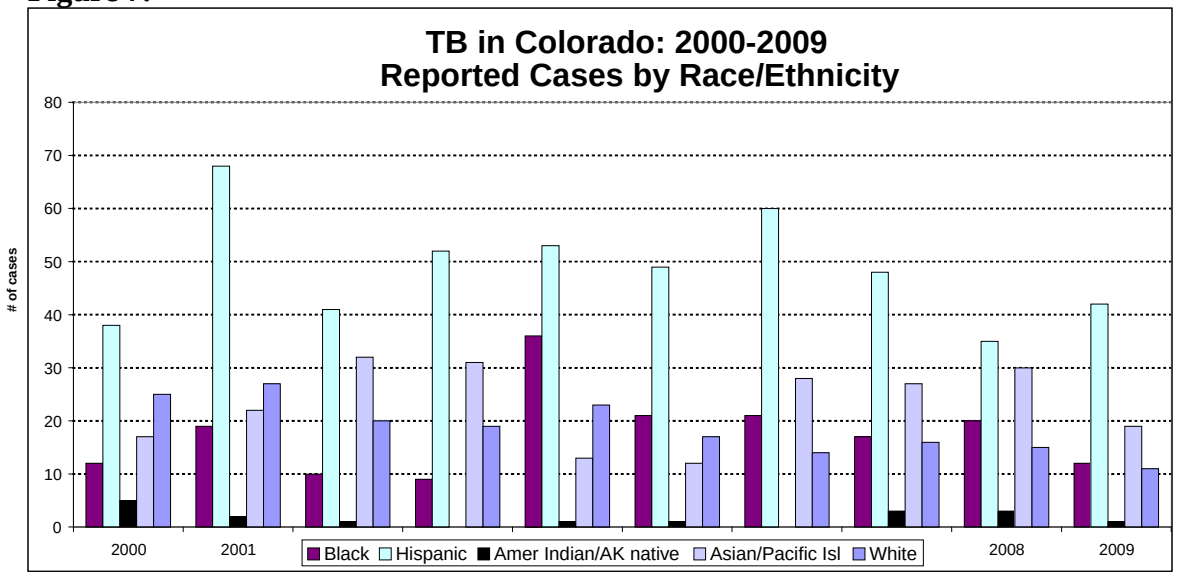


Figure 7.



The United States Centers for Disease Control and Prevention considers Colorado a low-incidence state in relationship to reportable TB disease (case rate less than 3.5 per 100,000 persons); however, case rates in most minority populations exceed the "low-incidence" threshold. **Table 7** compares race and ethnicity TB case rates from 2008 to 2009.

Table 7. TB in Colorado: 2008 and 2009 by Race/Ethnicity

	2008		2009	
Race/ethnicity	**Number of cases**	**Rate***	**Number of cases**	**Rate***
White Non-Hispanic	15	0.4	11	0.3
Black/African-American	20	9.1	12	5.3
Hispanic	35	3.9	42	4.5
Asian/Pacific Islander	30	19.3	19	12.2
American Ind/AK native	3	3.8	1	1.2
TOTAL	**103**	**2.1**	**85**	**1.7**

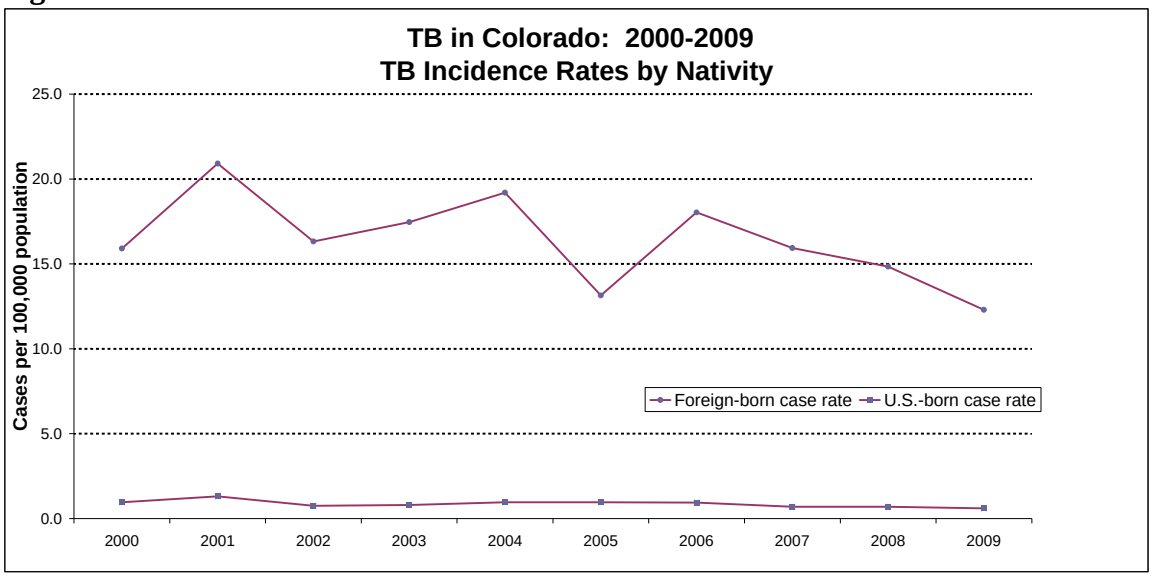
*Per 100,000 persons

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

TB Incidence Rates by Nativity

In 2009, the TB incidence in the foreign-born population living in Colorado was 12.3 per 100,000 persons, which is 20.5 times that of the U.S.-born population (0.6 per 100,000). Since 2000, more than two-thirds (69 percent) of the cases of TB reported in Colorado were among foreign-born individuals **(Figure 8 and Figure 9)**.

Figure 8.

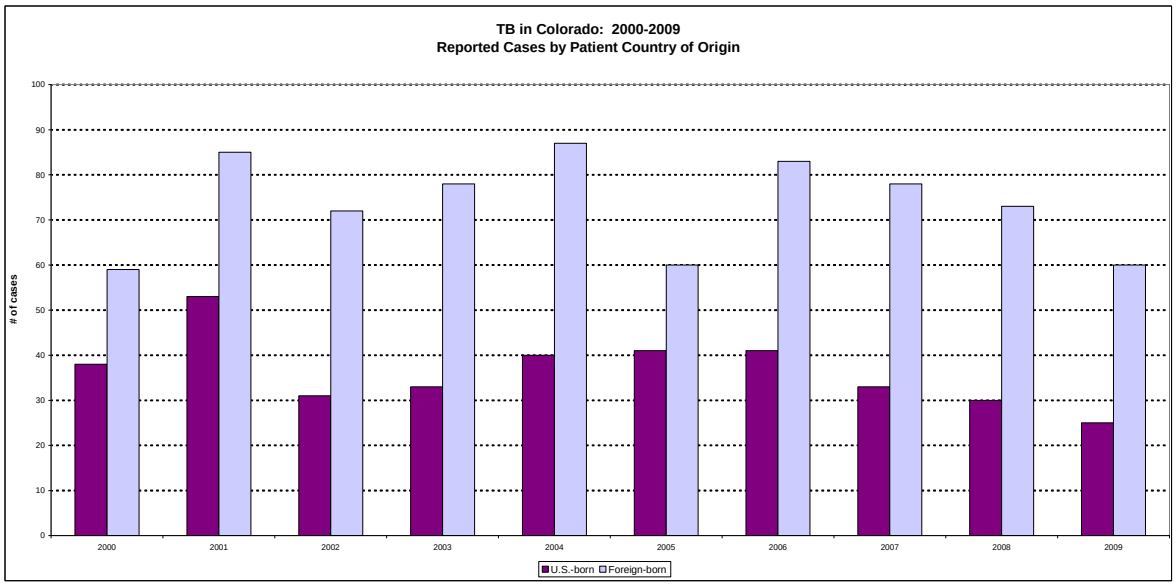


In 2008, 73 foreign-born cases of TB were reported in Colorado, representing 71 percent of all cases that year. In 2009, there were 60 foreign-born cases who came from 18 different countries. Mexico had the largest single-country cohort (26 cases or 31 percent). **Table 8** shows a breakdown of the countries of origin for all active cases of TB disease in 2008 and 2009.

Table 8. Comparison of Colorado TB Cases by Country of Nativity
2008 & 2009

2008		**2009**	
Country	Number of Cases	Country	Number of Cases
Afghanistan	1	Afghanistan	0
Austria	0	Austria	1
Bhutan	2	Bhutan	2
Burma	2	Burma	1
Cambodia	1	Cambodia	0
China	2	China	0
Cuba	1	Cuba	0
El Salvador	2	El Salvador	1
Eritrea	1	Eritrea	0
Ethiopia	4	Ethiopia	3
Guatemala	0	Guatemala	1
Honduras	1	Honduras	1
Hungary	1	Hungary	0
India	5	India	5
Indonesia	0	Indonesia	1
Kenya	1	Kenya	3
Korea	1	Korea	0
Laos	1	Laos	0
Liberia	1	Liberia	0
Madagascar	1	Madagascar	0
Mexico	22	Mexico	26
Mongolia	1	Mongolia	1
Morocco	1	Morocco	0
Nepal	3	Nepal	2
Peru	2	Peru	1
Philippines	3	Philippines	3
Rwanda	1	Rwanda	1
Somalia	5	Somalia	2
U.S.	30	U.S.	25
Viet Nam	7	Viet Nam	5
Total	**103**	**Total**	**85**

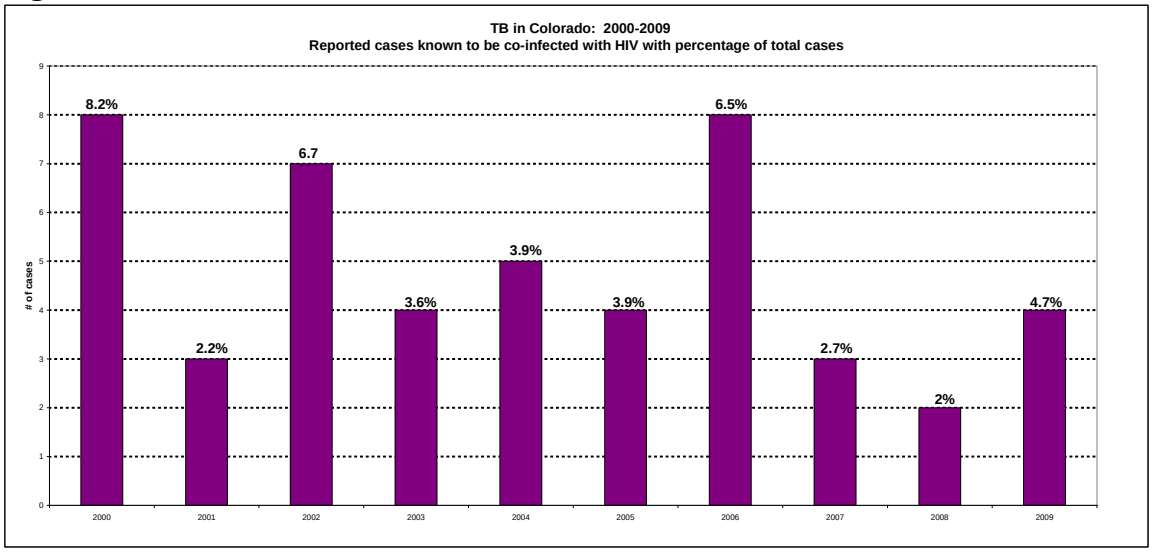
Figure 9.



HIV Co-infection

Worldwide, one in four people with HIV die due to TB. Co-infection occurs more frequently in HIV-infected people because HIV weakens the immune system, greatly increasing the likelihood of progression from latent infection to active TB disease in HIV-infected persons who have latent TB infection. In Colorado, this global trend is not as evident. Of the 85 cases of TB in 2009, four persons were co-infected with HIV. Test results for HIV were available for 73 of 85 (86 percent) TB cases reported in 2009. One person refused an HIV test, and one was tested but results were unavailable. Ten of the 85 patients were not offered an HIV test. **Figure 10** shows the total number of HIV cases among TB patients over the last 10 years, as well as the percentage of co-infection each year.

Figure 10.



Drug Resistance and TB

Of the 85 TB cases in 2009, 11 were resistant to at least one TB drug. Six of the 11 (55 percent) resistant cases were resistant to one of the four primary TB drugs: isoniazid, rifampin, pyrazinamide and ethambutol. Three of those cases were resistant to isoniazid alone, and three were resistant to pyrazinamide alone. One of the 11 was resistant to streptomycin alone. Three cases were resistant to both isoniazid and streptomycin, and another case was resistant to both pyrazinamide and streptomycin. There were no cases of multi-drug resistant TB (MDR-TB) or extensively-drug resistant TB (XDR-TB) identified. In 2008, there were 16 cases identified with resistance to at least one TB drug. Of those 16, seven were resistant to isoniazid alone, followed by four cases resistant to pyrazinamide alone. Five were resistant to one or more second-line drugs.

Table 9. Tuberculosis in Colorado: 2007-2009 Drug Susceptibilities

	2007	**2008**	**2009**
Drug(s)	**Number resistant**	**Number resistant**	**Number resistant**
isoniazid only	6	7	3
pyrazinamide only	3	4	3
ethambutol only	0	1	0
isoniazid and streptomycin	2	0	3
isoniazid and rifampin	1	0	0
pyrazinamide and streptomycin	0	0	1
streptomycin only	3	2	1
streptomycin and ethionamide	0	1	0
isoniazid, streptomycin and ethionamide	0	1	0
Total	**15**	**16**	**11**

Directly Observed Therapy (DOT)

Directly observed therapy (DOT) is the standard of care for administering TB medications. Directly observed therapy is required for all pulmonary cases of TB and involves health care workers observing the patient taking his/her medications to ensure compliance with and completion of the treatment regimen. During 2008, there were 101 people who were treated for TB. Two others were diagnosed after the time of death. Ninety-four of the 101 patients completed treatment through DOT, self-administered treatment (SAT) or a combination of both. The data for 2009 are not complete because five patients remain on treatment. As of November 1 2010, 80 patients have received treatment, 70 of whom have completed treatment via SAT or a combination of these modalities. **Table 10** presents the number and percentage of cases receiving DOT in 2008 and 2009. Due to the length of time to complete varying treatment regimens for TB, 2008 data are the most recent data available.

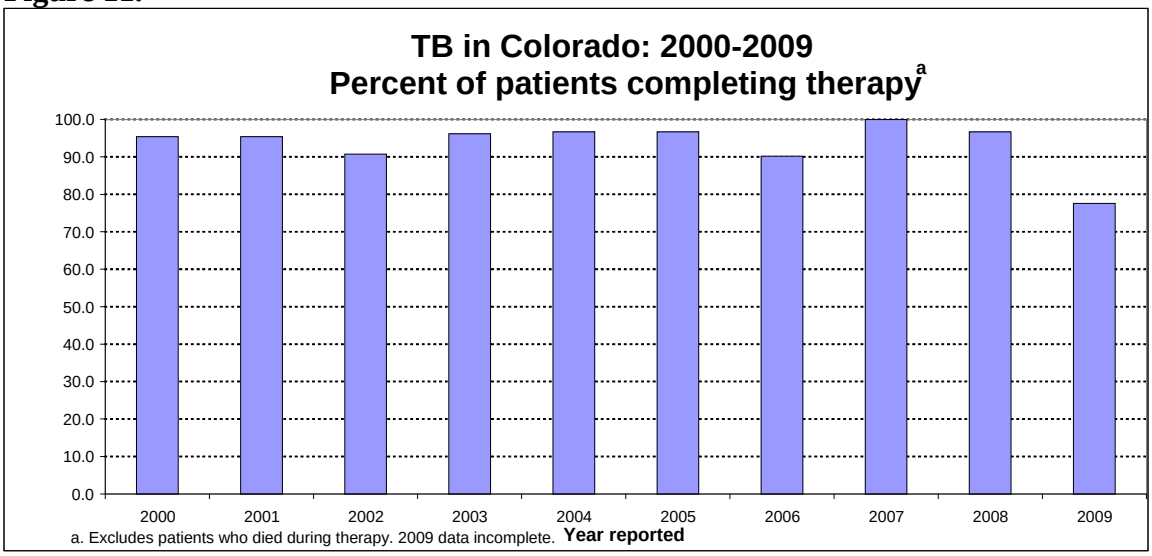
Table 10. Number and Percentage of Patients Receiving DOT in Colorado 2008-2009

	2008		2009*	
	N	**%**	**N**	**%**
DOT only	88	85	68	85
DOT + self administered	11	11	9	11
Self administered only	2	2	2	2.5
Dead at Diagnosis	2	2	1	1.3
TOTAL	**103**	**100**	**80**	**100**
*2009 data are preliminary; five cases are pending.				

Completion of TB treatment

The standard treatment for TB is six months in duration and utilizes the four "first-line" TB drugs: INH, PZA, RIF, and EMB. Of 93 eligible cases reported in 2008 (the most current year for which treatment completion data are available), 86 patients (92.5 percent) completed treatment within 12 months. Another four cases completed therapy beyond the 12-month period for a total of 90 (96.7 percent), exceeding the national goal of 93 percent. 2009 treatment completion data will be described in the 2010 surveillance report when these data will be complete. **Figure 11** includes preliminary 2009 treatment completion data, along with complete data for the previous nine years.

Figure 11.



Contact Investigations

The TB Program is responsible for TB control throughout the state of Colorado, which includes the public health imperative to conduct contact investigations (CIs) on all cases of infectious (pulmonary 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 since 2002. In 2008, 44 sputum smear positive or sputum smear negative/culture positive cases yielded 998 contacts. As a result of these investigations, two active cases of TB disease and 160 cases of latent TB infection were identified. Of

those 160 cases, 128 started LTBI treatment (80 percent) and 82 patients (63 percent) completed LTBI treatment. The 2009 data are incomplete, but preliminary findings indicate 41 sputum smear positive and 11 sputum smear negative/culture positive cases were identified. These led to 489 contacts being identified. Of those, two cases of active TB disease were identified, and treatment was initiated. In addition, 174 cases of LTBI were identified, of which 141 (81 percent) started treatment.

Table 11. Tuberculosis in Colorado: 2002-2009 Follow-up and Treatment for Contacts to Tuberculosis Cases

	2002	2003	2004	2005	2006	2007	2008	2009*
Number of sputum smear- or culture-positive cases	60	45	48	44	64	40	44	41
Total contacts	1,388	593	1,462	1,317	1,523	594	1,185	489
Average contacts per infectious case	23.1	13.1	30.5	29.9	23.7	14.8	26.9	11.9
Number (%) of contacts evaluated*	1,017 (73%)	489 (82%)	1,170 (80%)	1,113 (85%)	1,290 (85%)	432 (73%)	998 (84%)	445 (91%)
Number (%) of contacts with latent TB infection	253 (25%)	111 (23%)	351 (30%)	220 (20%)	274 (21%)	127 (29%)	160 (16%)	174 (39%)
Number (%) of infected contacts starting treatment	164 (65%)	89 (80%)	276 (79%)	179 (81%)	217 (79%)	101 (79%)	128 (80%)	141 (81%)
Number (%) of contacts starting treatment who completed treatment	121 (74%)	63 (71%)	187 (68%)	129 (72%)	146 (67%)	83 (82%)	82 (63%)	N/A
Number (%) of contacts with active TB disease	2 (<1%)	3 (<1%)	16 (1%)	7 (<1%)	9 (<1%)	3 (<1%)	2 (<1%)	2 (<1%)

Note: Evaluated = symptom check and tuberculin skin test, chest X-ray, sputum studies as indicated.
*2009 data are preliminary.

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 found to have noninfectious TB is classified as a Class B1. Those with a chest X-ray that suggests a history of TB disease that is not currently active are classified as Class B2. The Division of Global Migration and Quarantine notifies CDPHE's TB Control Program of all class B1 and B2 individuals who are entering the state. The CDPHE TB Control Program forwards these referrals to the local health departments of the counties where the individual will reside. The local health departments provide medical evaluations and treatment for infection, whether active or latent. In 2008, the CDPHE TB Control Program received 252 notifications for immigrants and refugees designated as Class B1 and B2, of which 84.5 percent were evaluated. Five immigrants or refugees were evaluated and diagnosed with active TB disease. In 2009, there were 307 Class B notifications of which 301 were confirmed as

arriving in Colorado. Of those 301 arrivals, 207 (69 percent) were evaluated. Two were found to have active TB disease. **Table 12** shows a breakdown of Class B data for 2005-2009 in Colorado.

Table 12. Class B Data 2005-2009 for Colorado

	2005		2006		2007		2008		2009*	
	n	%	n	%	n	%	n	%	n	%
Class B notifications	103		147		165		252		307	
Moved prior to evaluation	6	5.8	9	6.1	8	4.8	20	7.9	6	2.0
Confirmed Arrivals	97	94.2	138	93.9	157	95.2	232	92.1	301	98.0
Evaluated	85	87.6	128	92.8	155	98.7	196	84.5	207	68.8
TB disease diagnosed	4	4.7	3	2.3	7	4.5	5	2.6	2	1.0
isoniazid recommended (LTBI)	43	50.6	63	49.2	72	46.5	105	53.6	112	54.1
Started treatment	38	88.4	51	81.0	67	93.1	92	87.6	90	80.4
Completed treatment	22	57.9	44	86.3	50	74.6	72	78.3	36	40.0
Currently on treatment									48	53.3

*2009 data preliminary

Conclusion

The Colorado Department of Public Health and Environment's TB Control Program will continue to both develop and maintain strong partnerships with local health departments (municipal and county), neighboring states' TB programs, and federal agencies to prevent and control TB in Colorado. While the number of TB cases and case rates continue to decline, the number of TB cases reported among foreign-born persons continues to be of concern. Emphasis on completion of treatment requires close collaboration with local health departments and other partners to prevent both further spread of the disease and the emergence of drug-resistant TB. Emphasis on 100 percent HIV testing rates among persons with active TB will continue in consideration of the well-established role of TB as an opportunistic infection in HIV positive persons.