

Annual Tuberculosis Report Colorado 2007

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**Colorado Department
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Summary

Colorado reported 111 new cases of active tuberculosis (TB disease) in 2007. This represents a 10 percent decrease in the number of cases reported in 2006 (124), with the largest decrease noted in the Hispanic population. Birth in a country with high TB prevalence remains the strongest risk factor for developing active TB (70 percent of cases) followed by excess alcohol use (10.8 percent).

Twenty of the state's 64 counties reported a new case of TB in 2007. As in previous years, Denver County reported the majority of cases (n=37). Six cases were reported in counties that have not had a TB case for \geq five years.

The overall case rate for TB in Colorado is 2.3 per 100,000, as compared to the overall rate in the United States of 4.4 per 100,000. The rate in the foreign-born population (15.9 per 100,000) was 22 times that of the U.S.-born population (0.7 per 100,000). Seventy percent of cases were foreign-born, as compared to 59 percent in 2005 and 67 percent in 2006.

The rate in the minority population (7 per 100,000) was 14 times the rate in the majority population (0.5 per 100,000). While minorities make up 29 percent of the state's population, 86 percent of new TB cases occurred in racial and ethnic minorities.

The ages of people reported with TB in 2007 ranged from 1 year to 99 years, with a mean and median age of 48 and 46, respectively. The largest number of TB cases were diagnosed among people aged 65-74 years, and the smallest among people 5-14 years of age. The highest incidence was in people 85 years and older, with 11 cases per 100,000, while the lowest incidence was found in the 5- to 9-year-old age group at 0.3 cases per 100,000.

Twelve of the 74 (16 percent) culture-positive TB cases in 2007 were resistant to one or more primary drugs: isoniazid, rifampin, pyrazinamide and ethambutol. One of those cases was multi-drug resistant TB (defined as being resistant to at least two of the first-line anti-TB drugs). There were no cases of extensively drug resistant TB identified.

The standard treatment for TB is six months in duration and uses isoniazid, rifampin, pyrazinamide and ethambutol. Of the 124 cases reported in 2006 (the most current year for which treatment completion data is available), 112 patients were eligible to complete treatment within 12 months. Of these, 101 (90 percent) completed therapy within a 12-month period, meeting the national goal of 90 percent.

In 2006 (the most current year with data available), contact investigations associated with the 64 patients whose sputum cultures grew *Mycobacterium tuberculosis* were completed, and 1,523 exposed people were identified. Nine people were found to have active TB disease and were treated. An additional 274 people were found to have latent TB infection and 217 (79 percent) initiated treatment. Of these, 146 (67 percent) completed a course of treatment, which significantly reduces the risk of future, active TB disease.

Table 1 shows a comparison between 2006 and 2007 cases.

**Table 1. Tuberculosis in Colorado:
Comparison of 2006 and 2007 Cases**

	Year reported			
	2006		2007	
	n	%	n	%
Age Group (years)				
<15	7	5.6	7	6.2
15-24	20	16.1	16	14.4
25-44	36	29.0	29	23.4
45-64	30	24.2	25	26.0
65+	31	25.0	34	30.0
TOTAL	124	100.0	111	100.0
Gender				
Male	66	53.2	69	62.1
Female	58	46.8	42	37.9
TOTAL	124	100.0	111	100.0
Race/Ethnicity				
White	14	11.3	16	14.5
Black	21	16.9	17	15.3
Hispanic	60	48.4	48	43.2
American Indian/Alaskan Native	0	0.0	3	2.7
Asian/Pacific Islander	28	22.6	27	24.3
Multiple race	1	0.8	0	0.0
TOTAL	124	100.0	111	100.0
Region				
Denver metro ^a	92	74.2	84	75.6
Other than Denver metro	32	25.8	27	24.4
TOTAL	124	100.0	111	100.0
Country of Origin				
United States	41	33.1	33	29.7
Mexico	36	29.0	31	27.9
Other countries	47	37.9	47	42.4
TOTAL	124	100.0	111	100.0
HIV Status Among 25-44 Age Group				
Negative	30	83.3	27	93.1
Positive	5	13.9	2	6.9
Testing done, results unknown	0	0.0	0	0.0
Refused testing	1	2.8	0	0.0
Not offered	0	0.0	0	0.0
TOTAL	36	100.0	29	100.0
Risk factors^b				
Birth in a high TB-prevalence country	83	66.9	78	70.2
Homeless within past year	7	5.6	6	5.4
Resident of correctional facility at diagnosis	1	0.8	2	1.8
Resident of long-term care facility	7	5.6	5	4.5
Injected drug use within past year	0	0.0	1	0.9
Non-injected drug use within past year	4	3.2	5	4.5
Excess alcohol use within past year	11	8.9	12	10.8
Health care worker within past two years	1	0.8	3	2.7

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

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

Tuberculosis in Colorado A Summary of Cases Reported in 2007

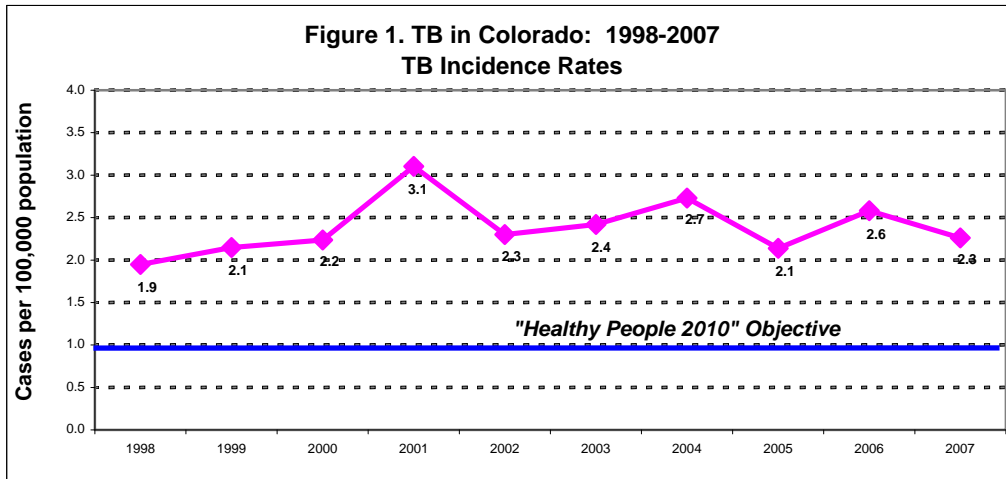
Tuberculosis incidence

Colorado reported 111 cases of active tuberculosis (TB) in 2007. While the United States has seen a slow decline in the number of TB cases over the past 10 years (1998-2007), Colorado has documented a relatively stable number of cases with a mean of 107 cases and a range between 79 and 138 in the 10-year period (**Table 2**).

Table 2. Tuberculosis Cases and Case Rates per 100,000 Population, Colorado and United States, 1998-2007

Year	Colorado			United States	
	Cases	Population	Rate	Cases	Rate
1998	79	4,054,343	1.9	18,361	6.8
1999	88	4,098,315	2.1	17,531	6.4
2000	97	4,338,789	2.2	16,377	5.8
2001	138	4,446,919	3.1	15,989	5.6
2002	104	4,521,798	2.3	15,078	5.2
2003	111	4,586,780	2.4	14,871	5.1
2004	127	4,653,004	2.7	14,511	4.9
2005	101	4,722,460	2.1	14,093	4.8
2006	124	4,804,353	2.6	13,767	4.6
2007	111	4,908,152	2.3	13,293	4.4

In 2007, the overall case rate for TB in Colorado was 2.3 per 100,000. To meet the “Healthy People 2010” goal of 1.0 or fewer cases per 100,000, Colorado will need to reduce the number of new cases by approximately 55 percent(**Figure 1**).



Tuberculosis cases by county

Twenty of the state’s 64 counties reported a new case of TB in 2007. The distribution of TB cases in Colorado disproportionately affects Denver County. While Denver County represents roughly 12 percent of the state’s total population, it accounted for 33 percent of the TB disease burden in 2007. The largest increase in TB cases was noted in Jefferson County, from 5 to 9 cases, while the largest decline in cases occurred in Arapahoe County, from 22 to 17 cases(**Figure 2, Table 3**).

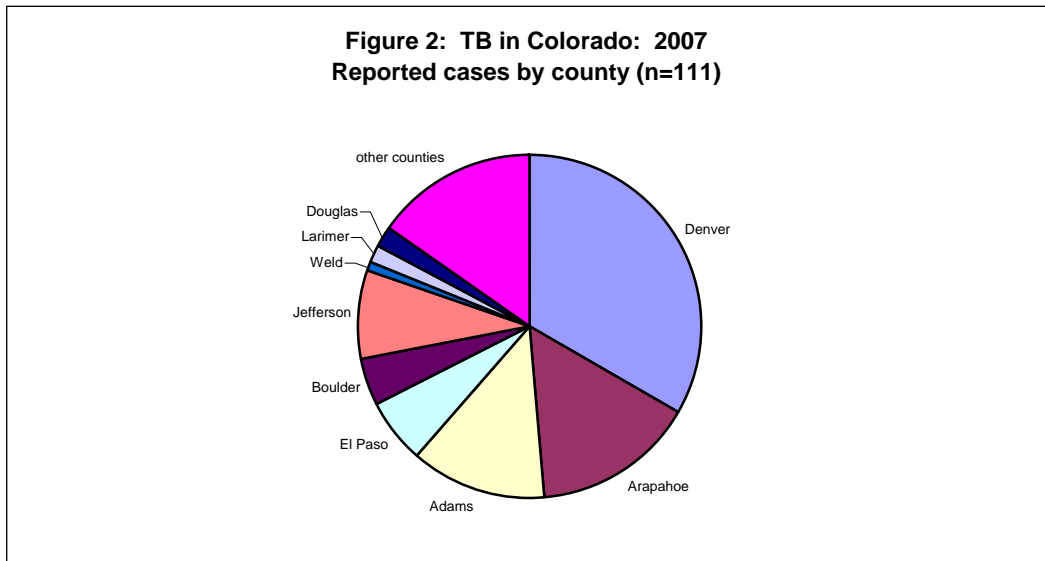


Table 3. Tuberculosis in Colorado: 1998 – 2007
Cases by County and Year of Report

NOTE: Only counties reporting cases are listed.

County	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Adams	7	8	4	15	11	9	13	6	17	14
Alamosa	0	0	0	0	0	0	0	1	0	0
Arapahoe	6	12	11	11	20	20	18	17	22	17
Archuleta	0	0	0	0	0	1	0	0	0	0
Bent	1	0	0	0	0	0	0	0	0	1
Boulder	4	3	6	5	5	13	2	3	7	5
Broomfield				1	0	0	0	1	0	0
Chaffee	0	0	0	0	0	1	0	0	0	0
Conejos	0	0	0	0	0	1	0	0	1	0
Costilla	0	0	0	1	0	0	0	0	0	0
Crowley	0	0	0	0	0	0	1	0	0	0
Delta	0	0	2	1	0	0	0	0	0	1
Denver	34	39	42	55	38	38	47	42	40	37
Douglas	1	1	0	0	2	0	3	0	1	2
Eagle	0	0	2	0	1	2	0	1	0	0
El Paso	4	9	7	7	5	4	9	9	10	7
Elbert	0	0	0	1	0	1	0	0	0	0
Fremont	1	0	0	0	0	2	0	1	0	1
Garfield	1	0	0	0	1	0	0	0	2	2
Grand	0	0	0	0	0	0	2	1	2	0
Gunnison	0	0	0	2	0	0	0	0	0	0
Jefferson	6	5	6	9	4	7	10	5	5	9
La Plata	0	0	1	1	1	0	1	0	0	0
Lake	0	0	0	0	0	0	0	0	0	1
Larimer	1	0	2	3	3	3	2	2	4	2
Las Animas	0	1	0	1	0	0	0	0	0	2
Lincoln	1	0	0	0	0	0	0	0	0	0
Logan	0	0	0	0	0	0	0	1	0	0
Mesa	2	0	2	4	2	2	0	0	0	0
Moffat	0	1	0	0	0	0	0	1	0	0
Montezuma	0	0	1	0	0	0	2	0	0	1
Montrose	0	0	2	1	0	0	0	0	0	0
Morgan	0	0	1	0	1	1	1	2	0	2
Otero	2	1	1	3	0	0	0	0	1	0
Phillips	0	1	0	0	0	0	0	1	0	0
Pitkin	0	0	1	1	0	0	0	1	2	0
Pueblo	5	5	0	3	6	2	3	3	2	4
Rio Blanco	0	0	0	0	0	1	1	0	0	0
Rio Grande	0	1	0	1	0	0	0	0	0	1
Saguache	0	0	0	2	0	0	0	0	0	0
Sedgwick	0	0	0	0	0	0	1	0	0	0
Summit	0	0	2	0	0	0	2	0	1	0
Weld	3	1	4	10	4	2	9	3	5	1
Yuma	0	0	0	0	0	1	0	0	2	1
TOTAL	79	88	97	138	104	111	127	101	124	111

The five-year average TB incidence rate, by county, is provided in Table 4. Thirteen counties have an average case rate greater than the average state case rate of 2.5 per 100,000 (Table 4).

**Table 4: Tuberculosis in Colorado: 2003-2007
Mean Case Rates by County**

County	Mean Cases 2003-2007	2006 Population	Cases Per 100,000 People Per Year	County	Mean Cases 2003-2007	2006 Population	Cases Per 100,000 People Per Year
Sedgwick	0.25	2,606	9.6	Mesa	0.5	135,468	0.4
Grand	1.25	14,222	8.8	Douglas	1	265,470	0.4
Rio Blanco	0.5	6,288	8.0	Baca	0	4,263	0.0
Yuma	0.75	10,009	7.5	Bent	0	6,266	0.0
Denver	41.75	580,223	7.2	Cheyenne	0	2,057	0.0
Conejos	0.5	8,587	5.8	Clear Creek	0	9,483	0.0
Phillips	0.25	4,633	5.4	Costilla	0	3,602	0.0
Pitkin	0.75	16,420	4.6	Custer	0	4,000	0.0
Crowley	0.25	6,092	4.1	Delta	0	30,676	0.0
Arapahoe	19.25	542,316	3.5	Dolores	0	1,946	0.0
Morgan	1	28,540	3.5	Gilpin	0	5,088	0.0
Adams	11.8	415,010	2.8	Gunnison	0	14,437	0.0
Summit	0.75	27,964	2.7	Hinsdale	0	851	0.0
Boulder	6.25	288,603	2.2	Huerfano	0	8,020	0.0
Weld	4.75	236,908	2.0	Jackson	0	1,520	0.0
Archuleta	0.25	12,208	2.0	Kiowa	0	1,518	0.0
Montezuma	0.5	25,343	2.0	Kit Carson	0	7,814	0.0
Moffat	0.25	13,729	1.8	Lake	0	8,054	0.0
Pueblo	2.5	153,243	1.6	Las Animas	0	16,465	0.0
Alamosa	0.25	15,765	1.6	Lincoln	0	5,770	0.0
Fremont	0.75	48,117	1.6	Mineral	0	966	0.0
Eagle	0.75	50,894	1.5	Montrose	0	38,903	0.0
Chaffee	0.25	16,919	1.5	Ouray	0	4,358	0.0
El Paso	8	578,336	1.4	Park	0	16,802	0.0
Otero	0.25	19,452	1.3	Prowers	0	13,800	0.0
Jefferson	6.75	534,691	1.3	Rio Grande	0	12,803	0.0
Logan	0.25	21,684	1.2	Routt	0	22,299	0.0
Elbert	0.25	23,235	1.1	Saguache	0	6,568	0.0
Larimer	2.75	277,343	1.0	San Juan	0	589	0.0
Garfield	0.5	53,020	0.9	San Miguel	0	7,345	0.0
La Plata	0.25	48,752	0.5	Teller	0	22,726	0.0
Broomfield	0.25	47,521	0.5	Washington	0	4,936	0.0
				TOTAL	119	4,813,536	2.5

Tuberculosis by age group

In 2007, TB cases were reported among people ranging from 1 year to 99 years of age. In 2007, 31 percent of TB cases occurred among people ≥ 65 years, followed by those ages 25-44 and 45-64 (26 percent and 23 percent respectively)(**Figure 3**).

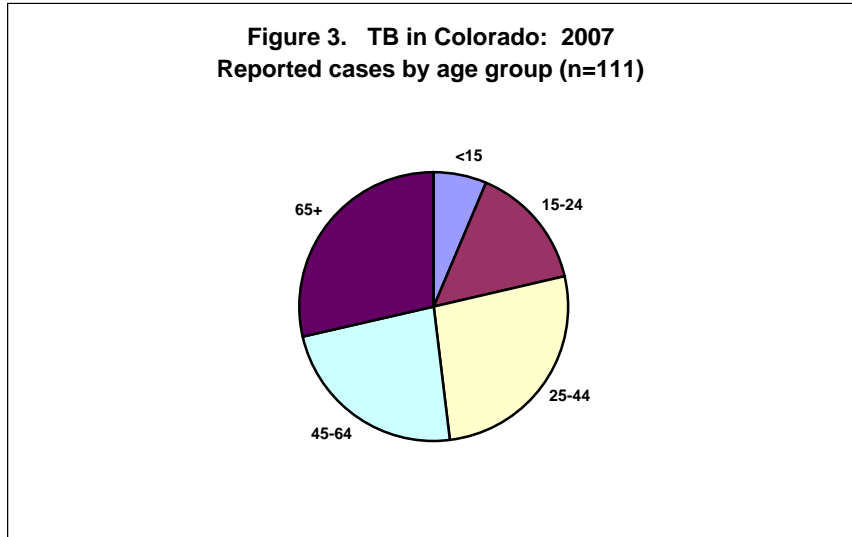


Table 5 shows that the highest TB incidence was among people in the 85+ age group (11 cases per 100,000) and lowest (0.3 cases per 100,000) among children ages 5-9.

**Table 5: Tuberculosis in Colorado – 2007
Reported Cases by Age Group**

Age group	Male	Female	Total	Population estimate	Rate*
0 to 4	2	2	4	355,422	1.1
5 to 9	1	0	1	339,857	0.3
10 to 14	1	1	2	325,146	0.6
15 to 19	7	2	9	357,840	2.5
20 to 24	3	4	7	377,873	1.9
25 to 29	4	3	7	308,077	2.3
30 to 34	4	3	7	348,062	2.0
35 to 39	3	4	7	374,046	1.9
40 to 44	4	4	8	364,545	2.2
45 to 49	5	3	8	387,622	2.1
50 to 54	2	1	3	357,060	0.8
55 to 59	7	1	8	305,651	2.6
60 to 64	5	1	6	221,096	2.7
65 to 69	6	6	12	147,167	8.2
70 to 74	4	3	7	119,994	5.8
75 to 79	5	0	5	96,782	5.2
80 to 84	2	2	4	67,174	6.0
85+	4	2	6	54,739	11.0
TOTAL	69	42	111	4,908,153	2.3

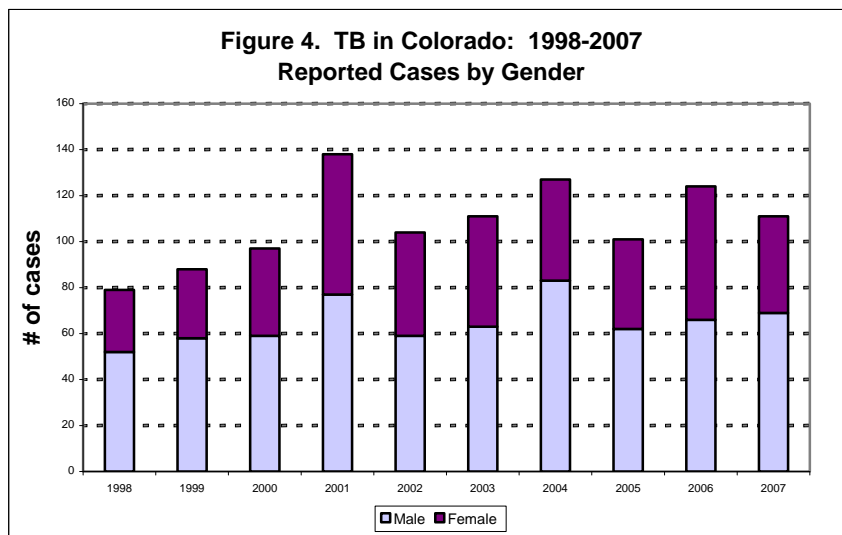
Active TB in young children is particularly concerning as it is indicative of ongoing transmission in the community as well as missed opportunities for preventive therapy. Seven cases of TB were reported in children less than 15 years of age, four of which occurred in children less than 5 years of age. Of the seven TB cases found among children in 2007, six were foreign-born and one was U.S.-born (Table 6).

**Table 6: Tuberculosis in Colorado – 2007
Reported Cases by Age Group and Patient Country of Origin**

Age Group	United States	Foreign	Total
0-4	1	3	4
5-14	0	3	3
15-24	2	14	16
25-34	3	11	14
35-44	4	11	15
45-54	2	9	11
55-64	3	11	14
65-74	6	13	19
75-84	6	3	9
85+	6	0	6
TOTAL	33	78	111

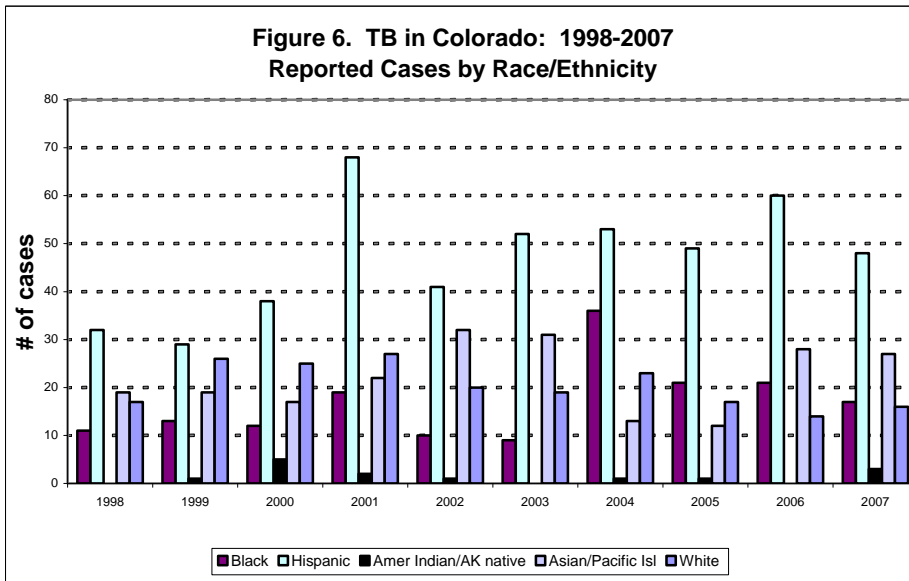
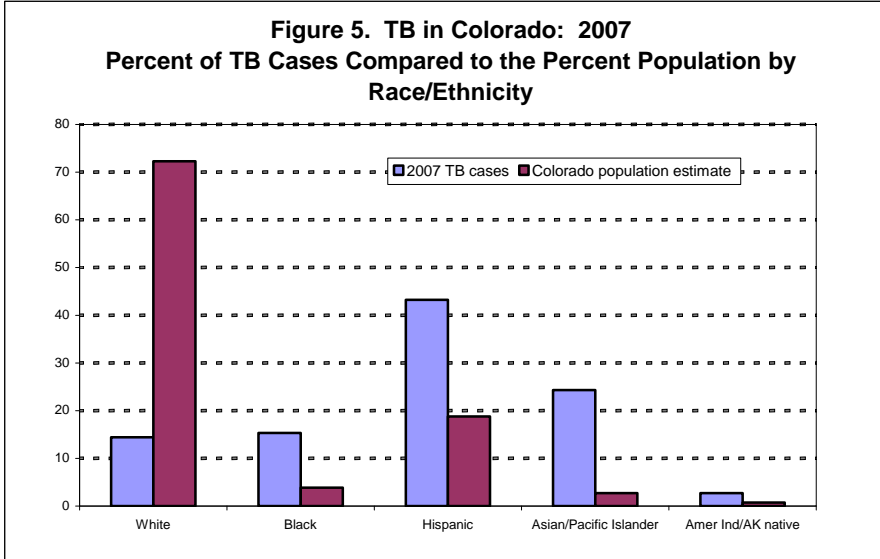
Tuberculosis by gender

TB incidence historically has been higher among males than females, although this gap appears to be narrowing. In 2007, males represented 62 percent (n=69) of all TB cases in Colorado (Figure 4). 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, underlying susceptibility to TB, or the distribution of risk factors, such as substance abuse and homelessness.



Tuberculosis by race/ethnicity

The number of reported cases of TB in Colorado is highest among racial and ethnic minorities. In 2007, 85 percent of the total number of reported cases occurred among people who were either Hispanic (43 percent), Asian/Pacific Islander (24 percent), African American (15 percent), or American Indian/Alaskan Native (3 percent) (**Figure 5 and Figure 6**).



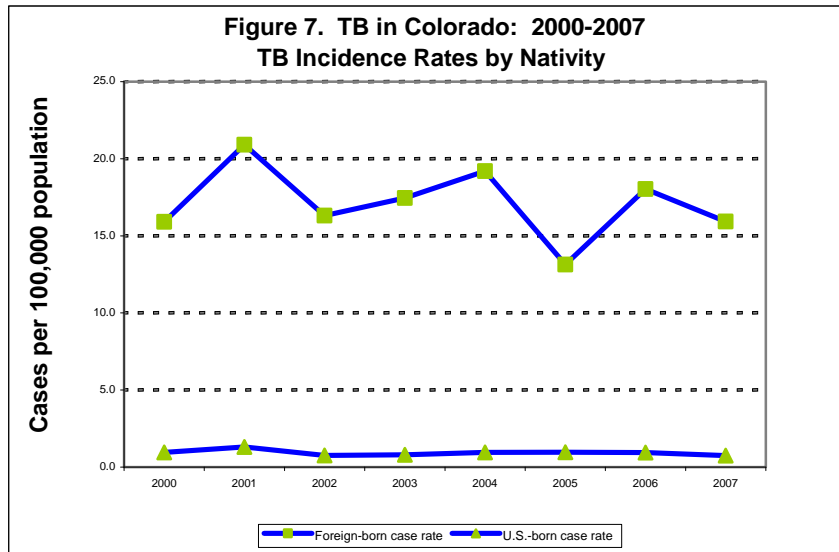
Although Colorado is categorized as a state with a low incidence of TB (case rate less than 3.5 per 100,000), case rates in most minority populations exceed the “low incidence” threshold.

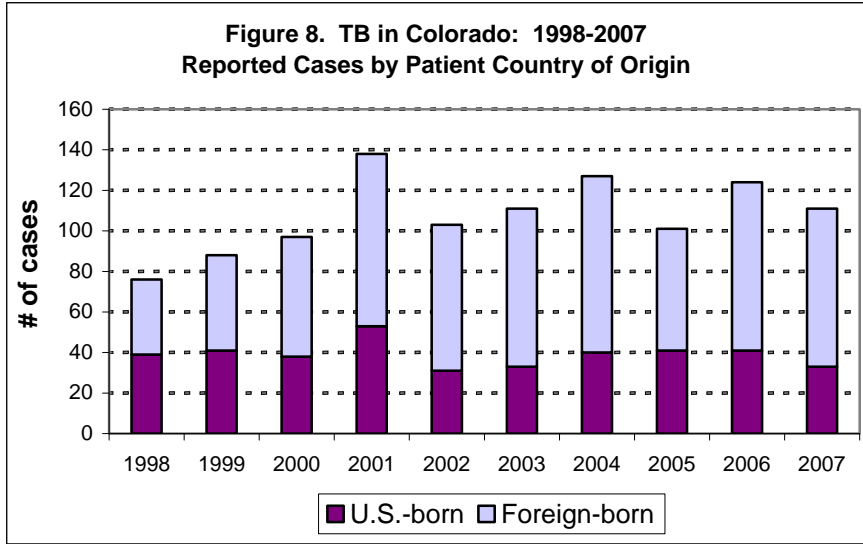
Table 7: TB in Colorado: 2007
Case Rates (per 100,000) by Race/Ethnicity

Race/ethnicity	2007		
	Cases	Population estimate	Rate
White	16	3,468,364	0.5
Black	17	184,988	9.2
Hispanic	48	901,739	5.3
Asian/Pacific Islander	27	130,109	20.8
American Indian/Alaskan Native	3	35,930	8.3
Multiple race	0	76,239	0.0
TOTAL	111	4,797,369	2.3
Year 2010 goal: ≤ 1.0 case per 100,000 population			

TB incidence rates by nativity

The TB incidence in the foreign-born population at 16 per 100,000 is 22 times that of the U.S.-born population (0.7 per 100,000). Since 1999, more than one-half of the cases of TB reported in Colorado were among foreign-born individuals (**Figure 7 and Figure 8**).





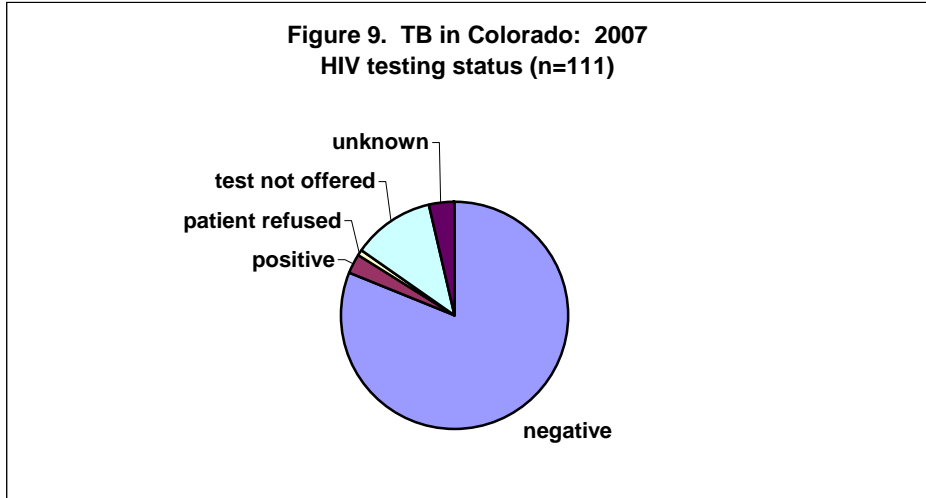
In 2007, 78 foreign-born cases were reported in Colorado, representing 70 percent of all cases. Affected individuals were born in 21 different countries, all of which have higher background rates of TB disease than the United States. Of the cases of TB among foreign-born people, 39 percent occurred in people born in Mexico.

**Table 8. Tuberculosis in Colorado: 2007
Patient Country of Origin**

Country	Cases	Country	Cases
Bosnia	1	Korea	3
Burma	1	Laos	1
China	6	Liberia	1
El Salvador	2	Mexico	31
Eritrea	1	Nepal	2
Ethiopia	5	Pakistan	1
Ghana	2	Philippines	4
Guatemala	1	Somalia	5
Hungary	1	Thailand	1
India	4	Vietnam	4
Japan	1	TOTAL	78

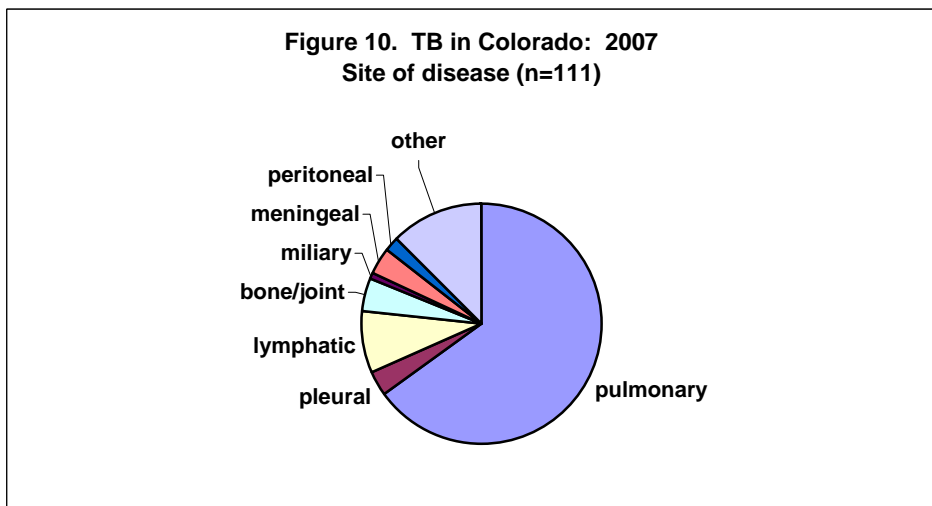
HIV/Co-infection

TB occurs more frequently in HIV-infected people because HIV weakens the immune system, greatly increasing the likelihood of progression from latent to active TB disease in people who have latent TB infection. HIV testing results were available for 92 of 111 (83 percent) of TB cases reported in 2007. Three cases of TB (3 percent) were co-infected with HIV (**Figure 9**).



Tuberculosis cases by major site of disease

Tuberculosis most often attacks the lungs, but may affect any part of the body, including the kidney, spine and brain. In 2007 in Colorado, 64 percent of people with TB had pulmonary disease (**Figure 10**). The second most common site of the disease was the lymph system (8 percent). Among the pulmonary cases, 37 percent were sputum smear positive, a strong indicator of infectiousness.



Drug resistance and TB

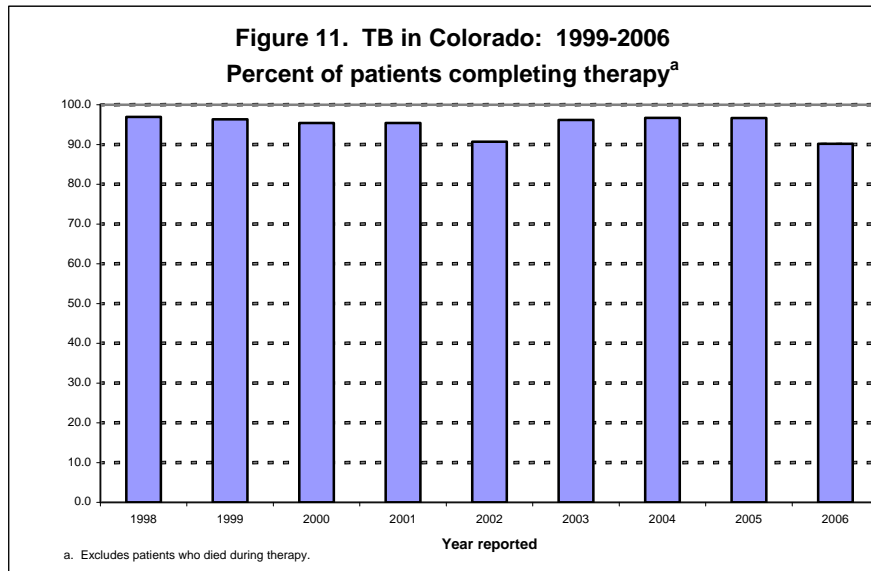
Drug susceptibilities were available for 100 percent of the 74 culture positive TB cases in 2007. Twelve specimens were resistant to one or more primary drugs, which include: isoniazid (INH); rifampin (RIF); pyrazinamide (PZA); and ethambutol (EMB). One of the specimens was multi-drug resistant TB (defined as being resistant to at least INH and RIF). Three cases were resistant to Streptomycin only, a second-line drug. None of the individuals had extensively drug resistant TB. The primary resistance patterns are shown in Table 9.

**Table 9. Tuberculosis in Colorado: 2007
Drug Susceptibilities**

Drug(s)	Number resistant
INH only	6
Streptomycin only	3
PZA only	3
INH and Streptomycin	2
INH and RIF	1
Total	15

Completion of TB treatment

The standard length of treatment for TB is six months and uses isoniazid, rifampin, pyrazinamide and ethambutol. In 2006, 112 patients were eligible for treatment completion within 12 months. Of these, 101 (90 percent) completed their course of treatment during the recommended time frame (Figure 11). Six people (5 percent) required greater than 12 months to complete treatment, four (4 percent) were lost to follow-up, and one (1 percent) moved to another country and treatment completion information was not obtained. Data for 2007 are preliminary; however, all new affected people in 2007 that were alive at diagnosis have initiated treatment.



Contact Investigations

It is a public health responsibility to conduct contact investigations on all cases of infectious (pulmonary and laryngeal) TB. Contacts 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 10 is a summary of contact investigations since 2001. In 2006 (the most current year for which data is available), 64 investigations were completed and 1,523 exposed people were identified. As a result of these investigations, a total of nine active cases of TB were identified and treated. Of the 274 people identified with latent TB infection, 217 (79 percent) initiated treatment, and 146 (67 percent) completed treatment for latent TB infection.

**Table 10. Tuberculosis in Colorado: 2001-2006
Follow-up and Treatment for Contacts to Tuberculosis Cases**

	2001	2002	2003	2004	2005	2006
Number of sputum smear or culture-positive cases	77	60	45	48	44	64
Total contacts	1107	1388	593	1462	1317	1523
Average contacts per infectious case	14.4	23.1	13.1	30.5	29.9	23.7
Number (%) of contacts evaluated*	864(78%)	1017(73%)	489(82%)	1170(80%)	1113(85%)	1290(85%)
Number (%) of contacts with latent TB infection	329(38%)	253(25%)	111(23%)	351(30%)	220(20%)	274(21%)
Number (%) of infected contacts starting treatment	233(71%)	164(65%)	89(80%)	276(79%)	179(81%)	217(79%)
Number (%) of contacts starting treatment who finished treatment	149(64%)	121(74%)	63(71%)	187(68%)	127(71%)	146(67%)
Number (%) of contacts with active TB disease	15(1%)	2(<1%)	3(<1%)	16(1%)	7(1%)	9(<1%)

* Evaluated = symptom check and tuberculin skin test, chest X-ray, sputum studies as indicated.