

TUBERCULOSIS IN COLORADO

A Summary of Cases Reported in 2005

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Colorado reported 101 new cases of active TB in 2005 for a case rate of 2.1 per 100,000 population. Though this was a decrease from the 127 cases reported the previous year, this likely represents fluctuation and not a true decrease. Nineteen of the state's 64 counties reported cases with the majority being reported from the Denver Metro area and specifically Denver County (42 cases). Alamosa, Logan, Moffat, and Phillips Counties reported cases after not having a case in at least six years. Twenty counties have not reported a case of TB for at least 13 years.

As compared to Colorado's population, which is approximately 74 percent non-Hispanic white, minorities are over-represented among TB cases. Eighty-three percent of new TB cases occurred in racial and ethnic minorities. Forty-nine percent of the cases were classified as nonwhite Hispanic and 21 percent were classified as African American/Black. At 7.0 per 100,000, the case rate in the minority population is 14 times the rate in the majority population.

The incidence in Colorado's foreign-born population is 13.1 per 100,000 compared to the U.S.-born rate of 1.0 per 100,000. Fifty-nine percent of the cases were foreign-born—a decrease from the previous few years. Cases were born in 19 different countries with Mexico being the predominant country of origin.

Cases in children are especially concerning because they are a sign of recent transmission and missed opportunities for TB prevention. Seventeen cases (17 percent) were in children less than 15 years, and six of those were less than five years. Six of the 17 children were U.S.-born, and 11 were foreign-born. Seven of the 11 foreign-born children were newly arrived in the United States.

Of the 127 cases reported in 2004 who were alive at diagnosis and who did not die during therapy, 97 percent completed an appropriate course of therapy. Twelve cases had organisms resistant to one primary drug, however there were no new cases of multi-drug resistant TB. All cases with drug resistance were from the Denver Metro area.

In 2004, 48 cases were either sputum smear or culture positive. Contact investigations were conducted and 1462 exposed persons were identified. Sixteen exposed persons were found to have TB disease and were treated. Another 351 had latent TB infection. Preliminary data indicate 187 of those have completed treatment thereby reducing the risk of future disease.

Tuberculosis in Colorado A Summary of Cases Reported in 2005

Colorado reported 101 new cases of active TB in 2005 (**Figure 1**). Though this was a decrease from the 127 cases reported the previous year, this likely represents fluctuation and not a true decrease. **Table 1** shows a comparison between 2004 and 2005 cases. Birth in a high TB prevalence country is the number one risk factor, and excess alcohol use is a distant second.

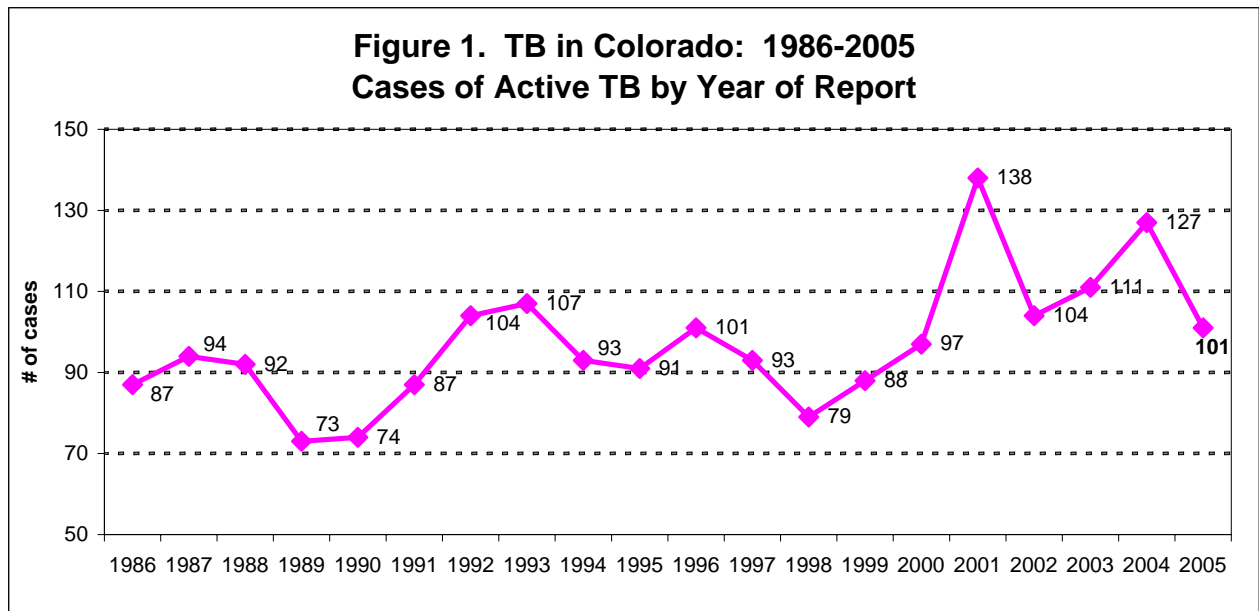


Table 1. TB in Colorado: Comparison of 2004 and 2005 Cases

	Year reported			
	2004		2005	
	n	%	n	%
Age Group (years)				
<15	25	19.7	17	16.8
15-24	18	14.2	12	11.9
25-44	41	32.3	21	20.8
45-64	24	18.9	25	24.8
65+	19	15.0	26	25.7
TOTAL	127	100.0	101	100.0
Gender				
Male	83	65.4	62	61.4
Female	44	34.6	39	38.6
TOTAL	127	100.0	101	100.0
Race/Ethnicity				
White	23	18.1	17	16.8
Black	36	28.3	21	20.8
Hispanic	53	41.7	49	48.5
Amer Ind/AK native	1	0.8	1	1.0
Asian/Pacific Is	13	10.2	12	11.9
Multiple race	1	0.8	1	1.0
TOTAL	127	100.0	101	100.0
Region				
Denver metro ^a	93	73.2	74	73.3
Other than Denver metro	34	26.8	27	26.7
TOTAL	127	100.0	101	100.0
Country of Origin				
United States	40	31.5	41	40.6
Mexico	35	27.6	29	28.7
Other countries	52	40.9	31	30.7
TOTAL	127	100.0	101	100.0
HIV Status Among 25-44 Age Group				
Negative	34	82.9	16	76.2
Positive	4	9.8	3	14.3
Testing done, results unknown	1	2.4	0	0.0
Refused testing	2	4.9	0	0.0
Not offered	0	0.0	2	9.5
TOTAL	41	100.0	21	21.0
Risk factors^b				
Birth in a high TB prevalence country	86	67.7	59	58.4
Homeless within past year	5	3.9	7	6.9
Resident of correctional facility at diagnosis	4	3.1	7	6.9
Resident of long-term care facility	3	2.4	4	4.0
Injected drug use within past year	1	0.8	1	1.0
Non-injected drug use within past year	1	0.8	5	5.0
Excess alcohol use within past year	13	10.2	13	12.9
Health care worker within past 2 years	4	3.1	2	2.0

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

Beginning in 2001, Boulder and Broomfield Counties are included as part of Denver metro.

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

Incidence

In 2005, the overall case rate for TB in Colorado was 2.1 per 100,000 population (**Figure 2**). Colorado continues to be categorized as a low incidence state (case rate of less than 3.5 per 100,000 population), though the case rates in most minority populations exceed 'low incidence' threshold (**Table 2**). At 7.0 per 100,000, the case rate in the minority population is 14 times the rate in the majority population. The incidence in Colorado's foreign-born population is 13.1 per 100,000 compared to the U.S.-born rate of 1.0 per 100,000. To meet the "Healthy People 2010" goal of 1.0 or fewer cases per 100,000 population, Colorado will need to reduce the number of new cases by half.

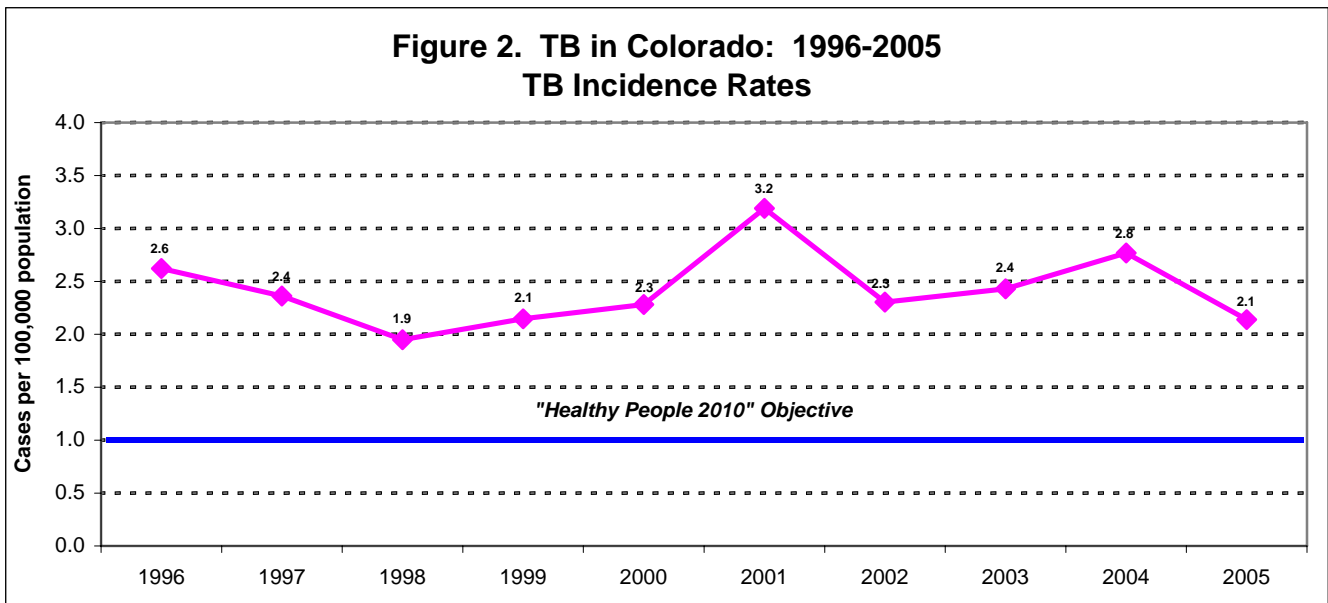
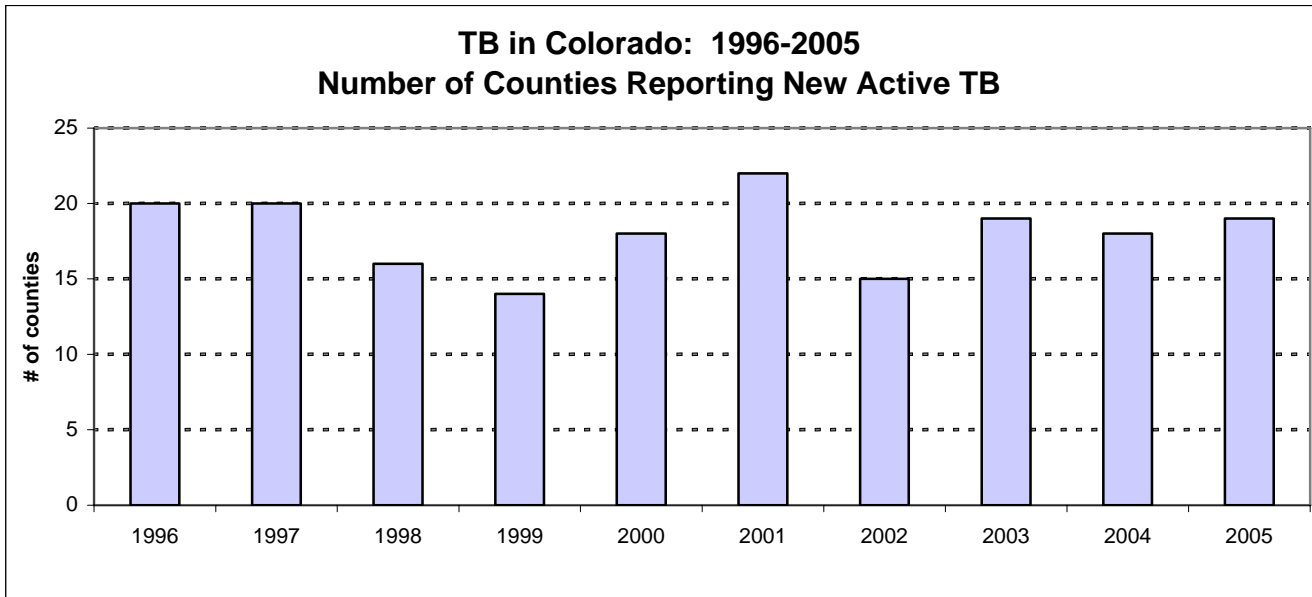


Table 2. TB in Colorado: 2005
Case Rates (per 100,000) by Race/Ethnicity

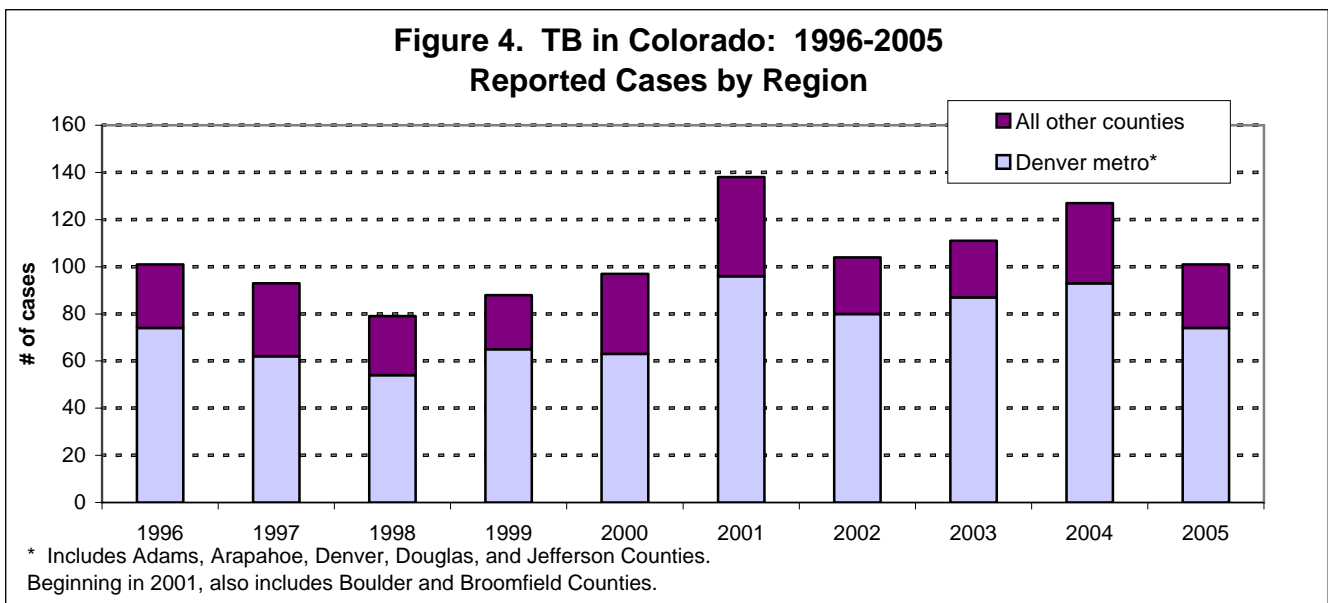
Race/ethnicity	2005		
	# cases	Pop est.	Rate
White	17	3515559	0.5
Black	21	173724	12.1
Hispanic	49	807252	6.1
Asian/Pacific Islander	12	106689	11.2
Amer Ind/AK native	1	31629	3.2
Multiple race	1	85918	1.2
TOTAL	101	4,720,772	2.1
Year 2010 goal: <=1.0 cases per 100,000 population			

Location

Nineteen of the state's 64 counties reported a new case of TB in 2005. Alamosa, Logan, Moffat, and Phillips Counties reported cases in 2005 after not having a case in at least six years. Twenty counties have not reported a case of TB for at least 13 years. The largest increase from 2004 to 2005 for any county was one case. The largest decrease (from 13 to 6) was in Adams County (**Figure 3, Table 3**).



Though 56 percent of the state's population resides in the Denver Metro counties of Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas, and Jefferson, 73 percent of the cases of TB are from those metropolitan counties (**Figure 4**).



**Table 3. TB in Colorado: 1993-2005
Cases by County and Year of Report**

NOTE: Only counties reporting cases are listed.

County	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Adams	4	4	5	10	10	7	8	4	15	11	9	13	6
Alamosa	1	1	0	0	1	0	0	0	0	0	0	0	1
Arapahoe	9	7	11	13	10	6	12	11	11	20	20	18	17
Archuleta	0	0	0	1	0	0	0	0	0	0	1	0	0
Bent	2	0	0	0	0	1	0	0	0	0	0	0	0
Boulder	8	5	5	1	6	4	3	6	5	5	13	2	3
Broomfield	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	0	1
Chaffee	0	0	0	0	0	0	0	0	0	0	1	0	0
Conejos	1	0	0	0	0	0	0	0	0	0	1	0	0
Costilla	0	0	0	0	0	0	0	0	1	0	0	0	0
Crowley	1	0	0	1	0	0	0	0	0	0	0	1	0
Delta	2	2	1	1	0	0	0	2	1	0	0	0	0
Denver	51	39	45	40	37	34	39	42	55	38	38	47	42
Douglas	0	0	0	2	1	1	1	0	0	2	0	3	0
Eagle	1	0	1	1	3	0	0	2	0	1	2	0	1
El Paso	5	8	3	5	5	4	9	7	7	5	4	9	9
Elbert	1	0	0	0	0	0	0	0	1	0	1	0	0
Fremont	1	1	1	0	1	1	0	0	0	0	2	0	1
Garfield	0	1	0	0	1	1	0	0	0	1	0	0	0
Grand	0	0	0	0	0	0	0	0	0	0	0	2	1
Gunnison	0	0	0	0	1	0	0	0	2	0	0	0	0
Jefferson	8	4	3	8	4	6	5	6	9	4	7	10	5
La Plata	0	0	0	2	0	0	0	1	1	1	0	1	0
Lake	0	1	0	1	0	0	0	0	0	0	0	0	0
Larimer	1	2	4	0	3	1	0	2	3	3	3	2	2
Las Animas	0	0	2	1	2	0	1	0	1	0	0	0	0
Lincoln	0	1	0	0	0	1	0	0	0	0	0	0	0
Logan	0	0	0	0	0	0	0	0	0	0	0	0	1
Mesa	3	1	1	5	1	2	0	2	4	2	2	0	0
Moffat	0	0	0	0	0	0	1	0	0	0	0	0	1
Montezuma	0	0	1	0	0	0	0	1	0	0	0	2	0
Montrose	1	1	0	1	1	0	0	2	1	0	0	0	0
Morgan	0	3	2	1	1	0	0	1	0	1	1	1	2
Otero	1	0	0	1	1	2	1	1	3	0	0	0	0
Park	0	1	0	0	0	0	0	0	0	0	0	0	0
Phillips	0	0	0	0	0	0	1	0	0	0	0	0	1
Pitkin	1	0	0	0	0	0	0	1	1	0	0	0	1
Prowers	0	1	0	0	0	0	0	0	0	0	0	0	0
Pueblo	4	3	3	4	1	5	5	0	3	6	2	3	3
Rio Blanco	0	0	0	0	0	0	0	0	0	0	1	1	0
Rio Grande	0	0	0	0	0	0	1	0	1	0	0	0	0
Routt	0	0	0	0	1	0	0	0	0	0	0	0	0
Saguache	0	0	0	0	0	0	0	0	2	0	0	0	0
Sedgwick	0	0	0	0	0	0	0	0	0	0	0	1	0
Summit	0	0	0	0	0	0	0	2	0	0	0	2	0
Washington	0	1	0	0	0	0	0	0	0	0	0	0	0
Weld	1	6	3	2	3	3	1	4	10	4	2	9	3
Yuma	0	0	0	0	0	0	0	0	0	0	1	0	0
TOTAL	107	93	91	101	94	79	88	97	138	104	111	127	101

The rates in counties with small populations may vary considerably from year to year although there may be a change of only one or two cases. In order to make a more realistic comparison, the average incidence for counties during the past five years is listed in **Table 4**. At 3.4 cases per 100,000 per year, the incidence for the Denver metro counties combined is double the incidence in the rest of the state (1.7 per 100,000 per year). Denver County's case rate of 7.8 per 100,000 is four times the rest of the state.

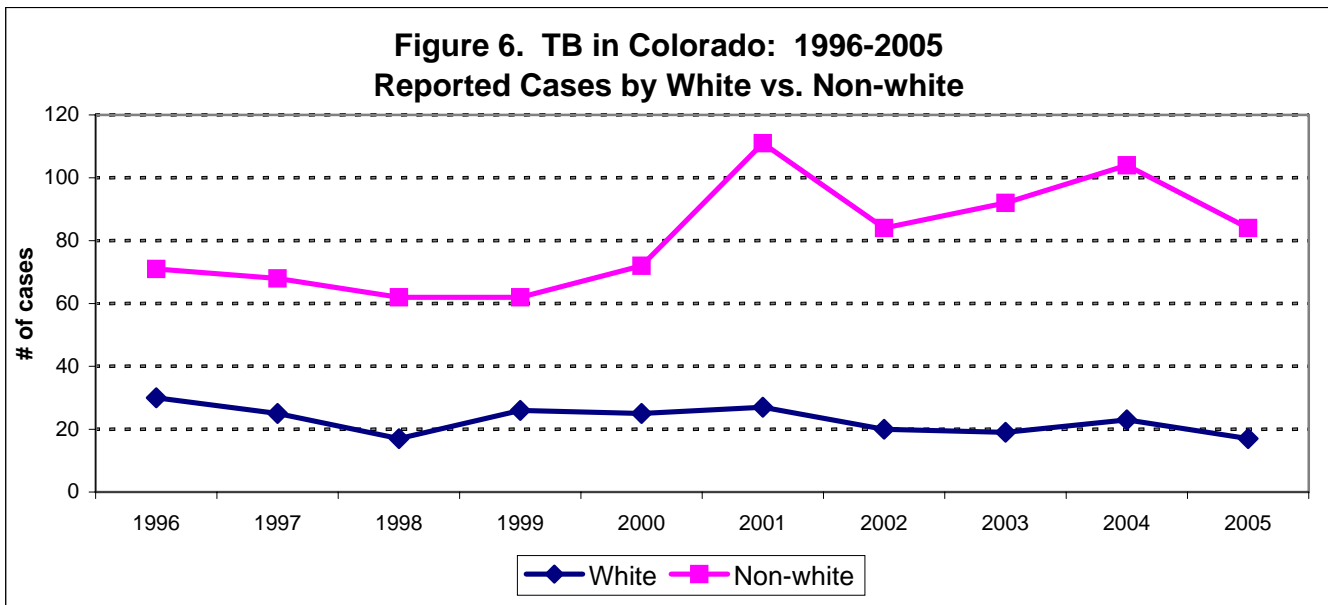
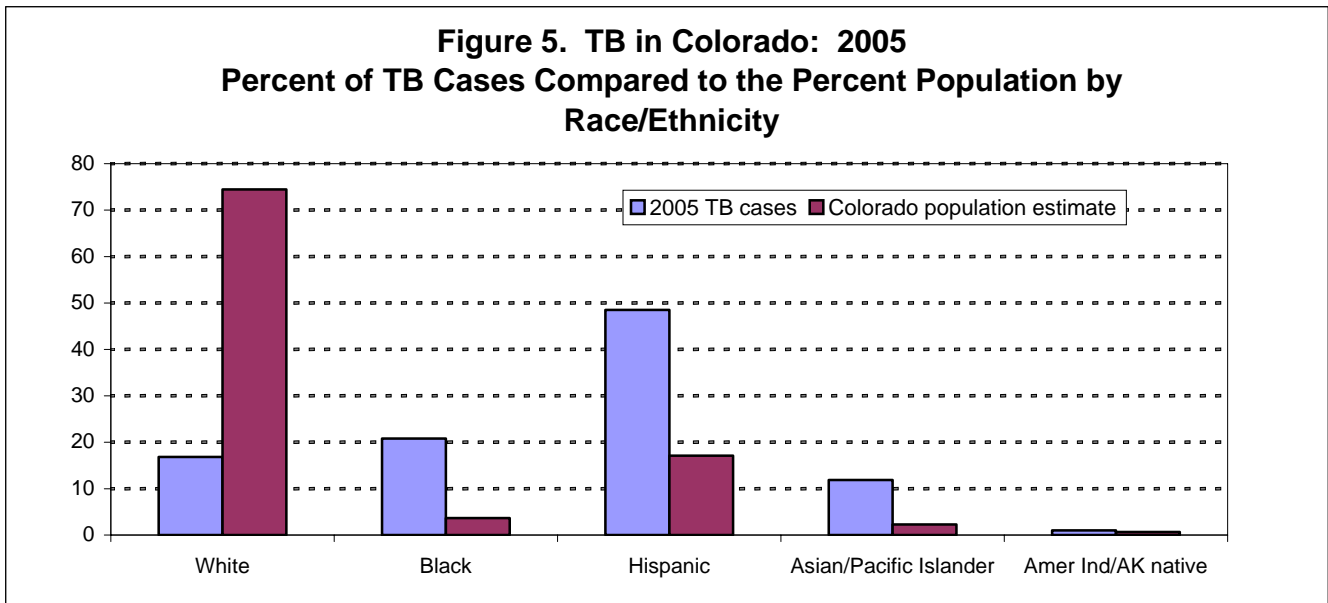
**Table 4. Tuberculosis in Colorado: 2001-2005
Mean Case Rates by County**

County	Mean cases 2001-2005	2003 population	Cases per 100,000 persons per year
Denver	44.0	566,173	7.8
La Plata	0.6	7,904	7.6
Sedgwick	0.2	2,755	7.3
Rio Blanco	0.4	6,033	6.6
Saguache	0.4	6,365	6.3
Costilla	0.2	3,729	5.4
Phillips	0.2	4,548	4.4
Grand	0.6	13,732	4.4
Morgan	1.0	28,244	3.5
Crowley	0.2	5,812	3.4
Arapahoe	17.2	520,501	3.3
Otero	0.6	19,754	3.0
Gunnison	0.4	13,994	2.9
Adams	10.6	385,262	2.8
Weld	5.6	209,649	2.7
Pitkin	0.4	16,421	2.4
Conejos	0.2	8,457	2.4
Pueblo	3.4	148,707	2.3
Boulder	5.8	283,616	2.0
Yuma	0.2	10,018	2.0
Elbert	0.4	22,220	1.8
Archuleta	0.2	11,196	1.8
Eagle	0.8	46,927	1.7
Montezuma	0.4	24,551	1.6
Rio Grande	0.2	12,886	1.6
Moffat	0.2	13,349	1.5
Summit	0.4	27,114	1.5
Jefferson	7.2	529,479	1.4
Alamosa	0.2	15,545	1.3
Mesa	1.6	125,072	1.3
Fremont	0.6	47,571	1.3
El Paso	6.8	547,566	1.2

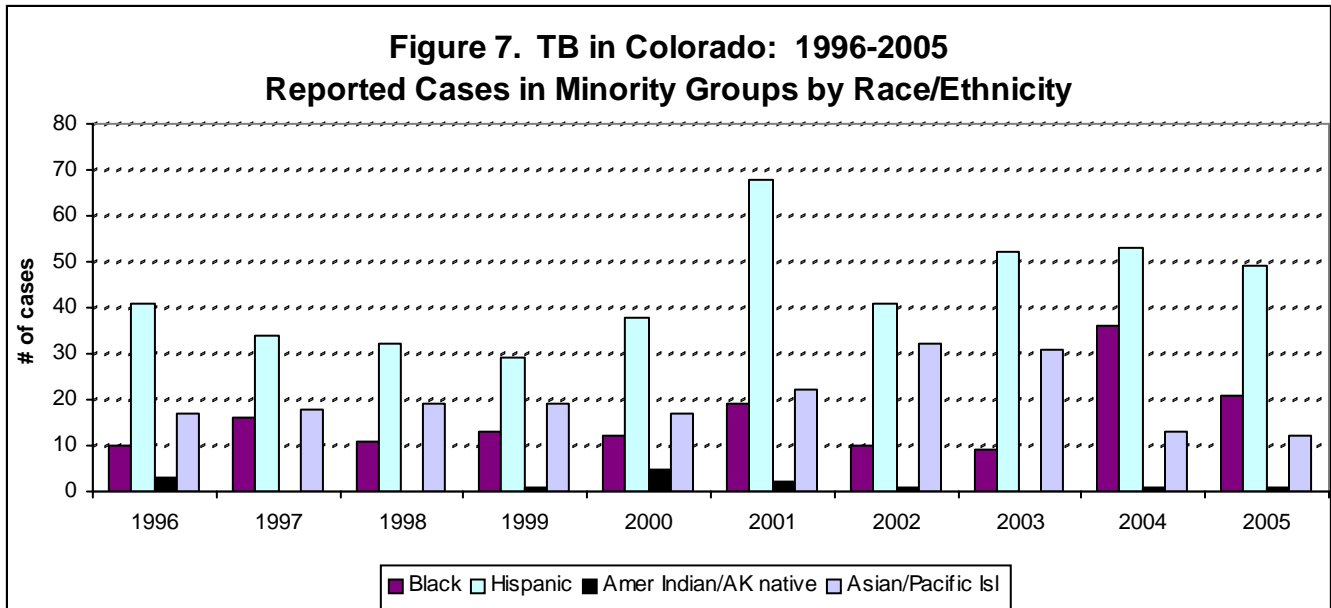
County	Mean cases 2001-2005	2003 population	Cases per 100,000 persons per year
Las Animas	0.2	16,302	1.2
Chaffee	0.2	16,746	1.2
Larimer	2.6	265,489	1.0
Broomfield	0.4	43,484	0.9
Logan	0.2	21,915	0.9
Delta	0.2	29,662	0.7
Montrose	0.2	36,116	0.6
Douglas	1.0	225,694	0.4
Garfield	0.2	48,396	0.4
Baca	0	4,348	0.0
Bent	0	6,397	0.0
Cheyenne	0	2,184	0.0
Clear Creek	0	9,649	0.0
Custer	0	3,896	0.0
Dolores	0	1,848	0.0
Gilpin	0	4,912	0.0
Hinsdale	0	804	0.0
Huerfano	0	8,060	0.0
Jackson	0	1,594	0.0
Kiowa	0	1,543	0.0
Kit Carson	0	8,054	0.0
Lake	0	46,790	0.0
Lincoln	0	6,152	0.0
Mineral	0	906	0.0
Ouray	0	4,030	0.0
Park	0	16,120	0.0
Prowers	0	14,163	0.0
Routt	0	21,366	0.0
San Juan	0	570	0.0
San Miguel	0	7,173	0.0
Teller	0	22,156	0.0
Washington	0	5,092	0.0

Race/Ethnicity

As compared to Colorado's population, which is approximately 74 percent non-Hispanic white, minorities are over-represented among TB cases (**Figure 5 and Figure 6**). Eighty-three percent of new TB cases occurred in racial and ethnic minorities. Forty-nine percent of the cases were classified as nonwhite Hispanic and 21 percent were classified as African American/Black.

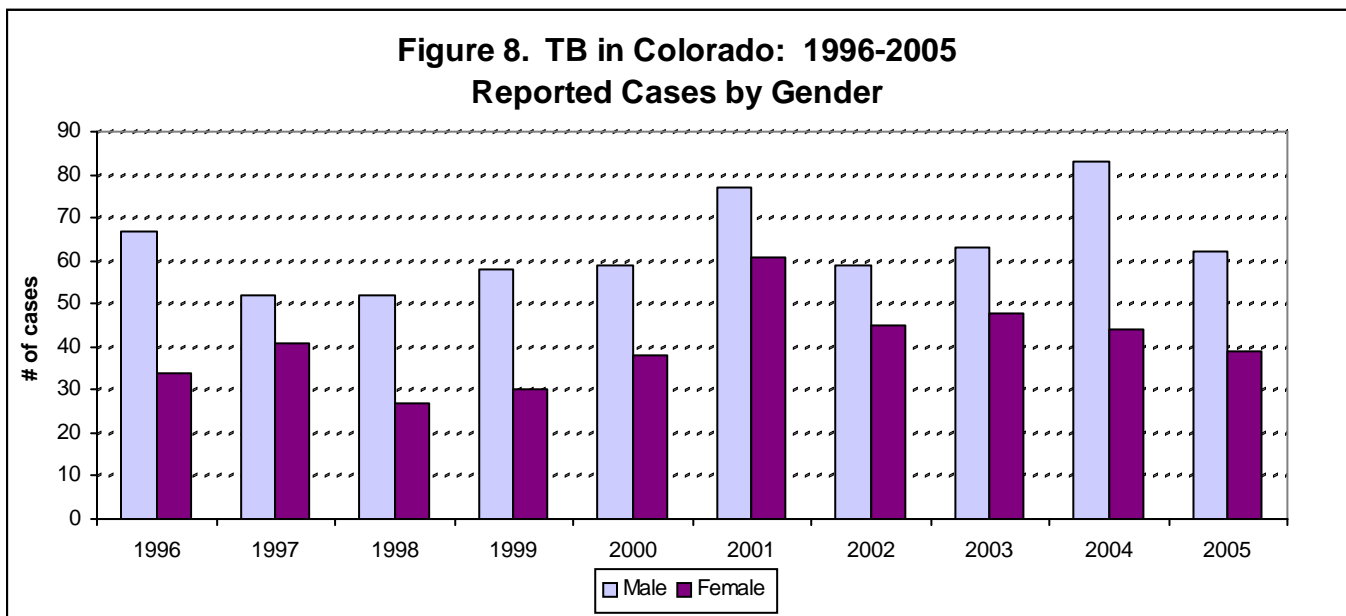


The number of cases by race/ethnicity among minority groups is shown in **Figure 7**.



Gender/Age

In Colorado, more cases of TB occur in men. This is also true nationally (**Figure 8**).



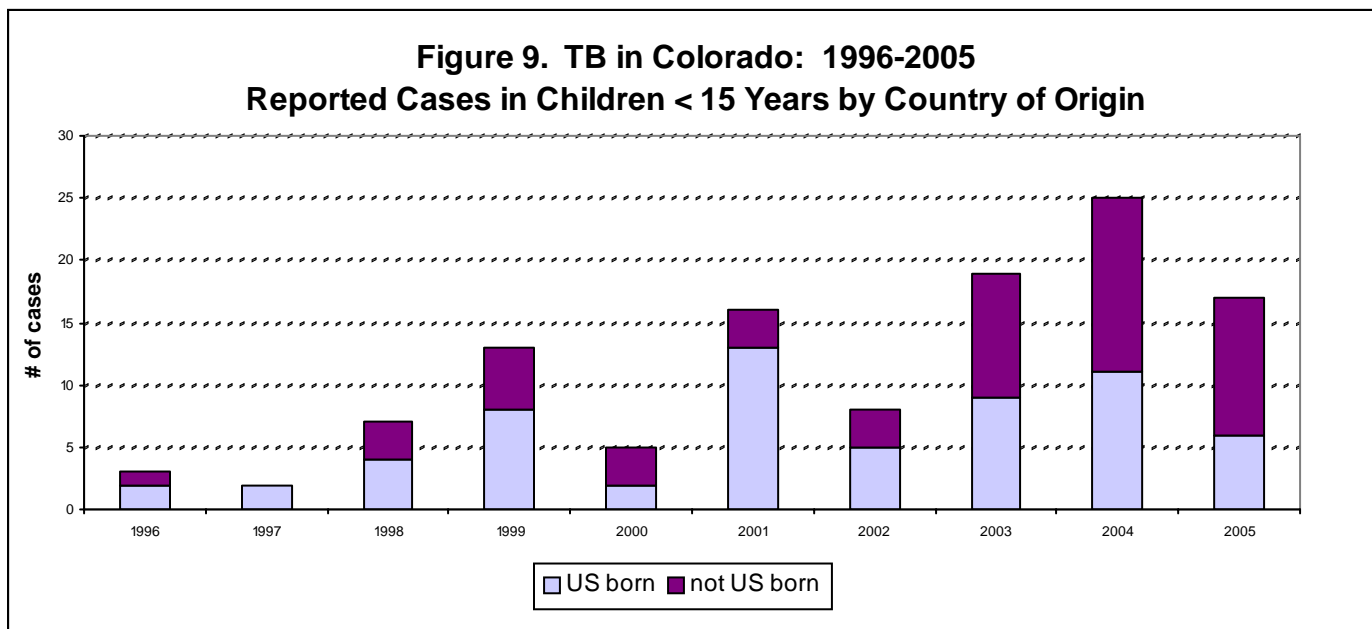
The ages of persons reported with TB in 2005 ranged from less than one year to 95 years with an average of 44 years. The 85 years and older age group had the highest incidence with 9.5 cases per 100,000 population (**Table 5**). Seventeen cases (17 percent) were in children less than 15 years and six of those were less than five years. Cases in children are especially concerning because they are a sign of recent transmission and missed opportunities for TB prevention. Six of the 17 children were US-born, and 11 were foreign-born (**Figure 9**). Seven of the 11 foreign-born children were newly arrived in the United States.

Table 5. TB in Colorado: 2005
Cases and Case Rates by Age Group and Gender

Age group	Male	Female	Total	Pop.est.	Rate*
0-14	11	6	17	988,723	1.7
15-24	8	4	12	694,575	1.7
25-34	9	5	14	662,605	2.1
35-44	5	2	7	730,019	1.0
45-54	10	4	14	715,655	2.0
55-64	8	3	11	470,828	2.3
65-74	6	4	10	250,437	4.0
75-84	4	7	11	155,491	7.1
85+	1	4	5	52,439	9.5
TOTAL	62	39	101	4,720,772	2.1

* Cases per 100,000 persons.

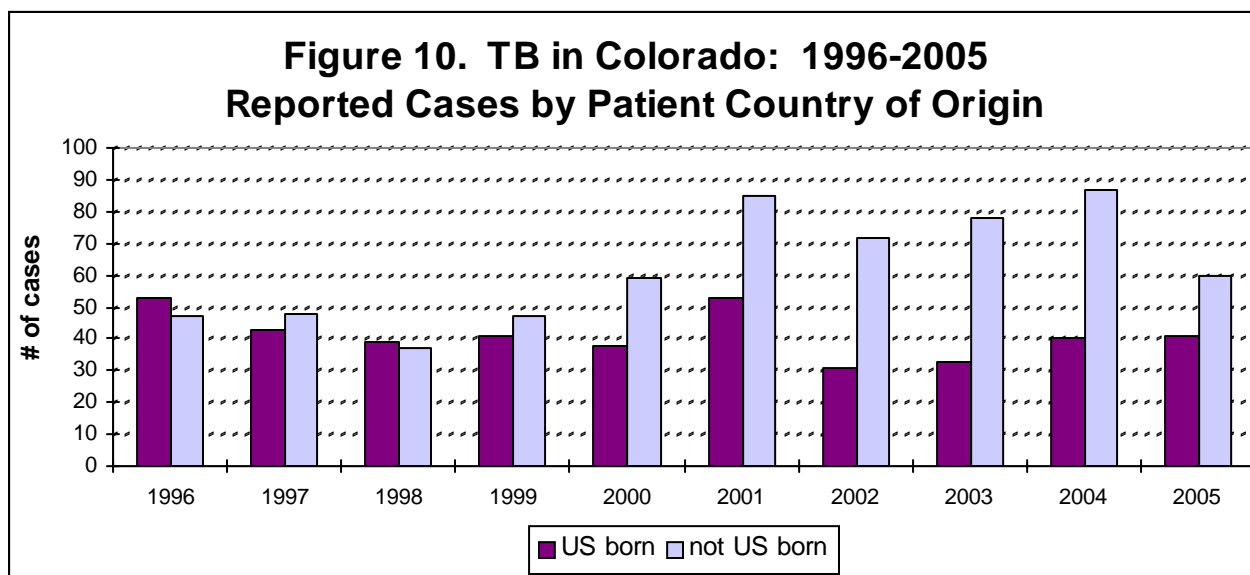
Figure 9. TB in Colorado: 1996-2005
Reported Cases in Children < 15 Years by Country of Origin



Foreign-born

In 2005, 59 percent of the cases were foreign-born—a decrease from the previous few years (**Figure 10**). Cases were born in 19 different countries with Mexico being the predominant country of origin (**Table 6**).

Persons immigrating to the U.S. are required to undergo medical screening prior to entrance. Immigrants found to have “non-infectious” TB are given a designation of Class B TB and are required, upon arrival in the U.S, to report to the local health agency for further evaluation. Four persons who were designated as Class B TB were diagnosed with active TB disease upon arrival in Colorado. An additional eight refugees/asylees arrived in the U.S. with active TB disease, which was not identified during the overseas screening process.



**Table 6. TB in Colorado: 2005
Patient Country of Origin**

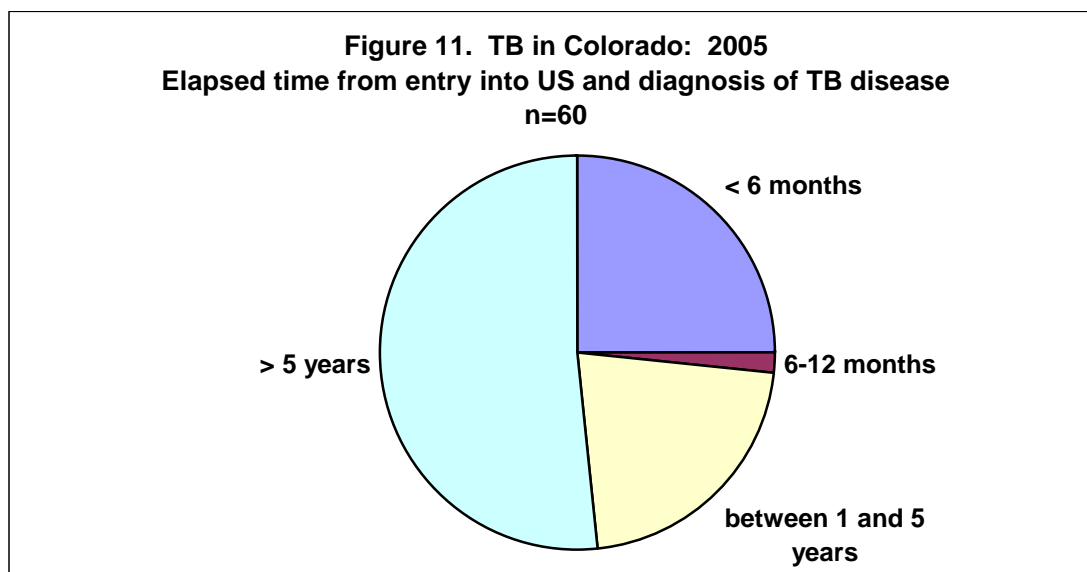
Country	# of cases	Country	# of cases
Afghanistan	1	Philippines	3
Ethiopia	3	Puerto Rico	1
Guatemala	1	Rwanda	1
Honduras	1	Senegal	1
India	1	Somalia	3
Kenya	1	Spain	1
Korea	5	Togo	1
Liberia	2	Uzbekistan	1
Mexico	29	Vietnam	3
Peru	1	TOTAL	60

Table 7 shows the number of cases by age group for those born in the United States and those born outside the United States. Generally, foreign-born cases occur more frequently than U.S.-born cases in all age groups except the older and the very young.

Table 7. TB in Colorado: 2005
Reported Cases by Age Group and Patient Country of Origin

Age Group	USA	Foreign	Total
0-4	5	1	6
5-14	1	10	11
15-24	3	9	12
25-34	2	12	14
35-44	5	2	7
45-54	5	9	14
55-64	5	6	11
65-74	4	6	10
75-84	7	4	11
85+	4	1	5
TOTAL	41	60	101

Elapsed time since entry into the U.S. was available for all 60 foreign-born cases reported in 2005 as shown in **Figure 11**.

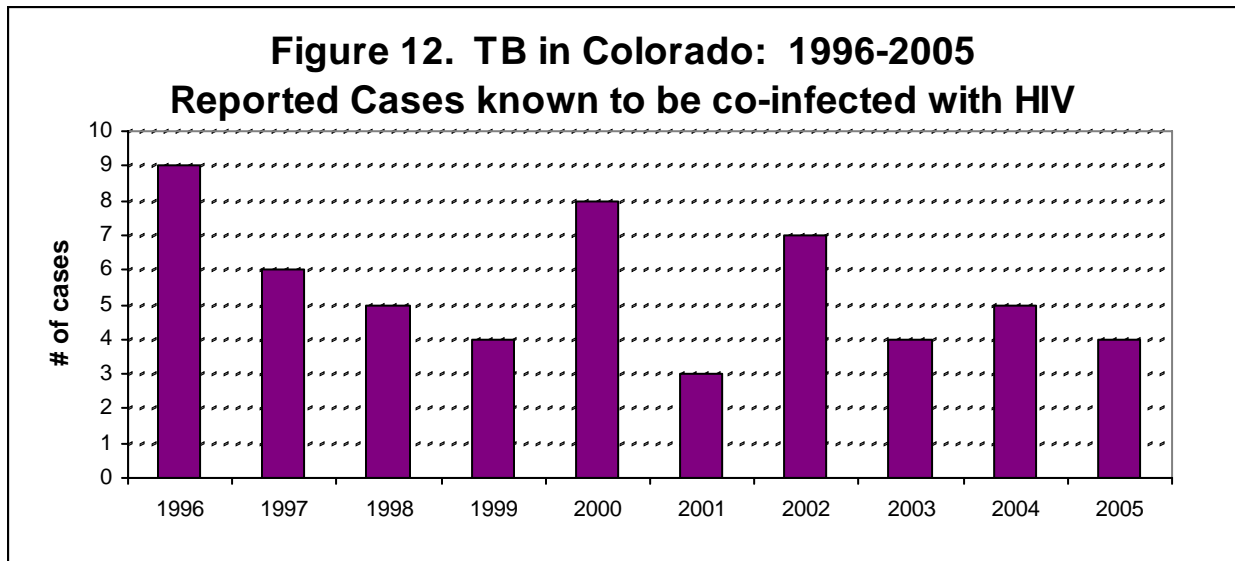


Occupation

The occupational status is known for 94 of the 101 cases reported in 2005. Two cases were health care workers (currently or within the past two years); one case was in a migrant worker (currently or within the past two years); 28 worked at a variety of jobs not known to present a high risk for TB; and 63 were unemployed (including children and retired persons).

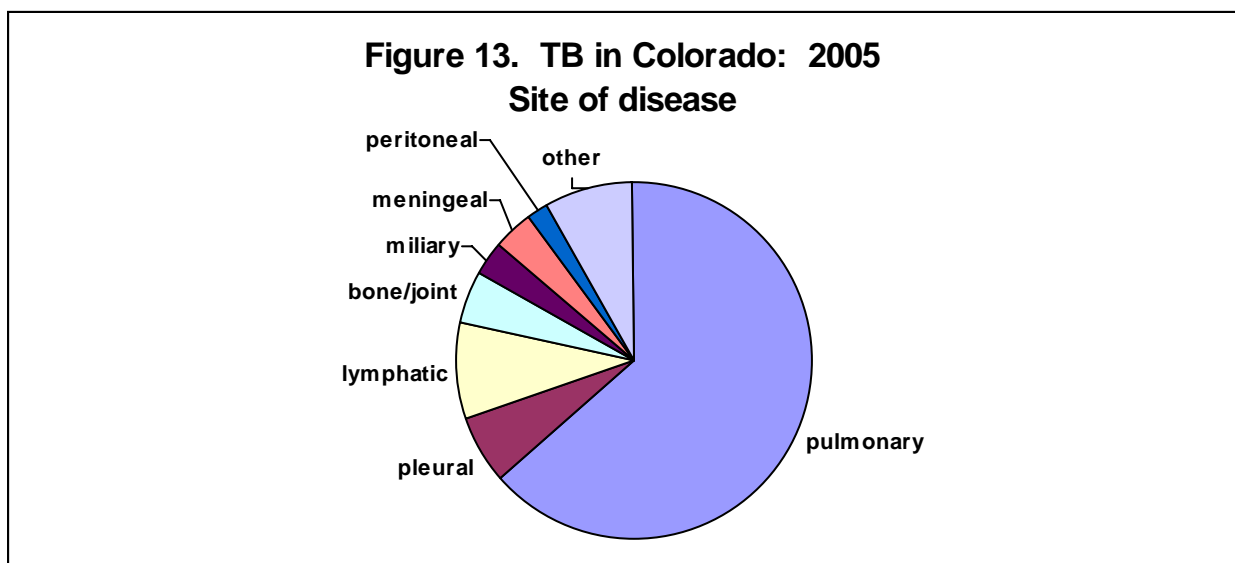
HIV/TB Co-infection

In 2005, four cases of active TB were co-infected with HIV (**Figure 11**). HIV testing was done in 80 percent of cases (81 of 101). The national goal is to have HIV status reported for at least 75 percent of all newly reported TB cases age 25-44. Colorado exceeded this goal by reporting HIV status for 90 percent of cases age 25-44.



Site of Disease

Though 63 percent of TB cases were pulmonary, TB caused disease in many other sites (**Figure 13**). Sites classified as 'other' include bone marrow, pericardium, liver, pancreas, small intestine, colon, and brain.



Drug Susceptibilities

Drug susceptibility results were available for the 69 culture-positive TB cases in 2005. Twelve were resistant to one primary drug (isoniazid-INH, rifampin-RIF, pyrazinamide-PZA, ethambutol-EMB). All cases with drug resistance were from the Denver-metro area. Seven of the cases were foreign-born and one was U.S.-born. The primary resistance patterns were as follows:

3 INH only

5 PZA (NOTE: Three were *Mycobacterium bovis*, which is part of the MTB complex and causes tuberculosis in humans, cattle, and other warm-blooded animals. It is characteristically resistant to PZA. The remaining two were *M. tuberculosis* and were also resistant to streptomycin)

There were no new cases of multi-drug resistant (MDR) TB (defined as being resistant to at least INH and RIF) in 2005 (**Figure 14**).

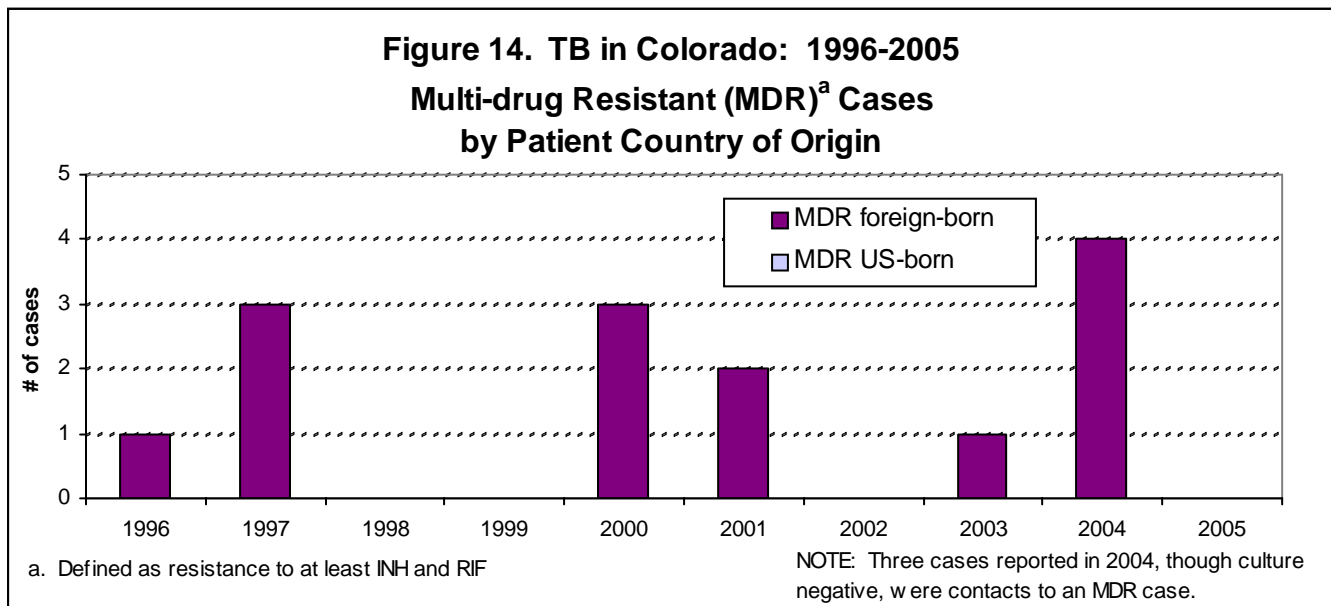


Table 8 describes the 18 cases of MDR TB in Colorado from 1995 to 2005. Three of the cases, though diagnosed in other countries, were managed and treated in Colorado.

**Table 8. TB in Colorado: 1996-2005
Cases of Multi-drug Resistance (MDR)^a**

Report year	Age group at diagnosis (years)	Sex	County	Country of origin	Resistant to ^b	Completion of therapy
1996	50-54	F	Arapahoe	Mexico	IRPE	died after 20 months of therapy
transfer ^c 1996	30-34	F	Boulder	China	IR	completed (22 months)
1997	20-24	F	Boulder	India	IRP	moved after 6 months of therapy outcome unknown
1997	45-49	M	Denver	Viet Nam	IRPES	completed (26 months)
1997	25-29	F	Adams	Mexico	IRPE	died after 11 months of therapy
2000	20-24	F	Boulder	Mexico	IRP	completed (26 months)
transfer ^c 2000	30-34	F	Larimer	Mexico	IR	completed (25 months)
2000	35-39	F	Adams	Mexico	IRPES	completed (26 months)
2000	35-39	M	Denver	Mexico	IR	completed (28 months)
2001	60-64	F	Denver	China	IRP	moved after 6 months of therapy outcome unknown
transfer ^c 2001	40-44	M	El Paso	Korea	IRPES	completed (18 months)
2001	65-69	M	Adams	Peru	IRS	completed (18 months)
2003	25-29	F	Boulder	China	IRPES	completed (18 months)
2004	30-34	M	Denver	Sudan	IRS	currently on therapy ^d
2004	10-14	M	Denver	Sudan	IRS	clinical case, contact of MDR case
2004	10-14	M	Denver	Sudan	IRS	clinical case, contact of MDR case
2004	5-9	M	Denver	Sudan	IRS	clinical case, contact of MDR case

a. Defined as resistance to at least isoniazid and rifampin.

b. I=isoniazid, R=rifampin, P=pyrazinamide, E=ethambutol, S=streptomycin

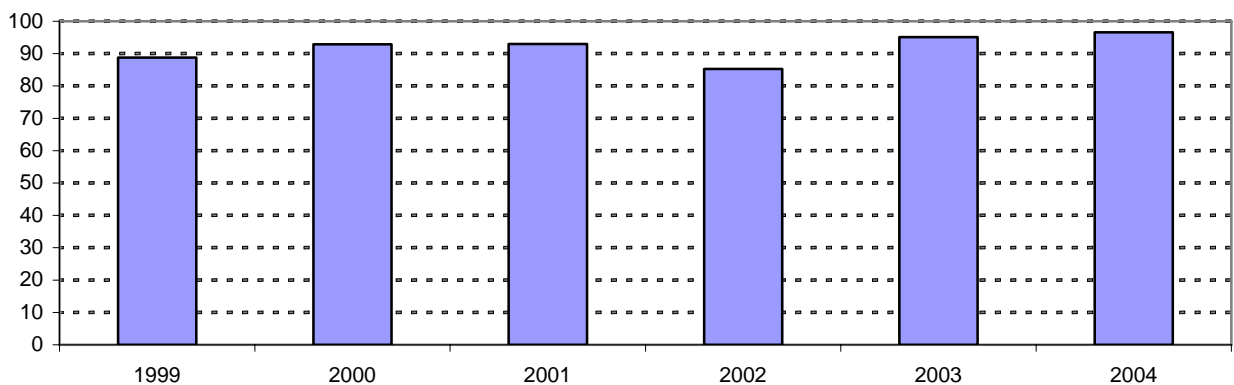
c. Cases not included on graphs of MDR. Cases are counted in the reporting area where they are diagnosed.

d. As of 2/2006.

Completion of Therapy

The usual treatment for TB is six months using INH, RIF, PZA, and EMB. In 2004, two patients were dead at diagnosis and six patients died during therapy. Of the remaining cases, 117 were eligible to complete therapy within a year, and two cases required extended treatment. Of those eligible to complete within a year, 113 (96.6 percent) did so which exceeded the national goal of 90 percent (**Figure 15**). All new cases reported in 2005, who were alive at diagnosis, have started therapy.

Figure 15. TB in Colorado: 1999-2004
Percent completing therapy within one year^a



a. Excludes patients with 1) initial resistance to rifampin, 2) bone, meningeal, or miliary TB in children (<15 years), and 3) those who died during 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. Thus it is critical to find, evaluate, and treat infected contacts when appropriate. **Table 9** gives a summary of contact investigations since 1999. In 2004, 48 investigations were completed and 1462 exposed persons were identified. Seven of these investigations were quite large—involving more than 70 persons each. Preliminary data for 2005 are not available until August 2006.

Table 9. TB in Colorado: 1999-2004
Follow-up and Treatment for Contacts to Tuberculosis Cases

	1999	2000	2001	2002	2003	2004^a
Number of sputum smear or culture positive cases	51	53	77	60	45	48
Total contacts	643	860	1107	1388	593	1462
Average contacts per infectious case	12.6	16.2	14.4	23.1	13.1	30.5
Number (%) of contacts evaluated ^b	474 (74%)	529 (62%)	864 (78%)	1017 (73%)	489 (82%)	1170 (80%)
Number (%) of contacts with latent TB infection	145 (31%)	229 (43%)	329 (38%)	253 (25%)	111 (23%)	351 (30%)
Number (%) of infected contacts starting treatment	115 (79%)	153 (67%)	233 (71%)	164 (65%)	89 (80%)	276 (79%)
Number (%) of contacts starting treatment who finished treatment	102 (89%)	86 (56%)	149 (64%)	121 (74%)	63 (71%)	187 (68%)
Number (%) of contacts with active TB disease	0	1 (<1%)	15 (1%)	2 (<1%)	3 (<1%)	16 (1%)
a. Preliminary data						
b. Evaluated=symptom check and tuberculin skin test, chest x-ray, sputum studies as indicated.						