

Tuberculosis in Colorado A Summary of Cases Reported in 2004

Colorado reported 127 new cases of active TB in 2004. With the exception of 2001 when 138 cases were reported, this is the highest number of cases reported in over two decades and a 14 percent increase from 2003 (**Figure 1**). **Table 1** shows a comparison between 2003 and 2004 cases. Birth in a high TB prevalence country is the number one risk factor, and excess alcohol use is a distant second.

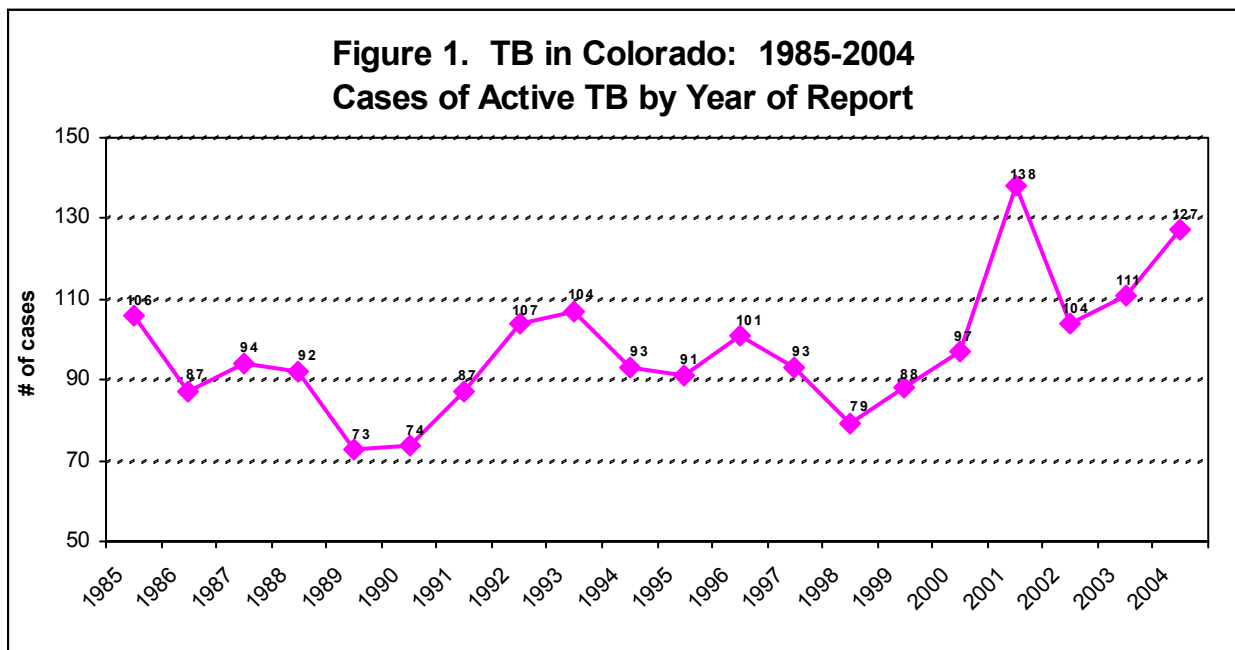


Table 1. TB in Colorado: Comparison of 2003 and 2004 Cases

	Year reported			
	2003		2004	
	n	%	n	%
Age Group (years)				
<15	19	17.1	25	19.7
15-24	10	9.0	18	14.2
25-44	42	37.8	41	32.3
45-64	21	18.9	24	18.9
65+	19	17.1	19	15.0
TOTAL	111	100.0	127	100.0
Gender				
Male	63	56.8	83	65.4
Female	48	43.2	44	34.6
TOTAL	111	100.0	127	100.0
Race/Ethnicity				
White	19	17.1	23	18.1
Black	9	8.1	36	28.3
Hispanic	52	46.8	53	41.7
Amer Ind/AK native	0	0.0	1	0.8
Asian/Pacific Is	31	27.9	13	10.2
Multiple race	0	0.0	1	0.8
TOTAL	111	100.0	127	100.0
Region				
Denver metro ^a	87	78.4	93	73.2
Other than Denver metro	24	21.6	34	26.8
TOTAL	111	100.0	127	100.0
Country of Origin				
United States	33	29.7	40	31.5
Mexico	35	31.5	35	27.6
Other countries	43	38.7	52	40.9
TOTAL	111	100.0	127	100.0
HIV Status Among 25-44 Age Group				
Negative	35	83.3	34	82.9
Positive	4	9.5	4	9.8
Testing done, results unknown	0	0.0	1	2.4
Refused testing	1	2.4	2	4.9
Not offered	2	4.8	0	0.0
TOTAL	42	100.0	41	41.0
Risk factors^b				
Birth in a high TB prevalence country	77	69.4	86	67.7
Homeless within past year	6	5.4	5	3.9
Resident of correctional facility at diagnosis	0	0.0	4	3.1
Resident of long-term care facility	3	2.7	3	2.4
Injected drug use within past year	1	0.9	1	0.8
Non-injected drug use within past year	2	1.8	1	0.8
Excess alcohol use within past year	10	9.0	13	10.2
Health care worker within past 2 years	5	4.5	4	3.1

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 2004, the overall case rate for TB in Colorado was 2.8 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 the minority populations all exceed 'low incidence' threshold (**Table 2**). At 8.9 per 100,000, the case rate in the minority population is 13 times the rate in the majority population. The incidence in Colorado's foreign-born population is 19.5 per 100,000. Colorado will need to reduce the number of new cases of TB to less than 50 to meet the "Healthy People 2010" goal of 1.0 or fewer cases per 100,000 population.

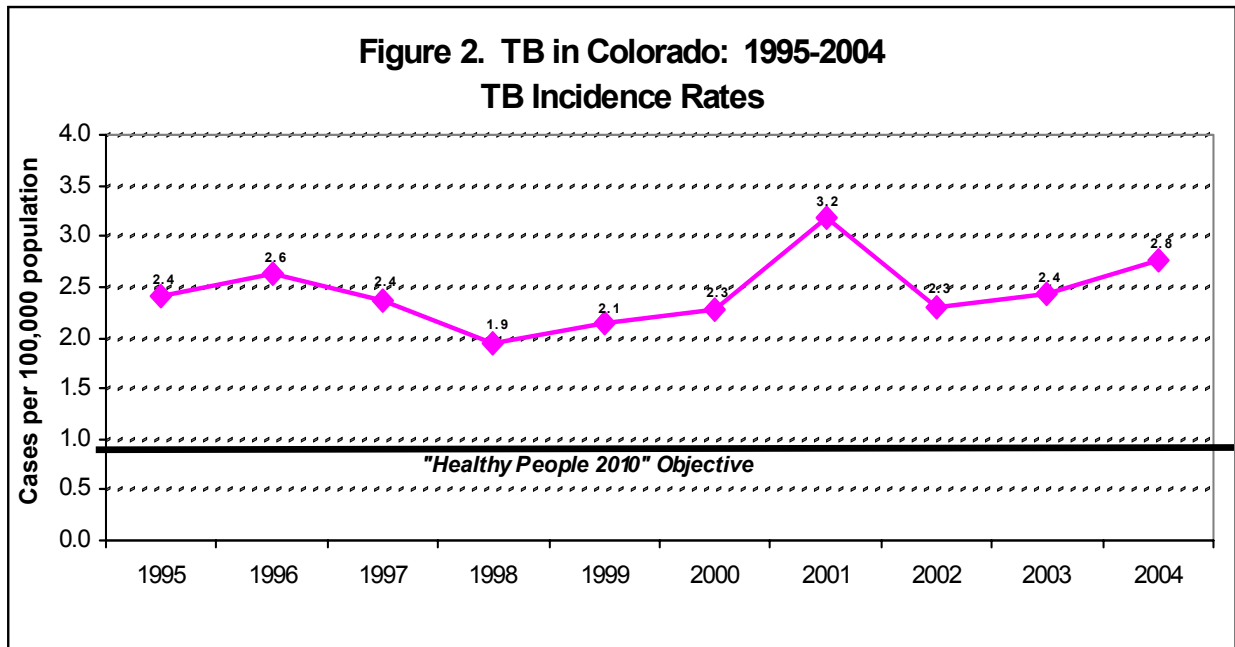
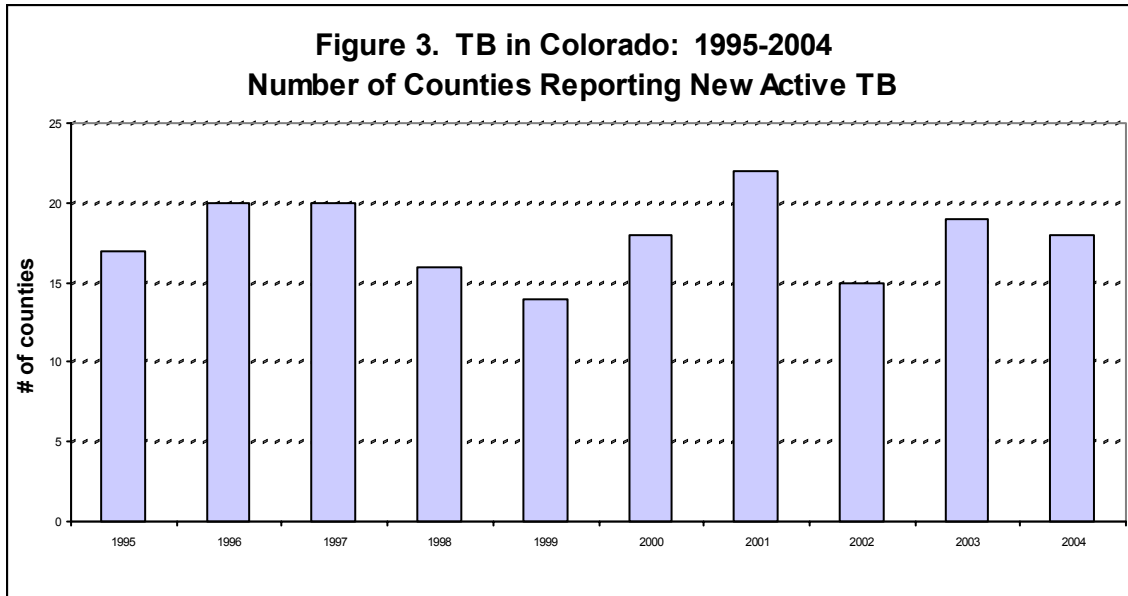


Table 2. TB in Colorado: 2004
Case Rates (per 100,000) by Race/Ethnicity

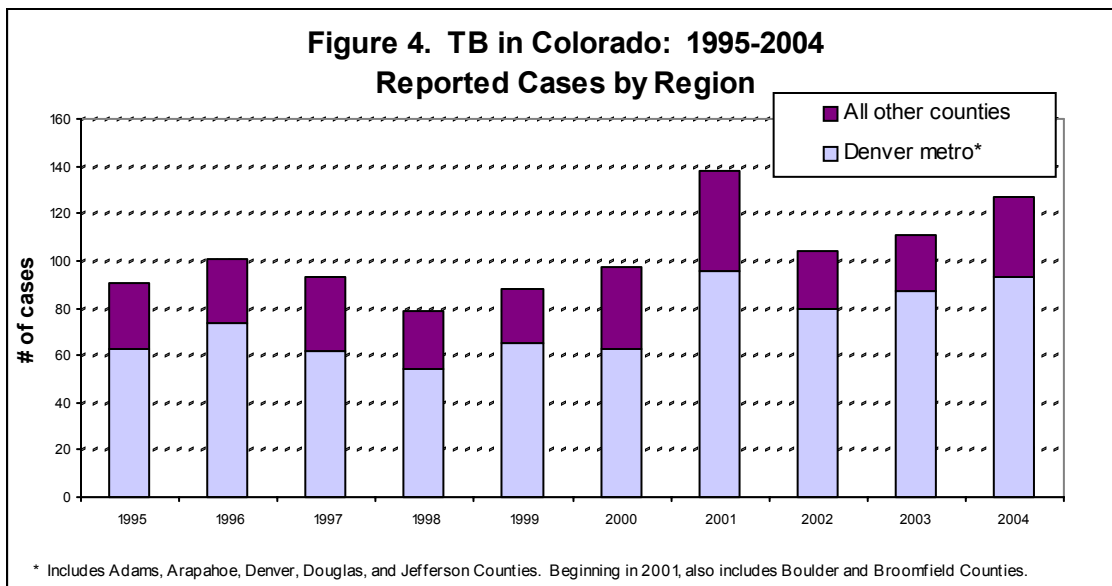
Race/ethnicity	2004		
	# cases	Pop est.	Rate
White	23	3,415,533	0.7
Black	36	168,782	21.3
Hispanic	53	784,284	6.8
Asian/Pacific Islander	13	103,654	12.5
Amer Ind/AK native	1	30,729	3.3
Multiple race	1	83,473	1.2
TOTAL	127	4,586,455	2.8
Year 2010 goal: <=1.0 cases per 100,000 population			

Location

Eighteen of the state's 64 counties reported a new case of TB in 2003 with the majority of cases being reported from the Denver metro area. Crowley, Grand, and Sedgwick Counties reported cases in 2004 after not having a case in at least eight years. Boulder County, after having the largest increase from 2002 to 2003 (five and 13 cases respectively), had the largest decrease in 2004 with only two cases. Denver County reported nine more cases than the previous year, and Weld County jumped from two cases in 2003 to nine cases in 2004 (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: 1993-2004
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
Adams	4	4	5	10	10	7	8	4	15	11	9	13
Alamosa	1	1	0	0	1	0	0	0	0	0	0	0
Arapahoe	9	7	11	13	10	6	12	11	11	20	20	18
Archuleta	0	0	0	1	0	0	0	0	0	0	1	0
Bent	2	0	0	0	0	1	0	0	0	0	0	0
Boulder	8	5	5	1	6	4	3	6	5	5	13	2
Broomfield	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	0
Chaffee	0	0	0	0	0	0	0	0	0	0	1	0
Conejos	1	0	0	0	0	0	0	0	0	0	1	0
Costilla	0	0	0	0	0	0	0	0	1	0	0	0
Crowley	1	0	0	1	0	0	0	0	0	0	0	1
Delta	2	2	1	1	0	0	0	2	1	0	0	0
Denver	51	39	45	40	37	34	39	42	55	38	38	47
Douglas	0	0	0	2	1	1	1	0	0	2	0	3
Eagle	1	0	1	1	3	0	0	2	0	1	2	0
El Paso	5	8	3	5	5	4	9	7	7	5	4	9
Elbert	1	0	0	0	0	0	0	0	1	0	1	0
Fremont	1	1	1	0	1	1	0	0	0	0	2	0
Garfield	0	1	0	0	1	1	0	0	0	1	0	0
Grand	0	0	0	0	0	0	0	0	0	0	0	2
Gunnison	0	0	0	0	1	0	0	0	2	0	0	0
Jefferson	8	4	3	8	4	6	5	6	9	4	7	10
La Plata	0	0	0	2	0	0	0	1	1	1	0	1
Lake	0	1	0	1	0	0	0	0	0	0	0	0
Larimer	1	2	4	0	3	1	0	2	3	3	3	2
Las Animas	0	0	2	1	2	0	1	0	1	0	0	0
Lincoln	0	1	0	0	0	1	0	0	0	0	0	0
Mesa	3	1	1	5	1	2	0	2	4	2	2	0
Moffat	0	0	0	0	0	0	1	0	0	0	0	0
Montezuma	0	0	1	0	0	0	0	1	0	0	0	2
Montrose	1	1	0	1	1	0	0	2	1	0	0	0
Morgan	0	3	2	1	1	0	0	1	0	1	1	1
Otero	1	0	0	1	1	2	1	1	3	0	0	0
Park	0	1	0	0	0	0	0	0	0	0	0	0
Phillips	0	0	0	0	0	0	1	0	0	0	0	0
Pitkin	1	0	0	0	0	0	0	1	1	0	0	0
Powers	0	1	0	0	0	0	0	0	0	0	0	0
Pueblo	4	3	3	4	1	5	5	0	3	6	2	3
Rio Blanco	0	0	0	0	0	0	0	0	0	0	1	1
Rio Grande	0	0	0	0	0	0	1	0	1	0	0	0
Routt	0	0	0	0	1	0	0	0	0	0	0	0
Saguache	0	0	0	0	0	0	0	0	2	0	0	0
Sedgwick	0	0	0	0	0	0	0	0	0	0	0	1
Summit	0	0	0	0	0	0	0	2	0	0	0	2
Washington	0	1	0	0	0	0	0	0	0	0	0	0
Weld	1	6	3	2	3	3	1	4	10	4	2	9
Yuma	0	0	0	0	0	0	0	0	0	0	1	0
TOTAL	107	93	91	101	94	79	88	97	138	104	111	127

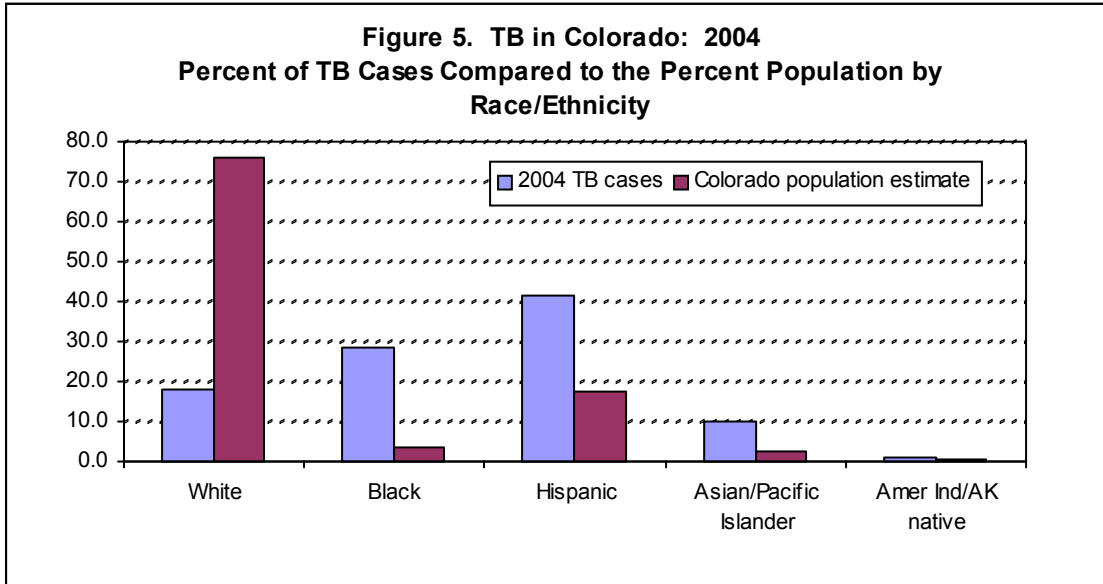
The rates in counties with small populations may vary considerably from year to year although there may be a change of only one or two cases. In order to make a more realistic comparison, the average incidence for counties during the past five years is listed in **Table 4**. At 3.4 cases per 100,000 per year, the incidence for the Denver metro counties combined is more than double the incidence in the rest of the state (1.5 per 100,000 per year).

**Table 4. Tuberculosis in Colorado: 2000-2004
Mean Case Rates by County**

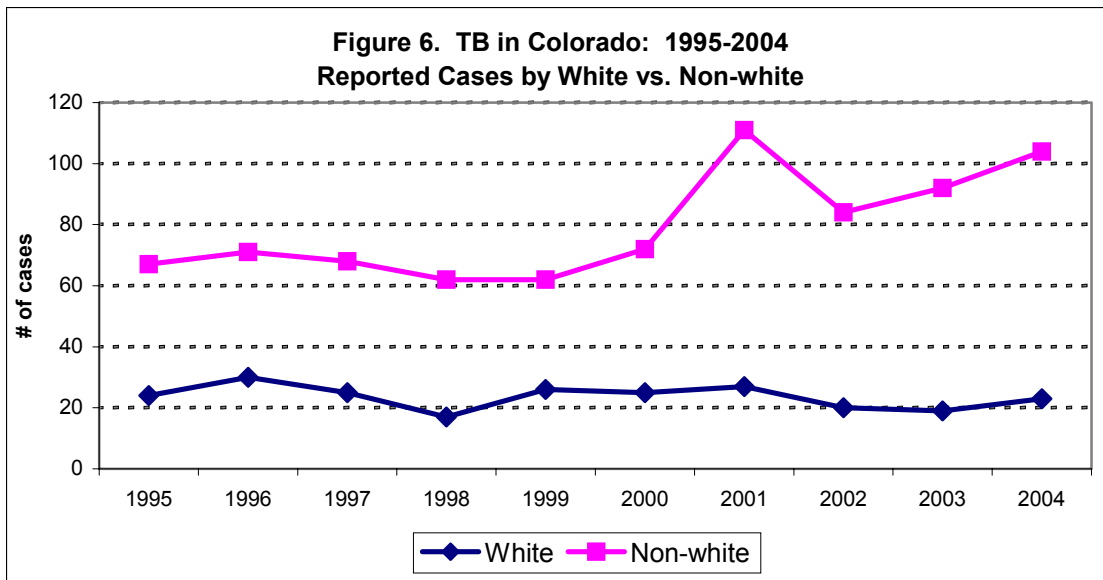
County	Mean cases	2002 population	Cases per 100,000 persons	County	Mean cases	2002 population	Cases per 100,000 persons
	2000-2004		per year		2000-2004		per year
Denver	44.0	560,882	7.8	Larimer	2.6	263,900	1.0
Sedgwick	0.2	2,743	7.3	Fremont	0.4	47,431	0.8
Rio Blanco	0.4	6,063	6.6	Broomfield	0.3	41,948	0.6
Saguache	0.4	6,195	6.5	Douglas	1.0	213,526	0.5
Costilla	0.2	3,746	5.3	Garfield	0.2	47,441	0.4
Otero	0.8	19,717	4.1	Alamosa	0.0	15,377	0.0
Crowley	0.2	5,822	3.4	Baca	0.0	4,401	0.0
Arapahoe	15.8	513,932	3.1	Bent	0.0	6,072	0.0
Summit	0.8	26,798	3.0	Cheyenne	0.0	2,207	0.0
Grand	0.4	13,421	3.0	Clear Creek	0.0	9,528	0.0
Weld	5.8	201,164	2.9	Custer	0.0	3,769	0.0
Morgan	0.8	27,854	2.9	Dolores	0.0	1,876	0.0
Gunnison	0.4	13,999	2.9	Gilpin	0.0	4,899	0.0
Adams	10.4	375,380	2.8	Hinsdale	0.0	810	0.0
Montezuma	0.6	24,216	2.5	Huerfano	0.0	8,034	0.0
Pitkin	0.4	16,257	2.5	Jackson	0.0	1,603	0.0
Conejos	0.2	8,400	2.4	Kiowa	0.0	1,574	0.0
Boulder	6.4	282,069	2.3	Kit Carson	0.0	8,034	0.0
Eagle	1.0	45,819	2.2	Lake	0.0	8,005	0.0
Delta	0.6	29,196	2.1	Lincoln	0.0	6,123	0.0
Yuma	0.2	9,911	2.0	Logan	0.0	21,917	0.0
Pueblo	2.8	147,057	1.9	Mineral	0.0	865	0.0
Archuleta	0.2	10,912	1.8	Moffat	0.0	13,351	0.0
Elbert	0.4	21,936	1.8	Ouray	0.0	3,977	0.0
La Plata	0.8	46,281	1.7	Park	0.0	15,738	0.0
Montrose	0.6	35,435	1.7	Phillips	0.0	4,529	0.0
Mesa	2.0	122,463	1.6	Prowers	0.0	14,180	0.0
Rio Grande	0.2	12,559	1.6	Routt	0.0	20,941	0.0
Jefferson	7.4	530,847	1.4	San Juan	0.0	563	0.0
Las Animas	0.2	15,836	1.3	San Miguel	0.0	7,135	0.0
Chaffee	0.2	16,692	1.2	Teller	0.0	21,988	0.0
El Paso	6.4	541,069	1.2	Washington	0.0	5,071	0.0

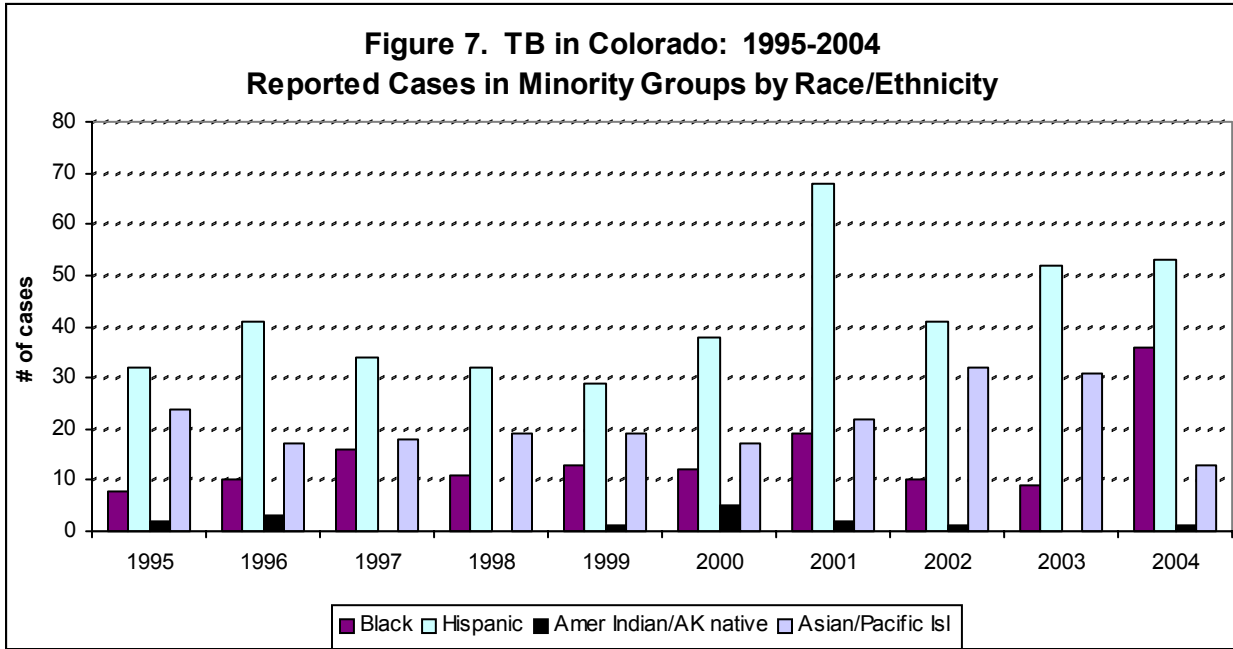
Race/Ethnicity

Of the 127 TB cases, 104 (82 percent) occurred in racial and ethnic minorities. Forty-two percent of the cases were classified as nonwhite Hispanic and 28 percent were classified as African American/Black. The number of cases in Black jumped from nine reported in 2003 to 36 in 2004. Thirty-one of those 36 cases were foreign-born. As compared to Colorado's population, which is approximately 74 percent non-Hispanic white, minorities are over-represented among TB cases (Figure 5).



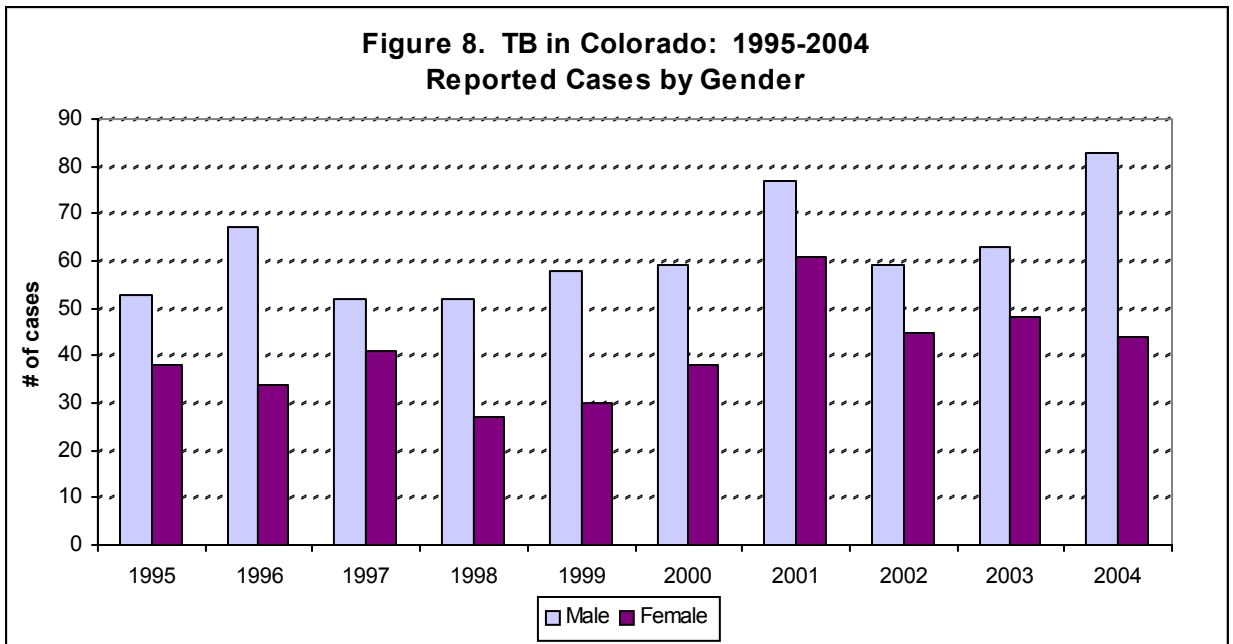
The number of cases among the white race/ethnicity group has been relatively stable, while cases among the non-white race/ethnicity groups have increased (Figure 6). The number of cases by race/ethnicity among minority groups is shown in Figure 7.





Gender/Age

In 2004, nearly twice the number of cases of TB occurred among males compared to females (Figure 8).

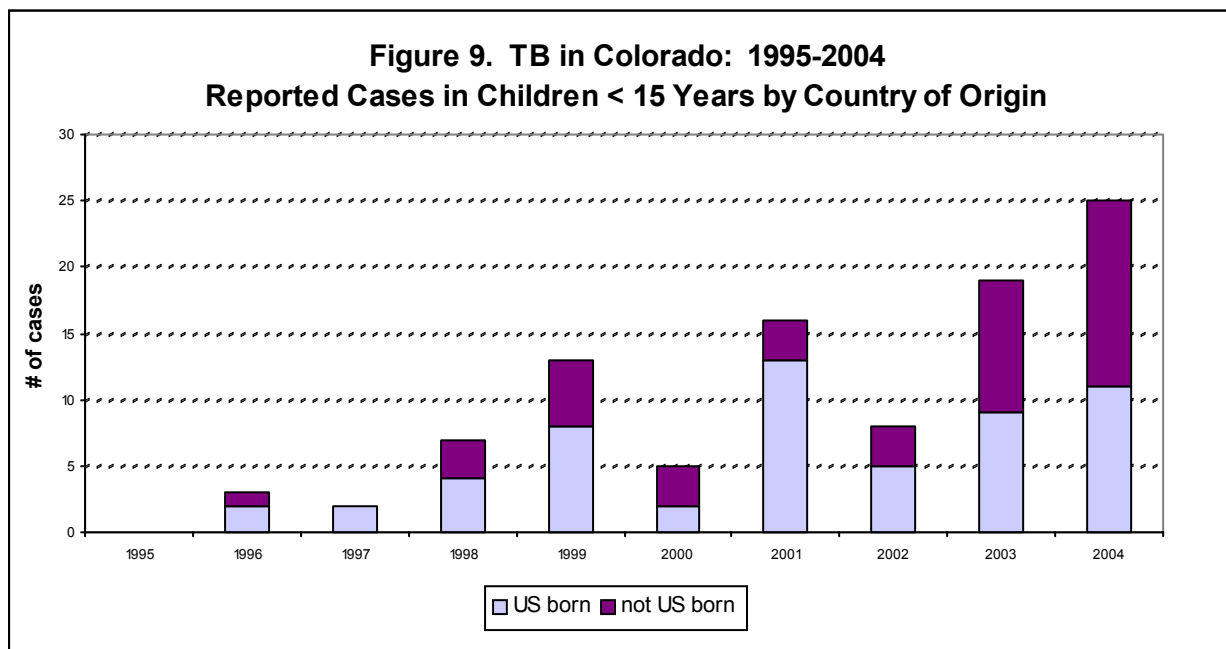


The ages of persons reported with TB in 2004 ranged from less than one year to 93 years with an average of 36 years. The 75-84 years age group had the highest incidence with 5.2 cases per 100,000 population (**Table 5**). Twenty-five cases (20 percent) were in children less than 15 years; 14 were children less than five years. Of the 25 cases in children, 11 were US-born, and 14 were foreign-born (**Figure 9**). Eleven of the 14 foreign-born children were newly arrived in the United States. Cases in children are especially concerning because they are a sign of recent transmission and missed opportunities for TB prevention.

Table 5. TB in Colorado: 2004
Cases and Case Rates by Age Group and Gender

Age group	Male	Female	Total	Pop.est.	Rate*
0-14	18	7	25	966,498	2.6
15-24	11	7	18	659,943	2.7
25-34	15	8	23	681,694	3.4
35-44	12	6	18	732,906	2.5
45-54	11	5	16	683,431	2.3
55-64	4	4	8	414,283	1.9
65-74	5	4	9	243,086	3.7
75-84	5	3	8	153,115	5.2
85+	2	0	2	51,500	3.9
TOTAL	83	44	127	4,586,455	2.8

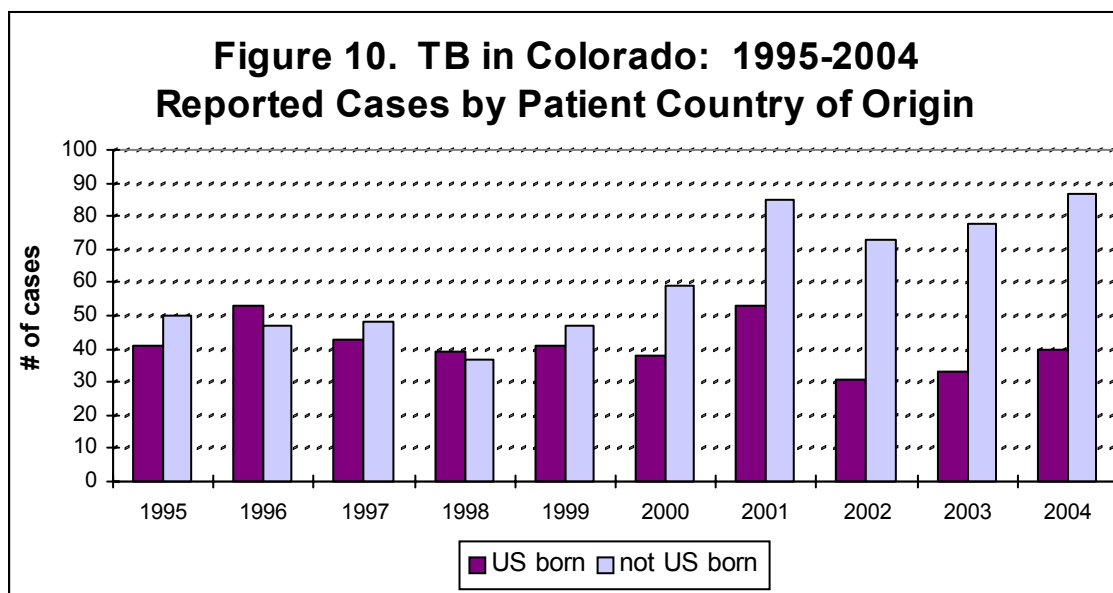
* Cases per 100,000 persons.



Foreign-born

In 2004, 69 percent of the cases were foreign-born (**Figure 10**). Cases were born in 26 different countries with Mexico being the predominant country of origin (**Table 6**). Thirty-one cases were from African countries.

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. Of the foreign-born cases reported in 2004, four were designated as Class B TB. An additional 18 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: 2004
Patient Country of Origin**

Country	# of cases	Country	# of cases
China	2	Pakistan	1
Congo	1	Peru	1
El Salvador	1	Philippines	2
Ethiopia	9	Puerto Rico	1
Ghana	1	Senegal	1
India	4	Somalia	6
Iraq	1	Soviet Union	2
Japan	1	Sudan	5
Kenya	2	Thailand	1
Korea	1	Uganda	3
Liberia	1	Ukraine	1
Mali	1	Vietnam	2
Mauritania	1		
Mexico	35	TOTAL	87

Table 7 shows the number of cases by age group for those born in the United States and those born outside the United States.

Table 7. TB in Colorado: 2004			
Reported Cases by Age Group and Patient Country of Origin			
Age Group	USA	Foreign	Total
0-4	8	6	14
5-14	3	8	11
15-24	1	17	18
25-34	1	22	23
35-44	6	12	18
45-54	5	11	16
55-64	3	5	8
65-74	5	4	9
75-84	6	2	8
85+	2	0	2
TOTAL	40	87	127

Elapsed time since entry into the U.S. was available for all 87 foreign-born cases reported in 2004. Twenty-seven (31 percent) were in the U.S. less than six months prior to diagnosis; eight (nine percent) had been in the U.S. six to 12 months; 20 (23 percent) had been in the U.S. more than one year and less than five years; and 32 (37 percent) had been in the U.S. for more than five years. Foreign-born cases were in the U.S. an average of six and a half years prior to diagnosis.

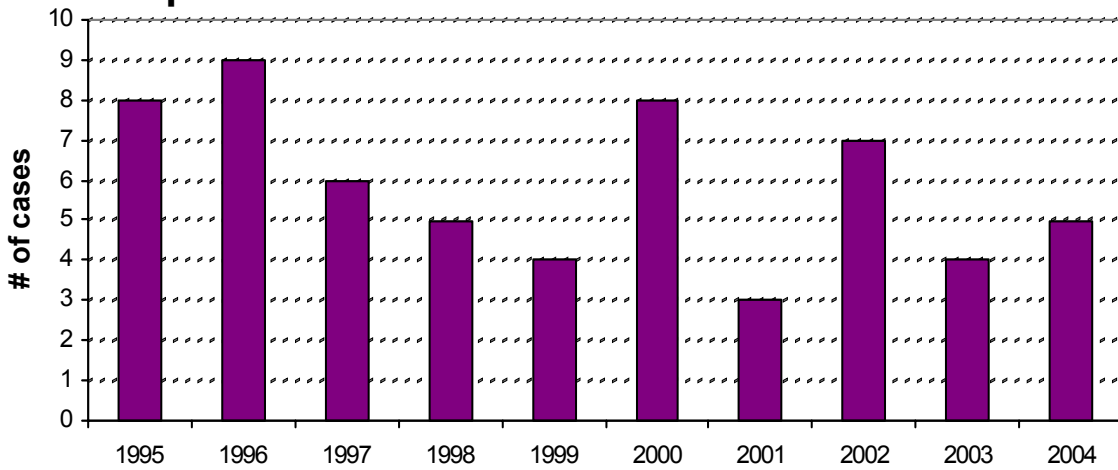
Occupation

The occupational status is known for 124 of the 127 cases reported in 2004. Four cases were health care workers (currently or within the past two years); 48 worked at a variety of jobs not known to present a high risk for TB; and 72 were unemployed (including children and retired persons).

HIV/TB Co-infection

In 2004, five cases of active TB were co-infected with HIV (**Figure 11**). HIV testing was done in 76 percent of cases (96 of 127). 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 93 percent of cases age 25-44.

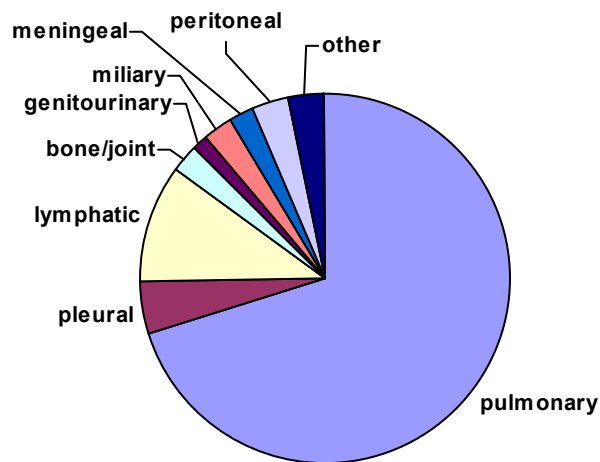
**Figure 11. TB in Colorado: 1995-2004
Reported Cases known to be co-infected with HIV**



Site of Disease

Though the majority of TB cases (70 percent) were pulmonary, TB caused disease in many other sites (**Figure 12**).

**Figure 12. TB in Colorado: 2004
Site of disease**



Drug Susceptibilities

Drug susceptibility results were available for all culture-positive TB cases in 2004. Seven (9.3 percent) of the 75 culture-positive cases were resistant to one or more primary drugs (isoniazid-INH, rifampin-RIF, pyrazinamide-PZA, ethambutol-EMB). All seven cases with drug resistance were foreign-born. The primary resistance patterns were as follows:

3 INH only

3 PZA (NOTE: All *Mycobacterium bovis*. *M. bovis*, which is part of the MTB complex, causes tuberculosis in humans, cattle, and other warm-blooded animals. It is characteristically resistant to PZA.)

1 INH, RIF, and EMB

(Of note, since streptomycin is no longer considered a *primary* drug for the treatment of TB, resistance to streptomycin is not listed.)

There were four new cases of multi-drug resistant (MDR) TB -- defined as being resistant to at least INH and RIF (**Figure 13**). One of the cases was culture-positive and had susceptibility results available. The other three cases were culture-negative; however they were contacts to a culture-confirmed case of MDR.

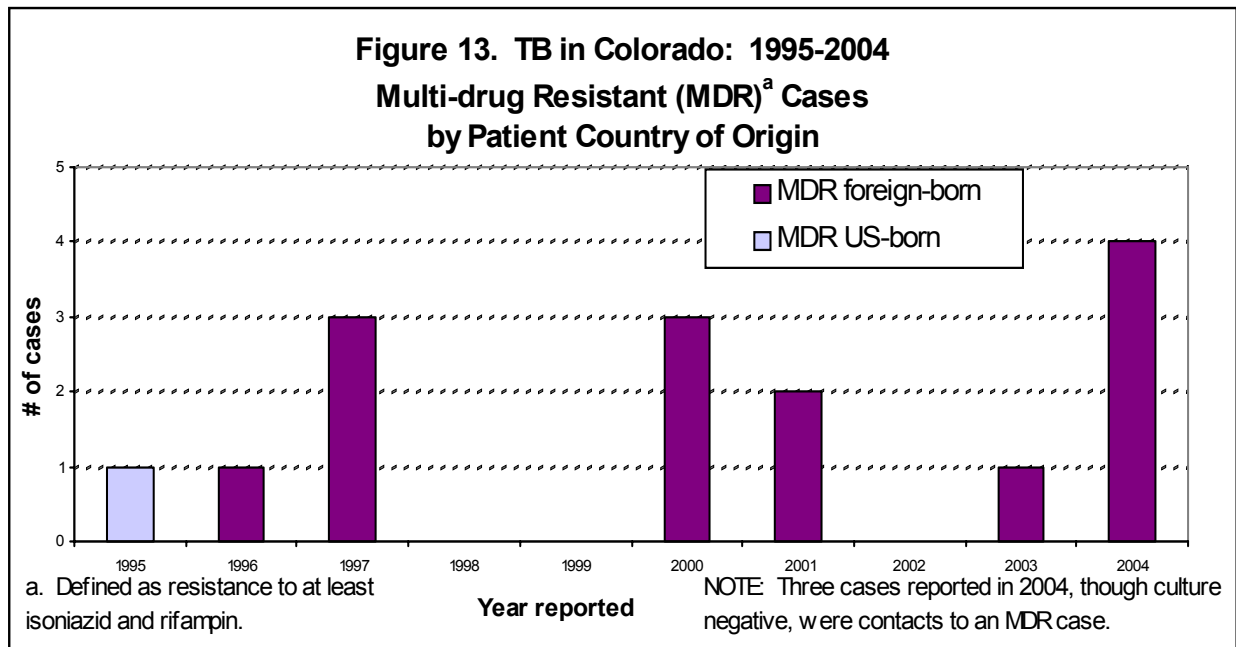
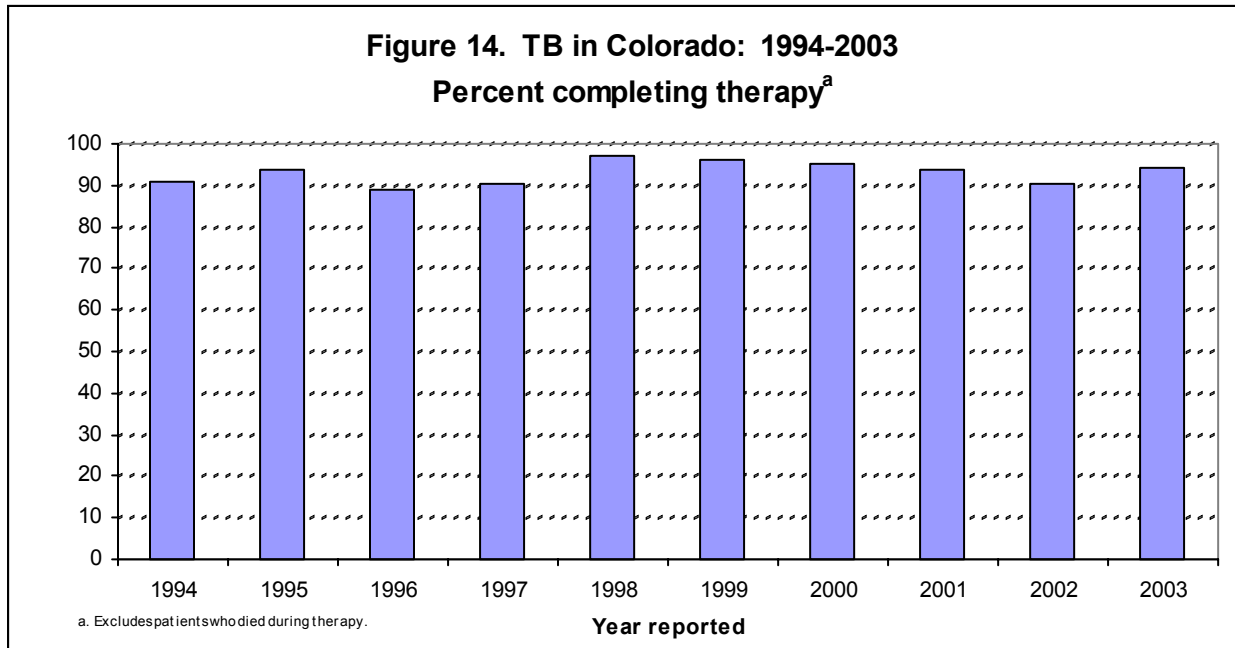


Table 8 describes the 18 cases of MDR TB in Colorado from 1995 to 2004. Three of the cases, though diagnosed in other countries, were managed and treated in Colorado.

Table 8. TB in Colorado: 1995-2004						
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
1995	60-64	M	Denver	US	IRS	completed (26 months)
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	currently on therapy ^d
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 5/2005.						

Completion of Therapy

The usual treatment for TB is six months using INH, RIF, PZA, and EMB. The Colorado Board of Health requires directly-observed therapy for pulmonary TB. As shown in **Figure 14**, over 90 percent of patients reported in 2003 completed an appropriate course of therapy. All new cases reported in 2004, who were alive at diagnosis, have started therapy.



Contact Investigations

It is a public health responsibility to conduct contact investigations on all cases of infectious (pulmonary and laryngeal) TB. Contacts to infectious cases are evaluated for the presence of latent or active 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 from 1999 to 2003. Preliminary data for 2004 are not available until August 2005.

Table 9. TB in Colorado: 1999-2003					
Follow-up and Treatment for Contacts to Tuberculosis Cases					
	1999	2000	2001	2002	2003^a
Number of sputum smear or culture positive cases	51	53	77	60	45
Total contacts	643	860	1107	1388	593
Average contacts per infectious case	12.6	16.2	14.4	23.1	13.1
Number (%) of contacts evaluated ^b	474 (74%)	529 (62%)	864 (78%)	1017 (73%)	489 (82%)
Number (%) of contacts with latent TB infection	145 (31%)	229 (43%)	329 (38%)	253 (25%)	111 (23%)
Number (%) of infected contacts starting treatment	115 (79%)	153 (67%)	233 (71%)	164 (65%)	89 (80%)
Number (%) of contacts starting treatment who finished treatment	102 (89%)	86 (56%)	149 (64%)	121 (74%)	63 (71%)
Number (%) of contacts with active TB disease	0	1 (<1%)	15 (1%)	2 (<1%)	3 (<1%)
a. Preliminary data					
b. Evaluated=symptom check and tuberculin skin test, chest x-ray, sputum studies as indicated.					